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Rixs Creek Rehabilitation Strategy
Rix's Creek Pty Ltd
11-Oct-2018

Rix's Creek Mine - Rehabilitation Strategy

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Client: Rix's Creek Pty Ltd

ABN: 25 003 824 244

Prepared by

AECOM Australia Pty Ltd
St Patrick's Commercial Centre, Queens Street, Singleton NSW 2330, Australia
T +61 2 6575 9000 F +61 2 6575 9099 www.aecom.com
ABN 20 093 846 925

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Quality Information

Document Rix's Creek Mine - Rehabilitation Strategy

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Prepared by Dee Murdoch

Reviewed by Simon Murphy

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	29-Jun-2015	Specialist Report - Draft for peer review	Simon Murphy Project Manager	
B	03-Aug-2015	Specialist Report - Draft - for client review	Simon Murphy Project Manager	
C	19-Aug-2015	Final - Consistency Review	Simon Murphy Project Manager	
E	26-Sep-2018	Final draft	Simon Murphy Project Manager	
F	11-Oct-2018	Final	Simon Murphy Project Manager	

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1.0 Introduction

1.1 Project Background

1.1.1 Overview

Rix's Creek Mine (the Mine), is owned and operated by Bloomfield Collieries Pty Limited, a subsidiary of The Bloomfield Group (Bloomfield). The Mine is an open cut coal mine approximately 5km north-west of Singleton in the Hunter Valley Coalfields of NSW. The Mine currently produces approximately 1.5 million tonnes per annum (Mtpa) of product coal from its existing operations.

The Bloomfield Group is seeking approval for the Rix's Creek Continuation of Mining Project (the Project), which relates to the continued operation of the existing open cut coal mine. The Project would allow the Mine to continue to operate as an open cut mine, accessed via its existing infrastructure facilities.

The Project seeks to extend the life of the existing open cut mining operation until approximately 2037. The continuation of mining operations will extend in a north-westerly direction mining within current Mining Lease Boundaries however will require an additional Mining Lease (MLA 487) for an out of pit dump. The continuation of operations will utilise the existing mine access, Coal Handling and Preparation Plant (CHPP), coal stockpiling and rail facilities.

This version of the Rehabilitation Strategy builds on the August 2015 version and has been developed to address the Independent Planning Commission (IPC) 'recommendations', specifically R8 to R15 which relate to rehabilitation and mine closure.

1.1.2 Proposed Development

The Project seeks to continue the existing mining operation at the Mine and to mine up to 4.5Mtpa ROM coal per year. Mining methods will be the same as those currently employed at the Mine, being multi-seam bench open cut techniques. Run of mine (ROM) coal will continue to be processed onsite at the existing CHPP which has capacity to accept the proposed increase in throughput. Product coal will then be transported by rail to the port of Newcastle. It is estimated that the Mine could yield a total of 32 million saleable tonnes of coal at an overburden ratio of approximately 10.5:1, before coal seams are exhausted.

The components of the proposed development comprise:

- The ongoing use of, and future additions to, the existing mine fleet;
- Use of the existing mine infrastructure facilities including the CHPP;
- Continuation of operating hours - 24 hours a day 7 days a week;
- Use of existing and new rejects and tailings emplacements;
- Rail transport of product coal to the port of Newcastle;
- Mine closure and rehabilitation; and
- Environmental management.

1.2 Project Area

The mine is located in the Upper Hunter Valley, within the Singleton local government area, approximately 1.5km northwest of Singleton. The site occupies an area of approximately 1,823 hectares (ha), and is dissected in half by the New England Highway. Refer **Figure 1** for the Project location and **Figure 2** for the layout of the existing Project area.

1.3 Purpose of the Report

The following Section provides information on the various regulatory requirements that form the basis for the Rehabilitation Strategy, whilst also collating all relevant rehabilitation objectives and practices as have been documented in the Mining Operations Plan (MOP) (Rehabilitation Management Plan) and EIS documents

1.3.1 Regulatory Requirements

1.3.1.1 Director-General's Requirements

The Rix's Creek Continuation of Mining Project Environmental Impact Statement has been prepared in accordance with Division 4.1, Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) which ensures that the potential environmental effects of a proposal are properly assessed and considered in the decision-making process.

In preparing this Rehabilitation Strategy, the Director–General's Requirements (DGRs) issued for the Rix's Creek Continuation of Mining Project (SSD 13_6300) on 3 March 2014 have been addressed as required by Clause 75F of the EP&A Act, whilst the Strategy also provides a platform for the rehabilitation program across the entire Mine. The key matters raised by the Director-General for consideration in the Rehabilitation Strategy are outlined in **Table 1** along with a reference to where the requirements are addressed in the report.

Table 1 Director General Requirements Applicable to Rehabilitation Impact Assessment

Director Generals Requirement		Section Addressed
Rehabilitation	Rehabilitation – including the proposed rehabilitation strategy for the site (assuming closure of the mine upon completion of the proposed development), having regard to the key principles in the Strategic Framework for Mine Closure, including: • rehabilitation objectives, methodology, monitoring programs,	This document
	• performance standards and proposed completion criteria;	**Section 7.0**
	• nominated final land uses and land forms (including cross sections), having regard to any relevant strategic land use planning or resource management plans or policies;	**Sections 5.0**and **6.0**
	• justification for inclusion and proposed location of a final void, and consideration of alternatives; and	**Section 5.8**
	• the potential for integrating this strategy with adjacent mines.	**Section 6.7**

1.3.1.2 IPC Requirements

The key matters pertaining to rehabilitation and mine closure which were raised in the IPC report are listed in Table 2, along with a reference to where the requirements are addressed in this document.

Table 2 IPC Report Recommendations

IPC Recommendation		Section Addressed
R8	That in order to address the principles of *Strategic Framework for Mine Closure,* the applicant implement the recommendations of the Unger Report requiring the applicant to prepare a stakeholder engagement strategy that ensures that stakeholders' specific issues of rehabilitation and closure are addressed appropriately in the Rehabilitation Strategy	**Sections 3.1** and **6.7**

IPC Recommendation		Section Addressed
R9	That the applicant records all targeted consultation on mine rehabilitation and closure planning within the Rehabilitation Strategy and demonstrates where issues raised in community consultation have been considered in the development of the Rehabilitation Strategy	**Section 3.1**
R10	That the applicant collates and includes all relevant rehabilitation objectives and practices identified within the MOP and other EIS documents into the Rehabilitation Strategy so that it is a consolidated reference for the rehabilitation and closure of the mine	**Section 1.3.2**
R11	in order to address the principles of *Strategic Framework for Mine Closure*, the Commission recommends that the Rehabilitation Strategy:	-
a	Identify all mine closure domains;	**Table 5**
b	Label and describe all domains including the proposed post mining land use;	**Section 5.0**
c	Ensure that rehabilitation and closure objectives, performance standards and completion criteria exist for all domains;	**Table 9**
d	consider sudden unplanned closure and temporary closure (care and maintenance);	**Section 4.0** and **Appendix A**
e	include a detailed commitment register;	**Section 1.3.2.2**
f	Identify and consult with stakeholders to explore closure risks and opportunities further; and	**Section 4.2**
g	include a plan to ensure that the Rehabilitation Strategy is updated and refined regularly to reflect changes in mine development and operational planning and environmental conditions	**Section 4.4**
R12	That the applicant carry out an evaluation of the socio –economic impacts of mine closure during the preparation of, and in the regular updates to, a Detailed Mine Closure Plan	**Section 4.5**
R13	That the applicant include a section in the Rehabilitation Strategy outlining the knowledge base around the past rehabilitation performance. This is intended to demonstrate that the site is able to achieve the proposed post mining land use. This knowledge base should be a summary of all existing baseline aspects as they relate to mine closure and demonstrate the outcomes from past rehabilitation showing where any lessons learnt have been incorporate in to the rehabilitation and mine closure planning for the site. The inclusion of this information in the Rehabilitation Strategy could further improve the provision of information to the community on progressive rehabilitation performance and site knowledge an which would support the proposed post mining land uses	**Section 2.1**
R14	That the Rehabilitation Strategy be revised to demonstrate a risk based approach to rehabilitation and closure. This would include the preparation of a register outlining the risks and opportunities relating to the closure of the mine. This should include not only the risks and opportunities relating to the physical closure and rehabilitation works, but also give regard to any existing legacy of residual (future) risks in accordance with the Principles of the *Strategic Framework for Mine Closure*	**Sections 4.0** and **8.4**

IPC Recommendation		Section Addressed
R15	That the Rehabilitation Strategy be revised to include additional detailed information around the final void water levels and water quality, including an assessment of any potential beneficial uses for the water that could be consider following closure of the mine	**Section 5.8**
R17	That the applicant explores opportunities to undertake an assessment of void water re-use. where opportunities are identified , these should be included in the Rehabilitation Strategy	**Section 5.8**
R26	That the applicants Heritage Management Plan and Rehabilitation Strategy detail how the Coke Ovens will be better accessed by the public given the historical significance of the site and provide options on how the site can be managed throughout the life of the Project and beyond mine closure.	**Section 5.2**

1.3.2 Rehabilitation Objectives

1.3.2.1 Mining Operations Plan – Rehabilitation Management Plan

The aim of the rehabilitation program at the Mine is to reinstate the pre-mining land capability of grazing land, with the post mined lands being revegetated with pasture species and areas of trees over grass to provide enhanced habitat for both native animals and domesticated stock. The focus on the earthworks and rehabilitation program is to provide stable landforms, compatible with the surrounding landscape that will allow optimal post mining landuse in terms of current social and economic constraints.

The proposed final landform at the Mine will:

- Provide a post mining landscape which will be safe and non-polluting, with a stable drainage network;
- Not impact the area of Land and Soil Capability Class 2 lands (SLR Consulting Australia Pty Ltd, 10 June 2015) and **Table 7**;
- Provide slopes of less than or equal to 10º (18%) (Land and Soil Capability Class 4) over the majority (53.8%) of the site;
- Provide slopes between 10-18^{o} (Land and Soil Capability Class 5) over 34% of the site;
- Have 80.7ha of land below water in the final void; and
- Limit areas of greater than 18° (33%) slopes to 7.7% of the Project area i.e. the batters of the tunnels under the highway and sections of the batters of the final void (Land and Soil Capability Class 6), prior to the void filling with water.

The area of the open body of water (80.7ha or 4% of the Project area) that will comprise the final void, with the level as predicted as at 2042, has not been included in the assessment of percentages of slope across the site, as the open body of land has been deemed as not being relevant in terms of quantifying land and soil capability.

1.3.2.2 EIS Documentation

The 2015 EIS document describes the overarching objectives with the following commitments to rehabilitation;

- Rehabilitation works will be closely integrated with mine production and will be undertaken progressively as mining proceeds;
- Disturbed land will be returned to a stable condition with a land capability at least equal to that which existed prior to mining;
- Creation of stable landforms compatible with the surrounding landscape;

- Establishment and maintenance of native vegetation links within the Mine Lease and to adjoining lands;
- Re-establish land with agricultural capability similar to the land prior to mining disturbance:
- Re-establishment of grazing lands on the most suitable areas of the site;
- To maintain a natural land form and the visual character of the site consistent with rural areas in the vicinity of the Mine;
- To establish surface water control devices that mimic pre mining hydrology; and
- To reinstate the Mine area into a mix of appropriate land uses suitable for the soil and landscape within which the Mine is situated, as well as having consideration of the Mine proximity to Singleton and potential higher uses which may be suitable for the location.

The overarching commitments within the 2015 EIS have provided the basis for the development of the Rehabilitation Strategy. Both the EIS and Rehabilitation Strategy will inform future Mining Operations and Rehabilitation Management Plans.

1.4 Report Structure

This report is structured as follows:

Section 1.0 Introduction – outlines the Project and presents the purpose of the report.

Section 2.0 History of land management at Rix's Creek Mine – includes rehabilitation goals and objectives and lessons learnt.

Section 3.0 Stakeholder consultation.

Section 4.0 Risk Assessments, including impact and opportunities.

Section 5.0 Proposed future use of disturbed areas

Section 6.0 Phases in the Rehabilitation Strategy - Safeguards and management - provides a summary of environmental mitigation and management responsibilities in relation to rehabilitation and land management for the Project.

Section 6.0 Performance Criteria, Measures and Indicators.

Section 7.0 Rehabilitation monitoring and reporting.

Section 8.0 Bibliography.

Section 9.0 Acronyms.

2.0 History of Land Management at Rix's Creek Mine

The Mine commenced operations in July 1990 following the granting of development consent on 19 October 1989. Since that time, the site has operated with a fleet of bulldozers, scrapers and more recently front end loaders and trucks to remove and manage overburden, topsoil and subsoil material with site currently occupying an area of approximately 1,823 ha and the project expansion for the continuation of mining with a final footprint of 2004.6 ha.

Historically voids from the mining operations have been used to manage tailings. Previous tailing emplacements have been dewatered and dried and the area covered with overburden material and rehabilitated with a pasture base plant community during the life of the Project. The success of recent trials linked to the drying of tailings from the CHPP will allow co-disposal of tailings with coarse reject, thus removing the need for additional tailings emplacements.

All carbonaceous and coarse reject materials are covered by a minimum of two metres of inert overburden material before the spoil area is shaped and rehabilitated. This mitigates any potential risk of spontaneous combustion and the stability of tip faces within the spoil area.

The rehabilitation program at the Mine is supported by over 80 year's company experience in mining and over 25 years in land management. The objective of the program is to reinstate the pre-mining land capability of grazing land, with stable landforms, compatible with the surrounding landscape, and allow for a range of possible post-mining land-uses. **Figure 3** shows the post mining landform as at 2042.

The Final Landform as shown in **Figure 3** is subject to the assessment of benefits of removing the western overburden emplacement area against the potential environmental impacts associated with increasing the height of the existing North Pit Dump and South Pit Dump. This assessment is being conducted following recommendation by the Independent Planning Commission for Rix's Creek Mine to conduct a "trade-off study" (R16). Pending outcome of the "trade-off study" the Rehabilitation Strategy will be modified to reflect the approved final landform.

The key elements of the rehabilitation program have and will continue to include:

- Setting overall rehabilitation aims and objectives;
- Developing appropriate rehabilitation performance indicators and completion criteria;
- Implementing in a timely manner the land rehabilitation program;
- Developing, reviewing and implementing a rehabilitation assessment program;
- Integration of the rehabilitation program into the Mine Environmental Management System (EMS) and Environmental Management Plans (EMP). The EMS and EMP provide a framework for environmental standards and procedures that are followed during construction, operation and decommissioning of its mining operations;
- Conducting a number of audits and inspections throughout the year, including regular internal EMS and compliance audits and other less routine audits. Site based environmental personnel also conduct regular inspections of all work areas. These assessments are reported in the site Annual Review Report which compiles monitoring results and discusses trends, system changes and responses to any potential issues identified during monitoring. Targets and future initiatives are also identified;
- Environmental monitoring and reporting via the monthly and Annual Review (AR) which are disseminated via the Rix's Coal Mine Community Consultative Committee (CCC), engagement with regulators and the company website – www.bloomcoll.com.au; and
- A request for rehabilitation sign-off to regulators, supported by results of the monitoring and reporting initiative above.

2.1 Lessons Learnt

Table 3 provides a summary of all existing baseline aspects as they relate to mine closure and how the knowledge, skills and lessons learnt from these practices have been incorporated into the rehabilitation and mine closure planning and day to day practices for the site.

Current trials underway are the Grazing Land Monitoring Trial at Rix's Creek Mine and an ACARP trial conducted at Rix's Creek Mine on how to economically protect high erodible spoil materials in rehabilitation. Both projects will have key outcomes and learnings that will enhance site knowledge and improve rehabilitation and final land use outcomes.

Table 3 Lesson Learnt from Past Practices

Outcome	Lesson Learnt
University of Newcastle Masters Thesis by CP Phillips "Utilisation of Sewage Sludge for Mine Site Rehabilitation – The Rix's Creek Mine Trial – 1992-1993"	
16 plots which received an application of biosolids produced dry biomass yields at least 125% higher than that of the standard plot. The particular significance of this result is that plots of pure overburden that were amended by an application of biosolids were able to sustain high biomass yields.	The most important conclusion of the trial was that biosolids application improved mine site rehabilitation techniques. No problems were encountered with the integration of biosolids into a normal rehabilitation program.
2005 Rix's Creek Beneficial use of Biosolids Trial collaboration with Thiess Services Pty Ltd and Sydney Water Corporation.	
A dewatered biosolids added nutrients and organic matters to topsoil and top soil substitutes which saved cost of using artificial fertilisers. Biosolids were incorporated into the subsoil clay material layer and topsoil layer during the rehabilitation process. Biosolids application rates of 50dt/ha (180mm thick) commensurate with current practice at State Forest NSW.	The application of biosolids improved mine site rehabilitation.
Resources Recovery Management – Rix's Creek Pasture Assessment Trial September 2014 – October 2017	
The purpose of this trial was to assess the quality and quantity of pasture produced on mine rehabilitation sites and determines the suitability of the site for the intended agricultural end use. Improved pasture was sown on four treatments, which included a Control using conventional fertiliser, Biosolids, and two Alternate Waste Treatment (AWT) Compost treatments. An un-grazed Native Pasture area was also sampled to gather comparable baseline data. Random quadrats were assessed along transect lines in each treatment for species diversity, herbage mass and forage quality. Data was collected annually for 4 years, commencing 12 months after sowing. The application of organic soil amendments increased pasture productivity and the dominance of the tall subtropical grasses (i.e. Rhodes and Panic), compared to the Control. This increased dominance of the Rhodes and Green Panic also reduced pasture diversity, with the Control plot demonstrating the highest diversity of pasture species. Grazing is likely to complement the long term objectives of improving pasture species diversity and forage quality.	Due to variation within treatments, the impacts on the soils were difficult to identify. However, the application of Biosolids and AWT Compost did significantly increase soil phosphate, with the AWT Compost 2 treatment demonstrating excessive soil phosphate levels. Soil nitrate levels were also higher in the Biosolids Treatment. In summary, all four treatments demonstrated that the sowing improved pasture species on rehabilitation sites was capable of producing more productive pastures than undisturbed native and naturalised pastures on land of equivalent class and soil type.

Outcome	Lesson Learnt
Weeds were suppressed on all treatments by subtropical grasses, but remained substantially higher in the Control. The weed content appeared inversely proportional to nutrient inputs and the productivity/dominance of subtropical grasses. The most profound effect was the affinity of Green Panic for the Biosolids, which dominated the sward, but was nearly absent in the Compost Treatments. The Biosolids treatment also recorded significantly higher pasture mass, leaf mass, forage quality and potential stocking rates. The reason for this result is not entirely clear, but is partly attributed to the higher nitrogen availability in the biosolids.	
University of Newcastle Masters Thesis by Benedicte Lutken "The utilisation of biosolids to store carbon in mine soils" Rix's Creek Mine Study June 2018.	
This study sampled and analysed soil from two former mine soils along with soil from a ref the carbon sequestration and improve general soil health. The site rehabilitated in 1992 showed significant improvements over the site rehabilitated in 2013 in healthier pH and decreased bulk density, greater amount of humic acid which indicates increased humic matter, increased carbon content (%), nitrogen content (%) and sulfur content (%). The field experiments furthermore revealed increased soil temperature and increased CO_2-flux in the site rehabilitated in 1992.	With the results of this study, it is concluded that biosolids amendments can improve soil heath and increase carbon sequestration in former mine soils.
2017 Independent Rehabilitation Monitoring	
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. *Land Scape Function* - 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;	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 (*Hyparrhenia 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 trajecting towards achieving the ultimate rehabilitation objective of re-

Outcome	Lesson Learnt
and • The soil nutrient cycling benchmark was met at 32 of the 35 monitoring sites. *Pasture Performance* - 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.	establishing safe and stable landforms compatible with the surrounding landscape and with a land capability suitable for grazing (i.e. class IV-V).
ACARP project C200015 Forestry Trial "Sustainable Management of Plantations for Rehabilitation, Carbon and Wood" NSW Department of Primary Industries October 2017.	
Following open cut coal mining operations there is a requirement for overburden to be rehabilitated. The typical land use following rehabilitation in the Upper Hunter is usually extensive grazing of pastures by livestock (namely cattle). However, in response to a request from the Upper Hunter Commercial Forests Steering Committee and the Muswellbrook Shire Council, a series of plantation forest trials were established in the late 1990s and early 2000s to investigate the potential commercial viability of growing plantation forests as an alternative to pastures post-mining. Following on from an earlier establishment trial (C10043), the focus of this research project was on the ongoing management of the dryland plantations with the objective of quantifying the benefits of an early non-commercial thinning and pruning regime. This project aims to: • Gather a Valley wide data base on most of the oldest tree plantations; • Apply thinning and pruning regimes to assess the benefit of early application in dryland plantations; • Manage existing stands via thinning to reduce risk of death and to maximise high value wood products and carbon returns; • Provide strongly-based full rotation projections (from year 15 data) on performance of species, land type and the species/land type interaction; and • Quantify the commercial costs and returns from carbon and timber from Corymbia maculate (Spotted gum) plantations established in the Upper Hunter Coalfields; and Compare investment in plantation Forestry with Grazing and Agroforestry options.	Of the species trialled in this project, the best all round performer is *Corymbia maculata*. While it has grown well on Buffer sites, an interesting finding has been that most stands of C. maculata have performed as well or better on the Overburden as exemplified by comparative results from the un-thinned Bulga site. While in general thinning has not yet led to an increase in overall stand volume, at the majority of sites it has resulted in an increase in the mean dominant Diameter of Breast Height (DBH) and mean dominant height of trees. Visual assessments indicate that thinning is likely to result in stands of better form, potentially resulting in the growth of higher value timber products.

Outcome	Lesson Learnt
Penny Dunstan Thesis at RCM	
Through art work, connections are enacted and a storied sense of place is drawn from the rocks, trees and grasses. History becomes, marked by the marks of artist/land interdependence and art participates in the co-constitution of place. Wayfinding enmeshes art-making and the walker; lines emerge from satellites, from graphite sticks, from kangaroo tracks, from words, connecting ancient pasts with modern futures; every footfall marking an honouring of new places emerging. In this context, the place of art is to transmute tracks into images and interactions into writings, creating an interactive way of knowing our shadowlands and making our minescapes matter. This exegesis and the artwork it describes propose a way of relating to land, of making minescapes matter. It involves reconsidering the world view where humans are outside of nature, where there is a disconnect between earth-others and humans, that allows us to turn away from areas and to illuminate the shadowlands of our modern lifestyles. It proposes an understanding that we are all part of the interactions with non-human others, and that caring about, and being accountable for, our environmental shadowlands constitute an important ethical stance. In combination with a discussion between earth science, environmental history and human geography, this research produced art works that contribute to the discourse surrounding ways of relating to terraformed environments. Informed through the use of a relational model of understanding the place of humans in the world, this research produces an empowering view of the possibility of bringing post-mining land back into the relationship with people.	This research contributes to a conversation between art and the mining industry, where each informs the other promoting discussion about legacy issues and the multiple possibilities of final landforms.

2.2 Rehabilitation Goals

The following rehabilitation goals underpin this Rehabilitation Strategy:

- Land will be rehabilitated in accordance with relevant requirements of the NSW Department of Planning and Environment Resources standards applicable at the time of rehabilitation;
- Rehabilitated land will represent a minimal source of offsite environmental impacts, such as dust emissions, water pollution, impact on visual amenity and weed spread;
- Rehabilitated land will require ongoing management inputs no greater than similar adjacent land;
- A viable drainage network will be reinstated on the site which is hydrologically stable and incorporates erosion controls and sediment collection dams which isolate effectively the rehabilitated area from adjoining area;
- Successful design and rehabilitation of landforms will be carried out to ensure structural stability, revegetation success and containment of wastes; and
- Post-mining land use will be compatible with surrounding land uses and provide optimal environmental, economic and community benefits.

2.3 Rehabilitation Objectives

The Mine will provide rehabilitated land that meets the following objectives.

General:

- Rehabilitated land will represent a minimal source of offsite environmental impacts, such as dust emissions, water pollution, impact to visual amenity, weeds spread and odour.
- Rehabilitated land will require ongoing management inputs no greater than similar adjacent land.
- Rehabilitation will be compatible with the proposed post-mining land-use.

Landform:

- Rehabilitated land will be safe and stable.
- Land capability will be returned to a class similar to that existing prior to the commencement of mining.
- Mined land will be re-contoured to a landform compatible with the surrounding natural landscape.
- A stable drainage network will be reinstated.

Growing media:

- A sustainable vegetation cover will be established on rehabilitated land (soils).

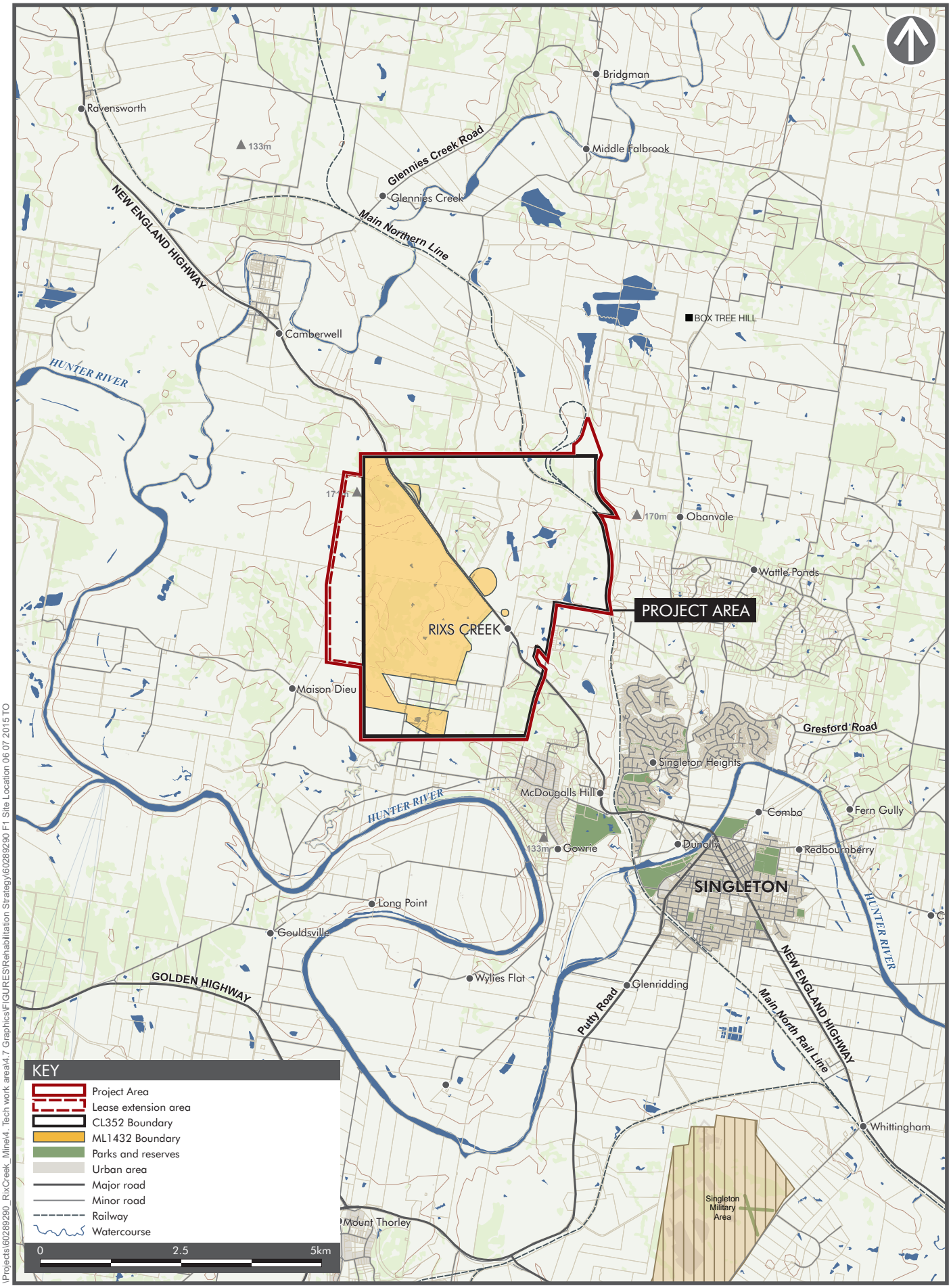
Vegetation;

- Rehabilitated land will be topsoiled, fertilised and sown with grass and/or native vegetation species.
- A sustainable vegetation cover will be established on rehabilitated land.
- Grazing areas will be established with a range of species suitable for pasture production in the area.
- Areas of trees over grass will be established with native species by either direct seeding or tubestock planting techniques.

Infrastructure which has no use post mining;

- All infrastructure, including roads, will be removed and rehabilitated.
- Footings will be removed to the existing ground level only, covered with a minimum of 0.5 metres of fill and rehabilitated.

- Electricity supply infrastructure (overhead lines, poles, substations, etc.) will be removed.
- The proposed and existing cut and cover tunnels under the New England Highway will be partially filled, allowing post mining access under the Highway for cattle.



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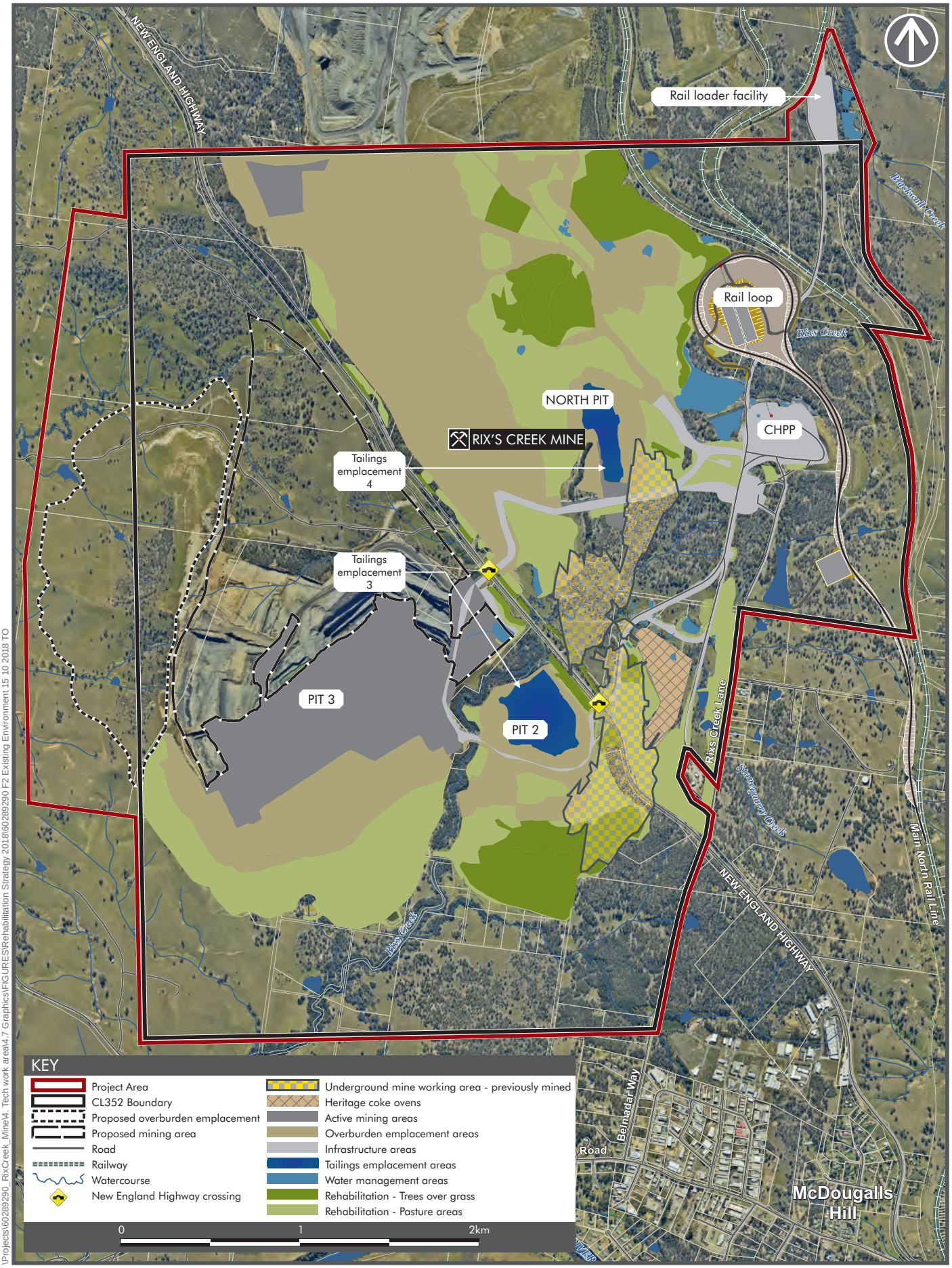
SITE LOCATION

Rix's Creek Continuation of Mining
Environmental Impact Statement

FIGURE 1



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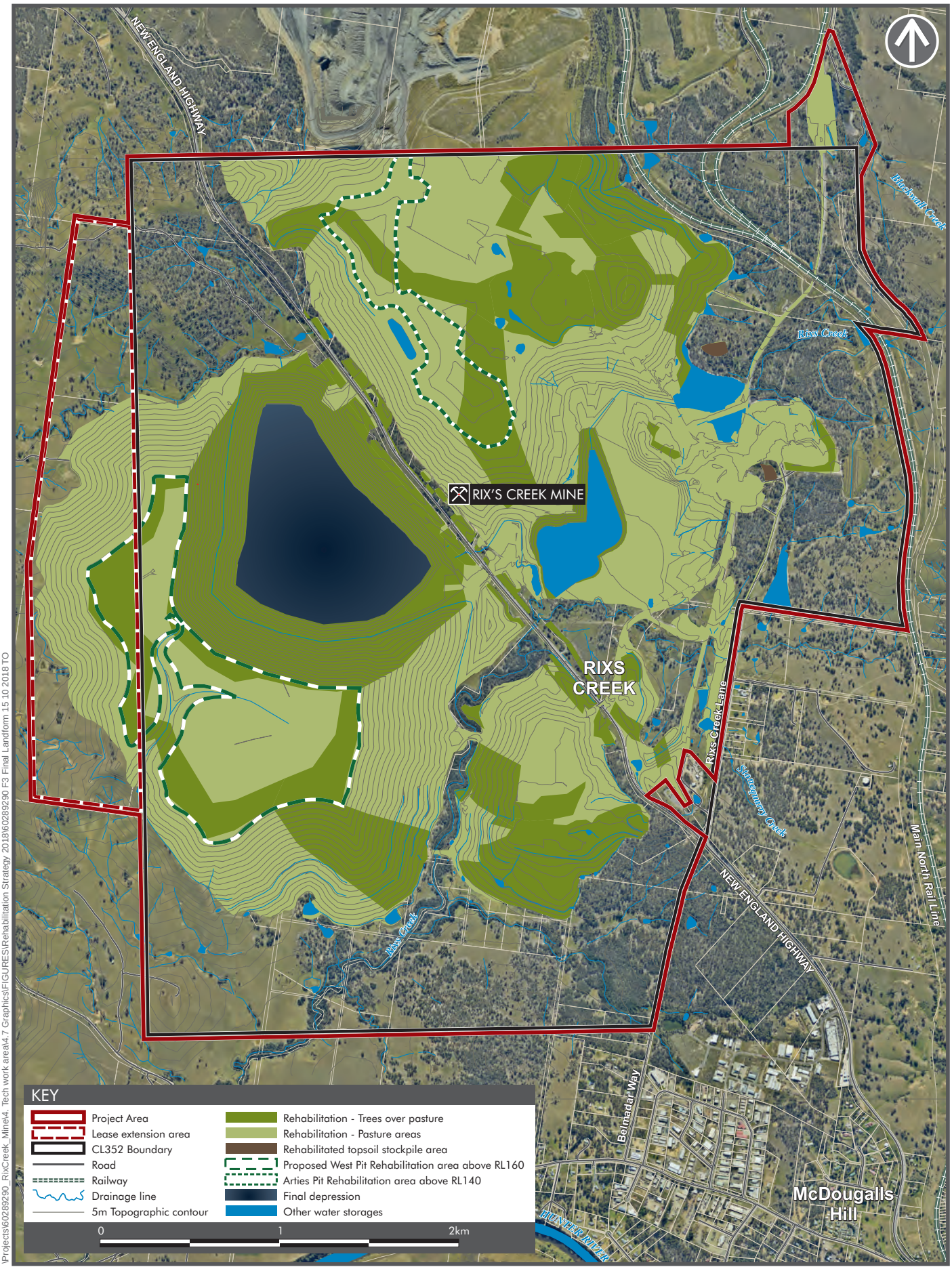
EXISTING ENVIRONMENT
Rix's Creek Continuation of Mining
Rehabilitation Strategy

FIGURE 2



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PROPOSED CONTINUATION OF MINING PROJECT - FINAL LANDFORM

Rix's Creek Continuation of Mining
Rehabilitation Strategy

FIGURE 3

3.0 Stakeholder Consultation

Community engagement and consultation has been ongoing during the development of the land management and rehabilitation program at the Mine. This engagement has included:

- Provision of a community information phone line;
- Maintenance of a website providing up to date information on the operation; www.bloomcoll.com.au;
- Company Newsletters to all The Bloomfield Group employees;
- Newsletters to local businesses and residents;
- Site inspections and open days; and
- Six monthly Community Consultative Committee (CCC) meetings with the committee consisting of three community representatives and chaired by a representative from Singleton Council. Other Government representatives are also invited to participate on the committee. Resources Regulator and NSW Planning and Environment (DP&E) officers have an open invitation to all meetings. The CCC provides a direct forum for the community to address environmental and operational concerns with site management and regulatory authorities.

Consultation specifically regarding the development of the Mine Operations Plan-Rix's Creek Mine, Mine Operations Plan (Rixs Creek Mine, March 2013) has been undertaken with:

- Resources Regulator;
- NSW Office of Water within the Department of Primary Industries (NOW);
- Singleton Shire Council; and
- The CCC.

3.1 Stakeholder Engagement Strategy

Moving forward, and in keeping with industry best practice, the compass of stakeholder engagement will be expanded to address the stakeholder expectations in terms of mine rehabilitation and closure (MR&C). The scope of the engagement will include all aspects of the engagement spectrum in accordance with the *Quality Assurance Standard for Community and Stakeholder Engagement* (International Assocation for Public Participation - Australasia, May 2015). The categories of public participation goals in this Standard range from low to high influence on outcomes: inform, consult, involve, collaborate or empower. This approach recognises that the stakeholders are being/will be affected by a MR&C process or outcome, as well as optimising how they may affect the MR&C process and outcome.

Future engagement will be based on these principles and will include:

- Inform - as per newsletters, community information line
- Consult - as per the CCC which is a direct forum for community representatives and clarification of the role of external stakeholders via the consultation process empowered by the CCC,
- Involve - increased recognition that the process of stakeholder engagement needs to be based on two way communication as per open days and survey of employees followed by feedback and discussion forums;
- Collaborate - identifying current, potential and future stakeholders via:
    - Identifying opportunities for improved management and innovation via the Upper Hunter Mining Dialogue (UHMD);
    - Optimising communication in context of "next land use" as the focus of the MR&C process e.g. active participation with Singleton Council during updates of the Local Environment Plan; and

  - Continued engagement throughout the life of the Mine with neighbouring mining operations e.g. optimising synergies related to the MR&C process between neighbouring mines and across mining tenures at a landscape level.

- Empower - maintaining a register of stakeholder feedback, so that input can be tracked over time and the company responses are able to be accessed; and
- Increased recognition that the MR&C process aims to minimise any significant and ongoing impacts to the broader environment or socio-economic dynamics e.g. participation in careers days at local schools, sourcing of apprentices from the local region.

4.0 Risk Assessment

4.1 Environmental Risk

An integral component of resource management is the management of environmental risks. The components of an activity are assessed relative to the risk they pose. The most critical component of this section is the implementation of mitigation measures to reduce risks to acceptable levels. The methodology used for the risk assessment was generally in accordance with Rix's Creek Mine Risk Management Standard, which follows the general principles outlined in *ISO 31000:2009 Risk Management – Principles and Guidelines* (Standards Australia). The method used for the risk assessment encompassed the following key steps:

1) Establish the context for the risk assessment process;
2) Identify risks and potential impact;
3) Analyse risks;
4) Evaluate risks to determine the necessary controls for mitigation; and
5) Re-assess the risk post identification of additional controls.

The key risks associated with Rix's Creek operations have been assessed using the Risk Rating Matrix provided in Table 4. The key identified risks and associated risk ratings for Rix's Creek mining and rehabilitation activities are provided in Appendix A.

Table 4 Risk Rating Matrix

Consequence (most likely outcome of the event)		Likelihood (of the event occurring)				
		A Certain	B Probable	C Possible	D Remote	E Improbable
Rating	Incident outcome / Potential outcome	Will occur	Likely to occur	Could occur	Unlikely to occur	Practically impossible
1. Catastrophic	Multiple fatalities, toxic release with ongoing detrimental effects, huge financial loss	1 (H)	3 (H)	5 (H)	7 (H)	11 (M)
2. Major	Fatality/extensive injury, off-site release with no ongoing detrimental effects, major financial loss	2 (H)	4 (H)	8 (H)	12 (M)	16 (M)
3. Moderate	Medical treatment injury, on-site release contained with outside assistance, high financial loss	6 (H)	9 (M)	13 (M)	17 (M)	20 (L)
4. Minor	First aid injury, on-site release contained with on-site resources, medium financial loss	10 (M)	14 (M)	18 (L)	21 (L)	23 (L)
5. Insignificant	No injury treatment, insignificant environmental impact, low financial loss	15 (M)	19 (L)	22 (L)	24 (L)	25 (L)

4.2 Closure risk assessment

A comprehensive closure risk assessment will be undertaken during the process of updating future MOPs and management plans. The current environmental risk assessment form the current MOP is contained within Appendix A .Consideration has been given to premature closure and has considered and recorded:

- Identified risks/hazards and opportunity events, causes and potential consequence/impact;
- Current preventative and/or mitigative controls/management strategies;
- Whether the item identified is a risk or opportunity;
- Effectiveness or adequacy of existing controls;
- Consequence category (i.e. Health and Safety, Environment, Financial, Reputation, Legal);

- Probable consequence with current control measures in place and potential maximum consequence;
- The likelihood of the event occurring with that consequence, considering existing controls and their effectiveness; and
- Any additional controls/actions to be included in a forward works plan.

Potential issues and opportunities considered during the premature closure risk assessments include a range of key aspects. A summary of the relevant topics considered include:

- Erosion and surface water management;
- Safety and health;
- Legal and compliance requirements e.g. National Greenhouse and Energy Reporting;
- Water management (surface and ground);
- Contaminated land;
- Waste management;
- Gas drainage;
- Geology, geochemistry and geotechnical;
- Rehabilitation – landform design and earthworks;
- Effect on visual amenity;
- Rehabilitation – revegetation and biodiversity re-establishment;
- Concerns relating to future site use and management;
- Optimising future site usage including potential for recreational and community access;
- Engaging with businesses to assess investment and employment opportunities through the utilisation of the infrastructure
- Monitoring;
- Infrastructure and fixed plant;
- Mobile equipment;
- Changes in traffic movement on the New England Highway;
- Human resources;
- External relations;
- Cultural and historical heritage including opportunities to record the history of mining across the site;
- Closure costs;
- Tenure and land ownership;
- Decrease in The Bloomfield Groups social investment expenditure;
- Joint Venture and commercial; and
- Interface with surrounding operations.

4.3 Environmental risk management

Further details on the management of the identified environmental risks are provided in the current MOP. This information is updated based upon:

- Feedback received from stakeholders during events such as CCC meetings, open days and staff surveys and toolbox talks;
- Reviews to the Environmental Management System (EMS) which establishes environmental standards and procedures that are followed during construction, operation and decommissioning of its mining operations;
- Amendments to the Environmental Management Plans and site based procedures which underpin the day to day management of the mine activities;
- Site audits and inspections; and
- Environmental reporting – further details are provided in **Section 8.0**.

4.4 Updating the MOP

Changes to mine development and operational planning and environmental conditions are reported via the MOP / Rehabilitation Management Plan, rather than the Rehabilitation Strategy. The reason being is that the current MOP provides a platform for a prescriptive approach to landform and landscape design and an approach that facilitates the ability to incorporate change in context of the land use component of mine closure. In doing so opportunities are provided for optimising post mine land use in context of the environmental, social and economic perspective.

4.5 Social and economic impact

A key component to be considered in the MR&C process is that of the social and economic impact to the local and wider community and other identified stakeholders. Building on the information pertaining to social and economic impact which was collated during the EA process, the stakeholder engagement processes as discussed in **Section 3.0** will be used as a platform to assess, review and monitor the proposed impact of the rehabilitation and mine closure processes during the life of and post the operation of the mine.

5.0 Proposed Future Use of Disturbed Areas

The aim of rehabilitation at the Mine is to reinstate the pre-mining land capability of grazing land, with stable landforms, compatible with the surrounding landscape, and allow for a range of possible post-mining land-uses.

To assist in defining the lands encompassed in the Mine Operations Plan / Rehabilitation Management Plan and this Rehabilitation Strategy, the site has been divided into a range of differing domains based on final land use as described in the Mine Operations Plan. In accordance with the NSW Trade & Investment Environment Sustainability Unit -Mineral Resources – *ESG3 Mining Operations Plan Guidelines* (NSW Trade & Investment Environment Sustainability Unit - Mineral Resources, March 2013) the primary domains have been defined on the premise of land management units within the Mine site, usually with unique operational and functional purpose and therefore similar geophysical characteristics. Secondary domains are defined as land management units characterised by a similar post mining land use objective.

The primary and secondary domains are shown in **Table 5**.

Table 5 Primary and Secondary Domains

Primary Domains	Secondary Domains
Unmined land	Unmined land
Infrastructure Area	Infrastructure Area
Heritage Area	Heritage Area
Water Management Area	Water Management Area
Tailings Emplacement Area	Rehabilitated Lands – Pasture
Overburden Emplacement Area	Rehabilitated Lands – Trees over Grass
Rehabilitated Lands – Pasture	Final Void
Rehabilitated Lands – Tree over Grass	
Final Void	
Active Mining Area	

Further information on these domains and the key issues that pertain to their management is provided in the following sections. A pictorial representation of the final landform and land use is provided on **Figure 3**., recognising that the location of the Domains is subject to variation and may change in accordance with the life of the mine, as reflected in the MOP.

5.1 Active Mining Area

Active Mining Areas comprise areas where active mining activities will occur during the life of the approved mining operations. These activities include highwalls, lowwalls, active voids, spoils and ramps. This domain generally cannot be progressively rehabilitated as they are required up to the end of production for accessing coal and related infrastructure services

5.2 Heritage Area

The Heritage Area comprises the Rix's Creek Coke Ovens and associated works, which are heritage-listed items. The area is fenced, maintained and conserved in accordance with the *Rix's Creek Colliery Coke Ovens Conservation Plan* (Rixs Creek Mine, 2007). Management of the operation recognise historical significance of the area encompassed by the Heritage Area and will consult with Singleton Council and OEH as to how best allow / limit access to the coke oven site throughout the life of the Project and beyond mine closure. Details on these options will be reported via updates of the Heritage Plan and the Annual Review Report.

5.3 Infrastructure Area

All surface infrastructure, where a post mining use (subject to separate environmental impact assessment and approval) cannot be identified, will be removed from the site. The following description of the decommissioning of the infrastructure areas is provided, pending alternate post mining land use for these areas. These descriptions do not account for additional material to remediate the site being sourced from areas outside the present planned operations of the Rix's Creek mine.

It is noted that following completion of the open cut mining proposed by the Project, there will remain a coal resource within the Mine Lease area that could be accessed by underground mining techniques, primarily bord and pillar mining. Any underground mining or mining beyond the life of the Project would be subject to a separate environmental impact assessment and approval process at the time.

Where carbonaceous or unsuitable materials for rehabilitation is identified on hard stand areas, infrastructure areas or haul roads it will be managed in the final stages of capping of the tailings storage facility or covered in the floor of the final void. Any crossings (i.e. culverts) will, where practical, be removed and the pre-existing drainage line reinstated. All roadside markers (tyres and guideposts) and signs are also to be removed from within the area once mine closure activities have been completed.

A light vehicle access road is to be maintained to enable inspections of the site following closure of the Mine.

The proposed and existing cut and cover tunnels under the New England highway will be partially filled, allowing post mining access under the highway for domestic livestock and opportunistic movement of native fauna.

5.3.1 Clean Coal Stockpile

The carbonaceous material on the base of the ROM and product stockpile areas will be managed as discussed previously. Where possible, the material will be considered for reprocessing before the CHPP is decommissioned. Once this has been completed, inert spoil will be placed over the tailings storage facility impoundment to maintain a cap, with a cap also placed over the former coal stockpile and infrastructure areas.

5.3.2 Coal Handling and Preparation Plant

The entire CHPP and infrastructure pad area will be managed to facilitate the appropriate drainage of surface runoff from the site. Appropriate surface water management structures (contour banks, drains and settlement ponds) will also be constructed, where required. The final landform will allow water to flow away from the site via drainage lines.

5.3.3 Clean Coal Reclaim Aerial Stacker and Reclaim Tunnel and Train Loader Facility

The Rix's Creek Mine rail loading facility currently includes conveyors, a surge bin, train-loading bin, access roads, sediment dams, and laydown areas. During the decommissioning phase should contaminated, carbonaceous or material unsuitable for rehabilitation be identified in the areas of the Mine rail loading facility, it will be managed as discussed previously.

5.4 Water Management Areas

This domain includes components of the network of dams, pipes, pumps and drainage lines that compose the Mine water management system that is in place to control the movement of water around the site. These include sedimentation, diversion, mine water and water supply dams but exclude the tailings emplacement areas.
Figure 3 shows the configuration and drainage catchments of the final landform.

The water management system for the site during the life of the Mine requires water to be effectively sourced, captured, diverted, stored, monitored, used and reticulated across the site. This system is based on adherence to well established, best water management practices in the Australian mining industry. These principles are:

- Efficient use of water based on the concepts of 'reduce, re-use and recycle';

- Avoiding or minimising contamination of clean water streams and catchments; and
- Protecting downstream water quality and return of water to the environment and for other beneficial uses such as agriculture.

Water run-off from the rehabilitated landform is to be directed into ephemeral channels that flow into the existing drainage pattern around the Mine. The water run-off in the channels will vary in volume depending on local weather conditions and storm activity. Temporary sediment controls such as the use of gabions, geotextiles, hay bales, sediment control fencing techniques, and other techniques used during Mine life, may be integrated with vegetation and permanent engineering strategies to achieve stability in relevant areas.

Where appropriate, water storage dams will be incorporated into the landscape with a view to supplying watering points for cattle. These dams will be revegetated with plant species (e.g. grass species and emergent reeds) suitable to ensure stability of the dam wall and batters whilst also providing potential localised habitat for native fauna.

Temporary sediment detention features may be designed into the channels during construction periods. These features will provide protection during construction to the receiving waters in terms of water quality. To achieve rapid stabilisation, particularly in high flow scenarios, quick establishing pasture species will be used. There has been extensive use of pasture species for this purpose on both the Mine and other mines, and techniques are well developed. Reconstructed drainage lines will be revegetated with species prevalent within the existing ephemeral water course. Vegetation established during rehabilitation will ensure long term channel stability.

The drainage pattern of the final landform will be designed to integrate with the surrounding catchments and will be revegetated to achieve long term stability and erosion control and also to harmonise with more general rehabilitation and revegetation strategies. Clean water diversion banks on overburden emplacements will be retained to divert water away from fill areas. Reconstructed drainage channels will be established where required in accordance with lead practice standards at the time of construction. In terms of future use, these areas will be protected from incompatible land use activities such as over grazing which may damage their integrity, by strategic fencing and management of cattle grazing pressure.

5.5 Tailings Emplacement Area

Tailings disposal throughout the life of the Project will be in the form of a thickened paste disposal method. The tailings cake contains negligible free water; it is spreadable and quite easily handled. The dewatered tailings cake is disposed separately or mixed with coarse reject and disposed of in overburden emplacements using trucks.

Pit 1 tailings emplacement (tailings emplacement #4) is the only active tailings emplacement during the life of the Project. This area will be maintained for the purpose of backup for tailings management, even though co disposal will be the preferred disposal technique. The tailings emplacement areas will be allowed to dry following last disposal prior to rehabilitation. Post drying the tailings emplacement areas will be revegetated with a species mix aligned to the surrounding plant community i.e. grassland and tree over grass.

5.6 Overburden Emplacement Areas

Overburden produced from the active mining area will be placed in designated out of pit emplacement areas and/ or placed within mined out sections of the open cut to create a final landform. Spoil dumping locations will be managed to maintain flexibility and productivity of the overburden haulage fleet while giving consideration to environmental conditions. In general the dumps will be constructed in reasonably flat layers incorporating rehabilitated edges where possible. The disturbed faces of the Overburden Emplacement Areas may be temporarily vegetated via aerial seeding of fast germinating and establishing grasses.

The aim of the overburden emplacement design is to achieve:

- Overburden emplacement capacity balanced with final landform design in order to minimise areas of disturbance and create a stable landform with visual relief where possible;

- Reduced visual impacts of the existing area adjacent to the New England Highway;
- Safety considerations included to mitigate the hazards that the site may pose to unauthorised people who access the area;
- Runoff water quality similar to undisturbed lands and not degrade receiving stream channels;
- A rehabilitated landform that will support vegetation species and composition diversity aligned to plant diversity in adjacent unmined lands;
- Land that will support its designated post-mining uses; and
- A rehabilitated landform that is compatible with the surrounding landscape.

5.7 Rehabilitated Lands

The mined lands are to be rehabilitated back to pasture and areas of trees over grass. The proposed final landform at the Mine will be consistent with the surrounding landscape. The final adopted rehabilitation and management options for this domain will largely depend on the prevailing condition in terms of landscape and optimising landuse in terms of current social and economic constraints.

5.7.1 BSAL Verification Assessment

The Biophysical Strategic Assessment Land (BSAL) Verification Assessment for the Mine was undertaken in April 2014 by SLR Consulting (SLR Consulting, July 2014).

The assessment area was defined as the proposed Overburden Emplacement Area totalling approximately 170 ha in area, as well as the required 100m buffer, which resulted in a total 245.4 ha for the Assessment Area. Approximately 53.5 ha were greater than 10% slope and two distinct soil types were found: Subnatric Brown Sodosol (173.9 ha), Eutrophic Brown Chromosol (71.5 ha).

The Subnatric Brown Sodosol failed the fertility criteria within the BSAL protocol and was therefore considered non BSAL. The two detailed sites within the assessment area for the Eutrophic Brown Chromosol were excluded on the basis of being greater than 10% slope and depth to physical barrier < 0.75 m. However the areas of this soil type within the 0 to 10% slope were considered to contain a deeper profile and therefore would satisfy the 12 criteria within the Interim protocol. These areas were isolated pockets of less than 20ha and therefore cannot be considered BSAL.

It has been concluded that there is no qualifying BSAL within the Assessment Area.

5.7.2 Agricultural Impact

The Agricultural Impact Assessment (Neil Nelson Agvice Pty Ltd, July 2015) that was completed for the 170ha of land that comprises the lease extension (Mine Lease Application 487) concluded the following in relation to the current and potential impact on agricultural production:

- Grazing will be continued on the land until the out of pit dump is formed (potentially 2017). Of the 170 ha lease extension area, 78 ha will be disturbed by the project and grazing excluded, while 92 ha will not be disturbed and will remain as native pasture (allowing potential continuance of grazing);
- Grazing will recommence on the sown rehabilitated land once the pastures have shown to be stable and deemed suitable for grazing;
- The economic impact from the loss of production from grazing during the period of disturbance and rehabilitation is relatively small;
- Rehabilitation of the disturbed land will re-instate the land to the same land and soil capability class as prior to disturbance; and
- Pasture will be sown on the rehabilitated land for a post mining land use of grazing. Current research undertaken examining beef cattle production on rehabilitated pastures compared to natural pastures, indicate that equivalent or higher production is possible on the rehabilitated sown pasture.

These conclusions are supported by the proven current land management practices at the Mine, together with the recent studies into the sustainability and profitability of grazing on mined lands in the Upper Hunter - ACARP Project No. 53259 and the Glencore grazing trials.

5.7.3 Land and Soil Capability

Land capability is the physical capacity of the land to sustain a range of land uses and management practices in the long term without degradation to soil, land, air and water resources. The allocation of capability classes to the lands pre 2012 was undertaken following review of topography and soils information contained in the Environmental Impact Statement (EIS) that underpins the approval of the current mining operations (Envirosciences Pty Limited, Nov 1994), together with a review of GIS based data related to slope and the proposed management of the known growing media resource. For the purpose of this comparison, the correlation of slope to Land and Soil Capability class has been used and is shown on **Table 6**. A diagrammatic representation of the project area showing the existing mining operation in context of Land Capability is provided **Figure 4**.

Table 6 Correlation of Slope to Land and Soil Capability Classes

Slope	Land and Soil Capability Class	Colours as per Figure 4
<10°	4	Green
10°	4	Red
10°-18°	5	Purple
>18°	6	Navy

An assessment of soils and land capability of the 339.5ha (the footprint of the Project) was undertaken as part of the technical specialist report *Soils and Land Impact Assessment* (SLR Consulting Australia Pty Ltd, 10 June 2015) with a summary of the assessment provided in **Table 7**.

Based on the soil types and their distribution across the Mine site, an assessment of the capability of the Mine was undertaken in accordance with the Office of Environment & Heritage (OEH) guideline *The Land and Soil Capability Assessment Scheme; Second approximation* (Office of Environment & Heritage, 2012) (referred to as the Land and Soil Capability Class Guideline).

Whilst it is recognised that the growing media will in part comprise shallow soils and the presence of sodic subsoils, the Mine land management program will ensure that there are no rocky outcrops. Proactive management of erosion (wind and water) will be carried out and cropping will not be included in the program. These measures together with the use of soil ameliorants including though not limited to biosolids, will enable the land to return to post mining Land and Soil Capability Classes comparable to that pre mining. The area of each Land and Soil Capability Class pre and post mining for the entire Mine Lease area is shown in **Table 7** and includes consideration of the amelioration measures as discussed above.

Table 7 Indicative Land and Soil Capability Areas – Pre and Post Mining – Entire Mine Lease

Pre Mining			Post Mining*							
			Disturbed Area			Undisturbed Area		Post Mining Total		
Class	Area (ha)	%	Slope	Class	Area (ha)	Class	Area (ha)	Class	Area (ha)	%
2	9.6	0.5	<10°	4	549.9	2	9.6	2	9.6	0.5
4	496.4	25	10°	4	302	4	226.3	4	1078.2	53.8
5	1096.2	55	10°-18°	5	144.8	5	536.9	5	681.7	34
6	402.4	20	>18°	6	13	6	141.4	6	154.4	7.7
			Inundated	N/A	80.7	Inundated	0	N/A	80.7	4
Total	**2004.6**				**1090.4**		**914.2**		**2004.6**	

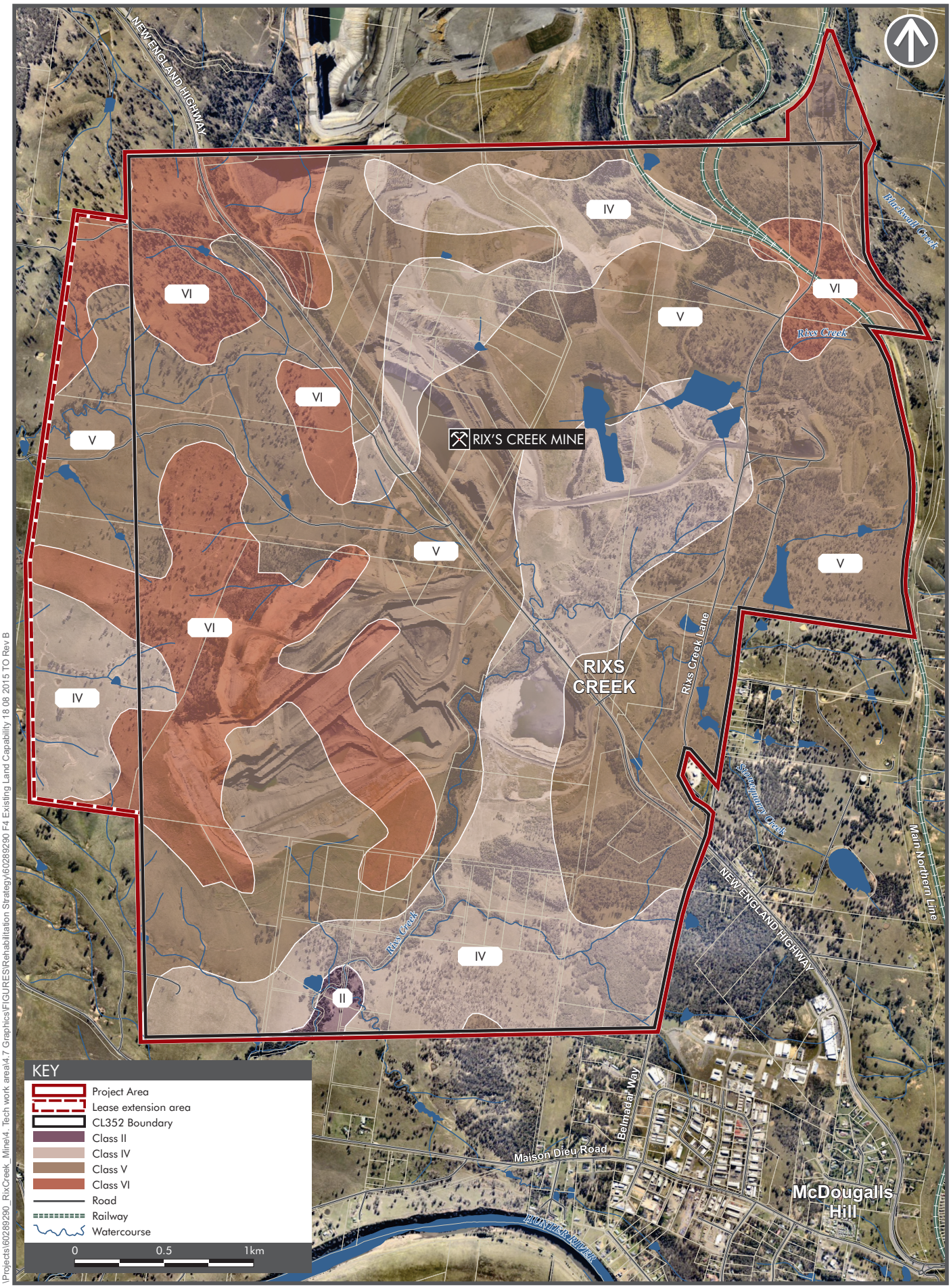
**Indicative only. Final landform slope & class subject to update for final approved mine plan*

5.7.4 Final Landform

The proposed final landform at Rix's Creek will be consistent with the surrounding natural landscape and slope classes as shown in **Figure 3**. It will have:

- A post mining landscape which will be safe and non-polluting, with a stable drainage network;
- An area of Land and Soil Capability Class 2 lands not impacted by the operation;
- The majority (53.8%) of the site with slopes less than or equal to 10º (18%) (Land and Soil Capability Class 4);
- 34% of the site with slopes between 10-18^{o} (Land and Soil Capability Class 5) of which 80.6ha would be land below water in the final void; and
- Approximately 7.7% of the Project area with areas of greater than 18° (33%) slopes i.e. the batters of the tunnels under the highway and sections of the batters of the final void (Land and Soil Capability Class 6), prior to the void filling with water.

The area of the open body of water (80.7ha or 4% of the project area) that will comprise the final void, at the level as predicted as at 2042, has not been included in the assessment of percentages of slope across the site, as the open body of land is not deemed relevant in terms of quantifying land and soil capability.



\Projects\60289290_RixCreek_Mine\4. Tech work area\4.7 Graphics\FIGURES\Rehabilitation Strategy\60289290 F4 Existing Land Capability 18 08 2015 TO Rev B

AECOM

EXISTING LAND CAPABILITY

Rix's Creek Continuation of Mining
Environmental Impact Statement

DATA SOURCE: Soil Conservation Service (1986), OEH (2010)

FIGURE 4

5.8 Final Void

This domain includes the final highwall, void, low wall, spoil and ramps of the void, the location of which is shown on **Figure 3**. The final void, low walls and ramps cannot be rehabilitated progressively over the Mine life as coal will continue to be accessed from the final void location up to the end of production. All areas of the site, with the exception of the final void and its surrounding catchments, will be free draining. The aim is to maintain the effective catchment contribution and yield to the Hunter River following the cessation of mining.

The following key planning considerations have been incorporated into the design for this domain in context of future potential access (unauthorised and other).

- Create a final void of relatively low safety risk as the depression grades can be climbed safely by foot;
- Minimise out-of-pit dump and dump levels enhancing visual amenity; and
- Create a void depression that is not easily visible or recognisable improving the visual amenity of the Project area.

The low wall slopes of the final void landform will be designed with an overall slope of around 18 degrees. The final void landform will be rehabilitated with vegetation species and diversity that are appropriate for the surrounding landform. The highwall will also be rehabilitated using the best reasonable and feasible rehabilitation technologies available at the time and revegetated with species that are appropriate for its steepness, aspect, and water retention capabilities.

Design alternatives for the final void will continually be evaluated and will be prepared as part of the closure planning process and will be in accordance with the EIS or a subsequent modification. Regardless of the final design alternative selected, the location and use of the final void is outside the 100-year recurrence interval flood prone area of the Hunter River.

Groundwater studies have modelled the rate of filling of the final void both in context of water quantity and quality. The key issues that have been considered in context of the rehabilitation of the voids include:

- Salinity levels in the final void which result from the intrinsically saline groundwater;
- Ecosystem health in the water body of the void;
- Selection of plant communities that can be developed and sustained on the batters of the void, which as the water levels rise will aid in the development of aquatic ecosystems; and
- The proposed final void is designed with 18 degree batters to provide safe access by foot for continued land management and grazing of the area by cattle, in doing so ensuring access and safety for site users and domesticated and native animals, If restricted access to areas of the site is required at the time of closure further landform shaping, fencing or placement of large rocks may be considered and agreed with relevant government authorities.

During the operational phase of the Project, The Bloomfield Group is committed to undertake further investigations into the void rehabilitation options and strategies. These may include:

- More detailed hydrological (runoff quality and quantity) and geochemical assessment aimed at more accurately predicting long term void water levels and mechanisms that may be used to enable the void to self-regulate its salinity;
- Active liaison with DRE so that the regulator can more comprehensively understand the complex nature of final void issues and provide more strategic advice on its requirements for the rehabilitation outcome for residual voids;
- Review of the potential littoral, limnetic, profundal and benthic zones and associated stratification, mixing (or lack thereof) and environments of the layers which may occur in the water in the final void and the potential issues that may occur should alterations to the predicted environment occur. Issues to consider may include temperature, salinity, depth, light and the deposition and accumulation of sediments and other materials;

- Review of other open bodies of water where the layers of the water don't intermix i.e. the meromictic lakes or where mixing occurs at least once per year i.e. holomictic lakes; and
- An assessment of any potential beneficial use for the water that could be considered following closure of the mine. This assessment will build on the works undertaken by the NSW Minerals Council (NSWMC) via the Upper Hunter Mining Dialogue (UHMD) "Upper Hunter Valley Voids Project". The NSWMC:
    - Conducted a Stakeholder Workshop as a forum to bring industry and community together to begin discussions, visioning and concepts for the future use of closed mine voids in the region; following this;
    - A literature review was commissioned, which examined national and international examples of pit void end uses; and
    - A study of pit void lakes water quality to improve understanding of potential pit lake end uses for (UHMD) coal mining operations.

It should be noted that the design contained in the Rehabilitation Strategy does not account for additional material to remediate the final pit void that may be sourced from areas outside the present planned operations of the Mine.

5.9 Unmined Land

This domain includes all unmined lands owned by the Mine, within the Mining Lease, which are not used for purposes related to mining. Land uses which surround this domain are agricultural to the northwest, west and south west, mining (Rix's Creek North Mine) to the northeast and smaller agricultural holdings to the south and south east. To the immediate south east of the Mine Lease area is the McDougall's Hill Business park which contains a number of light industrial and bulky goods business.

The unmined or buffer lands are a valuable resource, providing:

- Analogue sites for establishing baseline criteria by which the rehabilitation objectives and success can be compared;
- Areas that can be incorporated with the rehabilitated lands to enable beef cattle production; and
- A potential for future development of non-agricultural based activities aligned to optimal post mining landuse.

The buffer lands are to be managed to enhance landuse values during and after the life of the Project. The management of these lands will require:

- Corridor management in the context of grazing and biodiversity;
- Fencing and access control;
- Weed and vertebrate pest species management and control;
- Track construction and maintenance;
- Strategic grazing and stock control; and
- Bushfire management.

6.0 Phases in the Rehabilitation Strategy

The Bloomfield Group has extensive and proven experience in achieving successful mine rehabilitation. Rehabilitated areas will continue to be established and managed in accordance with methods currently in place under the Mine EMS which includes commitments to progressive rehabilitation and monitoring.

The aim of rehabilitation at the Mine is to reinstate the pre-mining land capability suited to grazing land, with stable landforms, compatible with the surrounding landscape, and allow for a range of possible post-mining land-uses. Initial post-mining land use options identified for the mining lease included:

- Agriculture – cattle grazing;
- Open space – retention of areas as grassed and woodland open space;
- Native vegetation – including stands of native plant species and communities and corridors of vegetation connecting to stands of native vegetation on neighbour properties;
- Recreation – passive recreation in areas - subject to appropriate safety measures being implemented;
- Residential - subdivision of varying density for rural areas;
- Industrial – buildings and factories;
- Aquaculture based ventures or water for industry from the final void; and
- Commercial – sections along the New England Highway.

Various options were also considered for surrounding land owned by the Company. These holdings would be reviewed in unison with the strategic planning policy updates being undertaken by Singleton Council, which will identify potential higher uses of land surrounding the Mine given its proximity to Singleton and key transport and services infrastructure.

To the extent practicable, rehabilitation will be undertaken progressively during the life of the Mine. Progressive rehabilitation will minimise the area of exposed disturbance and reduce environmental impacts. Progressive rehabilitation will also enable significant economic advantages and efficiencies through better integration of equipment use during mining and rehabilitation, reduced earth moving costs and improved topsoil management. Ultimately, this practice will lead to enhanced rehabilitation outcomes.

Sufficient personnel and resources will be allocated during mining to enable progressive rehabilitation. Final rehabilitation will continue to be included in the Mine budget for the period of operation. Progressively rehabilitating mined land may also enable the progressive return of security bonds subsequent to successful rehabilitation of defined areas. Rehabilitation planning will consider the logical sequence of actions needed to achieve rehabilitation success.

The Bloomfield Group has and will continue to be involved in research projects focusing on the rehabilitation of open-cut mines. This work continues to be carried out either by company personnel or in conjunction with organisations such as ACARP, the University of Newcastle and the NSW Minerals Council. A number of techniques have been used and further developed including the use of biosolids, weed control, plant species selection and grazing and pasture assessment.

The ultimate rehabilitation objective will be achieved through a series of conceptual phases which are shown diagrammatically in **Figure 5** and described as:

- **Phase 1**: Decommissioning – removal of hard stand areas, buildings, contaminated materials, hazardous materials;
- **Phase 2**: Landform Establishment – incorporates gradient, slope, aspect, drainage, substrate material characterisation and morphology;
- **Phase 3**: Growing Media Development – incorporates physical, chemical and biological components of the growing media and ameliorants that are used to optimise the potential of the media in terms of the preferred vegetative cover;

- **Phase 4**: Ecosystem and Landuse Establishment – incorporates revegetated lands and habitat augmentation; species selection, species presence and growth together with weed and pest animal control / management and establishment of flora;
- **Phase 5**: Ecosystem and Landuse Sustainability – incorporates components of floristic structure, nutrient cycling recruitment and recovery, community structure and function which are the key elements of a sustainable landscape; and
- **Phase 6**: Rehabilitation Complete – Landuse and landscape is deemed as suitable to be relinquished from the Mining Lease.

Table 8 shows the relevant rehabilitation phases for each domain, based on the post mining landuse and landscape, and the rehabilitation objectives to be achieved.

Table 8 Relevant Rehabilitation Phases for Each Domain

Domain / Rehabilitation Phase	Active Mining	Heritage Area	Infrastructure Area	Water Management Area	Tailings Emplacement Area	Overburden Emplacement Areas	Rehabilitated lands – Pasture	Rehabilitated Lands – Tree over Grass	Final Void	Unmined Land
Stage 1 – Decommissioning	N/A	N/A	✓	✓	✓					
Stage 2 – Landform Establishment	N/A	N/A	✓	✓	✓	✓	✓	✓	✓	
Stage 3 – Growing Media Development	N/A	N/A	✓	✓	✓		✓	✓	✓	
Stage 4 – Ecosystem and Landuse Establishment	N/A	N/A			✓		✓	✓	✓	
Stage 5 – Ecosystem and Landuse Sustainability	N/A	N/A			✓		✓	✓	✓	✓
Stage 6 – Rehabilitation Complete	N/A	N/A	✓	✓	✓	✓	✓	✓	✓	

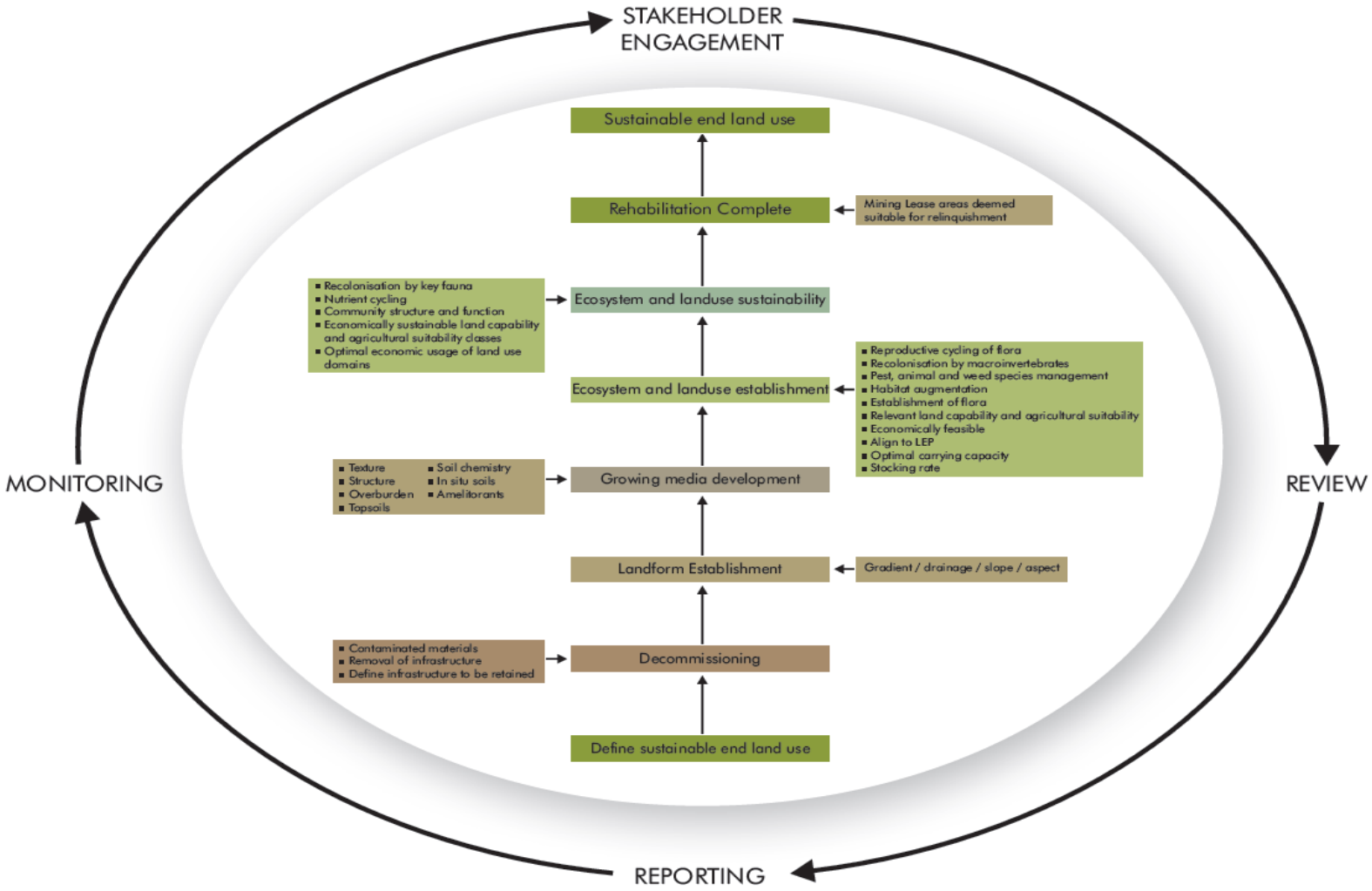


Figure 5 Conceptual Phases of Sustainable Ecosystem Development

(NSW Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy, Sept 2013)

6.1 Phase 1 Decommissioning

Phase 1 provides for the removal of hard stand areas, buildings, contaminated materials and hazardous materials.

The only decommissioning activities scheduled for the life of the current MOP (Rix's Creek South Mine MOP 2018) are the works associated with the tailings emplacement area #3 located in Pit 2 and covering an area of 19 ha. All decommissioning works will be undertaken in accordance with a Section 101 Approval once obtained from Resources Regulator.

The objectives, criteria and performance indicators for Rix's Creek rehabilitation domains for the Decommissioning phase are provided in **Table 9**.

6.2 Phase 2 Landform Establishment

6.2.1 Surface Shaping

Reshaping principally involves re-contouring overburden emplacement areas into the designed shape for final rehabilitation. The bulk final movement of overburden will usually be undertaken using bulldozers. Ideally, reshaping will result in a stable landform with slopes and drainage patterns which blend in with the surrounding natural topography. Slope stability is integral to rehabilitation design and slopes in excess of 10 degrees are not favoured. However, slopes steeper than 10 degrees may be necessary in some locations to ensure rehabilitation merges seamlessly with adjacent undisturbed land.

The final landform may change over time with the advent of new technologies or changes to the planning development framework for Singleton. Given the proximity of the Mine to Singleton, higher order land uses may be more appropriate for sections of the Lease area by the end of the Project life.

Any changes to the final landform which may evolve to accommodate a range of potential future land uses would be subject to modifications to the Project Approval.

6.2.2 Deep Ripping and Rock Raking / Removal

Once bulk reshaping is completed, the landform is deep-ripped and the final trim/rock raking is undertaken. The ripping loosens up any near surface strata within the landform that have been compacted during placement, aiding root penetration during vegetation establishment. The final trim smooths out any wash-outs and gullies, rough edges, temporary access tracks, local steep slopes and prepares the surface for revegetation.

Rock-raking is the final stage of reshaping and removes or buries exposed surface rock greater than 500 mm in diameter. Rocks are either buried within the spoil structure or may be left in groups on the surface as fauna habitat. This raking is usually done along the contour, leaving a cultivated surface that minimises the risk of erosion until vegetation can be established.

6.2.3 Drainage Establishment

Suitable drainage will be integrated into the rehabilitation design, to ensure the final landform can safely shed surface runoff without giving rise to erosion. Long or steep slopes are to be divided by the construction of contour banks to collect and divert water moving across the slopes. Contour banks would direct the surface water at a drop of no greater than 1 in 100 into a drainage line (via a sediment dam) or into some form of protected drop structure that will direct the water down the gradient in a controlled or protected manner.

6.3 Phase 3 Growing Media Development

Growing media development involves processes to achieve a soil which is capable of supporting a sustainable plant community. It includes consideration of the chemical, physical and biological properties of the media and takes into account issues such as specialist requirements (e.g. soil ameliorants) aligned to the revegetation of the disturbed areas, whilst also incorporating consideration of landuse both for grazing and biodiversity that may deviate from the traditional post mining landuse.

6.3.1 Overburden Characterisation

Overburden material varies in physical and geochemical properties, in accordance with the geology of the area and the extent of exposure to weathering. Chemical analyses of the spoil materials indicate that, in general, the overburden is slightly sodic and alkaline, but within acceptable ranges for use as a plant growth medium.

In order to fully understand the selective handling of materials, assessment of the characteristics of soil and overburden material will continue to be undertaken throughout the life of the Mine as per the parameters listed in **Table 9**.

Overburden characterisation is important to:

- Identify material for use in the root zone which is capable of supporting sustainable vegetation establishment;
- Identify materials which limit plant growth or which may contaminate surface or ground water, and hence may require special handling, treatment or disposal; and
- Identify any propensity for spontaneous combustion.

Soil studies undertaken for the EIS (SLR Consulting Australia Pty Ltd, June 2015) mapped the soils, determined stripping depths and rehabilitation suitability. The specialist study defined two main soil types occurring across the Project area – Subnatric Brown Sodosols and Eutrophic Brown Chromosols. The Sodosols dominated the Project area and were located on the creeklines, flats, lower slopes, midslopes and on the ridgeline in the north. These soils varied in topsoil depth from 0.1m to 0.3m, with an abrupt clear boundary to the clay subsoil. The Chromosols dominated the upper slopes and ridges. All soils have been assesses as suitable for stripping and reuse on the rehabilitated lands in accordance with the following considerations.

6.3.2 Topsoil and Subsoil Characterisation

During the life of the Project topsoil and subsoil characterisation will continue to be undertaken in order to:

- Identify any physical or chemical deficiencies or limiting factors (particularly alkalinity, salinity and sodicity and soil dispersion) which may affect such things as vegetation establishment and landform stability; and
- Develop selective placement strategies and/or develop suitable amelioration techniques.

6.3.3 Soil Stripping

Topsoil is suitable for stripping across the assessment site, from a minimum depth of 0.10 m to a maximum depth of 0.40 m. For the majority of the land, topsoils can be used without treatment. Subsoils can also be widely stripped, including to a maximum depth of 1.10 m at locations at the base of slopes where material has accumulated.

6.3.4 Soil Stockpile Management

The following soil stockpile management practices will be used to increase the long term viability of the soil resources in stockpiles:

- Topsoil stockpiles will be located outside of proposed mining areas and away from slopes and drainage lines where possible;
- Stockpiles will be constructed with a “rough” surface condition to reduce the risk of erosion, improve drainage and promote revegetation;
- Stockpiles will be no higher than three metres in order to minimise issues with anaerobic conditions;
- Stockpiles will be fertilised and seeded to maintain soil structure, organic matter and microbial activity, whilst areas which are to be inactive for extended periods may be seeded with the final species mix;
- Stockpiles will be located to prevent runoff leaving the site;

- Where necessary soil ameliorants will be applied to dispersive soil stockpiles, at a rate commensurate with the findings of the soil assessment pertaining to sodicity and dispersion; and
- Weed control strategies will be implemented particularly for any noxious weeds. Immediate revegetation will provide vegetative competition to assist with control of undesirable plant species.

6.3.5 Soil Amelioration

Soil/spoil ameliorants will be spread and integrated into the surface layer to address soil sodicity and assist with soil structural properties. As the majority of subsoils are potentially sodic they are usually treated with ameliorants including gypsum at a rate of up to 200kg/ha, with these materials being ploughed into the top 30cm of the profile. In addition, sodic subsoils where exposed, will be managed with appropriate erosion and sediment control structures in place (contour banks, sediment retention ponds, rock armouring etc.).

6.3.6 Topdressing

Topsoil stripped ahead of mining will be is applied to the reshaped surface in an even layer generally not less than 100mm. Depending on the quality of the topdressing material, ameliorants may be integrated with topsoil at this stage. Topsoil will be used as a first priority but where topsoil has not been available in sufficient volumes, biosolids and biosolids/mulch mix have been successfully used to improve soil structure and act as a source of nutrients, improving establishment of vegetation especially in those areas returning to pasture. Biosolids are generally applied at a rate no greater than 100 t/ha (wet weight), using a tractor towed spreader trailer. A biosolids/mulch mix (1:1 ratio) has been shown to be a very successful topsoil supplement and is usually applied at a rate of 200 – 250 t/ha.

6.3.7 Integration

Once the material has been top-dressed, the surface will be contour disc or chisel ploughed to integrate the topdressing material. This assists in binding the topdressing material with the underlying spoil and is a requirement of the EPA guidelines *Use and Disposal of Biosolids Products* (NSW Environment Protection Authority, 2000). The area will then be contour cultivated to create seed entrapments and microclimates prior to sowing.

6.3.8 Land Management Practices

Land management practices that are implemented at the Mine relating to the handling of growing media include:

- Progressive rehabilitation of final landforms as soon as practicable after completion of mine-related disturbance activities;
- Weed management prior to stripping the area to be cleared (following a clearing permit) will be completed, alternatively after timber is cleared, if present, to allow access;
- Stripping of topsoil and subsoil material that is deemed as not requiring treatment to address issues such as sodicity using a bulldozer or grader – (preserving the top 50-100mm in tree area's to optimise the management of the topsoil seed bank) and removal using a front end loader and trucks. When the situation allows, this material will be placed directly onto final shaped overburden or stored in stockpiles not > 3m in height;
- Adding soil ameliorants (gypsum/lime) to subsoil material requiring treatment prior to stripping. Use of a bulldozer to strip subsoil material and a front end loader and trucks to move soil before being stored in stockpiles not > 3m in height;
- Seeding of all stockpiled materials with a seasonal dependant cover crop incorporating a mix of fast germinating and growing sterile species, together with a mix of pasture grass and legume species;
- Shaping of post mined lands to a landform as defined in **Figure 3**;
- Assessing stockpiled material prior to spreading of growing media on the post mined lands, in terms of suitability as a growing media and if required soils ameliorants (gypsum, lime, organic matter) will be added. Stockpiled material will also be assessed in terms of weed infestation and managed via the use of registered herbicides and / or scalping of weed infested material. Stockpiled material will be managed for weeds on a regular basis;

- Maintaining an inventory of available soil to ensure adequate topsoil materials are available for planned rehabilitation activities; and
- Restricting vehicular traffic on the soils to be stripped. Traffic will be excluded from soils that are sensitive to structural degradation.

6.3.9 Erosion and Sedimentation

Erosion and sedimentation at the Mine is controlled under the *Water Management Plan* (WMP) (Bloomfield Company Ltd, 2011) which includes an *Erosion and Sediment Control Plan* (ESCP) (JP Environmental, 2010). Prior to the disturbance of land associated with any construction activities at the site, appropriate erosion and sediment controls are established and approved by the Environmental Officer. All erosion and sediment management and related control structures are consistent with the specifications contained in *Managing urban stormwater – soils and construction, Volume 1*, 4th edition (Landcom, 2004) and particularly *Volume 2E Mines and Quarries* (DECC, 2008).

Where practicable, runoff from undisturbed catchments is diverted around the construction activities via diversion drains and banks which direct water into the natural watercourses. Runoff from disturbed areas is retained on site in sediment dams and allowed to settle prior to discharge into the natural system. Drains, diversion banks and channels are compacted and stabilised as they are constructed.

General measures in place at the Mine to minimise erosion and sediment mobilisation during operation include:

- Installing erosion and sediment controls prior to the disturbance of any land;
- Minimising the extent of disturbance to the extent that is practical;
- Reducing the rate of water flow across the ground (e.g. through the use of rock check dams and flow capture and arrest or energy dissipation devices) particularly on exposed surfaces and in areas where water concentrates;
- Progressively rehabilitating disturbed land and constructing drainage controls to improve stability of rehabilitated land;
- Ripping of rehabilitation areas to promote infiltration;
- Use of fast germinating and establishing plant species to assist in surface stabilisation;
- Protecting natural drainage lines and watercourses by constructing erosion control devices which include sediment retention dams and diversion banks and channels. Steep gradients will require the installation of a rock riprap, geotextile fabric sediment filters or other suitable measures; and
- Restricting access to rehabilitated areas.

Erosion control on reshaped and rehabilitated areas is achieved by minimising the time taken to establish vegetation. Suitable drainage densities will be established with sediment detention basins being constructed in the flow lines. Sediment detention basins will be used along haul roads and around areas of disturbance. These structures will be de-silted as necessary.

6.4 Phase 4 Ecosystem and Landuse Establishment

6.4.1 Clearing and Reuse of Vegetation

This will be achieved by:

- Limiting the cleared width to that required to effectively operate the mine; and
- Programming the works so that only the areas which are scheduled for mining activities are cleared.

The proposed use of felled vegetation will follow current best practice and may include the collection of timber for fencing; incorporating ground cover, understorey species and saplings into stripped topsoil; and respreading large woody debris onto re-contoured land. Stag trees will be installed on to the post mining landscape as part of the rehabilitation program to optimise future potential habitat for arboreal and avian fauna including Squirrel Gliders.

6.4.2 Fencing and Signage

Planning and design of the layout will be undertaken during this phase and will include consideration of fencing (materials and construction), delineation of paddocks, access to watering points, stock handling facilities and stock refuge areas.

6.4.3 Revegetation

The Bloomfield Group proposes to build on established revegetation techniques as the basis for the rehabilitation program. Review of the program will focus on:

- Potential variables impacting on rehabilitation programs and causes of failure;
- Suggested rehabilitation strategies for the successful reinstatement of pasture based plant communities on the site, including:
    - Establishing appropriate soil substrate: direct application of topsoil; stockpiled native topsoil; raw spoil plus addition of biosolids/organic growth medium; addition of other organic material;
    - Establishing a grassy understorey: grass species suitable for mine rehabilitation; low and high photosynthetic pathway species; establishing herbs and forbs;
    - Establishing the overstorey;
    - Seeding of areas of scattered mid and overstorey native plant species will be seeded throughout the areas returning to pasture and in areas defined for shelterbelts/ habitat corridors;
    - Supplementing vegetation in areas which have been seeded with tubestock of mid and over storey native plant species; and
    - Distributing seed by various methods: hand-broadcasting; hydro-mulching; direct seeding; air seeding.

Onsite management measures designed to ameliorate the predicted visual, airborne dust and noise impacts using the overburden emplacement include:

- The integration of tree corridors on the overburden emplacement area as progressive rehabilitation occurs;
- Establishing visual and ecological planting patterns of native trees to achieve landscape patterns that complement the existing spatial distribution of tree and grass cover in a grazing landscape; and
- Minimising exposure of work areas to sensitive receivers where possible.

The main revegetation steps may include:

- Species selection;
- Sowing rates and species proportions;
- Consideration of habitat augmentation;
- Seed pre-treatment requirements;
- Seed spreading and planting techniques;
- Soil amelioration and fertilizer requirements;
- Use of temporary cover crops to assist soil stabilisation;
- Protection from vertebrate pest species, domesticated stock and unauthorised access; and
- Maintenance requirements.

6.4.4 Sowing / Fertilising

The area will be sown and fertilised with the selected grass and/or tree seed mixes shortly after spreading the topsoil to avoid loss in activity of pre-existing micro flora. It also minimises the loss of topsoil due to wind and rain action. Fertiliser is not usually required where biosolids have been applied. Tubestock are planted in areas to provide visual screens.

A typical species list sown, in approximate kilograms per hectare, for the establishment of pastures for a post-mining grazing landuse include:

- Rhodes grass (1kg/ha), Couch grass (2kg/ha), Rye grass (4kg/ha), two sub. Clover (6kg/ha) varieties, Haifa white clover (2kg/ha), Woolly Pod Vetch (4kg/ha), green panic (5kg/ha), Sirosa phalaris (4kg/ha), Sephi Barrel Medic (4kg/ha), Lucerne (4kg/ha) and Kikuyu (1kg/ha).

The focus of this mix is to establish a vegetation cover that ensures surface stability, reduction in the risk of soil erosion whilst also providing a plant community suitable for sustaining beef cattle. During this phase of the rehabilitation program, cattle may be introduced, under a carefully managed program, to the rehabilitated lands with a purpose of enhancing nutrient cycling via consumption of grown feed and production of manure and the trampling and incorporation of plant material (green and dead) into the surface soil layer

A typical list of native species used in the revegetation program under direct seeding, all of which align to the tree species characteristic of the pre mining and surrounding plant communities include:

- *Angophora floribunda, E.crebra, E. moluccana, E. sideroxylon, E. tereticornis, E. albens, Corymbia maculata, Acacia concurrens, A. decora, A. decurrens, A. falcata, A. filicifolia, A. implexa, A. paradoxa, A. salicina, Hardenbergia violacea.*

A seed collection program aims to provide 75% of the seed as local provenance material, where available.

A typical list of native species, all of which align to the tree species characteristic of the pre mining and surrounding plant communities, used in the revegetation program under tubestock planting for visual screens and on bunds include:

- *Angophora floribunda, E.crebra, , E. moluccana, E. sideroxylon, E. tereticornis, E. albens, Corymbia maculata, Acacia concurrens, A. decora, A. decurrens, A. falcata, A. filicifolia, A. implexa, A. paradoxa, A. salicina, Allocasuarina leuhmannii, Casuarina glauca.*

6.4.5 Weed Management and Control

All noxious weeds will be managed and controlled as per the requirements of the *Noxious Weeds Act 1993*. Control of weeds will be undertaken in direct consultation with the Local Land Services, Singleton Council and Upper Hunter Weeds Authority staff using a combination of mechanical, biological and chemical controls.

Particular attention will be paid to the control of African Olive (*Olea europaea subsp cuspidate*) across the site as the invasion of this species is listed as a potential key threatening process to the Central Hunter Grey Box- Ironbark Woodland and the Hunter Lowlands Redgum Forest both of which are listed under the *Threatened Species Conservation Act* 1995.

6.4.6 Vertebrate Pest Animal Management and Control

The Mine has in place an annual feral animal management and control program that will also be carried out for the life of the Mine. All work will be implemented in close liaison with the staff of the Local Land Services and in close communication with adjoining land users to ensure a coordinated approach to pest management.

6.4.7 Nesting Boxes

Nesting boxes for a range of arboreal and avian species will be established in older areas of rehabilitated lands once tree heights are adequate to support them and provide primary habitat for these species, as they recolonise these areas.

6.4.8 Carrying Capacity and/or Stocking Rates

The Agricultural Impact Assessment (Neil Nelson Agvice Pty Ltd, July 2015) states that the current stocking rate is 5 Dry Sheep Equivalent (DSE) per hectare on the areas of existing pasture, though with good seasonal conditions and increased fertiliser application and seed sowings, this could increase to 7 D.S.E. per hectare for unmined lands. This is comparable to the carrying capacities estimated by NSW DPI for similar pasture types within the Hunter Region (NSW Dept. of Primary Industries, 2006).

The direct seeding species mix and land management practices that are currently used for the post mined lands returning to grazing at the Mine are similar to those used on other mines across the Hunter. Based on the assessment of the following parameters;

- Pasture quality (digestibility , crude protein and metabolisable energy;
- Cattle weight;
- Cattle health; and
- Carcass comparison.

It is feasible to assume that the conclusion of the Glencore Grazing trial (NSW Minerals Council UHMD Presentation) which follow could be achieved at the Mine;

- Tropical pastures which are synonymous with rehabilitated lands generally have a higher feed quality and are more readily grazed that native grasses, resulting in enhanced cattle productivity performance.

This is further supported by recent unpublished studies undertaken by mine environment staff to assess pasture growth on post mined lands where the growing media that has been treated with biosolids (current practice at the Mine) and two compost treatments used as post mined lands soil ameliorants. This study determined that the areas that had been treated with biosolids offered the highest potential stocking rates at 7.3DSE/ha at March 2015.

6.5 Phase 5 Ecosystem and Landuse Sustainability

Ecosystem and Landuse Sustainability involves the ongoing management of applicable areas in order to achieve a stable and sustainable ongoing land use or environment depending on the allocated post mining land use for a given area. For example grass or grass over trees. Key processes in ensuring this is achieved include:

- Development of landuse and land capability which is consistent with the surrounding areas;
- Development of landuse options that provide optimal and sustainable social and economic benefit to the local community;
- Selection of species to achieve species diversity and abundance for both flora and fauna;
- Development of profiles in the growing media; and
- Use of vegetation communities capable of withstanding catastrophic events e.g. bushfire and extensive drought.

A number of these processes would of already been established during previously phases of the rehabilitation strategy, for example landform establishment during Phase 2 and growth media development during Phase 3. Phase 5 does not seek to establish new practices but rather to MONITORING and review ongoing works and adjust practices is necessary to manage the ongoing success of the rehabilitation to achieve a self-sustaining outcome following the completion of works (Phase 6).

6.5.1 Maintenance revegetation works

As with all successful grazing based systems, maintenance works are required in terms of fertiliser and vegetation enhancement to ensure successful growth of cattle. Maintenance works to be implemented at this phase of the rehabilitation program may include:

- Soil sampling for the purpose of defining fertiliser and seeding regimes;
- Application of defined fertiliser – in terms of rates and mix; and
- Over sowing of pasture with legumes – species may include, sub. Clover (6kg/ha) varieties, Haifa white clover (2kg/ha), Woolly Pod Vetch (4kg/ha), green panic (5kg/ha), Sirosa phalaris (4kg/ha), Sephi Barrel Medic (4kg/ha) and Lucerne (4kg/ha).

6.5.2 Bushfire Management

A hazard reduction plan has been drawn up in consultation with the Rural Fire Service. The Rural Fire Service conduct hazard reduction activities on The Bloomfield Group managed lands surrounding the mining operation.

Bushfire risk is managed through ameliorative actions as well as management safeguards.

Ameliorative actions:

- Ensuring mining activities that have the potential to cause ignition such as sparks from vehicles, metal grinding, welding etc. are managed;
- Ensuring vegetation does not interfere with power lines;
- Creating firebreaks to ensure that bushfire does not spread from surrounding lands; and
- Grazing on older established rehabilitation areas if required to reduce fuel loads.

Management safeguards:

- The provision of firefighting equipment;
- Fire training for staff and on site fire-fighting team;
- Suppression of any bushfire outbreaks;
- Effective communication strategies to ensure all employees, contractors and service providers are aware of fire emergency policies and procedures as well as any NSW Rural Fire Services Fire Bans;
- Maintenance of appropriate fire breaks and perimeter trails; and
- Hazard reduction burns conducted when required by the local Darlington Bushfire Brigade.

6.6 Phase 6 Rehabilitation Complete

By this stage ongoing monitoring and implementation of maintenance works will demonstrate that the rehabilitation process has been successful.

Once a rehabilitated area is deemed to be potentially suitable for sign-off, a Sign-off Report will be submitted to the regulators. This report will include the following information for the proposed sign-off area:

- Survey Plan clearly showing the proposed area;
- Area size, disturbance and rehabilitation history;
- Monitoring data compared against rehabilitation aims, objectives and completion criteria;
- Final maintenance inspection findings;
- Photographs of the proposed area; and
- Analysis of rehabilitation development and sustainability.

At the completion of rehabilitation:

- The site would be safe, stable and non-polluting;
- With the exception of inputs related to the operation of a grazing property (e.g. fertiliser on areas of pasture) the site would be self-sustainable;

- The rehabilitation program would have been signed off by all parties;
- The Mine Lease (or a portion of a greater lease) would be relinquished, and the security bond returned; and
- The mine would have no further responsibility for these areas and the relevant Mine Operations Plan would provide details of relevant agency reviews and sign-offs.

6.7 Potential for Integrating this Strategy with Adjacent Mines

Where practical the post mining landform will be developed to align with that of the adjoining Rix's Creek North Operations and consistent with the landscape of the surrounding area.

The revegetation program will review the rehabilitation planning framework of the Rix's Creek North Mine as defined in its Mine Operations Plan and recent Annual Reviews in the context of the location of biodiversity areas, pathways to optimise pasture for beef cattle grazing and water storage features. The Statement of Commitments in the Rix's Creek North Project Approval, states that "*The majority of the post-mine landform will be revegetated with a combination of native and improved pasture species with scattered tree lots and tree corridors linking the surrounding rehabilitated areas, proposed tree planting corridors and surrounding existing native vegetation"*, which is in accordance with the rehabilitation objectives of the Mine.

7.0 Performance Criteria, Measures and Indicators

In accordance with the DRE Mine Operations Plan Guidelines (NSW Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy, Sept 2013) the performance criteria, measure and indicators have been defined for each domain in the context of the phase of the rehabilitation program. This includes the following:

- Nomination and justification of **performance measures**. Performance measures are used to quantify the rehabilitation and land management programme in terms of efficiency or effectiveness and establish the indicative timeframes for completion, and the standards of completion;
- Identification of **performance indicators** of the biophysical environment or where applicable' the built environment, that can be reliably measured and audited over time using accepted scientific techniques and standards i.e. Australian Standards to demonstrate (and track) the progress of an aspect of rehabilitation towards a desired completions criteria; and
- Establishment of the **performance/completion criteria** for each indicator which quantitatively demonstrates rehabilitation. These are objective target levels or values and are usually in a numerical value.

The criteria, measures and indicators which provide the framework for this Strategy are those that have been developed for the Mine Operations Plan and are underpinned by a range of documents which relate to land management and site rehabilitation. These include industry standards and Rix's Creek Mine Standards and Procedures. The ongoing development of these documents will provide the basis for the periodic review of the Mine Operations Plan with resultant amendments being recorded in the Annual Review Report.

There is an element of risk attached to the development of performance criteria, in that it is impossible to predict all of the variables that might influence the recovery or otherwise of those lands which are rehabilitated. Many variables operate at catchment or regional scales, such as river flows and pest outbreaks. Other factors that operate at continental or even global level, include climatic influences (including droughts or floods brought about by La Niña and El Niño events). These factors may significantly influence the long-term sustainability of the vegetated lands at the Mine. To this end, the performance criteria and measures have been designed to provide an appropriate benchmark or guide against which to assess the management of Project lands and the resulting improvements.

The objectives, measures, performance indicators and criteria are designed to form the basis of the performance measure and provide the ability to track the development of sustainable ecosystems through the conceptual phases in **Figure 6.** This information is provided for all defined rehabilitation domains in **Table 9** and aligned to a pictorial representation in **Figure 5**.

The objectives, measures, performance indicators and criteria relating to the phase of Rehabilitation Complete will be defined in the mine closure MOP and as such are not described in **Table 9**.

Where required, these elements are completed with input and agreement from relevant external parties, such as landowners and regulators. A flowchart of the rehabilitation process is presented in **Figure 6**.

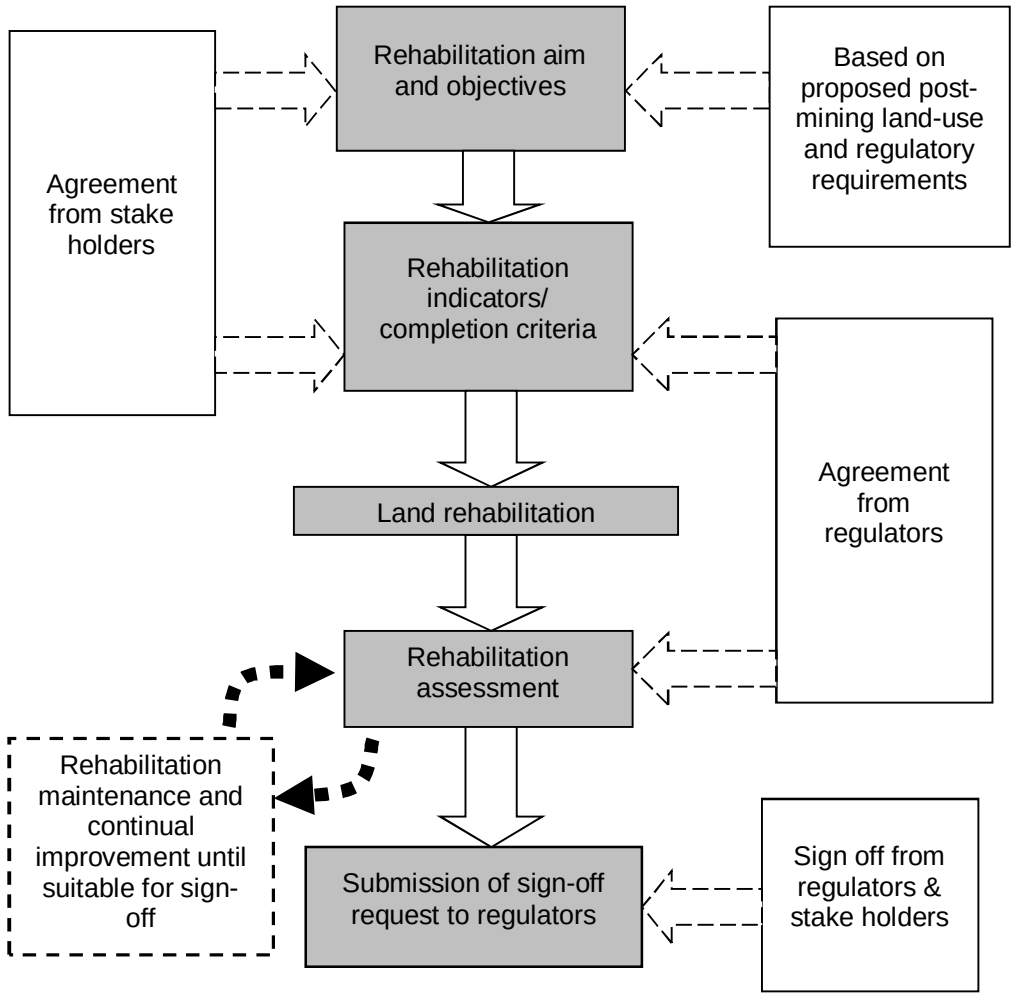


Figure 6 Bloomfield Group Rehabilitation Management Process

Table 9 Rehabilitation Objectives, Performance Indicators and Measures and Criteria

Objective	Performance Indicator	Performance Measure	Completion Criteria	Justification / Source
Phase 1 – Decommissioning				
Domain – Tailings Emplacement Area				
Removal of tailings infrastructure associated with tailings emplacement area	Removal of pipelines and pumps and related tailings infrastructure	Audit showing safe removal of all tailings infrastructure	Section 101 from DTIRIS-DRE	DRE Requirements
Successful capping of tailings emplacement area to ensure no contamination from buried tailings materials	Cover of inert material	• Engineering inspections / Tailings emplacements audits; and • Acceptable cover material for capping design documentation.	Third party audits and site inspections reports confirm successful achievement of final land use	DRE Requirements
Phase 2 – Landform Establishment				
All Domains except Final Void				
Rehabilitated land will: Be safe and stable; Be compatible with the surrounding natural landscape; and Incorporate a stable drainage network	• Year 1: Rehabilitated areas of greater than 10° slopes will be minimised during re-contouring; • Year 1: Appropriately designed water/sediment management structures (contour banks, drains and drop structures) incorporated into landform design and constructed during re-contouring; • Year 3: No evidence of slumping, settling or subsiding landform; • Year 3: Erosion rills	• Third party audit against safety regulations; • Slopes surveyed and reconciled against approved final slopes in the Final Mine Closure Plan; and • Rehabilitation monitoring results – rill surveys.	• No rehabilitated areas of greater than 18° slopes; • No evidence of failed sediment control structures (dams, drains and drops structures); • Surface tailings emplacement areas will be capped with 2m of overburden and rehabilitated; and • Erosion rills remaining stable. No significant increases in number and/or size of rills since last monitoring.	(DECC, 2008)

Objective	Performance Indicator	Performance Measure	Completion Criteria	Justification / Source
	stabilising, compared to Year 1 results; and • Year 5: No evidence of failed water management structures.			
Phase 3 – Growing Media Development				
Domain – Rehabilitated Lands				
A sustainable vegetation cover will be established on rehabilitated land (soils)	• Year 3: pH, EC and nutrient levels moving towards completion criteria; and • Year 5: pH, EC and EAT at or near completion criteria. Nutrient levels acceptable.	Tests assessing the growing media's chemical properties – pH, EC, nutrient levels	Soils in the root zone should meet the following criteria: • EC <0.6 dS/m; • pH between 4.5 and 9; • EAT Class 3 – 8; and • Nutrient levels acceptable for pasture establishment.	Mine Operations Plan
Rehabilitated land will be topsoiled, fertilised and sown with grass and/or native vegetation species	Year 1: Biosolids applied in accordance with Environmental Guidelines: Use and Disposal of Biosolids Products ((NSW Environment Protection Authority, 2000))	GIS data sets with records of areas and application rates for biosolids use	Rehabilitation documented, indicating the required works completed	Mine Operations Plan
Phase 4 – Ecosystem and Landuse Establishment				
Domain – Rehabilitated Lands				
Land will be rehabilitated in accordance with relevant DRE standards applicable at the time of rehabilitation	Relinquishment reports and associated monitoring data	DRE rehabilitation audits	DPI-MR sign-off on land submitted for relinquishment	Mine Operations Plan
Land and soil capability will be returned to a class similar to that existing prior to the commencement of mining (generally Classes IV, V and VI)	Land and soil capability indicators met	• Rehabilitation monitoring results; and • GIS mapping of land and soil capability classes with relevant data collected during rehabilitation	• Land meets land and soil capability classes as per final landuse design; and • Land and soils capability classes mapped on relinquishment plan.	(NSW Office of Environment & Heritage, Oct 2012)

Objective	Performance Indicator	Performance Measure	Completion Criteria	Justification / Source
		monitoring.		
Rehabilitated land will be topsoiled, fertilised and sown with pasture and/or native vegetation species	Year 3: 70 % vegetation cover, with evidence of tree establishment in tree lots	Rehabilitation monitoring results	Rehabilitation documented, indicating the required works completed	Mine Operations Plan
Property layout will be planned and designed for optimal use in terms of cattle management	Planning, design and layout undertaken including fencing (materials and construction), delineation of paddocks, access to watering points, stock handling facilities and stock refuge areas	• GIS data on fences, gates, access tracks and paddock layout; • Routine inspections of fences; and • Access tracks are inspected and maintained.	• GIS data sets; • All fences are intact and contain/ control cattle movement; and • Access tracks are accessible and fit for purpose.	Mine Operations Plan
A sustainable vegetation cover will be established on rehabilitated land	• Year 3: Evidence of litter layer developing; • Year 3: Tree plots indicating good tree growth; and • Year 5: Tree species displaying successful recruitment.	Rehabilitation monitoring results	• Achieve a vegetation cover of 70%, or combined live and litter cover of 70% in established tree belt areas; • Tree belts or plots established, with evidence of continued recruitment; and • Surface litter layer present at 75% of sites	Mine Operations Plan
	• Weed and pest animal control is implemented.	• GIS data on control programs; • GIS data on weed distribution and density; and • Records on implemented	• Noxious weeds and pest animal species are controlled in accordance with legislative requirements.	Mine Operations Plan

Objective	Performance Indicator	Performance Measure	Completion Criteria	Justification / Source
		work including pesticide usage.		
Bushfire preparedness and risk mitigation.	Vegetation is managed to control fire	• Implementation of ameliorative actions and management safeguards; and • GIS data on areas where bushfires impact.	• Any bushfires starting on site are controlled; and • GIS data on bushfire footprint.	*Rural Fires Act 1997*
Phase 5 – Ecosystem and Landuse Sustainability				
Rehabilitated land will: • Represent a minimal source of offsite environmental impacts; • Require ongoing management inputs no greater than similar adjacent land; and • Be compatible with the proposed post-mining land-use.	All progress indicators regarding landform stability and vegetation cover met	Rehabilitation monitoring results	All completion criteria regarding landform stability and vegetation cover met	Mine Operations Plan
	Carrying capacity and stocking rates are comparable to that of surrounding lands	• Assessment of herbage mass and herbage composition; • Assessment of feed quality and potential carrying capacity; • Assessment of soil nutrient; and • Assessment of cattle weight.	Average weight gain for 350kg yearlings is >1.0kg/day	(NSW Dept. of Primary Industries, 2006)
	Weeds reported and treated during monitoring program	• Annual weed surveys; and • GIS records of weeds infestations and treatment areas.	No significant infestations of declared weeds	*Noxious Weeds Act 1993,* TSC Act – Key Threatening Processes Australian and NSW Weed Strategies
	Water monitoring results within limits of the current Environment Protection Licence (EPL)	Ongoing monitoring and inspection of water management structures by appropriately qualified person	Water leaving site must meet current EPL criteria	Current EPL

8.0 Rehabilitation Monitoring and Reporting

8.1 Inspection

All rehabilitated areas will be inspected by site environment staff (or specialist consultants) to note any problem areas (such as bare patches, failed vegetation, drainage structure failure, significant erosion or significant weed infestation) requiring maintenance or further treatment. Remedial works will then be scheduled to address these areas. The assessment program is designed to collect sufficient data to compare the results of rehabilitation against the agreed completion criteria. The assessment program consists of three components:

- Annual maintenance inspections;
- Scheduled rehabilitation monitoring; and
- Review of inspection/measurement data over time to assess rehabilitation performance.

In the event that the inspection finds there are issues with the rehabilitation, further investigations should be undertaken to determine the possible causes and identify an appropriate remediation strategy. Factors to consider include:

- Nutrient levels;
- Soil limitations such as depth, pH, salinity;
- Insect attack, weeds or other pests;
- Species mix in revegetation programs;
- Drought or storm damage; and
- Excessive grazing.

Where appropriate, the rehabilitation procedures will be amended to improve the standard of rehabilitation.

8.2 Monitoring Sites

The monitoring sites will be permanently marked using steel pickets or similar. Representative monitoring sites will be established in newly rehabilitated areas at an average of one site per 10 ha of newly rehabilitated land, with monitoring plots being based on a 50m transect, positioned along the contour of the slope, and permanently marked using steel pickets. Each site will be monitored within 12 months of establishment and then every two years after. This will provide three sets of monitoring data in the first five years following rehabilitation.

The parameters to be assessed include:

- Landform:
  - Average slop gradient; and
  - Steepest slope gradient.
- Drainage:
  - Contour bank design – number interval and gradient;
  - Contour banks discharge point; and
  - Other drainage structures – dams, drop structures, diversions.
- Surface preparation:
  - Topsoil used – source, depth;
  - Ameliorants or supplements used – rate / ha; and

  - Ripping – depth / type.
- Vegetation establishment;
  - Method – direct seeding or tubestock;
  - Seed mix – species, rate, source;
  - Tubestock – species, density, source; and
  - Fertiliser – type, rate.
- Carrying capacity and stocking rates –
  - Assessment of herbage mass and herbage composition;
  - Assessment of feed quality and potential carrying capacity;
  - Assessment of soil nutrient; and
  - Assessment of cattle weight.
- Weeds – distribution, density and species;
- Fauna recolonising the area – in terms of species recorded and their indicators e.g. scats, tracks, nests;
- Vegetation – groundcover as percentage, groundcover species; species diversity; evidence of recruitment; plant health;
- Nutrient recycling – depth of litter; presence of cryptograms;
- Soils/surface condition;
- Land and soil capability;
- Erosion and stability; and
- A photo showing the general rehabilitation condition.

A standard monitoring plot design as shown in **Figure 7** will be used.

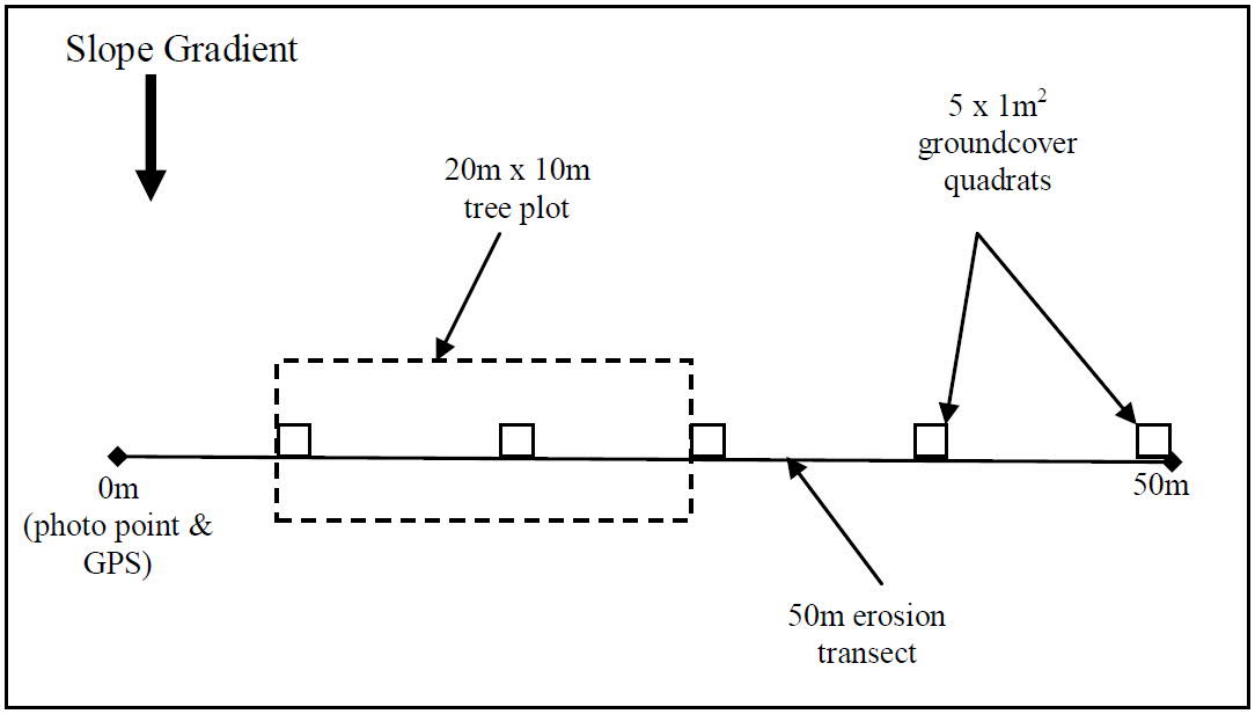


Figure 7 Standard Layout of Rehabilitation Monitoring Plot

8.2.1 Soil Analysis

Soil analysis will be undertaken to confirm that growth media is not likely to inhibit the sustainable development of a vegetative cover. As well as field observations and tests made during monitoring, soils analysis will consist of:

- Collecting representative root zone soil samples during field monitoring;
- Sampling prior to application of biosolids to define the application rates that can be used as per the EPA guidelines (NSW Environment Protection Authority, 2000); and
- Testing for pH, EC and Emerson Aggregate Test (indication of erosion potential).

8.2.2 Pasture Productivity Assessment

In areas with a post mining landuse aligned to pasture, pasture sampling will be undertaken in accordance with the collection technique guidelines – *Form Collect1-Version No.2-01/11/07 supplied by the NSW Department of Primary Industries* (DPI) (NSW Department of Primary Industries, 2007). Samples are to be sent to an accredited laboratory for analysis to determine the quality of feed available. Based on the testing results on the feed quality, pasture productivity will be calculated aligned to stocking rates and farm size assessment tools relevant for beef cattle in the Hunter Valley, which in turn determine sustainable carrying capacities.

8.2.3 Land and Soil Capability Assessment

As for disturbance monitoring, the survey area for this component of the monitoring program will not be limited to the transect/plot area, but rather will include the broader surrounding area containing the nominated transects/plots. The land and soil capability system is applied to the survey area in accordance with the guidelines *The Land and Soil Capability Assessment Scheme* (NSW Office of Environment & Heritage, Oct 2012).

Data will be collected on a range of hazards that are assessed to determine the land and soil capability of the land. These will include climate, soils, erosion and landform.

8.2.4 Photographic Monitoring

Photos will be taken from the permanent star pickets located at the start and end of the monitoring transect/plot, looking in the direction of the transect line. A ground to sky ratio of 5:1 is used where possible. Once the 50 m tape has been laid between the two star pickets, three digital photographs are to be taken as follows:

- A photograph is to be taken to the left of the tape (with the tape just in the frame in the far right);
- A photograph is to be taken with the tape (and star picket) in the centre of the frame; and
- A photograph is to be taken to the right of the tape (with the tape just in the frame in the far left).

Alternatively, and depending on the capability of the digital camera being used, a panoramic shot can be taken centred around the star picket.

8.3 Reporting

Figure 8 diagrammatically shows the rehabilitation process feedback loop and shows how the Rehabilitation Strategy relates with the rehabilitation monitoring, annual reporting, other site plans, MOPs, and conceptual mine closure plans.

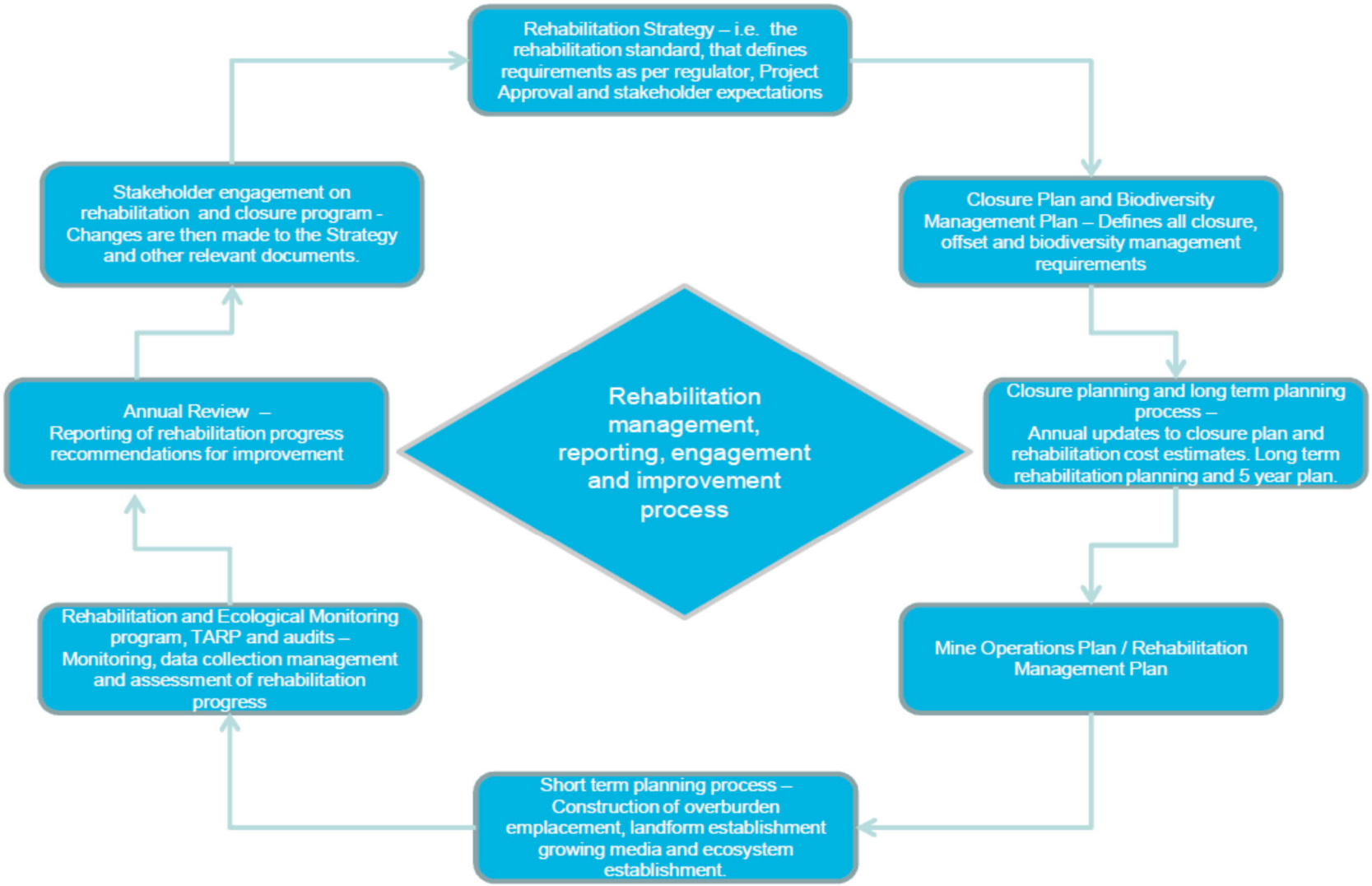


Figure 8 Rehabilitation Process Feedback Loop

8.3.1 Mine Operations Plan

Under the *Mining Act 1992*, environmental protection and rehabilitation are regulated by conditions in all mining leases, including requirements for the submission of a Mine Operations Plan.

The Rix's Creek Mine Operations Plan (Rix's Creek Mine, 2018) was prepared for the owner/operator of Rix's Creek - Bloomfield Collieries Pty Limited (BCL) for the specific purpose of satisfying the requirements of Mining Lease 1432 (ML 1432 – Clause 2) and Coal Lease 352 (CL352 – Clause 3). It was also prepared in accordance with requirements of the DRE *Draft Mining Operations Plan Guidelines* (NSW Trade & Investment Environment Sustainability Unit - Mineral Resources, March 2013) for Level 1 mines.

8.3.2 Environmental Management System

The ongoing effectiveness and efficiency of the site Management System is monitored as part of the operation's day-to-day management. Feedback from this and other more formal reviews and/ or following special occurrences, form the basis for System improvement and re-design.

In general, Management Systems are reviewed and up-dated as follows:

- Every three years; or
- Whenever there is a significant change to relevant legislation; or
- If required to do so by the Regulations; or
- Whenever there is a significant change to the operations; or
- If required (in writing) to do so by the Chief Inspector; or
- Whenever control measures are found to be ineffective either through:
- Changes to the working environment; or
- Changes to operating systems; or
- Subsequent risk assessments; or
- The findings of an audit; or
- Following a fatality or dangerous incident that could reasonably have been expected to result in a fatality; or
- Following an assessment of a related safety alert.

Continual Improvement

Operational activities will be subject to regular review to ensure conformance with commitments made in the EMS and subordinate plans and strategies.

Document Management

Copies of this document will be managed under the Group Document Management System. This document and other relevant documents are kept on site and are available to all employees.

The Bloomfield Group company directors will be responsible for the overall rehabilitation and environmental performance of the Mine. Senior Operational managers have direct responsibility for the rehabilitation process. The Senior Environmental Officer provides direction and advice to ensure site environmental compliance is maintained. The Senior Environmental Officer and Environmental Officer are responsible for the implementation of the works for the Mine. This involves insuring all aspects of the rehabilitation processes are followed and carried out.

8.3.3 Annual Review Report

The Bloomfield Group prepares an Annual Review Report in accordance with the Integrated Mining Policy, Mining Lease Requirements and Development Consent Conditions.

This Annual Review Report is a comprehensive Environmental review which includes:

- A review of rehabilitation which compiles monitoring results and discusses trends, system changes and responses to any potential issues identified during monitoring. Targets and future initiatives are also identified;
- Description of the works (including any rehabilitation) that were carried out during the previous calendar year, and the works that are proposed to be carried out over the current calendar year;
- A comprehensive review of the monitoring results and complaints records of the Project over the previous calendar year, which includes a comparison of these results against the:
  - Relevant statutory requirements, limits or performance measures/criteria;
  - Monitoring results of previous years; and
  - Relevant predictions in the Environmental Assessments;
- Identification of any non-compliance over the previous calendar year, and description of actions which were (or are being) taken to ensure compliance;
- Identification of any trends in the monitoring data over the life of the project;
- Identification of any discrepancies between the predicted and actual impacts of the Project, and analysis of discrepancies;
- Identification of the potential cause of any significant discrepancies; and
- Description of measures which will be implemented over the current calendar year to improve the environmental performance of the project.

8.3.4 Relinquishment Reporting

Prior to submission of a sign-off proposal, the land proposed for signoff will be subjected to a final maintenance inspection. This inspection will cover the whole area proposed for sign-off. The outcome of the inspection will be a documented description and photographic record of the general condition of rehabilitation, highlighting any areas of potential concern. This report will be included in the submission to the Resources Regulator.

Once a rehabilitated area is deemed to be potentially suitable for sign-off, a Sign-off Report will be submitted to the regulators. This report will include the following information for the proposed sign-off area:

- Survey Plan clearly showing the area proposed for relinquishment;
- Area size, disturbance and rehabilitation history;
- Monitoring data compared against rehabilitation aim, objectives and completion criteria;
- Final maintenance inspection findings;
- Photographs of the proposed area; and
- Monitoring data that demonstrates that the proposed area has reached the objectives, measures, performance indicators and criteria for Rehabilitation Complete as described in the MOP.

8.4 Premature Closure – Care and maintenance

Premature closure could come in a number of forms, such as:

- A short-term care and maintenance (C&M) phase lasting one to two years which could be due to price or weather issues for example, but have a foreseeable resolution date;
- Longer term C&M lasting more than one to two years, which could be triggered by large scale technical failures or financial bankruptcy of the owner, but there is a foreseeable solution enabling future operations; and
- Unplanned early closure, where future operations are not foreseeable under any plausible circumstances.

These scenarios could also occur at various times throughout the project life. This makes it impractical to have a detailed plan for all possible scenarios. However, the following provides an example of a preliminary framework that could be utilised for contingency plans for a short term C&M scenario:

- Open cut:
  - Close unnecessary ramp;
  - Shape benches for drainage control; and
  - Establish monitoring requirements and resources.
- Overburden emplacement areas;
  - Confirm that sumps and sediment management infrastructure are operational; and
  - Undertake temporary rehabilitation of exposed areas.
- Water storages:
  - All dams would remain under this situation, although pump and pipe infrastructure may be altered to meet the requirements of the revised water balance.
- Tailings storage:
  - Update the site procedures and train the relevant personnel in the details.
- Infrastructure:
  - Undertake shutdown procedure including isolating and tagging out equipment;
  - Secure chemical storages;
  - Run down stocks, send to other sites or return to suppliers as required;
  - Remove contaminated wastes;
  - Review the magazine and blasting agents compound stocks; run down stocks, send to other sites or return to suppliers, as required; and
  - Secure any infrastructure that will not be active through the C&M period.

The reporting as detailed in **Section 8.3** highlight the fact that such reports contain up-to-date information of the disturbed areas and the progressive rehabilitation status. Information in future MOP's and Rehabilitation Strategy's may be used for planning associated with premature closure

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10.0 Acronyms

ACARP	Australian Coal Association Research Program
AEMR	Annual Environmental Management Report
BCL	Bloomfield Collieries Pty Limited
BSAL	Biophysical Strategic Assessment Land
CCC	Community Consultative Committee
CHPP	Coal Handling Preparation Plant
DGRs	Director–General's Requirements
DP&I	Department of Planning and Infrastructure
DPE	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
DRE	Division of Resources and Energy, within the NSW Department Trade & Investment, Regional Infrastructure & Services
DRG	NSW Department of Planning and Environment-Division of Resources and Geoscience
DTIRIS	NSW Department Trade & Investment, Regional Infrastructure & Services
EA	Environmental Assessment
EC	Electrical Conductivity
EMP	Environmental Management Plans
EMS	Environmental Management System
EPA	NSW Environmental Protection Agency
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPL	Environmental Protection Licence
ESCP	Erosion and Sediment Control Plan
GIS	Geographical Information System
ha	Hectare
IPC	Independent Planning Commission of New South Wales
ML	Mining Lease
MR&C	Mine Rehabilitation and Closure

Mtpa	Million tonnes per annum
NSWMC	New South Wales Minerals Council
OEH	Office of Environment and Heritage
REMP	Rehabilitation and Environmental Management Plan
ROM	Run Of Mine
RR	NSW Department of Planning and Environment- Resources Regulator
TEA	Tailings emplacement areas
UHMD	Upper Hunter Mining Dialogue
WMP	Water Management Plan

Appendix A

Environmental Risk Assessment

Appendix A Key Risks Associated with Rix's Creek Operations

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - EXPLORATION

Process Area	Activity	Aspect	Raw (potential risk)				Existing Controls	Existing Controls				Proposed Controls	Residual Risk			
			C	P		R		C	P		R		C	P		R
Exploration	Survey of the drill locations	Damage to vegetation	5	c	5c	22 (L)	1. Employee Inductions 2. Experienced people 3. Use of existing tracks where possible	5	d	5d	24 (L)					
		Disturbance of Aboriginal heritage	2	d	2d	12 (M)		2	d	2d	12 (M)	1. Employee Inductions 2. Surveys completed to identify sites and assess significance. 3. Aboriginal Groups have been consulted 4. All known artefacts have been fenced off 5. The sites will be salvaged with the Aboriginal Community prior to the area being disturbed by mining. 6. Aboriginal Heritage Management System.	2	e	2e	16 (L)
		Disturbance of European heritage	2	d	2d	12 (M)		2	d	2d	12 (M)	1. Employee Inductions 2. Surveys completed to identify sites and assess significance. 3. No heritage items have been identified.	5	e	5e	25 (L)
		Wheel track erosion	3	d	3d	17 (L)	1. Use existing tracks where possible 2. Draft Erosion & Sediment Control Management Plan 3. Scheduled Environmental Inspections 4. Systems audits 5. Environmental Protection Licence 6. Existing Sediment Control Dams	4	e	4e	23 (L)					
		Fire hazard	3	d	3d	17 (L)	1. Employee Inductions 2. Hazard reduction program 3. Competent employees 4. Bushfire Management Plan 5. Onsite fire fighting capabilities	4	d	4d	21 (L)					
		Dust	3	d	3d	17 (L)	1. Employee Inductions 2. Land Disturbance Management System (dust) 3. Water cart availability 4. Complaints Protocol 5. Mindful of weather (wind) conditions.	5	e	5e	25 (L)					
		Potential for spills of hydrocarbons from vehicle accident.	4	d	4d	21 (L)	1. Mine Transport Management Plan 2. Bushfire Management Plan 3. Scheduled Environmental Inspections 4. Contractor Management System 5. Incident Notification and Reporting Procedure 6. Emergency Response Procedure	4	e	4e	23 (L)					
		Injury to or loss of threatened flora and fauna *(note work area mostly cleared)*	4	d	4d	21 (L)	1. Mine Transport Management Plan 2. Employee Inductions 3. Daylight operations	4	e	4e	23 (L)					
		Potential to introduce weeds	5	e	5e	25 (L)	1. Vehicle wash at entrance 2. Employee inductions 3. Scheduled Environmental Inspections 4. Weed Control Contractors	5	e	5e	25 (L)	not considered an issue				
	Clearing of drill lines and Site establishment and Digging Pits	Injury to or loss of threatened flora and fauna *(note work area mostly cleared)*	4	c	4c	18 (L)	1. Mine Transport Management Plan 2. Employee Inductions 3. Daylight operations	4	d	4d	21 (L)					
		Sediment leaving the site	3	c	3c	13 (M)	1. Use existing tracks where possible 2. Draft Erosion & Sediment Control Management Plan 3. Scheduled Environmental Inspections 4. Systems audits 5. Environmental Protection Licence 6. Existing sedimentation dam on boundary	4	d	4d	21 (L)					
		Loss of top dressing material	4	c	4c	18 (L)	1. Mining Operations Plan 2. Minimal surface disturbance	4	d	4d	21 (L)					
		Disturbance of Aboriginal heritage	2	c	2c	8 (M)	1. Non existent in area under investigation	2	c	2c	8 (M)	1. Employee Inductions 2. Surveys completed to identify sites and assess significance. 3. Aboriginal Groups have been consulted 4. All known artefacts have been fenced off 5. The sites will be salvaged with the Aboriginal Community prior to the area being disturbed by mining. 6. Aboriginal Heritage Management System.	2	e	2e	16 (L)
		Disturbance of European heritage	2	c	2c	8 (M)		2	c	2c	8 (M)	1. Employee Inductions 2. Surveys completed to identify sites and assess significance. 3. No heritage items have been identified.	5	e	5e	25 (L)
		Potential to introduce weeds	5	e	5e	25 (L)	1. Vehicle wash at entrance 2. Employee inductions 3. Scheduled Environmental Inspections 4. Weed Control Contractors	5	e	5e	25 (L)	not considered an issue				
		Noise	4	d	4d	21 (L)	1. Daylight activity 2. Employee Inductions 3. Maintenance Management System 4. Complaints Protocol	4	e	4e	23 (L)					
		Dust	3	c	3c	13 (M)	1. Mindful of weather (wind) conditions 2. Employee Inductions 3. Land Disturbance Management System (dust) 4. Water cart availability 5. Complaints Protocol 6. Supervisor Inspections	5	e	5e	25 (L)					
		Fire hazard	3	d	3d	17 (L)	1. Employee Inductions 2. Hazard reduction program 3. Competent employees 4. Bushfire Management Plan 5. Onsite fire fighting capabilities	4	d	4d	21 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - EXPLORATION

Process Area	Activity	Aspect	Raw (potential risk) C	P		R	Existing Controls	Existing Controls C	P		R	Proposed Controls	Residual Risk C	P		R
		Hydraulic hose oil spill	3	c	3c	13 (M)	1. Maintenance Management System 2. Environmental Emergency Response Procedure 3. Spill kits 4. Employee Inductions 5. Employee Consultation Systems 6. Incident Notification and Reporting Procedure	4	d	4d	21 (L)					
	Establish drill rig and drilling (including demobilisation)	Erosion with sediment leaving site (wheel tracks)	4	d	4d	21 (L)	1. Use existing tracks where possible 2. Draft Erosion & Sediment Control Management Plan 3. Scheduled Environmental Inspections 4. Systems audits 5. Environmental Protection Licence 6. Existing sedimentation dam on boundary 7. Contractor Management System 8. Contractor Inductions	5	d	5d	24 (L)					
		Hydrocarbon storage	3	c	3c	13 (M)	1. Mobile equipment 2. Contract Management System 3. Contractor Induction 4. Onsite spill kits 5. Bushfire Management Plan 6. Supervisor Inspections 7. Incident Notification and Reporting Procedure	4	d	4d	21 (L)					
		Potential to introduce weeds	4	c	4c	18 (L)	1. Vehicle wash at entrance 2. Contractor inductions 3. Scheduled Environmental Inspections 4. Weed Control Contractors 5. Supervisor Inspections	4	d	4d	21 (L)					
		Injury to or loss of threatened flora and fauna *(note work area mostly cleared)*	5	e	5e	25 (L)	1. Mine Transport Management Plan 2. Employee Inductions 3. Daylight operations	5	e	5e	25 (L)	not considered an issue				
		Hydraulic hose oil spill	3	c	3c	13 (M)	1. Mobile equipment 2. Contract Management System 3. Contractor Induction 4. Onsite spill kits 5. Bushfire Management Plan 6. Supervisor Inspections 7. Incident Notification and Reporting Procedure	4	d	4d	21 (L)					
		Spillage of hydrocarbons during transfer from the service truck.	3	c	3c	13 (M)	1. Mobile equipment 2. Contractor Management System 3. Contractor Induction 4. Onsite spill kits 5. Bushfire Management Plan 6. Incident Notification and Reporting Procedure	4	d	4d	21 (L)					
		Hydrocarbon leaking from tank	3	c	3c	13 (M)	1. Mobile equipment 2. Contractor Management System 3. Contractor Induction 4. Onsite spill kits 5. Bushfire Management Plan	4	d	4d	21 (L)					
		Noise	4	c	4c	18 (L)	1. Daylight activity 2. Employee Inductions 3. Maintenance Management System 4. Complaints Protocol 5. Supervisor Inspections 6. Contractors Management Systems 7. Contractor Inductions	4	d	4d	21 (L)					
		Dust	3	c	3c	13 (M)	1. Employee Inductions 2. Land Disturbance Management System (dust) 3. Water cart availability 4. Complaints Protocol 5. Supervisor Inspections 6. Contractors Management Systems 7. Contractor Inductions 8. Mindful of weather (wind) conditions.	3	d	3d	17 (L)					
		Fire hazard	4	d	4d	21 (L)	1. Hazard reduction program 2. Bushfire Management Plan 3. Onsite fire fighting capabilities 4. Supervisor Inspections	5	d	5d	24 (L)					
		Waste management e.g. oily rags, empty drums	4	b	4b	14 (M)	1. Contractor Management System 2. Contractor Induction 3. Onsite waste bins 4. Supervisor Inspections	5	d	5d	24 (L)					
	Traffic movement e.g. water cart, geologist, driller, logger	Potential to introduce weeds	4	d	4d	21 (L)	1. Vehicle wash at entrance 2. Employee inductions 3. Scheduled Scheduled Environmental Inspections 4. Weed Control Contractors	5	d	5d	24 (L)					
		Wheel track erosion	4	b	4b	14 (M)	1. Use existing tracks where possible 2. Draft Erosion & Sediment Control Management Plan 3. Scheduled Environmental Inspections 4. Systems audits 5. Environmental Protection Licence 6. Contractor Management System 7. Supervisor Inspections 8. Contractor Induction	4	d	4d	21 (L)					
		Fire hazard	4	d	4d	21 (L)	1. Hazard reduction program 2. Bushfire Management Plan 3. Onsite fire fighting capabilities 4. Supervisor Inspections 5. Contractor Management System 6. Contractor Induction	5	d	5d	24 (L)					
		Noise	4	c	4c	18 (L)	1. Daylight activity 2. Employee Induction 3. Maintenance Management System 4. Complaints Protocol 5. Supervisor Inspections 6. Contractor Management System 7. Contractor Induction	4	d	4d	21 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - EXPLORATION

Process Area	Activity	Aspect	Raw (potential risk) C	P	R		Existing Controls	Existing Controls C	P	R		Proposed Controls	Residual Risk C	P	R	
		Dust	3	c	3c	13 (M)	1. Employee Induction 2. Land Disturbance Management System (dust) 3. Water cart availability 4. Complaints Protocol 5. Supervisor Inspections 6. Contractor Management System 7. Contractor Induction 8. Mindful of weather (wind) conditions.	4	d	4d	21 (L)					
		Potential for spills of hydrocarbons from vehicle accident.	4	d	4d	21 (L)	1. Mine Transport Management Plan 2. Bushfire Management Plan 3. Scheduled Environmental Inspections 4. Incident Notification and Reporting Procedure 5. Contractor Management System 6. Contractor Induction 7. Incident Notification and Reporting Procedure	4	e	4e	23 (L)					
		Injury to or loss of threatened flora and fauna *(note work area mostly cleared)*	5	e	5e	25 (L)	1. Mine Transport Management Plan 2. Employee Inductions 3. Daylight operations	5	e	5e	25 (L)	not considered an issue				
		Loss of radiation source	4	d	4d	21 (L)	1. Contractor Management System 2. Contractor Induction 3. Use of NATA approved contractor	4	e	4e	23 (L)					
	Open holes and pits after drilling	Injury to or loss of threatened flora and fauna *(note work area mostly cleared)*	4	d	4d	21 (L)	1. Fill in pits and cap holes 2. DPI guidelines 3. Mining Lease Conditions	5	e	5e	25 (L)	not considered an issue				
		Aquifer contamination	4	d	4d	21 (L)	1. Dry area 2. Capping holes 3. Deep hard rock aquifer 4. No alluvial aquifers involved 5. Poor water quality	5	e	5e	25 (L)	not considered an issue				
	Rehabilitation	Potential to introduce weeds	4	c	4c	18 (L)	1. Vehicle wash at entrance 2. Employee inductions 3. Scheduled Environmental Inspections 4. Weed Control Contractors	4	d	4d	21 (L)					
		Erosion with sediment leaving site	4	d	4d	21 (L)	1. Use existing tracks where possible 2. Draft Erosion & Sediment Control Management Plan 3. Scheduled Environmental Inspections 4. Systems audits 5. Licence 6. Existing sedimentation dam on boundary	5	d	5d	24 (L)					
		Noise	4	d	4d	21 (L)	1. Daylight activity 2. Employee Inductions 3. Maintenance Management System 4. Complaints Protocol 5. Supervisor Inspections 6. Contractors Management Systems 7. Contractor Inductions	4	e	4e	23 (L)					
		Dust	3	c	3c	13 (M)	1. Employee Inductions 2. Land Disturbance Management System (dust) 3. Water cart availability 4. Complaints Protocol 5. Supervisor Inspections 6. Contractors Management Systems 7. Contractor Inductions 8. Mindful of weather (wind) conditions	5	e	5e	25 (L)					
		Hydraulic hose oil spill	4	d	4d	21 (L)	1. Maintenance Management System 2. Emergency Spill Response 3. Spill kits 4. Employee Inductions 5. Employee Consultation Systems 6. Incident Notification and Reporting Procedure	5	d	5d	24 (L)					
		Fire hazard	4	d	4d	21 (L)	1. Inductions 2. Hazard reduction program 3. Competent employees 4. Bushfire Management Plan 5. Onsite fire fighting capabilities	5	d	5d	24 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - PRE-STRIPPING

Process Area	Activity	Aspect	Raw (potential risk)				Existing Controls	Existing Controls				Proposed Controls	Residual Risk			
			C	P	R			C	P	R			C	P	R	
Pre-stripping	Clearing of vegetation - *note: site predominantly cleared*	Injury to or loss of threatened flora and fauna	2	b	2b	5 (H)	1. Draft Land Disturbance Management System 2. Work area mostly cleared.	3	d	3d	17 (L)	1. Assessment has been made on the presence / absence of threatened species 2. No threatened species were identified within the area to be disturbed 3. A relevant DECC approved research program will be committed to by Bloomfield commensurate to the loss of any Lower Hunter Spotted Gum Ironbark Forest Endangered Ecological Community within the Project area.	3	d	3d	17 (L)
		Disturbance of Aboriginal heritage sites	2	c	2c	8 (M)		2	c	2c	8 (M)	1. Employee Inductions 2. Surveys completed to identify sites and assess significance. 3. Aboriginal Groups have been consulted 4. All known artefacts have been fenced off 5. The sites will be salvaged with the Aboriginal Community prior to the area being disturbed by mining. 6. Aboriginal Heritage Management System.	2	e	2e	16 (L)
		Disturbance of European heritage sites	2	c	2c	8 (M)		2	c	2c	8 (M)	1. Employee Inductions 2. Surveys completed to identify sites and assess significance. 3. No heritage items have been identified.	5	e	5e	25 (L)
		Dust	3	b	3b	9 (M)	1. Mindful of weather (wind) conditions 2. Employee Inductions 3. Land Disturbance Management System (dust) 4. Water cart availability 5. Complaints Protocol 6. Supervisor Inspections 7. Supervisor Audits	4	d	4d	21 (L)					
		Noise	4	d	4d	21 (L)	1. Employee Inductions 2. Maintenance Management Systems 3. Complaints Protocol 4. Supervisor Inspections 5. Supervisor Audits 6. Altered operating conditions at set times (ie. night time) to reduce noise.	4	e	4e	23 (L)					
		Erosion with sediment leaving site	4	c	4c	18 (L)	1. Employee Inductions 2. Internal drainage 3. Existing Sediment Control Dam 4. Draft Erosion & Sediment Control Plan 5. Mining Operations Inspection System 6. Scheduled Environmental Inspections	4	d	4d	21 (L)					
		Spillage of hydraulic oil from damaged hose	4	b	4b	14 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Employee Consultation Systems 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8 Supervisor Audits	5	d	5d	24 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - PRE-STRIPPING

Process Area	Activity	Aspect	Raw (potential risk) C	P	R		Existing Controls	Existing Controls C	P	R		Proposed Controls	Residual Risk C	P	R	
		Potential to introduce weeds	4	d	4d	21 (L)	1. Weed Control Contractors 2. Scheduled Environmental Inspections 3. Vehicle wash at entrance 4. Employee Inductions 5. Employee Consultation Systems 6. Contractor Induction 7. Supervisor Inspections 8. Supervisor Audits 9. Contractor Management System	5	d	5d	24 (L)					
		Disposal of cleared timber (potential loss of habitat)	3	b	3b	9 (M)	1. Pre-clearance protocol	4	e	4e	23 (L)					
		Spillage of hydrocarbons when transferring from service truck	4	b	4b	14 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site On-site Spill Kits 4. Employee Inductions 5. Employee Consultation Systems 6. Incident Notification and Reporting Procedure 7. Mobile equipment 8. Competency Management System	4	d	4d	21 (L)					
	Stripping of Top-dressing Material	Disturbance of Aboriginal heritage sites	2	c	2c	8 (M)		2	c	2c	8 (M)	1. Employee Inductions 2. Surveys completed to identify sites and assess significance. 3. Aboriginal Groups have been consulted 4. All known artefacts have been fenced off 5. The sites will be salvaged with the Aboriginal Community prior to the area being disturbed by mining. 6. Aboriginal Heritage Management System.	2	e	2e	16 (L)
		Potential to introduce weeds	4	d	4d	21 (L)	1. Vehicle wash at entrance 2. Employee inductions 3. Scheduled Environmental Inspections 4. Weed Control Contractors 5. Contractor Management System 6. Contractor Inductions	5	d	5d	24 (L)					
		Disturbance of European heritage sites	2	c	2c	8 (M)		2	c	2c	8 (M)	1. Employee Inductions 2. Surveys completed to identify sites and assess significance. 3. No heritage items have been identified.	5	e	5e	25 (L)
		Dust	3	b	3b	9 (M)	1. Mindful of weather (wind) conditions 2. Employee Inductions 3. Land Disturbance Management System (dust) 4. Water cart availability 5. Complaints Protocol 6. Supervisor Inspections 7. Supervisor Audits	3	d	3d	17 (L)					
		Noise	4	b	4b	14 (M)	1. Employee Inductions 2. Maintenance Management Systems 3. Complaints Protocol 4. Supervisor Inspections 5. Supervisor Audits 6. Altered Operating Conditions at set times (ie night time) to reduce noise.	4	e	4e	23 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - PRE-STRIPPING

Process Area	Activity	Aspect	Raw (potential risk) C	P	R		Existing Controls	Existing Controls C	P	R		Proposed Controls	Residual Risk C	P	R	
		Erosion with sediment leaving site	3	b	3b	9 (M)	1. Employee Inductions 2. Internal drainage for part of the area 3. Existing Sediment Control Dam 4. Draft Erosion & Sediment Control Plan 5. Mining Operations Inspection System 6. Scheduled Environmental Inspections	4	d	4d	21 (L)					
		Spillage of hydraulic oil from damaged hose	4	b	4b	14 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site On-site Spill Kits 4. Employee Inductions 5. Employee Consultation Systems 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8. Supervisor Audits 9. Mine Transport	5	d	5d	24 (L)					
		Spillage of hydrocarbons when transferring from service truck	4	b	4b	14 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Employee Consultation Systems 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8 Supervisor Audits	4	d	4d	21 (L)					
		Loss of top dressing material	3	b	3b	9 (M)	1. Mining Operations Plan 2. Employee awareness and supervision 3. Employee consultation system 4. Scheduled Environmental Inspections 5. Competency Management System	4	d	4d	21 (L)					
		Quality of top dressing material reduced through damage to soil structure	4	c	4c	18 (L)	1. Direct placement wherever possible 2. Top dressing material stockpile management 3. Mining Operations Plan 4. Employee awareness and supervision 5. Employee consultation system 6. Scheduled Environmental Inspections 7. Competency Management System	4	e	4e	23 (L)					
	Overburden drilling	Noise	3	c	3c	13 (M)	1. Employee Inductions 2. Maintenance Management Systems 3. Complaints Protocol 4. Supervisor Inspections 5. Supervisor Audits 6. Altered operating conditions at set times (ie. night time) to reduce noise.	3	d	3d	17 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - PRE-STRIPPING

Process Area	Activity	Aspect	Raw (potential risk) C	P	R		Existing Controls	Existing Controls C	P	R		Proposed Controls	Residual Risk C	P	R	
		Dust	3	c	3c	13 (M)	1. Dust Extraction Systems 2. Curtains and water on drill 3. Employee Inductions 2. Land Disturbance Management System (dust) 3. Water cart availability 4. Complaints Protocol 7. Supervisor Inspections 8. Supervisor Audits 9. Mindful of weather (wind) conditions	4	d	4d	21 (L)					
		Spillage of hydrocarbons when transferring from service truck	4	b	4b	14 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Employee Consultation Systems 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8 Supervisor Audits	4	d	4d	21 (L)					
		Spillage of hydraulic oil from damaged hose	4	c	4c	18 (L)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Employee Consultation Systems 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8. Supervisor Audits 9. Mine Transport Management Plan	5	d	5d	24 (L)					
	Blasting	Noise/ overpressure	2	b	2b	5 (H)	1. Shot Firing and Explosives Management System 2. Competent, experienced employees 3. Inhouse Mining Engineer 4. Access to external specialist input 5. Supervisor Inspections 6. Supervisor Audits 7. Complaints Protocol	3	d	3d	17 (L)					
		Vibration	2	b	2b	5 (H)	1. Shot Firing and Explosives Management System 2. Competent, experienced employees 3. Inhouse Mining Engineer 4. Access to external specialist input 5. Supervisor Inspections 6. Supervisor Audits 7. Complaints Protocol	4	d	4d	21 (L)					
		Dust	3	b	3b	9 (M)	1. Shot Firing and Explosives Management System 2. Access to external specialist input 3. Inductions 4. Land Disturbance Management System (dust) 5. Water cart availability 6. Complaints Protocol 7. Supervisor Inspections 8. Supervisor Audits 9. Mindful of weather (wind) conditions	4	c	4c	18 (L)					
		Noxious gas released to atmosphere *(unusual to experience wet holes in pre-strip)*	4	d	4d	21 (L)	1. Shot Firing and Explosives Management System 2. Access to external specialist input	5	e	5e	25 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - PRE-STRIPPING

Process Area	Activity	Aspect	Raw (potential risk)				Existing Controls	Existing Controls				Proposed Controls	Residual Risk			
			C	P	R			C	P	R			C	P	R	
	Excavation of overburden (using the excavator)	Noise	3	b	3b	9 (M)	1. Employee Inductions 2. Maintenance Management Systems 3. Complaints Protocol 4. Supervisor Inspections 5. Supervisor Audits 6. Altered operating conditions at set times (ie. night time) to reduce noise.	3	d	3d	17 (L)					
		Dust	3	b	3b	9 (M)	1. Mindful of weather (wind) conditions 2. Employee Inductions 3. Land Disturbance Management System (dust) 4. Water cart availability 5. Complaints Protocol 6. Supervisor Inspections 7. Supervisor Audits	4	d	4d	21 (L)					
		Visual	3	c	3c	13 (M)	1. Progressive Rehabilitation 2. Mine Planning 3. Timber screening 4. Informal Operational procedures (night lighting) 5. Community Consultation 6. Complaints Protocol	3	d	3d	17 (L)					
		Spillage of hydraulic oil from damaged hose	4	c	4c	18 (L)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Employee Consultation Systems 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8 Supervisor Audits	5	d	5d	24 (L)					
		Spillage of hydrocarbons when transferring from service truck	4	b	4b	14 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Employee Consultation Systems 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8 Supervisor Audits	4	d	4d	21 (L)					
		Taking coal with overburden (sponcom in rehabilitation)	4	e	4e	23 (L)	1. Burial of oxidised coal material 2. Supervisor Audits 3. Mining Operation Plan 4. Supervisor Inspections 5. Mining Operations Inspection Management System	5	e	5e	25 (L)	not considered an issue				
		Waste Management (during service days)	5	b	5b	19 (L)	1. Environmental Protection Licence 2. Onsite Waste bins 3. Use of Licensed Contractor for waste removal 4. Contractor Management System 5. Contractor Inductions 6. Supervisor Inspections 7. Maintenance	5	d	5d	24 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - PRE-STRIPPING

Process Area	Activity	Aspect	Raw (potential risk)				Existing Controls	Existing Controls				Proposed Controls	Residual Risk			
			C	P	R			C	P	R			C	P	R	
		Major shut downs (contractor)	5	b	5b	19 (L)	1. Environmental Protection Licence 2. Onsite Waste bins 3. Use of Licensed Contractor for waste removal 4. Contractor Management System 5. Contractor Inductions 6. Supervisor Inspections 7. Supervisor Audits	5	d	5d	24 (L)					
	Mining of coal	Noise	3	c	3c	13 (M)	1. Employee Inductions 2. Maintenance Management Systems 3. Complaints Protocol 4. Supervisor Inspections 5. Supervisor Audits 6. Altered operating conditions at set times (ie. night time) to reduce noise.	3	d	3d	17 (L)					
		Dust	3	b	3b	9 (M)	1. Mindful of weather (wind) conditions 2. Employee Inductions 3. Land Disturbance Management System (dust) 4. Water cart availability 5. Complaints Protocol 6. Supervisor Inspections 7. Supervisor Audits	4	d	4d	21 (L)					
		Spillage of hydrocarbons when transferring from service truck	4	b	4b	14 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Employee Consultation Systems 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8. Supervisor Audits 9. Competency Management System	4	d	4d	21 (L)					
	Hauling with rear dump trucks	Noise	3	b	3b	9 (M)	1. Employee Inductions 2. Maintenance Management Systems 3. Complaints Protocol 4. Supervisor Inspections 5. Supervisor Audits 6. Altered operating conditions at set times (ie. night time) to reduce noise.	3	d	3d	17 (L)					
		Dust	3	b	3b	9 (M)	1. Mindful of weather (wind) conditions 2. Employee Inductions 3. Land Disturbance Management System (dust) 4. Water cart availability 5. Complaints Protocol 6. Supervisor Inspections 7. Supervisor Audits	4	d	4d	21 (L)					
		Spillage of hydraulic oil from damaged hose	4	c	4c	18 (L)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Employee Consultation Systems 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8. Supervisor Audits 9. Emergency Response Procedure	5	d	5d	24 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - PRE-STRIPPING

Process Area	Activity	Aspect	Raw (potential risk) C	P	R		Existing Controls	Existing Controls C	P	R		Proposed Controls	Residual Risk C	P	R	
		Spillage of hydrocarbons when transferring from service truck	4	b	4b	14 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Employee Consultation Systems 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8 Supervisor Audits	4	d	4d	21 (L)					
		Exhaust emissions	4	b	4b	14 (M)	1. Original Equipment Manufacturer Standards 2. Maintenance Management System 3. Defect Management System 4. Supervisor Inspections 5. Supervisor Audits	4	e	4e	23 (L)					
	Hauling with on-highway trucks	Noise	3	c	3c	13 (M)	1. Contractor Management System 2. Engineer's Audits 3. RTA registered trucks 4. Six monthly shaker tests 5. Maintenance Management Systems 6. Complaints Protocol 7. Supervisor Inspections 8. Contractor Induction 9. Altered operating conditions at set times (ie. night time) to reduce noise.	3	d	3d	17 (L)					
		Dust	3	b	3b	9 (M)	1. Mindful of weather (wind) conditions 2. Employee Inductions 3. Land Disturbance Management System (dust) 4. Water cart availability 5. Complaints Protocol 6. Supervisor Inspections 7. Contractor Management System 8. Contractor Induction 9. Supervisor Audits	4	d	4d	21 (L)					
		Spillage of hydraulic oil from damaged hose	4	c	4c	18 (L)	1. Contractor Management System 2. Emergency Spill Response 3. On-site On-site Spill Kits 4. Employee Inductions 5. Employee Consultation Systems 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8. Supervisor Audits	5	d	5d	24 (L)					
		Spillage of hydrocarbons when transferring from service truck	4	b	4b	14 (M)	1. Contractor Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Employee Consultation Systems 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8. Supervisor Audits 9. Contractor Induction	4	d	4d	21 (L)					
		Exhaust emissions	4	b	4b	14 (M)	1. Original Equipment Manufacturer Standards 2. Supervisor Audits 3. Defect Management System 4. Supervisor Inspections 5. Contractor Management System	4	e	4e	23 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - PRE-STRIPPING

Process Area	Activity	Aspect	Raw (potential risk)				Existing Controls	Existing Controls				Proposed Controls	Residual Risk			
			C	P	R			C	P	R			C	P	R	
	Overburden dumping area (includes tipping with trucks)	Dust	3	b	3b	9 (M)	1. Mindful of weather (wind) conditions 2. Employee Inductions 3. Land Disturbance Management System (dust) 4. Water cart availability 5. Complaints Protocol 6. Supervisor Inspections 7. Supervisor Audits	4	d	4d	21 (L)					
		Noise	3	b	3b	9 (M)	1. Employee Inductions 2. Maintenance Management Systems 3. Complaints Protocol 4. Supervisor Inspections 5. Supervisor Audits	3	d	3d	17 (L)					
		Lighting of the dumps being directed into the residents houses resulting in visual impact issues.	4	b	4b	14 (M)	1. Direction of lights are changed so that they are not pointed towards the residents 2. Opportunity to enable dumping in an alternative dump or location on the dump after dark.	4	d	4d	21 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - MAIN DIG

Process Area	Activity	Aspect	Raw				Existing Controls	Existing Controls				Proposed Controls	Residual Risk			
			C	P	R			C	P	R			C	P	R	
Main Dig	Interburden drilling	Noise	3	d	3d	17 (L)	1. Employee Inductions 2. Maintenance Management Systems 3. Complaints Protocol 4. Supervisor Inspections 5. Supervisor Audits 6. Altered Operating Conditions at set times (ie night time) to reduce noise.	3	e	3e	20 (L)					
		Dust	3	c	3c	13 (M)	1. Mindful of weather (wind) conditions 2. Employee Inductions 3. Land Disturbance Management System (dust) 4. Water cart availability 5. Complaints Protocol 6. Supervisor Inspections	4	d	4d	21 (L)					
		Spillage of Hydrocarbons when transferring from Service Truck	4	b	4b	14 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Competency Management System 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8 Supervisor Audits	4	d	4d	21 (L)					
		Spillage of hydraulic oil from damaged hose	4	c	4c	18 (L)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Competency Management System 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8 Supervisor Audits	5	d	5d	24 (L)					
	Blasting	Noise/ overpressure	2	c	2c	8 (M)	1. Shot Firing and Explosives Management System 2. Competent, experienced employees 3. Inhouse Mining Engineer 4. Access to external specialist input 5. Supervisor Inspections 6. Supervisor Audits 7. Complaints Protocol 8. Altered Operating Conditions at set times (ie night time) to reduce noise.	3	d	3d	17 (L)					
		Vibration	2	b	2b	5 (H)	1. Shot Firing and Explosives Management System 2. Competent, experienced employees 3. Inhouse Mining Engineer 4. Access to external specialist input 5. Supervisor Inspections 6. Supervisor Audits 7. Complaints Protocol	4	d	4d	21 (L)					
		Dust	3	c	3c	13 (M)	1. Shot Firing and Explosives Management System 2. Access to external specialist input 3. Inductions 4. Land Disturbance Management System (dust) 5. Water cart availability 6. Complaints Protocol 7. Supervisor Inspections 8. Mindful of weather (wind) conditions	4	d	4d	21 (L)					
		Noxious gas released to atmosphere *(unusual to experience wet holes in pre-strip)*	4	d	4d	21 (L)	1. Shot Firing and Explosives Management System 2. Access to external specialist input	5	e	5e	25 (L)					
	Excavation of interburden	Noise	3	c	3c	13 (M)	1. Maintenance Management System 2. Competent, experienced employees 3. Supervisor Inspections 4. Supervisor Audits 5. Complaints Protocol 6. Altered Operating Conditions at set times (ie night time) to reduce noise.	3	d	3d	17 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - MAIN DIG

Process Area	Activity	Aspect	Raw				Existing Controls	Existing Controls				Proposed Controls	Residual Risk			
			C	P	R			C	P	R			C	P	R	
		Dust	3	c	3c	13 (M)	1. Mindful of weather (wind) conditions 2. Employee Inductions 3. Land Disturbance Management System (dust) 4. Water cart availability 5. Complaints Protocol 6. Supervisor Inspections 7. Supervisor Audits	4	d	4d	21 (L)					
		Spillage of hydraulic oil from damaged hose	4	c	4c	18 (L)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Incident Notification and Reporting Procedure 6. Supervisor Inspections 7. Supervisor Audits	5	d	5d	24 (L)					
		Spillage of Hydrocarbons when transferring from Service Truck	4	b	4b	14 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Competency Management System 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8 Supervisor Audits	4	d	4d	21 (L)					
		Taking coal with overburden (sponcom in rehabilitation)	4	d	4d	21 (L)	1. Burial of oxidised coal material 2. Internal Audit Management System 3. Mining Operation Plan 4. Supervisor Inspections 5. Supervisor Audits	5	e	5e	25 (L)					
		Waste Management (during service days)	5	b	5b	19 (L)	1. Environmental Protection Licence 2. Onsite Waste bins 3. Use of Licensed Contractor for waste removal 4. Contractor Management System 5. Contractor Inductions 6. Supervisor Inspections 7. Employee Inductions	5	d	5d	24 (L)					
		Major shut downs (contractor)	5	b	5b	19 (L)	1. Environmental Protection Licence 2. Onsite Waste bins 3. Use of Licensed Contractor for waste removal 4. Contractor Management System 5. Contractor Inductions 6. Supervisor Inspections 7. Employee Inductions	5	d	5d	24 (L)					
	Mining of coal	Noise	3	d	3d	17 (L)	1. Employee Inductions 2. Maintenance Management Systems 3. Complaints Protocol 4. Supervisor Inspections 5. Supervisor Audits 6. Competency Management System 7. Altered Operating Conditions at set times (ie night time) to reduce noise.	3	e	3e	20 (L)					
		Dust	3	c	3c	13 (M)	1. Mindful of weather (wind) conditions 2. Employee Inductions 3. Land Disturbance Management System (dust) 4. Water cart availability 5. Complaints Protocol 6. Supervisor Inspections	4	d	4d	21 (L)					
		Groundwater	3	c	3c	13 (M)	1. Experience mining in the area.	4	d	4d	21 (L)	*1. Groundwater Assessment* *2. Groundwater Model* *Note: Groundwater quality not suitable for use (ie. saline, deep)*	4	d	4d	21 (L)

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - MAIN DIG

Process Area	Activity	Aspect	Raw				Existing Controls	Existing Controls				Proposed Controls	Residual Risk			
			C	P	R			C	P	R			C	P	R	
		Spillage of hydraulic oil from damaged hose	4	c	4c	18 (L)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Toolbox Talks 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8 Supervisor Audits	5	d	5d	24 (L)					
		Spillage of Hydrocarbons when transferring from Service Truck	4	b	4b	14 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Toolbox Talks 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8 Supervisor Audits	4	d	4d	21 (L)					
		Hydrocarbon contamination of pit-water (pumps, spills)	3	c	3c	13 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Toolbox talks 6. Dedicated Experienced employee 7. Incident Notification and Reporting Procedure 8. Supervisor Inspections 9 Supervisor Audits	4	d	4d	21 (L)					
	Hauling with rear dump trucks	Noise	3	c	3c	13 (M)	1. Employee Inductions 2. Maintenance Management Systems 3. Complaints Protocol 4. Supervisor Inspections 5. Supervisor Audits 6. Competency Management System 7. Altered Operating Conditions at set times (ie night time) to reduce noise.	3	d	3d	17 (L)					
		Dust	3	c	3c	13 (M)	1. Mindful of weather (wind) conditions 2. Employee Inductions 3. Land Disturbance Management System (dust) 4. Water cart availability 5. Complaints Protocol 6. Supervisor Inspections 7. Supervisor Audits	4	d	4d	21 (L)					
		Visual	3	c	3c	13 (M)	1. Progressive Rehabilitation 2. Mine Planning 3. Timber screening 4. Informal Operational procedures (night lighting) 5. Community Consultation 6. Complaints Protocol	3	d	3d	17 (L)					
		Spillage of hydraulic oil from damaged hose	4	c	4c	18 (L)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Toolbox Talks 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8. Supervisor Audits	5	d	5d	24 (L)					
		Spillage of Hydrocarbons when transferring from Service Truck	4	b	4b	14 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Toolbox Talks 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8 Supervisor Audits	4	d	4d	21 (L)					
		Exhaust emissions	4	b	4b	14 (M)	1. Original Equipment Manufacturer Standards 2. Maintenance Management System 3. Defect Management System 4. Supervisor Inspections	4	e	4e	23 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - MAIN DIG

Process Area	Activity	Aspect	Raw				Existing Controls	Existing Controls				Proposed Controls	Residual Risk			
			C	P	R			C	P	R			C	P	R	
	Hauling with on-highway trucks	Noise	3	c	3c	13 (M)	1. Contractor Management System 2. Engineer's Audits 3. RTA registered trucks 4. Six monthly shaker tests 5. Maintenance Management Systems 6. Complaints Protocol 7. Supervisor Inspections 8. Contractor Inductions 9. Altered Operating Conditions at set times (ie night time) to reduce noise.	3	e	3e	20 (L)					
		Dust	3	b	3b	9 (M)	1. Mindful of weather (wind) conditions 2. Contractor Inductions 3. Land Disturbance Management System (dust) 4. Water cart availability 5. Complaints Protocol 6. Supervisor Inspections 7. Supervisor Audits	4	d	4d	21 (L)					
		Spillage of hydraulic oil from damaged hose	4	c	4c	18 (L)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Contractor Inductions 5. Contractor Management System 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8. Supervisor Audits 9. Toolbox Talks	5	d	5d	24 (L)					
		Spillage of Hydrocarbons when transferring from Service Truck	4	b	4b	14 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Contractor Inductions 5. Contractor Management System 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8. Supervisor Audits 9. Toolbox Talks	4	d	4d	21 (L)					
		Exhaust emissions	4	b	4b	14 (M)	1. Original Equipment Manufacturer Standards 2. Maintenance Management System 3. Defect Management System 4. Supervisor Inspections 5. Contractor Management System 6. Contractor Inductions 7. RTA Approval (Rego check) 8. Engineers Audits	4	e	4e	23 (L)					
	Overburden dump (in pit)	Dust	3	b	3b	9 (M)	1. Mindful of weather (wind) conditions 2. Employee Inductions 3. Land Disturbance Management System (dust) 4. Water cart availability 5. Complaints Protocol 6. Supervisor Inspections 7. Supervisor Audits	4	d	4d	21 (L)					
		Noise	3	c	3c	13 (M)	1. Employee Inductions 2. Maintenance Management Systems 3. Complaints Protocol 4. Supervisor Inspections 5. Supervisor Audits 6. Altered Operating Conditions at set times (ie night time) to reduce noise.	3	d	3d	17 (L)					
	In pit water management	Broken leaking pipes (on surface)	4	b	4b	14 (M)	1. Maintenance Management System 2. Scheduled Environmental Inspections 3. Inspection Management System 4. Supervisor Inspections 5. Engineering principles applied to design 6. Incidents Reporting Procedure 7. Dedicated Experienced person 8. Supervisor Audits	4	d	4d	21 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - MAIN DIG

Process Area	Activity	Aspect	Raw				Existing Controls	Existing Controls				Proposed Controls	Residual Risk			
			C	P	R			C	P	R			C	P	R	
		Discharge from open drains (dirty water system)	2	c	2c	8 (M)	1. Scheduled Environmental Inspections 2. Inspection Management System 3. Supervisor Inspections 4. Engineering principles applied to design 5. Incidents Reporting Procedure 6. Dedicated Experienced person	2	e	2e	16 (L)					
		Cross contamination of water segregation under extreme rainfall conditions	2	c	2c	8 (M)	1. Managing the level of Lake Foster 2. Discharge Water Management System 3. EPA Licence 4. Site Inspections 5. Scheduled Environmental Inspections 6. Nominated Experienced person	3	d	3d	17 (L)					
		Failure of clean water segregation	2	d	2d	12 (M)	1. Scheduled Environmental Inspections 2. Inspection Management System 3. Supervisor Inspections 4. Engineering principles applied to design 5. Incidents Reporting Procedure 6. Nominated Experienced person	3	d	3d	17 (L)					
	Bulk fuel storage	Bulk fuel storage (Portable Fuel Storage 1 x 40,000L, 1 x 15,000L, 2 x 5,000L) - Damage to side wall resulting in leak (NB: 40000L used for refuelling, others for supply and pumps)	2	c	2c	8 (M)	1. Towed empty only 2. Towed over prepared surfaces and under supervision only 3. Ensure tanks are always within the site 4. Supervisor Audits 5. Located in a temporary earth containment area 6. Scheduled Environmental Inspections 7. Maintenance Management System 8. Isolated storage area	3	d	3d	17 (L)					
		Spillage from the fuel fill point during filling of equipment	4	b	4b	14 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Toolbox Talks 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8 Supervisor Audits	4	d	4d	21 (L)					
		Spillage from tank as a result of hose being pulled off by equipment	2	c	2c	8 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Toolbox Talks 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8 Supervisor Audits 9. Emergency Cut off valve	4	d	4d	21 (L)					
	Sewerage treatment plant	Contamination of water ways (1 x main office, 1 x open cut workshop)	4	b	4b	14 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. Scheduled Environmental Inspections	4	d	4d	21 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - REHABILITATION

Process Area	Activity	Aspect	Raw				Existing Controls	Existing Controls				Proposed Controls	Residual Risk			
			C	P	R			C	P	R			C	P	R	
Rehabilitation	Reshaping (Overburden dumps)	Dust	3	b	3b	9 (M)	1. Mindful of weather (wind) conditions 2. Employee Inductions 3. Land Disturbance Management System (dust) 4. Water cart availability 5. Complaints Protocol 6. Supervisor Inspections 7. Competency Management System 8. Toolbox Talks	4	d	4d	21 (L)					
		Noise	3	b	3b	9 (M)	1. Employee Inductions 2. Maintenance Management System 3. Complaints Protocol 4. Supervisor Inspections 5. Supervisor Audits 6. Toolbox Talks	3	d	3d	17 (L)					
		Spillage of hydraulic oil from damaged hose	4	c	4c	18 (L)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Toolbox Talks 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8 Supervisor Audits	5	d	5d	24 (L)					
		Spillage of Hydrocarbons when transferring from Service Truck	4	b	4b	14 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Competency Management System 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8. Supervisor Audits 9. Toolbox Talks	4	d	4d	21 (L)					
		Erosion and sediment control	4	c	4c	18 (L)	1.Draft Erosion and Sediment Control Plan 2. Scheduled Environmental Inspections 3. External Audits (including Government) 4. Environmental Protection Licence 5. Existing Sediment Control Dams	5	d	5d	24 (L)					
	Top dressing material spreading and contour ripping	Dust	3	b	3b	9 (M)	1. Mine Transport Management Plan 2. Inductions 3. Land Disturbance Management System (dust) 4. Water cart availability 5. Complaints Protocol 6. Supervisor Inspections 7. Supervisor Audits 8. Mindful of weather (wind) conditions	4	d	4d	21 (L)					
		Noise	3	b	3b	9 (M)	1. Employee Inductions 2. Maintenance Management Systems 3. Complaints Protocol 4. Supervisor Inspections	3	d	3d	17 (L)					
		Spillage of hydraulic oil from damaged hose	4	c	4c	18 (L)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Toolbox Talks 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8. Supervisor Audits	5	d	5d	24 (L)					
		Spillage of Hydrocarbons when transferring from Service Truck	4	b	4b	14 (M)	1. Maintenance Management System 2. Emergency Spill Response 3. On-site Spill Kits 4. Employee Inductions 5. Toolbox talks 6. Incident Notification and Reporting Procedure 7. Supervisor Inspections 8. Supervisor Audits	4	d	4d	21 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - REHABILITATION

Process Area	Activity	Aspect	Raw				Existing Controls	Existing Controls				Proposed Controls	Residual Risk			
			C	P	R			C	P	R			C	P	R	
		Erosion and sediment control	4	c	4c	18 (L)	1. Draft Erosion and Sediment Control Plan 2. Scheduled Environmental Inspections 3. External Audits (including Government) 4. Environmental Protection Licence 5. Supervisor Inspections 6. Existing Sediment Control Dams	5	d	5d	24 (L)					
		Lime and gypsum dust	4	c	4c	18 (L)	1. Control moisture levels of lime	5	d	5d	24 (L)					
		Biosolids / runoff (incl odour)	3	c	3c	13 (M)	1. Use of DECC guidelines 2. Bunded storage areas	3	d	3d	17 (L)					
	Revegetation	Erosion with sediment leaving site	4	c	4c	18 (L)	1. internal drainage for part of the area 2. Draft Erosion & Sediment Control Plan 3. Existing Sediment Control Dams	5	d	5d	24 (L)					
		Potential to introduce weeds	4	c	4c	18 (L)	1. Buy certified seed from reputable supplier 2. Vehicle wash at entrance 3. Employee inductions 4. Scheduled Environmental Inspections 5. Weed Control Contractors	4	d	4d	21 (L)					
		Failure of seed to germinate and establishment	4	c	4c	18 (L)	1. Buy certified seed from reputable supplier 2. Employee and Contractor Inductions	5	d	5d	24 (L)					
		Bush fire hazard burning revegetated areas	3	c	3c	13 (M)	1. Employee Induction 2. Hazard reduction program 3. Competent employees 4. Bushfire Management Plan 5. Onsite fire fighting capabilities 6. Contractor Induction	4	d	4d	21 (L)					
		Sponcom in rehabilitated areas (odour)	4	d	4d	21 (L)	1. Burial of oxidised coal material 2. Supervisor Inspections 3. Mining Operation Plan 4. Mining Operations Inspection Management System	5	e	5e	25 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - MAINTENANCE

Process Area	Activity	Aspect	Raw				Existing Controls	Existing Controls				Proposed Controls	Residual Risk			
			C	P	R			C	P	R			C	P	R	
Maintenance / Open Cut Workshop	Waste Management	General Refuse (incl oily rags)	4	b	4b	14 (M)	1. Licensed Waste Contractor 2. Contractor Management System 3. Employee Inductions 4. Environmental Protection Licence 5. Toolbox Talks 6. Scheduled Environmental Inspections	5	d	5d	24 (L)					
		Scrap steel	5	b	5b	19 (L)	1. Licensed Recycling Contractor 2. Contractor Management System 3. Employee Inductions 4. Environmental Protection Licence 5. Toolbox Talks 6. Scheduled Environmental Inspections	5	e	5e	25 (L)					
		Contaminated Wastes	4	b	4b	14 (M)	1. Licensed Recycling Contractor 2. Contractor Management System 3. Employee Inductions 4. Environmental Protection Licence 5. Incident Reporting Procedure 6. Toolbox Talks 7. Scheduled Environmental Inspections	5	d	5d	24 (L)					
		Oil spills on ground	4	b	4b	14 (M)	1. On-site Spill Kits 2. Employee Inductions 3. Employee Consultation Systems 4. Emergency Response Procedure 5. Incident Reporting Procedure 6. Toolbox Talks 7. Scheduled Environmental Inspections	5	d	5d	24 (L)					
		Tyres	4	b	4b	14 (M)	1. Disposed of in the pit at depth	5	d	5d	24 (L)					
	Bulk fuel storage area (fuel farm)	Spills and leaks	3	b	3b	9 (M)	1. AS1940 approved area 2. Work Cover notified 3. On-site Spill Kits 4. Employee Inductions 5. Toolbox Talks 6. Emergency Response Procedure 7. Incident Reporting Procedure	4	d	4d	21 (L)					
		Damage to above ground pipes (fuel and oil)	3	b	3b	9 (M)	1. AS1940 approved area 2. Work Cover notified 3. Incident Reporting Procedure 4. Emergency Response Procedure 5. Scheduled Environmental Inspections 6. Toolbox Talks	4	d	4d	21 (L)					
		Bunded area filling with storm water reducing containment and resulting in bund breach during major spill	4	b	4b	14 (M)	1. AS1940 approved area 2. Work Cover notified 3. Maintenance Management System 4. Bilge Pump system in place in bunded areas 5. Incident Reporting Procedure 6. Emergency Response Procedure 7. Scheduled Environmental Inspections 8. Toolbox Talks	5	d	5d	24 (L)					
	Refuelling bay (conducted in Workshop - 3 x 30,000L tanks)	Spills and leaks	3	b	3b	9 (M)	1. AS1940 approved area 2. WorkCover notified 3. On-site Spill Kits 4. Employee Inductions 5. Toolbox Talks 6. Emergency Response Procedure 7. Incident Reporting Procedure 8. Scheduled Environmental Inspections	4	d	4d	21 (L)					
		Damage to above ground pipes (fuel and oil)	3	b	3b	9 (M)	1. AS1940 approved area 2. Work Cover notified 3. Incident Reporting Procedure 4. Scheduled Environmental Inspections	4	d	4d	21 (L)					
		Hose coming away from bowser (vehicle drives away with hose still attached)	2	b	2b	5 (H)	1. AS1940 approved area 2. Work Cover notified 3. Employee Inductions 4. Automatic shut-offs 5. Incident Reporting Procedure 6. Toolbox Talks	4	d	4d	21 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - MAINTENANCE

Process Area	Activity	Aspect	Raw				Existing Controls	Existing Controls			Proposed Controls	Residual Risk			
			C	P	R			C	P	R		C	P	R	
	Oil storage area	Spills and leaks	4	b	4b	14 (M)	1. AS1940 approved area 2. Work Cover notified 3. On-site Spill Kits 4. Employee Inductions 5. Toolbox Talks 6. Emergency Response Procedure 7. Incident Reporting Procedure 8. Scheduled Environmental Inspections	5	d	5d	24 (L)					
	Transformers	Release of PCB's in transformer oil	2	b	2b	5 (H)	1. PCB Disposal Procedure 2. Transformers in bunded areas 3. Following check on site found that no known PCB's on site.	5	e	5e	25 (L)				
		Oil spills	4	b	4b	14 (M)	1. Recycled 2. On-site Spill Kits 3. Employee Inductions 4. Transformers in bunded areas 5. Incident Reporting Procedure 6. Scheduled Environmental Inspections	5	d	5d	24 (L)				
	Parts washer	Failure and release degreasers/contaminants to the environment	4	b	4b	14 (M)	1. Serviced by licensed contractor 2. Contractor Management System 3. On-site Spill Kits 4. Employee Inductions 5. Incident Reporting Procedure	5	d	5d	24 (L)				
	Oil water separator	Failure and release of oil	4	b	4b	14 (M)	1. Waste oil tank with overflow monitor 2. Scheduled Environmental Inspections 3. Serviced by licensed contractor 4. Contractor Management System 5. On-site Spill Kits 6. Employee Inductions 7. Incident Reporting Procedure	5	d	5d	24 (L)				
	Workshop	Noise	3	d	3d	17 (L)	1. Isolated location 2. Employee Induction 3. Complaints Protocol 4. Supervisor Inspections 5. Supervisor Audits	3	e	3e	20 (L)				

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - MAINTENANCE

Process Area	Activity	Aspect	Raw				Existing Controls	Existing Controls				Proposed Controls	Residual Risk			
			C	P	R			C	P	R			C	P	R	
	Field Maintenance 1. Scheduled shut downs 2. breakdowns/running repairs	Noise	3	d	3d	17 (L)	1. Where ever possible maintenance conducted off site 2. Employee Induction 3. Complaints Protocol 4. Supervisor Inspections 5. Supervisor Audits	3	e	3e	20 (L)					
		Contaminated Waste Material	4	b	4b	14 (M)	1. Licensed Waste Contractor 2. Contractor Management System 3. Employee Inductions 4. EPL 5. Toolbox Talks 6. Maintenance Management System 7. Supervisor Inspections 8. Supervisor Audits	5	d	5d	24 (L)					
		Spills and leaks	4	b	4b	14 (M)	1. AS1940 approved area 2. WorkCover notified 3. On-site Spill Kits 4. Employee Inductions 5. Toolbox Talks 6. Emergency Response Procedure 7. Incident Notification and Reporting Procedure 8. Maintenance Management System 9. Supervisor Inspections 10. Supervisor Audits	5	d	5d	24 (L)					
		Transfer of diesel and lubes around site in service truck (accident - rollover)	3	c	3c	13 (M)	1. Mine Transport Management Plan 2. Employee Inductions 3. Purpose designed service truck 4. Compartmentalised tank 5. Competency Standard for service truck 6. Emergency Response Procedure 7. Bushfire Management Plan 8. Incident Notification and Reporting Procedure	4	d	4d	21 (L)					

BLOOMFIELD COLLIERY ENVIRONMENTAL RISK REGISTER - SUPPLY

Process Area	Activity	Aspect	Raw (potential risk)				Existing Controls	Existing Controls				Proposed Controls	Residual Risk			
			C	P	R			C	P	R			C	P	R	
Supply	Bulk Fuel Storage	***(See Maintenance)***														
	Transfer of fuel from road transport	Spillage of fuel during delivery of bulk fuel and oil	2	c	2c	8 (M)	1. Fuel & Bulk Oil Delivery Procedures 2. Contractor Management System 3. Contained delivery point 4. Use of competent delivery contractor 5. System audits 6. Incident Notification and Reporting Procedure 7. Scheduled Environmental Inspections 8. Emergency Response Procedure	3	d	3d	17 (L)					
		Damage to transport vehicle on site at refuelling point (eg. Light vehicle running into fuel truck)	3	c	3c	13 (M)	1. Engineering separation from earthworking equipment 2. Delivery trucks have segregated tanks 3. Emergency Response Procedure 4. Tanks located away from traffic areas	4	e	4e	23 (L)					
		Release of fuel to the environment as a result of a vehicle involved in accident on site	2	c	2c	8 (M)	1. Mine Transport Management Plan 2. Fuel & Bulk Oil Delivery Procedures 3. Contractor Management System 4. Safety Core Risk Assessment 5. Toolbox Talks 6. Competency Management System 7.Emergency Response Procedure	4	d	4d	21 (L)					
		Fuel transfer truck driving away from fill point with out disconnecting fuel supply hose	3	c	3c	13 (M)	1. Contractor has cut-off system whereby they cannot start the vehicle if a hose is still connected 2. Use of competent contractor 3. Contractor Management System 4. Bunded Area (AS1940) 5. Emergency Response Procedure 6. Fuel & Bulk Oil Delivery Procedures	5	e	5e	25 (L)					