

Narrabri Coal Mine – Revised Conceptual Mine Closure  
Plan for Stage 2 Longwall Operations  
Narrabri Coal Operations Pty Ltd

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Version: Final

# Narrabri Coal Mine – Revised Conceptual Mine Closure

## Plan for Stage 2 Longwall Operations

### Narrabri Coal Operations Pty Ltd

PREPARED BY:

SLR Consulting Australia Pty Ltd  
ABN 29 001 584 612  
10 Kings Road New Lambton NSW 2305 Australia

(PO Box 447 New Lambton NSW 2305 Australia)  
T: 61 2 4037 3200 F: 61 2 4037 3201  
E: newcastleau@slrconsulting.com www.slrconsulting.com

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## 1 INTRODUCTION

### 1.1 Document Update

This document was updated by SLR in 2016 as part of the amendment to an existing Extraction Plan and to include key aspects of the Narrabri Mine Modification 5 Environmental Assessment (August 2015). This report now outlines closure management for additional longwalls (LW107-LW110) within the Stage 2 area.

### 1.2 Background

The Narrabri Mine (the mine) is located to the west of the Kamilaroi Highway, approximately 28 kilometres (km) southeast of Narrabri and 28 km northwest of Boggabri in the Namoi Valley of NSW, which forms part of the Murray Darling Basin (see **Figure 1**). NCM is owned and operated by Narrabri Coal Operations Pty Ltd (NCOPL), which is a joint venture between Narrabri Coal Pty Ltd (70%), Upper Horn Investments (Australia) Pty Limited (7.5%), J-Power Australia Pty Limited (7.5%), Daewoo International Narrabri Investment Pty Limited and Kores Narrabri Pty Limited (7.5%), EDF Trading Australia Pty Limited (7.5%), in which Narrabri Coal Pty Ltd is an owned subsidiary of Whitehaven Coal Limited (WCL).

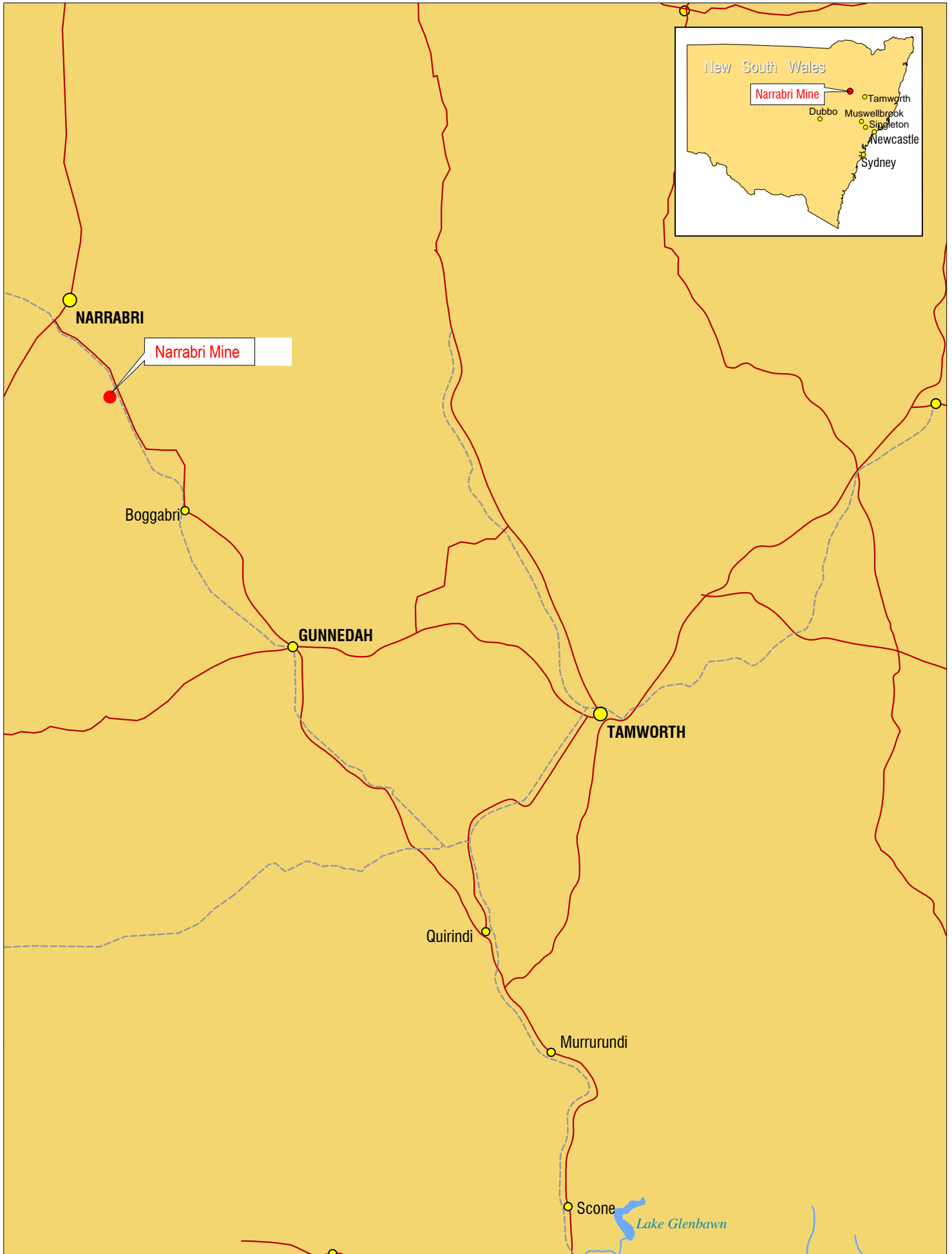
The site covers an area of approximately 5,298 hectares (ha), the majority of which is freehold agricultural and forested land, with a small section located in the Pilliga East and Jacks Creek State Forests. Narrabri Mine is wholly within Mining Lease (ML) 1609, which is held by Narrabri Coal Pty Ltd (NCOPL) and commenced mine construction in April 2008.

Mining at the site is being undertaken in two stages. Stage 1 (approved 13 November 2007) involved the establishment of surface facilities to support the underground operation using underground continuous miner methods. The completed components of Stage 1 of the mine include the following:

- Mine access road;
- Main office, administration area and light vehicle car park;
- Electrical sub-station;
- Equipment laydown area;
- Run-of-mine (ROM) coal and product coal pad hard stand areas;
- Box cut and mine portals;
- Amenity bund;
- Rail loop;
- Water storage and evaporation dams (lined); and
- An explosives magazine.

Stage 1 of the mine utilised a continuous miner method for coal extraction. In late 2009, Narrabri Coal applied to modify the Stage 1 approval (Project Approval 05\_0102) to facilitate an earlier commencement date for some preparatory activities ahead of the Stage 2 longwall mining project. These activities included: construction of a coal handling and preparation plant (CHPP) and mine ventilation shaft and fan infrastructure. This construction modification application was approved in March 2010.

In later 2009, a Stage 2 application was made to the then Department of Planning (DoP) under Part 3A of the *Environmental Planning and Assessment Act 1979 (NSW)* to convert existing mining operations to longwall mining of 26 longwall panels. The conversion to longwall mining would facilitate an increase in coal production from 2.5 to 8.0 million tonnes per annum (Mtpa) of ROM coal. The coal is crushed and prepared on site, then transported by rail to the Port of Newcastle for export.



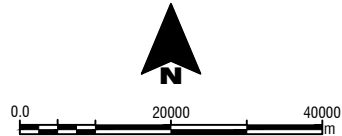
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**SLR** 

2 LINCOLN STREET  
LANE COVE  
NEW SOUTH WALES 2066  
AUSTRALIA  
T: 61 2 9427 8100  
F: 61 2 9427 8200  
www.slrconsulting.com

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Whitehaven Coal Group

**NARRABRI MINE CLOSURE PLAN**

**Site Locality Plan**

FIGURE 1

The Stage 2 project application also included construction and operation of a range of associated mine surface infrastructure and facilities including:

- Coal reject emplacement area (REA);
- Brine storage and evaporation ponds;
- Additional product coal stockpiles;
- Additional mine ventilation;
- De-watering and gas drainage facilities;
- Longwall unit assembly area;
- ROM pad extension;
- Additional sediment basins;
- All weather, unsealed access road;
- Additional electrical transformer facilities and power lines; and
- A combined water supply and disposal pipeline between the mine site and the Namoi River.

Project Approval 08\_0144 was granted by the then Department of Planning on 26 July 2010 to cover Stage 2 of the operations, which supersedes the previous Project Approval 05\_0102 for Stage 1 operations. The mine was granted approval to operate for 21 years and Narrabri Mine expects to extract 170 million tonnes (Mt) of coal over that period.

The Environmental Assessment completed by R.W Corkery and Co. Pty. Limited. (2009) details how the Narrabri Mine will significantly contribute to the local, state and federal economy by investing \$295 million in its operations. Narrabri Coal employed approximately 75 workers during its Stage 1 construction, and will reach an overall workforce of 211 at full height of operations – an increase of 98 employees arising from the Stage 2 project. The mine will contribute up to \$36 million a year in wages.

Schedule 2, condition 4 of the modification approval requires the following:

“The Proponent shall prepare and implement Extraction Plans for any second workings to be mined to the satisfaction of the Director-General. Each Extraction Plan must:

(g) include the following to the satisfaction of I&I NSW: and include “appropriate revisions to the Landscape Management Plan required under condition 3 of Schedule 5; ...”

An Extraction Plan is being updated to address second workings associated with the longwall extraction of Longwall (LW) 101- LW110 inclusive. The previous Extraction Plan only included LW101-LW106.



### 1.3 Updates based on Stakeholder Consultation

The Department of Primary Industries (DPI Water) recommended in the letter dated 1 September 2015 that they consider the “*Conceptual Mine Closure Plan* should be revised to consider the requirements of the Aquifer Interference Policy for post closure”.

A new section (see **Section 7.2**) has been added in this report to address this comment from DPI Water. This section includes a summary of potential groundwater impacts at closure and proposed groundwater monitoring and management post closure. **Section 7.2** has been prepared based on the Groundwater Assessment for the Narrabri Mod 5 Environmental Assessment (Hydrosimulations August 2015).

### 1.4 Mine Closure Planning

The Project Approval (08\_0144) for the Stage 2 mine operations requires the preparation of a *Landscape Management Plan* of which one component is the preparation of a *Mine Closure Plan*. This *Mine Closure Plan* was originally prepared by GSS Environmental, with SLR updating the document in 2015 to include LW 106 and in 2016 to include LW 107-LW110. This document has been prepared to satisfy the requirements of the *Mine Closure Plan* which is detailed in Schedule 5, Condition 5 (a) – (f) and Schedule 6, Condition 2 of the Project Approval as well as to update the management plan to include the additions included in the Stage 2 approval.

**Table 1** below shows the specific requirements of the Project Approval and where in the document they have been addressed.

**Table 1 Requirements of the Mine Closure Plan in accordance with the Project Approval for Stage 2 at Narrabri Coal**

Condition	Section where addressed in this report
5. The Mine Closure Plan must:	
(a) define the objectives and criteria for mine closure;	<b>2</b>
(b) investigate options for the future use of the site;	<b>1.4</b>
(c) provide a detailed methodology for decommissioning the site’s evaporation / storage ponds and the treatment of any accumulated salt within or around those ponds;	<b>5.1.4 and 5.1.5</b>
(d) investigate ways to minimise the adverse socio-economic affects associated with mine closure, including reduction in local and regional employment levels;	<b>4.4</b>
(e) describe the measures that would be implemented to minimise or manage the on-going environmental effects of the project; and	<b>7</b>
(f) describe how the performance of these measures would be monitored over time.	<b>7.3</b>

It is intended that this *Mine Closure Plan* will be progressively reviewed and updated over the remaining life of the mine to satisfy this requirement. It is intended that this plan provide conceptual information relating to mine closure and that it will generally be updated for the submission of each Extraction Plan (per Schedule 2, Condition 4), when there are significant changes to the operation, or as the mine approaches the end of its economical life. A Detailed Mine Closure Plan will be prepared when the mine is within 5 years of closure. A new Mining Operations Plan (MOP) will be prepared for the site, with this superseding this *Mine Closure Plan*. The new MOP will be prepared in accordance with current MOP Guidelines.

## 1.5 Current Mining and Rehabilitation Activities

Coal will be extracted from the underground operation within the Hoskissons Coal Seam through employing continuous miner and longwall mining methods, at a rate of up to 8 Mtpa. Continuous miner development mining machinery will be used to extract coal as part of the formation of mine roadways. Twin heading gate roads will be driven to form 306m wide longwall blocks. A longwall mining system will then extract these blocks by longwall mining techniques, which involves the extraction of large blocks of coal in slices up to 1.0 metre thick, 4.2m high from the longwall block. The mined coal is transported to the ROM coal stockpile area on the surface via a conveyor system within the conveyor drift.

ROM coal is crushed and sized to less than 50 mm through a crushing and sizing plant which is then stockpiled by a stacking conveyor on the 110,000 tonne (t) product stockpile. A proportion of the coal mined will be direct fed to the established CHPP for further processing and refinement. Coal rejects from the CHPP are expected to be in the order of 5% of total ROM coal production. Rejects from the CHPP will be emplaced on-site in the coal REA. Product coal is reclaimed from beneath the product stockpile and loaded into the rail load-out bin. The coal is then loaded into train wagons via the rail load-out bin for transportation to the Port of Newcastle for eventual export overseas.

The approved site layout for the life of the mine considered in this *Mine Closure Plan* is shown in **Figure 2**.

## 1.6 Conceptual Final Land Use Options

The conceptual final landform is proposed to be very similar to that which existed prior to the commencement of construction and mining activities at the site. The current approved final landform for closure used in the preparation of this plan is attached as **Appendix 1**).

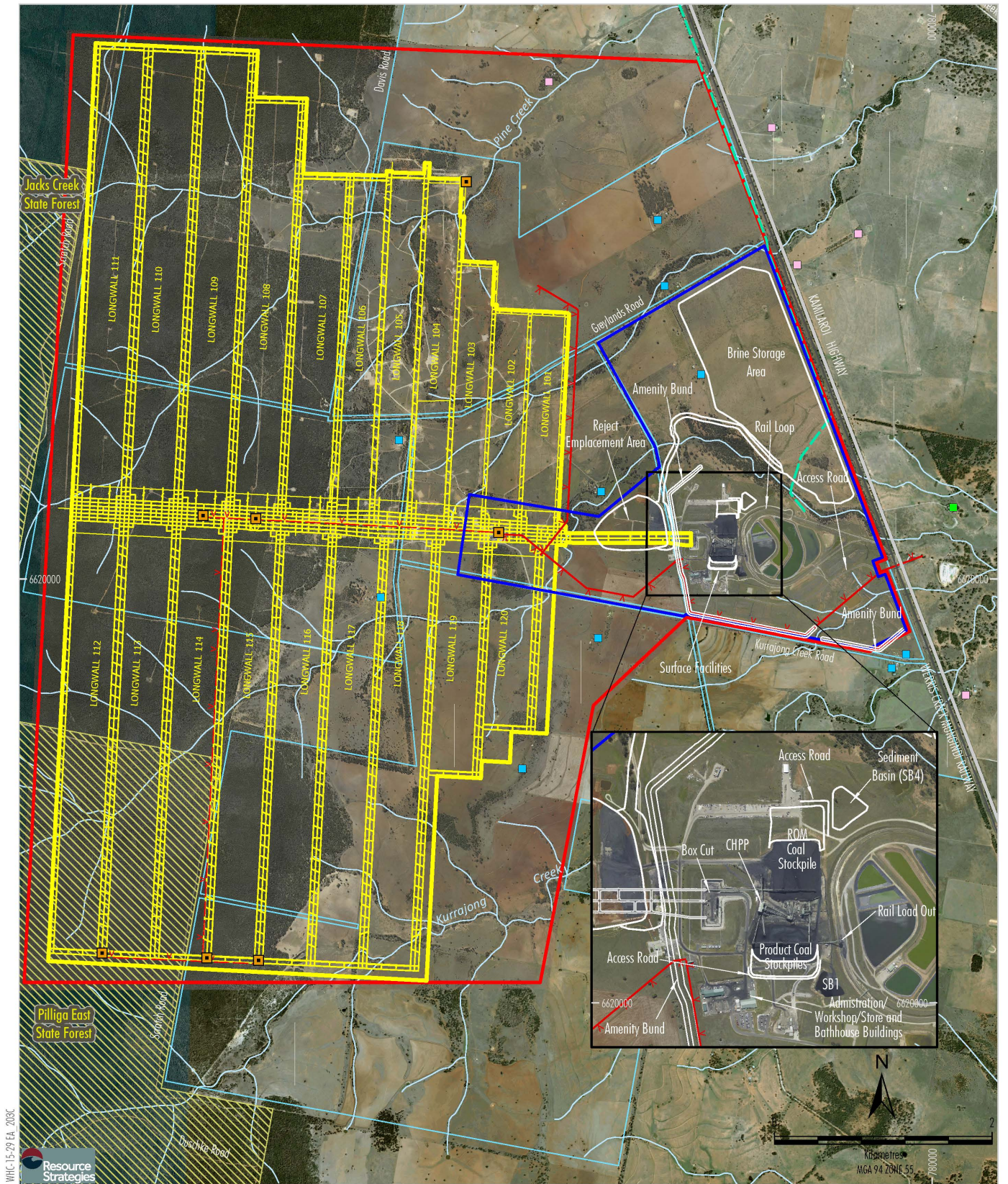
With the exception of a proportion of the perimeter amenity bund wall, covering approximately 3.0 ha, and most likely the rail loop covering 4.7 ha, all land disturbed during the life of the mine would be returned to a land capability / agricultural land suitability similar to the existing levels (where possible). Current final land use planning and rehabilitation activities are based on the assumption that the final land use is likely to be the resumption of agricultural activity.

The likely retention of the rail loop may influence the succeeding land use depending upon land uses around the Pit Top Area at that time. The presence of the rail loop may lend the site to be used for some other related activity or industry, including sale yards, transport hub or bulk goods storage. This will be more accurately determined closer to the end of the mine life through successive mine closure reviews.

The Project Approval requires that all areas disturbed within the mine footprint be rehabilitated to a state that restores ecosystem function, including maintaining or establishing self-sustaining native ecosystems comprising local native plant species and a landform consistent with the surrounding environment. Under these circumstances the post mining land capability class will be substantially the same as the pre-mining condition.

The 1:100,000 scale Land Capability map depicted in the Baan Baa map sheet area prepared by the former Soil Conservation Service of NSW indicates that the land within the Mine Site is mapped mainly as Class III land with a small area of Class IV land and larger areas of Class VI and Class VII land near Jacks Creek State Forest.

A review of Land Capability mapping and field survey during preparation of the original Plan indicated that the sections of the Mine Site that have been cleared and farmed in the past may be classified as Class III land. The land along the major drainage lines may be classified as Class IV and the remaining land associated with rocky ridges and sandy soils Class VII. The impact of longwall mining will generally not degrade Land Capability across the mine site following subsidence. However there may be individual areas where the impacts of subsidence are greater and these may have a downgraded land capability and/or agricultural suitability due to waterlogging, erosion or salinity (should they occur) (Geoff Cunningham Natural Resources Consultants Pty Ltd, 2009).



WHC-15-29 EA, 2016C  
Resource Strategies

Source: Orthophotos - Whitehaven Coal (March 2015) and Google Earth (Feb 2015); R.W. Corkery & Co Pty Ltd (2009), NSW Trade & Investment (2015) and NCOPL (2015)

- LEGEND**
- State Forest
  - Mining Lease Boundary (ML 1609)
  - Pit Top Area
  - Modified Underground Mine Footprint
  - Approved Surface Development (Not Constructed)
  - Modified Underground Mine Development
  - Electricity Transmission Line (Constructed)
  - Electricity Transmission Line (Not Constructed)
  - Namoi River Water Pipeline
  - Ventilation Shaft Location
  - Mine-owned Dwelling
  - Private Dwelling
  - Private Dwelling - NCOPL Agreement
  - Mine Owned Land

**W H C**  
 NARRABRI MINE  
 Modified Narrabri Mine  
 Indicative General Arrangement

**Figure 2**

## 1.7 Summary of the Mine Closure Activities

At the completion of mining at the Narrabri Mine, all infrastructure at the site will be removed (excluding the rail loop, southern section of the perimeter amenity bund and water management structures) and the land rehabilitated in accordance with this *Mine Closure Plan*.

Decommissioning will also require the sealing of the underground access portals and the removal of surface infrastructure, including offices, bath house, ROM coal stockpile infrastructure, REA, workshop, fuel storages, conveyors, ventilation shafts and operational water management structures. The post mining landform will then be reshaped to create a stable surface with slopes at a maximum of 4 degrees. Surface water management structures such as contour banks, diversion drains and settlement ponds required to provide permanent, long-term stable water flow and storage will be constructed. The open disturbed areas will be rock raked and ripped, in particular where roads and hardstand areas have compacted the existing ground, with ripping up to 1 m in depth. At least 150 mm of soil will then be spread over the site and seeded with a suitable cover crop to minimise soil erosion. Some roads may remain open if required for future land uses, and access to the site.

All areas above the longwall mining area will be rehabilitated to remediate areas affected by mine induced subsidence. Any mining-related surface infrastructure will be removed.

**Sections 5 and 6** of this report address the specific details relating to mine closure, decommission and rehabilitation in more detail.

**Appendix 1** shows the proposed conceptual final landform at the conclusion of mining at the site. Areas disturbed by mining activities will be revegetated at the completion of mining. The box-cut and the portals will be backfilled and shaped to replicate the pre-mining landform and managed in a manner consistent with the rehabilitation principles adopted for the site.

Following the removal of surface infrastructure from the drift portals within the box-cut, the entries will be sealed in accordance with appropriate DRE guidelines and the void backfilled using fill material recovered from the perimeter amenity bund. Any potentially hydrocarbon-contaminated material will either be removed for licensed disposal or bio-remediated on-site.

Accumulated salt within the evaporation / storage and brine storage ponds will be excavated and either placed within the drifts or box-cut prior to it being backfilled. NCOPL will undertake sufficient studies to ensure that the risk of contamination is minimal and develop appropriate contingency measures as required. The dam areas will be inspected and sampled to analyse ground beneath each dam or pond to confirm no leakage has occurred over the life of the pond. Should saline contamination be identified, it will be removed and disposed of within the backfilled box cut.

Once the remaining infrastructure is decommissioned and removed, the cut and fill disturbance will be profiled to ensure it has safe and stable slopes. These slopes will be shaped to create a more undulating landform, more consistent with the surrounds. A maximum of 4 degrees will be maintained across the site.

The retention or removal of the sealed site access road will be dependent on the final land use of the site and the requirements of the future landowner post mining. Notwithstanding, all internal minor roads and tracks required for access to mine infrastructure (i.e. the SIS gas drainage infrastructure) should be removed / rehabilitated and the pre-mining topography re-instated.

Maintenance of rehabilitation areas will consist of two applications of fertiliser as well as weed and feral animal management over a five year period after mine closure. Minor remedial earthworks or soil conservation works to address any erosion or sedimentation issues will also be undertaken over this period. Monitoring programs, such as air, noise and water quality monitoring will be continued until decommissioning and rehabilitation procedures have been completed. Rehabilitation will be monitored for a period of at least five (5) years after completion or when it can be demonstrated that the nominated completion criteria (see **Section 7.4**) have been achieved. This monitoring will include

visual inspections, tree density and percentage cover and transect studies, flora and fauna surveys and water quality monitoring of runoff waters. Water quality monitoring will be undertaken to verify the long-term salinity levels of any runoff waters.

The proposed monitoring is described further in **Section 7** of this conceptual *Mine Closure Plan*.

A Detailed Mine Closure Plan will be developed for the site at least 5 years prior to closure. This Plan will be developed in consultation with DRE and relevant stakeholders.

## 2 OBJECTIVES OF THE MINE CLOSURE PLAN

Planning for mine closure includes integrating the closure design for the entire mine site, identifying the timing of the planning process, considering issues which relate to specific rehabilitation methods and economical and community objectives, as well as making sure adequate financial provisions have been set aside.

The principal objectives of mine closure planning incorporated into this *Mine Closure Plan* include:

- To provide an overall framework for mine closure including rehabilitation and decommissioning strategies. In this regard a *Mine Closure Plan* should be considered a template on which future activities should be based;
- To ensure that adequate financial provision is made available to cover the cost of decommissioning, final rehabilitation and any other post closure costs related to the closure of the Narrabri Mine;
- To establish clear and agreed criteria with all relevant stakeholders, which can be used to provide the standard to which the final mine rehabilitation and post mining land use can be assessed against;
- To reduce or eliminate adverse environmental effects once the mine ceases operation;
- To ensure closure is completed in accordance with good industry practice as well as meeting the statutory requirements that may be applicable; and
- To ensure the closed mine does not pose an unacceptable risk to public health and safety.

The most effective mine closure plans are those that are integrated with the long term operational plans of the mine and are subject to regular review to accommodate regulatory, technological, social and economic change.

Specifically, the *Mine Closure Plan* has been assigned the following key objectives.

- Achievement of acceptable post-disturbance land use suitability – Mining and rehabilitation will aim to create a stable landform with land use capability and/or suitability similar to that prior to disturbance, unless other beneficial land uses are pre-determined and agreed. This will be achieved by setting clear rehabilitation success criteria and outlining the monitoring requirements that assess whether or not these criteria are being accomplished.
- Creation of stable post-disturbance landform - Disturbed land will be rehabilitated to a condition that is self-sustaining or one where maintenance requirements are consistent with the agreed post-mining land use(s).
- Preservation of downstream water quality – Surface and groundwater that leave the Mining Lease are not degraded to a significant extent. Current and future water quality will be maintained at levels that are acceptable for users downstream of the site.

This plan has generally been prepared in accordance with the requirements of the following relevant strategic land use planning and resource management plans and policies relating to mine rehabilitation and mine closure.

- Namoi Catchment Action Plan (Namoi Catchment Management Authority, 2007);
- Narrabri Local Environment Plan (Narrabri Shire Council, 1992);
- DRE Policy (EDG 03): – Mining Operations Plan Guidelines September 2013 (DRE);
- Strategic Framework for Mine Closure (ANZMEC and MCA, 2000);

- Leading Practice Sustainable Development Program for the Mining Industry – Mine Closure and Completion (Department of Industry Tourism and Resources, 2006);
- Current Mining Lease (ML1609) conditions; and
- Environment Protection Licence/ Water Licence/External Guidelines and Policies – as listed in **Section 3**.

Further specific legal and other requirements are outlined further below in **Section 3** of this conceptual *Mine Closure Plan*.



### **3 LEGAL AND OTHER REQUIREMENTS FOR MINE REHABILITATION AND MINE CLOSURE**

Government agencies at both the State and Federal level have formulated regulations, policies and guidelines that relate to mine closure and decommissioning. In addition, a number of industry and government councils have also developed frameworks / guidelines for mine closure.

This *Mine Closure Plan* has generally been developed to be consistent with the objectives of these key policies and guidelines described in the section below.

#### **3.1 Government Regulatory Frameworks**

##### **3.1.1 Mining Lease Conditions**

The principal regulatory instrument related to mine closure and decommissioning are the conditions attached to the Mining Lease issued by the Minister in accordance with the requirements of the *Mining Act 1992*. The Lease Conditions specify such matters as the demolition and removal of mine infrastructure and landforms in order to make the site safe. It requires the progressive rehabilitation of the areas disturbed by mining, utilising a security deposit provision linked to the MOP for the mine.

Operations under the Mining Lease are subject to a condition that the holder of the lease will not suspend mining operations within the mining area otherwise than in accordance with the written consent of the Minister. Such consent requires conditionally the documentation of systematic and timely decommissioning, clean up and rehabilitation to be incorporated in a final MOP. In addition, Condition 7 of the Mining Lease requires that all disturbed land must be rehabilitated to a sustainable / agreed land use to the satisfaction of the Director General.

In preparing a MOP a mining company is to make specific reference to mine closure and decommissioning, providing final landform / rehabilitation outcomes. MOPs can be prepared to cover up to a 7 year period and are to be completed in consultation with DRE. A final Closure Plan or MOP should be developed at least 5 years prior to mine closure. When rehabilitation and closure has been completed to an acceptable standard, Whitehaven will need to consult with DRE regarding the relinquishment of the Mining Lease.

##### **3.1.2 Other Department of Trade and Investment, Regional Infrastructure and Services – Resources and Energy (DTIRIS-RE) Guidelines**

Further to the requirements of the Mining Lease, the DTIRIS-RE also has in place a series of Environmental Management Guidelines for industry that are either directly or indirectly relevant to mine closure issues. They include:

- DRE EDG 03 – Mining Operations Plan Guidelines, October 2013);
- DPI-MR Policy EDP 07 (2002): – Criteria for Cancellation or Non-Renewal of Mining Leases.
- DPI-MR: ESB26 Rehabilitation Cost Calculation Tool V1.12 Excel Spreadsheet Tool used to calculate mine security deposits (DRE, August 2013).

EDG01 and EDG02 – borehole sealing requirements (DRE – April 2012 and December 1997).SLR has considered these policies and guidelines in the preparation of this *Mine Closure Plan* (where appropriate).

### 3.1.3 Environment Protection Licence (EPL)

The *Protection of the Environment Operations Act 1997* (POEO Act) requires all extractive industries, including coal mines, to hold an Environment Protection Licence (EPL). Licences are issued by the Office of Environment and Heritage (OEH) and are normally reviewed every three (3) years. The EPL contains specific conditions relating to the protection of the environment. The following EPL has been considered by SLR in the preparation of the *Mine Closure Plan*:

- Narrabri Mine EPL No. 12789 issued under the *Protection of the Environment and Operations Act, 1997*, granted by the Department of Environment and Climate Change (DECC) on 20 February 2008 for the mining of coal.

### 3.1.4 Project Approval Conditions

The Project Approval includes conditions that are relevant to mine closure such that they impose restrictions on the final rehabilitation and / or landform design. They also include other conditions that contain the requirements to undertake monitoring beyond the cessation of mining. Where appropriate these conditions have been considered in the preparation of this *Mine Closure Plan*.

A number of the conditions contained within the Project Approval, including the Statement of Commitments (SoCs), contain some reference to various aspects of mine closure particularly in the area of post-closure monitoring, care and maintenance. **Table 1** in **Section 1.3** in above includes the conditions of the Project Approval that are specifically related to mine closure.

### 3.1.5 Water Licences

Water Licences issued under the *Water Act 1912* and Water Access Licences issued under the *Water Management Act 2000* contain conditions that are relevant to mine closure, requiring the licensee to construct and maintain any works in a stable state for the life of the project.

SLR has considered the relevant conditions contained within the following legislation in the preparation of this *Mine Closure Plan*.

- Groundwater bores are licensed under the *Water Act 1912* and granted by the –Department of Primary Industries Water (DPI Water) for the monitoring of groundwater resources surrounding the mine. In addition, there are twelve (12) bores that are also sampled as part of the sites current groundwater monitoring program;
- A groundwater licence issued under the *Water Act 1912* and granted by the DPI Water for water captured as a result of underground mining; and
- Surface Water Licence AL811346 issued under the *Water Management Act 2000* and granted by DPI Water for irrigation purposes.

## 3.2 External Guidelines and Policies

### 3.2.1 Strategic Framework for Mine Closure (ANZMEC and MCA, 2000)

The Strategic Framework for Mine Closure (ANZMEC and MCA, 2000) has evolved as a cooperative development between the Australian and New Zealand Minerals and Energy Council (ANZMEC) and the Australian Minerals Industry represented by the Minerals Council of Australia (MCA). It provides a framework of issues to be considered as part of a *Mine Closure Plan*.

SLR has prepared this *Mine Closure Plan* to be consistent with this strategic document.

### **3.2.2 Enduring Value – Australian Minerals Industry Framework For Sustainable Development (Minerals Council of Australia, 2005)**

*Enduring Value* is a code where signatories commit to the principles of Sustainable Development. It replaces the old Minerals Industry Code of Conduct for Environmental Management. Narrabri Mine is currently not a signatory to the Code, although the general principles have been considered by SLR in the preparation of this *Mine Closure Plan*.

Enduring Value builds on the industry's commitment to continuous improvement in performance as outlined in the Australian Minerals Industry Code for Environmental Management (1996 – 2000) Minerals Council of Australia, 2000).

### **3.2.3 Guidance Paper – Financial Assurance for Mine Closure and Reclamation (ICMM 2006)**

This report has been prepared by the International Council of Mining and Metals (ICMM) and it considers environmental financial assurance measures. It looks at issues and current policies in the use of financial assurances through the industry; analysing trends that were revealed through a survey of the industry, governments and financial institutions.

### **3.3 Other State and Federal Agencies Policy and Guidelines**

While not specifically relevant in a regulatory context, other State agencies have also developed guidelines and policies that are applicable to mine closure and decommissioning. Where relevant these policies and guidelines have been considered by SLR in the preparation of this *Mine Closure Plan*.

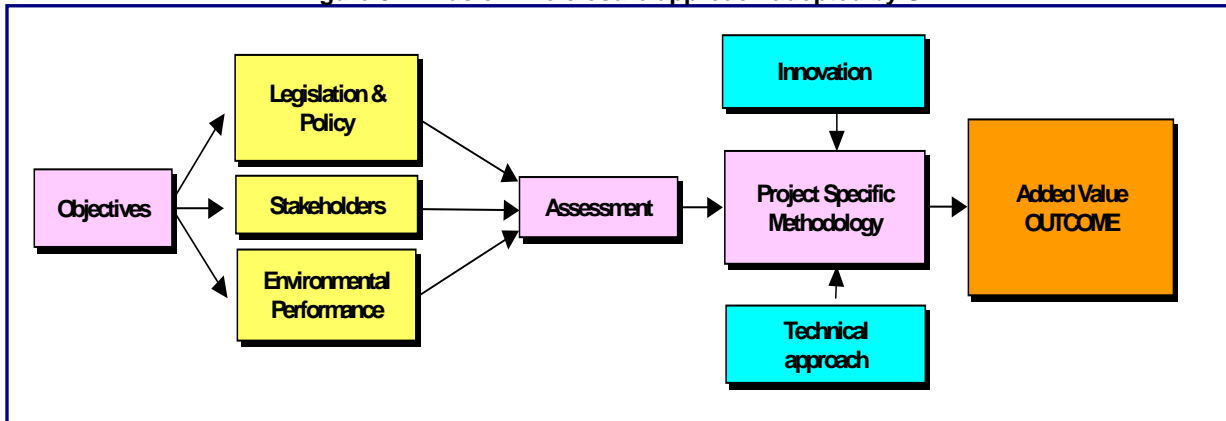
The policy and guidelines considered include:

- NSW Aquifer Interference Policy (Department of Primary Industries – Office of Water, September 2012);
- NSW Groundwater Policy Framework Document (Department of Land and Water Conservation 1997);
- NSW Groundwater Quality Protection Policy (Department of Land and Water Conservation, 1998);
- NSW Groundwater Quantity Management Policy (Department of Land and Water Conservation, 2001);
- State Groundwater Dependant Ecosystem Policy (Department of Land and Water Conservation, 2002);
- Farm Dams Policy (NSW Government, 1999);
- Weirs Policy (NSW Government, 1997);
- Rehabilitation Security Deposit Requirements for Mining and Petroleum Titles (DPI-MR, 2006)
- NSW Salinity Strategy - Taking on the Challenge (Department of Land and Water Conservation, 2000a); and
- ESG1 Rehabilitation Cost Estimate Guidelines (Industry and Investment NSW, 2010).

## 4 THE ADOPTED APPROACH TO PREPARING THE MINE CLOSURE PLAN

The basic approach adopted to identify the mine closure issues is illustrated in the **Figure 3** below:

**Figure 3 Basic mine closure approach adopted by SLR**



The approach adopted by SLR for developing this *Mine Closure Plan* has been firmly built on a *planning* focus to ensure the process of mine closure is able to occur in an orderly, cost effective and timely manner. Mine closure is a staged approach which should commence prior to disturbance of areas.

### 4.1 Key Steps in the Process of Developing the *Mine Closure Plan*

The following section includes detail on the key steps taken in the review of this *Mine Closure Plan* prepared for the approved Stage 2 of the Narrabri Coal Mine.

#### 4.1.1 Site Meetings and Document Review

##### 2011 Update

An initial site meeting was held between GSSE and representatives of Narrabri Mine on the 22 April 2009 to assist in the preparation of the Stage 1 *Mine Closure Plan*. It gave GSSE an opportunity to visit the site and get a detailed understanding of the mine layout as well as get an appreciation for operational issues that may impact on closure (i.e. proximity of the mine to “protected” sites, standard of rehab, etc). The Stage 2 *Mine Closure Plan* review and update has been prepared on the basis of information provided in the following documents:

- The Project Approval 08\_0144 dated 26 July 2010, issued under Section 75J of the *Environmental Planning and Assessment Act 1979*;
- Major Project Assessment - Narrabri Coal Project - Stage 2 (08\_0144). Director-General's Environmental Assessment Report Section 75I of the *Environmental Planning and Assessment Act 1979* prepared by the NSW Department of Planning, July 2010;
- Narrabri Coal Operations Pty Ltd – Environmental Assessment for the Narrabri Coal Mine Stage 2 Longwall Project, Report No. 674/16 prepared by R.W Corkery and Co. Pty Ltd, November 2009;
- Narrabri Coal Operations Pty Ltd - Narrabri Coal Mine - *Mine Closure Plan*, Report No. ECL01-002 prepared by GSS Environmental, July 2009;
- Narrabri Coal Operations Pty Ltd - Narrabri Coal Landscape Management Plan, Report No. 09-ARMPLA-0003 prepared by Eco Logical Australia, September 2009;

- Narrabri Coal Operations Pty Ltd - Narrabri Coal Mine - Stage 2 Longwall Project - Revision of the Approved *Mine Closure Plan* - Project Proposal, Ref. No. WHM02-002 prepared by GSS Environmental, April 2011; and
- Mine Subsidence Effect Predictions and Impact Assessment for the Proposed Longwalls 1 to 5 at the Narrabri Coal Mine, Narrabri by Ditton Geotechnical Services Pty. Ltd, July 2011.

### **2015 Update**

This *Mine Closure Plan* was updated by SLR in 2015 as part of the amendment to an existing Extraction Plan. This report was updated for an additional longwall (LW 106), with the Stage 2 area including LW 101-106. The review included:

- Updating of site status;
- Updating of legislation of approvals;
- Rearranging of domains to correspond with the Landscape Management Plan;
- Updating of figures; and
- Liaison with Eco Logical Australia (ELA).

### **2016 Update**

This *Mine Closure Plan* was updated by SLR in 2016 as part of the development of a new Extraction Plan. This report now outlines rehabilitation and closure management for an additional four longwall panels (LW107-LW110), with the Stage 2 area now including LW101-LW110. The review included:

- Review of subsidence predictions for LW107-LW110;
- Updating of site status;
- Updating of government agencies;
- Updating of figures; and
- Liaison with Eco Logical Australia (ELA).

With the only change to the mine plan being the inclusion of additional longwalls (LW107-LW110), there has been no requirement to complete major changes to the document.

## **4.2 Mine Closure Management “Domains”**

In order to best address the complexity of different mining activities across the site, SLR divided the mine site into series of management “domains” that enabled better focus on the treatment of like areas.

By addressing each like “domain” systemically SLR was able to focus on and address the specific aspects related to the closure of the mine. This included considering the combination of the location of the site, type of land disturbance and the specific environmental issues to be addressed.

This systematic approach has the added benefit in that it enables NCOPL to identify and implement effective mine closure and decommissioning on a progressive basis. This will result in the following key benefits both during and at the end of mining operations.

- Continually reduces liabilities by optimising rehabilitation works;
- Provide for a more accurate assessment of accrual for rehabilitation liability;
- Tests rehabilitation design;
- Reduces double handling;

- Enables a tighter control on “actual” costs to undertake various rehabilitation treatments and enables improvement in budget allocation;
- Identifies areas of high environmental risk (e.g., coal stockpiles, hydrocarbon contaminated areas); and
- Facilitates direct involvement by internal stakeholders (i.e. mining supervisors).

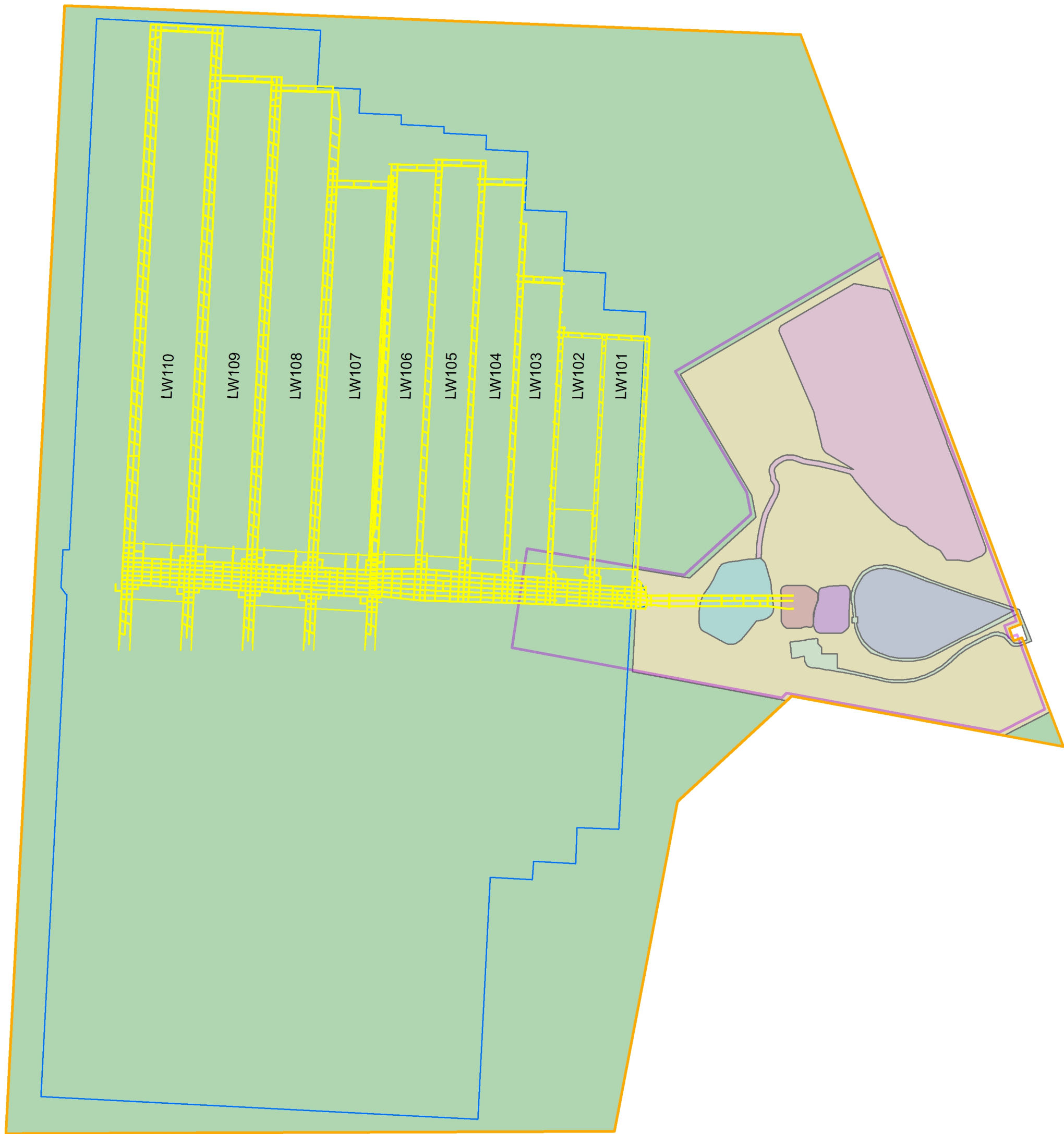
The following includes a summary of the domain areas used in this conceptual *Mine Closure Plan*.

- **Domain 1** Workshop, offices, bath house, staff car parking, access road, rail crossings, rail loop, and rail load out bin
- **Domain 2** Crushing and sizing equipment and coal stock piles
- **Domain 3** Box cut and transport, conveyor and ventilation drifts
- **Domain 4** Evaporation ponds and water storage dams
- **Domain 5** Other lands in the Pit Top Area (excluding Kurrajong Creek)
- **Domain 6** Surface of the Longwall Area and wider mining lease
- **Domain 7** Brine Storage Dams (BR1 – BR5)
- **Domain 8** Reject Emplacement Area and all weather unsealed road access.

Domain 6 is a large area consisting of both the longwall subsidence areas and other areas of the ML. Given this, Domain 6 has been further divided into management units, consisting of:

- Remnant vegetation
- Agricultural land
- Riparian
- Infrastructure
- Other areas of ML.

**Figure 4** shows the allocated Domain areas as they apply to this *Mine Closure Plan*.

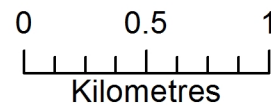


**Legend**

- LW101 to LW110
- Stage 1 (Pit Top Area)
- Stage 2 (Underground Longwall Area)
- Mining lease 1609

**Domain**

- Domain 1 - Workshop, offices, bath house, staff car parking, access road, rail crossings, rail loop, and rail load out bin
- Domain 2 - Crushing and sizing equipment and coal stock piles
- Domain 3 - Box cut and transport, conveyor and ventilation drifts
- Domain 4 - Evaporation ponds and water storage dams
- Domain 5 - Other lands in the Pit Top Area (excluding Kurrajong Creek)
- Domain 6 - Surface of the Longwall Area and wider mining lease
- Domain 7 - Brine Storage Dams (BR1 – BR5)
- Domain 8 - Reject Emplacement Area and all weather unsealed road access



**Figure 4 Mine Closure Domains**

Datum/Projection:  
GDA 1994 MGA Zone 55

Prepared by:NV Date:27/09/2016

### 4.3 Stakeholder Engagement

Narrabri Coal has recognised the value of identifying and engaging the key stakeholders during the development of a *Mine Closure Plan*. This is important as it enables recognised stakeholders to have their interests considered as part of the mine closure planning process. Engaging relevant stakeholders is seen as one of the fundamental principles for effective mine closure, as the closure of the mine can often be responsible for substantial changes in both the community and the environment in which it operates.

#### 4.3.1 List of Stakeholders Required to be Consulted

As stated in Schedule 5, Condition 3 of the Project Approval, consultation with key government departments is required for the preparation of the Landscape Management Plan, and subsequently this *Mine Closure Plan*. The following key government stakeholders have been included in any consultation relating to mine closure (and the Landscape Management Plan) at Narrabri Coal.

Relevant NSW Government Agencies were consulted during the preparation of the 2011 *Mine Closure Plan* as follows;

- NSW Department of Planning and Environment (DP&E);
- NSW Department of Primary Industries Water (DPI Water);
- NSW Office of Environment and Heritage (OEH);
- NSW Department of Trade and Investment, Regional Infrastructure Services – Resources and Energy (DRE); and
- Narrabri Shire Council (NSC).

A copy of their responses to the 2011 Stage 2 Landscape Management Plan (LMP), and where relevant to the *Mine Closure Plan*, has been included as an attachment to the LMP.

In addition, consultation has been undertaken with the community through the Community Consultation Committee (CCC) since the project commenced in 2008. This management plan will be discussed at the next CCC meeting.

Schedule 5 Condition 3 of the Project Approval outlines the requirement to prepare the overall Landscape Management Plan in consultation with NSW DPI Water, Office of Environment and Heritage and Narrabri Shire Council.

### 4.4 Socio-economic effects associated with Mine Closure

#### 4.4.1 Narrabri Coal Underground Mine

NCOPL recognises that the closure of the mine at that time is likely to have some impact on the local community. As part of the mine closure planning process, Narrabri Coal proposes to prepare a Social Impact Assessment (SIA). This will be prepared five (5) years out from final mine closure.

The SIA will consider the following keys issues with regard to closure:

- The SIA will consider the demands and contributions of the mine on local services to better assess the impacts of closure on those demands and contributions;
- Social sustainability post closure will be a key consideration;
- Establishing a benchmark for retention of economic activity within the site will be included in the considerations for the SIA;
- The SIA will include studies/monitoring of social contributions and sustainability post closure;



- The SIA will consider relationships with local suppliers (business planning workshops pre-closure with local businesses to assist them moving on from reliance on the mine);
- Stakeholders' ideas of end land use and their perceptions as part of the planning for the *Mine Closure Plan* and incorporating the consultation into developing and finalising the plan;
- During the preparation of the stakeholder consultation strategy there will be careful consideration of the methodology and consultation with individual stakeholders at each stage; and
- The nature of the current economic / social contribution compared to the future contribution / loss of contribution post closure.

The existing workforce will be retained until the cessation of coal mining. It is then anticipated that a reduced crew will be retained to complete any final decommissioning and rehabilitation works.

The key aspects that will need to be considered in relation to human resource issues moving towards closure include:

- Communication with workforce regarding closure. A communication strategy needs to be developed to ensure that the workforce remains informed;
- Retaining of key technical staff and mine workers required to implement closure of the site;
- Redundancy packages to be offered;
- When redundancy packages will commence being offered. Develop a strategy for scaling back the operation;
- Investigate the possibility of transfer of employment to another mine site;
- Counselling, career advice and training services to be offered to employees;
- Establishing a benchmark for retention of economic activity within the site;
- Studies/monitoring of social contributions and sustainability post closure;
- Relationships with local suppliers (business planning workshops pre-closure with local businesses to assist them moving on from reliance on the mine);
- Stakeholders' ideas of end land use and considering their perceptions as part of the planning for the *Mine Closure Plan* and incorporating the consultation into developing and finalising the plan;
- The preparation of the stakeholder consultation strategy which needs to give careful consideration to the methodology and consultation with individual stakeholders at each stage;
- The study data as part of planning for closure including data related to employees, suppliers and the wider community; and
- Understand the nature of the current economic / social contribution in order to consider the future contribution / loss of contribution post closure.

In addition to these human resource aspects, Narrabri Coal may investigate other options to address issues related to the community.

**Table 2** below is a summary of the stakeholder strategy that will be generally adopted for mine closure

**Table 2 Summary of the Stakeholder Strategy to be used during Mine Closure**

<b>Stakeholder</b>	<b>Proposed Strategy</b>	<b>Issues to be addressed</b>
Employees	Focus groups	Re-training Re-location Business development support Networks Voluntary redundancies
Local councils	Presentation with feedback invited	Baseline data Potential impacts Planning guidelines Future use of the site
<u>DRE</u>	Presentation with feedback invited	Baseline data Potential impacts Planning guidelines Future use of the site
Near neighbours	One-on-one interviews Information Sessions / invitation to comment	Future of the site Any concerns regarding closure
Mine Subsidence Board	Presentation with feedback invited	Management of subsidence.
Special interest groups	Information Sessions / invitation to comment	Future use of the site Identified potential impacts Strategy for enhancing benefits to local and regional communities
Broader community	Media release and invitation to comment	Future use of the site Opportunities Social impact of closure

## 5 MINE CLOSURE AND DECOMMISSIONING

The following section of the *Mine Closure Plan* outlines the proposed commitments for each domain under the scenario of mine closure. It is also intended that the satisfactory completion of these proposed commitments would be used as criteria to demonstrate that the decommissioning and rehabilitation of each of the nominated domains has been successfully completed. Further discussion of specific mine closure criteria is included as **Section 6** of this *Mine Closure Plan*.

### 5.1 Description of the decommissioning and rehabilitation commitments for each Domain

The plans attached as **Figure 4** shows the management domains identified as part of the mine closure document. There were eight (8) domains identified. The following sections provide a more detailed description of each domain, including an overall framework for the mine closure process, assumptions made, and the actions required to meet the nominated closure criteria for the domain.

#### 5.1.1 Domain 1: Administration Area(s), Workshop and Service Bay, CHPP and associated infrastructure (excludes Box cut, Access road, Rail loop and associated infrastructure)

**Domain 1** covers an area that includes the following key elements.

- Administration office, bath house, car park, associated storage sheds;
- Power lines, transformer facilities and associated infrastructure;
- Electricity sub-station and associated switch yard;
- Maintenance workshop, service bays, vehicle wash down, parts storages pads, bulk fuel storage tanks and infrastructure;
- Coal load-out bin and associated infrastructure for loading the trains;
- Water pipeline to the Namoi River;
- CHPP, Coal crushing and sizing equipment; and
- Coal stockpile areas.

#### **Administration Office, Car Park, Storage Sheds, Rail Crossing and Signal Equipment**

All surface infrastructure, with the exception of the mine access road and rail infrastructure, would be decommissioned, dismantled and removed from the mine site. All buildings, including the main administration building, car park and storage sheds will be required to be demolished and removed from the site. Notwithstanding this, should a future agreed final land use option require any of this present infrastructure, specific items (ie. some buildings) may remain at the site. Specific items may also be identified for relocation to other Whitehaven operations or on-sold for relocation elsewhere. For all elements dismantled, all recoverable scrap steel will be sold and recycled, with the remaining unrecyclable wastes either being taken to a licensed landfill or buried in the backfill of the box-cut. Only inert wastes will be placed in the box-cut in accordance with the DRE and OEH requirements.

The bio-cycle sewerage plant will be removed from site.

All concrete will be broken up and crushed to make an aggregate which will be utilised across the site or sold for some other beneficial reuse. The bitumen roadways and car parks areas around the administration areas will be ripped up with the inert waste material being placed in the box-cut and buried.

The entire area is then to be deep-ripped to at least 400 mm in two directions. Following which, 150 mm of topsoil will be spread over the entire area, ripped and seeded.

#### **Electricity Sub-Station, Switch Yard and Supply Mains**

All services including power, data and telephone will be isolated, disconnected and terminated to make them safe. The inspection pits and junction boxes for underground services will be sealed. Generally all underground services will be made safe and left buried in the ground. Overhead power lines will be removed and the materials (i.e. poles and wire) recovered for potential re-sale or recycling as applicable. Switch room buildings will be disconnected and demolished. The substations will be removed from the site and either used on another project or sold as a going concern.

#### **Workshop, Service Bays, Vehicle Wash Down, Parts Storages Pads and Bulk Fuel Storage Tanks**

All sumps will be de-watered and the excess coal removed prior to the commencement of demolition. In addition all items of equipment will be de-oiled, degassed, depressurised and isolated and all hazardous materials (HAZMATs) removed from the site.

All buildings, including the workshop, service bays, vehicle wash down bays, hard stand areas and fuel farms will be required to be demolished and/or removed from the site.

The fuel / lube bay infrastructure is to be removed from the site. The oil water separator is to be removed. All concrete footings and bunds will be broken up and removed with the inert waste material being buried in the box-cut. Where required, a Phase 2 assessment of contamination in the area will be undertaken by a suitably qualified consultant. Where the levels of contamination are considered too high for disposal in the box-cut, the material will be placed in a bio-remediation area.

The items will be demolished, removed and/or transported from the site as required. All recoverable scrap steel will be sold and recycled, with the remaining unrecyclable wastes either being taken to a licensed landfill or buried in the box-cut. Only inert wastes will be placed in the box-cut. Prior to disposal, all wastes will be assessed and classified in accordance with the *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes* (Department of Environment and Conservation, 2004) is a combination of the *Environmental Guidelines: Assessment, Classification and Management of Non-Liquid Wastes* (EPA, 1997) and the product of consultation on *Draft Environmental Guidelines for Assessment, Classification and Management of Liquid Wastes* (EPA, 1998).

All concrete will be broken up and crushed to make an aggregate which will be utilised across the site or sold for some other beneficial reuse.

At closure, a preliminary contaminated sites analysis (Phase 1) will be implemented to determine whether an assessment (Phase 2 – detailed investigation of contamination involving drilling, etc) should be conducted. This will quantify the amount of contaminated material that will need to be bio-remediated on site.

The entire area is then to be deep-ripped to at least 400 mm in two directions. Following which, 150 mm of topsoil will be spread over the entire area, ripped and seeded.

### **Coal Load-Out Bin and Associated Infrastructure**

The industrial buildings, rail loading bin (and associated infrastructure), conveyors and gantries will be demolished and removed from the site or on-sold or relocated to other operations. For all elements dismantled, all recoverable scrap steel will be sold and recycled, with the remaining unrecyclable wastes either being taken to a licensed landfill or buried in the backfill of the box-cut.

Only inert wastes will be placed in the box-cut in accordance with the DRE\_and OEH requirements.

All concrete will be broken up and crushed to make an aggregate which will be utilised across the site or sold for some other beneficial reuse.

### **Rail Loop**

At this point in time it is proposed that the rail loop will remain after mine closure. In the event that the rail loop is not retained, the rail cutting will be backfilled with material excavated from within the site and the disturbance footprint will be re-profiled to recreate a similar topography to pre-mining.

The entire area is then to be deep-ripped to at least 400 mm in two directions. Following which, approximately 150 mm of topsoil will be spread over the entire area, ripped and seeded.

### **Namoi River Water pipeline**

The 300mm diameter pipeline between the mine site and the Namoi River will be removed from the underground trenches and recycled as appropriate. Where possible the pipe would be reused. Notwithstanding the above, consultation will be undertaken with the appropriate stakeholders when imminent closure is within 5 years. If an acceptable arrangement can be made with the stakeholders, the pipeline infrastructure may be retained and used by another user post mining.

The associated pipeline infrastructure such as flow meters and pressure gauges would also be removed and either sold, recycled or disposed of as appropriate.

Vegetation over the pipeline would be removed and mulched for later use. Topsoil would be removed and stockpiled separate to sub-soil for placement in reverse order. The ground would be re-shaped to the surrounding soil surface and covered with stockpiled mulch. A sterile cover crop will be sown where required to prevent soil erosion and appropriate sediment controls emplaced. A longer-term revegetation program would be undertaken in conjunction with mine site rehabilitation works and would include sowing with a mix of native tree, shrub and grass species, planting native tubestock plants or a combination of both, depending on the location.

### **CHPP, Coal Crushing and Sizing Equipment and Surface Conveyors and Stackers**

Small buildings, CHPP, crushing and sizing equipment, conveyors and gantries will be demolished and removed from site or on sold or relocated to other operations. For all elements dismantled, all recoverable scrap steel will be sold and recycled, with the remaining unrecyclable wastes either being taken to a licensed landfill or buried in the backfill of the box-cut.

Only inert wastes will be placed in the box-cut in accordance with the DRE\_and OEH requirements.

All concrete will be broken up and crushed to make an aggregate which will be utilised across the site or sold for some other beneficial use.

### **Coal Stockpile Areas**

The carbonaceous material and coal stockpile areas will be stripped to a depth of at least 0.5m (or until it is cut back to original surface) and disposed of in the box-cut. The area will then be reshaped, trimmed and rock raked before 150 mm of topsoil is placed on the site.

The entire industrial area footprint will be deep-ripped to at least 400 mm in two directions. Following which, 150 mm of topsoil will be spread over the entire area, ripped and seeded.

In the event that the rail loop is not retained, as discussed previously, the material from the stockpile areas could also be placed into the rail cutting as fill in order to establish the profile back to as near as original as possible.

### **Disturbed Pit Top Land**

The entire domain area will then be regraded and trimmed to make a landform that is consistent with the surrounding topography. The regrading will be such that it will enable the free drainage of surface runoff from the site. Surface water management structures (contour banks, drains and settlement ponds) will also be constructed to ensure the water leaving the site does not result in erosion of the landform. The entire workshop / administration area will then be rock raked to remove all surface rock to a size less than 500mm and ripped to a depth of at least 1m in at least two directions. Where the area has been used by heavy equipment causing additional compaction it may need additional ripping to enable the establishment of vegetation in the area. Topsoil will be spread over the entire area, ripped and seeded.

Management of this area will require ongoing maintenance beyond closure of the mine. In the context of this conceptual *Mine Closure Plan*, maintenance constitutes two applications of fertiliser during the appropriate seasons and when determined necessary and weed management requirements over a five year period. However this will vary depending on the extent of weed infestation.

## **Domain 2: Crushing and Sizing Equipment and Coal Stockpiles**

**Domain 2** covers an area that includes the following key elements

- Crushing Plant
- ROM Stockpile Area
- Product Stockpile Area

## **Domain 3 Box-cut and Transport, Conveyor and Ventilation Drifts**

**Domain 3** covers an area that includes the following key elements.

- Box-cut void;
- Mine portals (transport and ventilation); and
- Conveyors.

### **Box-Cut and Drift Portals**

Following the removal of surface infrastructure from the drift portals within the box-cut, the entries will be sealed in accordance with the appropriate DRE\_guidelines and the box-cut backfilled using material recovered from the perimeter amenity bund and other inert material removed during demolition. The internal water management system in the box-cut will be de-watered and any contaminated water appropriately treated or taken from site for treatment.

Once backfilled, the surface will be shaped to restore continuity with the surrounding landscape. The entire area is then to be deep-ripped to at least 400 mm in two directions. Following which, approximately 150 mm of topsoil will be spread over the entire area, ripped and seeded as per the treatment described in the MOP.

### **Raw Water Storage Tanks**

The raw water storage tanks will be removed from the site. If still serviceable they may be on-sold for another purpose, if not they will be recycled with scrap steel leaving the site.

### **Piping and Electricity Infrastructure**

All services including power and water for the domain will be disconnected and terminated to make them safe. The inspection pits and junction boxes for underground services will be sealed. Generally all underground services will be made safe and left buried in the ground.

### **Rehabilitation of the Domain**

The entire domain area will then be regraded and trimmed to make a landform that is consistent with the surrounding topography. The regrading will be such that it will enable the free drainage of surface runoff from the site. Surface water management structures (contour banks, drains and settlement ponds) will also be constructed to ensure the water leaving the site does not result in erosion of the landform. The entire domain area will then be rock raked to remove all surface rock to a size less than 500mm and ripped to a depth of at least 400mm. Following which, approximately 150mm of topsoil will be spread over the entire area, ripped and seeded.

Management of this area will require ongoing maintenance beyond closure of the mine. In the context of this conceptual *Mine Closure Plan*, maintenance constitutes two applications of fertiliser and weed management requirements over a five year period. However this will vary depending on the extent of weed infestation.

## **5.1.2 Domain 4: Evaporation Ponds and water Storage Dams**

**Domain 4** covers an area that includes the following key elements.

- Evaporation ponds for the evaporation of saline water from the underground workings;
- Water storage dams for the storage of on-site raw water;
- Surface water diversions;
- Erosion and sediment control dams;
- Water conditioning plant (reverse osmosis); and
- Pumping and reticulation infrastructure.

### **Evaporation Ponds**

Accumulated salt in the evaporation/storage ponds will be excavated and either placed within the drifts of box-cut prior to backfilling or reinjected back into the goaf. Studies will be undertaken to ensure the risk of contamination is minimal.

Even though an impermeable liner has been used in these ponds, the subsoil beneath the liner will be analysed where required and any saline contaminated subsoil excavated and treated in the same way as the accumulated salt.

The remaining sub-surface material will be sampled and analysed for salinity. Should tests confirm no saline contamination the area will then be rehabilitated by back filling and reshaping to achieve the prescribed final landform as per Plan 6 of the MOP (MOP Plan 6 attached as **Appendix 1**). The area will be topsoiled, ameliorated and seeded with a pasture seed mix specified in the MOP and relevant to the season.

### **Water Storage Dams**

The current water storage ponds, settlement ponds and diversion banks in the Pit Top Area will be retained to provide erosion and sediment control during closure and to maximise the availability of water for any future use of the site post closure.

### **Surface Water Diversions**

Structural soil conservation works and the surface water diversion will remain in place where required to ensure that water is directed into the site water management system. These works may include the construction of additional waterways, drains, graded banks and check dams as required.

### **Erosion and Sediment Control Dams**

Erosion and sediment control dams will remain across the site to ensure that water leaving disturbed areas is adequately treated during closure and beyond.

Should any areas be disturbed they will be reshaped and the entire area is then to be deep-ripped to at least 400 mm in two directions. Following which, approximately 150 mm of topsoil will be spread over the entire area, ripped and seeded.

### **Water Conditioning Plant**

The water conditioning plant onsite which is used to treat underground water will be decommissioned, dismantled and removed from site. This unit may be on-sold or utilised at another Whitehaven site if it is still in a serviceable condition.

### **Pumping and Reticulation Infrastructure**

All pumping and surface reticulation infrastructure will be removed from the site.

### **Rehabilitation areas**

The entire domain area will then be regraded and trimmed to make a landform that is consistent with the surrounding topography. The regrading will be such that it will enable the free drainage of surface runoff from the site. Surface water management structures (contour banks, drains and settlement ponds) will also be constructed to ensure the water leaving the site does not result in erosion of the landform. The entire domain area will then to be rock raked to remove all surface rock to a size less than 500mm and ripped to a depth of at least 400mm. Following which, 150mm of topsoil will be spread over the entire area, ripped and seeded.

Management of this area will require ongoing maintenance beyond closure of the mine. In the context of this conceptual *Mine Closure Plan*, maintenance constitutes two applications of fertiliser and weed management requirements over a five year period. However this will vary depending on the extent of weed infestation.



### 5.1.3 Domain 5: Other Lands in the Pit Top Area (Excluding Kurrajong Creek)

**Domain 5** covers an area that includes the following key elements.

- Vegetation on either side the drainage line in this domain is mapped as Riparian Forest, whilst remaining woodland within this domain is mapped as Inland Grey Box Woodland, which constitutes White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community (EEC) under the TSC and EPBC Acts.
- The remainder of the domain is cleared and been used for agriculture in the past.

### 5.1.4 Domain 6: Area directly above longwall operations; including all other lands within the surrounding Mine Lease area

**Domain 6** consists of the areas that are directly above longwall operations, including ventilation and gas drainage infrastructure, as well as any areas indirectly affected by mining works. It includes all land owned or managed by NCOPL that is not used for the purposes of mining. The land primarily consists of agricultural land, woodland vegetation and State Forest which provides a buffer between the mine and surrounding neighbours.

The key aspects include:

- Subsided land surface (LW101–LW110);
- Ventilation and gas drainage infrastructure;
- Public road reserves and access tracks;
- Exploration boreholes;
- Dams; and
- Environmental monitoring locations.

#### **Subsidence areas**

Any ground disturbance indicated by surface cracking caused by subsidence will be progressively rehabilitated. For smaller width cracking, the surface would simply be ripped to allow the cracks to be filled in. In some instances, the surface cracking may be too wide to be effectively in-filled by surface ripping and in these instances, material excavated from within the footprint of the Reject Emplacement Area would be used to in-fill the cracks prior to ripping and revegetation.

#### **Ventilation and gas drainage infrastructure**

The ventilation and gas drainage infrastructure would be removed in much the same fashion as the Pit Top Area, albeit on a smaller and more widespread scale. When facilities are no longer required, they would be progressively removed and the area rehabilitated. All boreholes will be sealed to meet the EDG standards (Department of Mineral Resources, 1997a and 1997b). The clean and dirty water sumps will be removed with the areas reshaped to allow the free drainage of water through the site.

### **Access Tracks**

Access tracks constructed to access mine infrastructure will be ripped, regraded and reshaped. These areas will be allowed to re-vegetate naturally, however, if natural regeneration is ineffective, if required, additional topsoil will be sourced from other areas and spread over the former access tracks, followed by fertiliser and seed application. All access tracks that pre-date the mining activity will be retained following an erosion assessment and regraded/repared as appropriate.

### **Exploration Boreholes**

All exploration boreholes will be grouted, capped and sealed in accordance with DRE requirements.

Dams constructed as part of mining operations (i.e. clean and dirty water sumps at SIS gas drainage bores) will be removed and reshaped to be consistent with the surrounding landform,

### **Environmental monitoring locations**

All monitoring equipment will be removed after all post closure monitoring commitments are complete (see **Section 7.0**). All groundwater piezometers on the site will be capped.

### **General Land Management**

During closure any areas of land degradation, such as erosion, will be appropriately treated and rehabilitated. Feral animals, noxious weeds and fences will also be inspected and appropriately controlled or repaired. For more detail on general land management refer to the *Rehabilitation Management Plan (RMP)*.

### **Rehabilitation areas**

Rehabilitation of the environmental consequences of subsidence are addressed under various sub-components of the Extraction Plan, particularly in the following:

- *Rehabilitation Management Plan (component of Landscape Management Plan);*
- *Biodiversity Management Plan;*
- *Built Features Management Plan;*
- *Land Management Plan; and;*
- *Water Management Plan.*

Rehabilitation under these plans is intended to be completed as soon as practicable (i.e. progressively during longwall operations) and monitored as mining progresses to ensure any such works are stable in the longer term. Further detail of the predicted consequences and proposed rehabilitation works for this Domain is provided in **Sections 5.3 and 5.4**.

#### **5.1.5 Domain 7: Brine Storage Dams (BR1-BR5)**

**Domain 7** covers an area that includes the following key elements.

- Brine Storage Dams (BR1 – BR5)

### **Brine Storage Dams (BR1 – BR5)**

The Brine Storage Dams will be de-watered and the stored brine will be pumped back into the goaf areas and remaining gate roads of the completed longwall panels. The high density polyethylene (HDPE) plastic liner of each dam will be removed and transported to a waste disposal facility. Soil tests will be undertaken to determine if there has been any breaches of the plastic liner. Appropriate remedial measures would be undertaken to remove the saline contamination if required. If tests confirm no breaches have occurred, the dams will be backfilled, profiled, topsoiled and revegetated with pasture species to create a landform comparable with the surrounding topography.

#### **5.1.6 Domain 8: Rejects Emplacement Area**

**Domain 8** covers an area that includes the following key elements.

- Rejects Emplacement Area; and
- All weather unsealed access road.

### **Rejects Emplacement Area**

The Rejects Emplacement Area would be progressively capped with the previously stripped subsoil and topsoil as the permanent 14 degree batters of each cell are formed. On completion of each cell to the nominated 15m height, the top surface would be profiled and revegetated with a fast growing cover crop.

### **All weather unsealed access road**

The all weather, unsealed access road will be deep-ripped to at least 400 mm in two directions. 150 mm of topsoil will be spread over the entire road area, ripped and seeded.

### **Rehabilitation areas**

The entire domain area will then be regraded and trimmed to make a landform that is consistent with the surrounding topography. The regrading will be such that it will enable the free drainage of surface runoff from the site. Surface water management structures (contour banks, drains and settlement ponds) will also be constructed to ensure the water leaving the site does not result in erosion of the landform. The entire domain area will then be rock raked to remove all surface rock to a size less than 500mm and ripped to a depth of at least 400mm. Following which, 150mm of topsoil will be spread over the entire area, ripped and seeded.

Management of this area will require ongoing maintenance beyond closure of the mine. In the context of this conceptual *Mine Closure Plan*, maintenance constitutes two applications of fertiliser and weed management requirements over a five year period. However this will vary depending on the extent of weed infestation.

## **5.2 Revised Subsidence Impact Assessment Associated with LW107-LW110**

The Revised Subsidence Impact Assessment for LW107–LW110 has been completed by Ditton Geotechnical Services Pty. Ltd (DGS 2016). Section 12 of the DGS report summarises subsidence impacts including:

- First and Final maximum panel subsidence is likely to range between 2.53 m and 2.75 m (64% of the mining height).
- Maximum chain pillar subsidence is estimated to range between 0.28 m and 0.69 m above pillar width pairs ranging from 30 m to 34 m. The final vertical stress acting on the pillars are estimated to range from 18.3 to 26.2 MPa under double abutment loading conditions. Pillar FoS values range from 1.36 to 1.09 for a 3.7 m pillar height.

- Yielding of the chain pillars is not expected for the proposed mining layout (i.e. the predicted FoS values are  $> 1$ ). However, strain-hardening of the pillars due to core confinement and goaf materials within the panels themselves will limit and result in eventual cessation of subsidence if overloading conditions were to occur.
- Maximum panel tilts are estimated to range from 18 to 29 mm/m for 'smooth' profile subsidence, with occasional tilts from 27 mm/m to 44 mm/m due to discontinuous strata behaviour (i.e. localised block rotations).

### 5.2.1 Application of the Domain Plan to the Second Workings Modification

LW101 - LW110 are located within Domain 6 of the *Mine Closure Plan*. No new infrastructure is anticipated in association with these longwall panels.

### 5.2.2 Existing Decommissioning and Rehabilitation Commitments Applicable to the Second Workings Modification

As no new infrastructure is anticipated in association with LW 101 - 110 the existing decommissioning and rehabilitation commitments detailed in the *Mine Closure Plan* apply to the modification area. Based on the above potential subsidence impacts identified by DGS (2011), the existing decommissioning and rehabilitation approach applicable to the Stage 2 Area will include the following:

- Surface cracking will be rehabilitated in accordance with details provided in the Land Management Plan for LW 101 - 110;
- Changes in surface gradients that result in ponding will be rehabilitated in accordance with details provided in the *Land Management Plan* for LW 101 - 110;
- Instability and increased erosion of steep creek banks will be rehabilitated in accordance with details provided in the Land Management Plan for LW 101 - 110;
- Any surface built features to be retained (such as public roads, utility services, buildings, fences, dams, soil conservation banks) will be rehabilitated in accordance with processes provided for in the Built Features Management Plan for LW 101 - 110;
- Unsealed roads and tracks that are no longer required (i.e. surplus to the needs of the final land use) will be rehabilitated in accordance with the Rehabilitation Management Plan; and
- Impacts to vegetation during mining will be managed in accordance with the requirements of the Extraction Plan and associated approvals.

### 5.3 Progressive Rehabilitation

In order to reduce the amount of disturbed land at any one time, rehabilitation will be progressively undertaken on areas that cease to be used for mining or mining-related activities as soon as practical or within two years of becoming available. Results from current successful rehabilitation in the area or at other associated mining operations in the area, will be used to refine the proposed rehabilitation methods including aspects such as the selection of appropriate drainage measures/structures and plant species for re-establishment.

Notwithstanding this, it is not until the completion of longwall mining of individual panels that there will be the opportunity for larger areas to be progressively revegetated (the exception is the REA and gas drainage sites). Up until this point rehabilitation will generally be limited to plantings associated with erosion and sediment control and general landscaping.

Progressive rehabilitation of the REA and gas drainage sites will be completed as areas become available.

Detailed methodology on rehabilitation activities, including short and long term strategies, weed and pest management is provided in the Rehabilitation Management Plan.

## 5.4 Revegetation

An effective revegetation strategy is proposed that seeks to complement desirable post-mining land-use objectives whilst maintaining effective erosion and weed controls.

Revegetation activities will occur after the completion of reshaping, re-topsoiling and drainage activities. Where possible, the timing of the topsoiling and drainage works will be scheduled to enable a preferred seasonal sowing of grasses and tree seed in autumn or spring, and be undertaken as soon as possible after preliminary ground preparation works are completed in order to minimise the potential for soil erosion and weed invasion.

Detailed revegetation strategies for the mine site are provided in the *Rehabilitation Management Plan*, including short and long terms strategies.

The *Rehabilitation Management Plan* includes the progressive revegetation of areas as they become available (i.e. redundant gas drainage infrastructure sites, repaired areas of subsidence cracking, provision of site landscaping. The plan specifies species lists to be used in the following instances:

- Pasture species for the stabilisation of topsoil;
- Site landscaping (short term and long term); and
- Remnant vegetation and riparian management areas.

### 5.4.1 Rehabilitation Maintenance

Rehabilitated areas will be monitored on a regular basis to ensure that original objectives are achieved. Rehabilitation monitoring will include regular inspections for the following key aspects.

- Soil erosion;
- Revegetation success;
- Weed infestation (primarily noxious weeds, although where rehabilitation areas are dominated by other weeds (ie. *Galenia* sp) it will also be monitored and managed); and
- Integrity of water diversion drains, waterways and sediment control structures.

Maintenance works will be undertaken to address any deficiencies or areas of concern identified from monitoring. This may include the re-application of topsoil, re-seeding, re-planting, weed control, additional fertiliser applications, de-silting or repair of drainage works and sedimentation dams and infill and re-grading of eroded areas.

Further detail on rehabilitation monitoring and maintenance is detailed in the *Rehabilitation Management Plan*.

## 5.5 Weed and Pest Management

The presence of weed species has the potential to have a major impact on revegetation and regeneration outcomes at the mine. In addition to this, the presence of weed species within the surrounding land has the potential to significantly impact on the biodiversity value of the rehabilitated areas. Weed management will be a critical component of mine rehabilitation and landscaping activities.

## 5.6 Water Management in Rehabilitation Areas

All rehabilitated landforms will feature drainage provisions designed to effectively capture and divert surface water run-off to stable disposal areas prior to being discharged into surrounding watercourses. The drainage works will include contour banks or diversion drains at regular intervals down the rehabilitated slopes. Water to be discharged off site will initially pass into sedimentation dams with

sufficient capacity to allow for the settling of suspended solids. Suitable structures will be used to ensure the stability of water disposal points such as level sills, rock lined drop structures and/or energy dissipation measures.

The contour banks and dams will generally be designed to capture run-off from a 1 in 20 year ARI storm event and will be monitored for performance and adequacy during and after construction. All water management structures will be designed and implemented as per the *Managing Urban Stormwater, Soils and Construction: Volume 2E: Mines and Quarries DECCW (2008)*.

The construction of drainage works will closely follow the completion of reshaping activities to minimise the potential for surface degradation from heavy storm events that may occur prior to vegetation being established.

After the construction of drainage works, the area will be topsoiled and revegetated using a combination of pasture grasses and cover crops that seek to stabilise the ground surface as soon as possible (refer to Rehabilitation Management Plan).

Monitoring and remediation works will be undertaken as required on drainage structures during operation and the rehabilitation and closure phase of the operation.

## 6 REHABILITATION SUCCESS CRITERIA FOR MINE CLOSURE

In general terms, the DRE has established the following generic rehabilitation / closure criteria, and as such all mine sites must be rehabilitated according to the following criteria:

- Rehabilitation and rehabilitation outcomes consistent with the Environmental Assessment which formed the basis of approval;
- Based on mine closure criteria and rehabilitation outcomes developed through stakeholder consultation;
- Integrates rehabilitated native vegetation with undisturbed native vegetation to provide consolidated areas and wildlife corridors where possible;
- Suitable for an agreed subsequent land use as far as possible compatible with the surrounding land fabric and land use requirements;
- Addresses limitations of land capability as a consequence of mining and rehabilitation;
- Sustainable in terms of that land use;
- Stable and permanent landforms, with soils, hydrology, and ecosystems with maintenance needs no greater than those of surrounding land. (may include waste emplacements, voids, pits and water-bodies providing that they are part of the accepted final outcome);
- Securely and safely contain waste substances that have the potential to affect land use or result in pollution;
- Not present a hazard to persons, stock or native fauna;
- Addresses identified threatened species issues;
- Clean and tidy, and free of equipment/structures, except for heritage and other agreed features; and
- Freedom from unacceptable air and water pollution, and other environmental effects outside the disturbed area.

These generic mine closure criteria are currently under review. Once these updated criteria are approved by DRE and become available they should be integrated into this document so as to maintain a best practice approach to mine closure.

Through a stakeholder engagement process Narrabri Coal will need to refine these broader closure criteria to develop a list of criteria that are relevant to the site. Over time, through monitoring and maintenance, Narrabri Coal will need to demonstrate that the criteria are being met if they wish to reach the point where the responsibility for the mining lease is relinquished.

There has been no change in the criteria as part of the 2016 review of the *Mine Closure Plan*. Criteria will be reviewed and updated if required as part of the preparation of the new MOP, with this criteria to be consistent with the MOP Guidelines.

### 6.1 Preliminary Rehabilitation Success Criteria

Notwithstanding the above, the following preliminary success criteria (or closure criteria as they are often referred to) for the rehabilitation areas are included in **Table 3**. The success criteria are performance objectives or standards against which rehabilitation success in achieving a sustainable system for the proposed post-mine land use is demonstrated. Satisfaction and maintenance of the success criteria (as indicated by monitoring results) will demonstrate that the rehabilitated landscape is ready to be relinquished from the mine's financial assurance and could be handed back to stakeholders in a productive and sustainable condition.

The success criteria comprise indicators for vegetation, fauna, soil, stability, land use and safety on a landform-type basis that reflects the nominated post-mine land use of a mosaic of native vegetation, open grasslands with selective grazing opportunities.

For each element, standards that define rehabilitation success at mine closure are provided. Based on the generic indicators in **Table 3**, each criterion will be further developed to be specific, measurable, achievable, realistic and outcome based, and to reflect the principle of sustainable development. This will be based on results of further research and ongoing monitoring of the progressive rehabilitation areas. The success criteria will be reviewed every three to five years with stakeholder participation to ensure the nominated success criteria remain realistic and achievable.

**Table 3 Preliminary Rehabilitation Success Criteria**

Rehabilitation Element	Indicator	Criteria
<b>1. Rejects Emplacement Area</b>		
Landform stability	<i>Slope gradient</i>	Prior to placing waste, the emplacement footprint will be progressively stripped of topsoil and subsoil to a depth of about 400mm, with the stripped material being either stockpiled for later use in the rehabilitation of the emplacement, or placed directly on completed sections of the emplacement or at other locations on the mine site where rehabilitation may be required.
	<i>Erosion control</i>	Erosion control structures are installed at intervals commensurate with the slope of the landform. Average soil loss per annum is <40 tonnes/ha/yr (sheet erosion). Dimensions and frequency of occurrence of erosion rills and gullies are generally no greater than that in reference sites that exhibit similar landform characteristics.
	<i>Surface Water Drainage</i>	Use of contour banks and diversion drains to direct water into stable areas or sediment control basins. All landforms will be free draining except where specific structures (ie dams) have been constructed for the storage of water as required for sediment and erosion control or some post mining landuse.
Water quality		Ensure receiving waters affected by surface water runoff have contaminant limits of electrical conductivity maximum of 1,500 µS/cm and pH range of 5.5 to 8.5
Topsoil	<i>Salinity (electrical conductivity)</i>	Soil salinity content is <0.6 dS/m.
	<i>pH</i>	Soil pH is between 5.5 and 8.5.
	<i>Sodium content</i>	Soil Exchange Sodium Percentage (ESP) is <15%.
	<i>Nutrient cycling</i>	Nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts. Adequate macro and micro-nutrients are present.
Vegetation	<i>Land use</i>	Area accomplishes and remains as a healthy native woodland or as sustainable grazing pasture (where required).
	<i>Surface cover</i>	Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present). No bare surfaces >20 m <sup>2</sup> in area or >10 m in length down slope.
	<i>Species composition</i>	Subject to proposed land use, comprise a mixture of native trees, shrubs and grasses representative of regionally occurring woodland where possible OR palatable, nutritious pasture grass species are present.
	<i>Resilience to disturbance</i>	Established species survive and/or regenerate after disturbance. Weeds do not dominate native species after disturbance or after rain. Pests do not occur in substantial numbers or visibly affect the development of native plant species.
	<i>Sustainability</i>	Species are capable of setting viable seed, flowering or otherwise reproducing. Evidence of second generation of shrub and understorey



Rehabilitation Element	Indicator	Criteria
		species. Vegetation develops and maintains a litter layer evidenced by a consistent mass and depth of litter over subsequent seasons. More than 75% of shrubs and/or trees are healthy when ranked healthy, sick or dead.
Fauna	<i>Vertebrate species</i>	Representation of a range of species characteristics from each faunal assemblage group (e.g. reptiles, birds, mammals), present in the ecosystem type, based on pre-mine fauna lists and sighted within the three-year period preceding mine closure. The number of vertebrate species does not show a decrease over a number of successive seasons prior to mine closure.
	<i>Invertebrate species</i>	Presence of representatives of a broad range of functional indicator groups involved in different ecological processes.
	<i>Habitat structure</i>	Typical food, shelter and water sources required by the majority of vertebrate and invertebrate inhabitants of that ecosystem type are present, including: a variety of food plants; evidence of active use of habitat provided during rehabilitation such as nest boxes, and logs and signs of natural generation of shelter sources including leaf litter.
Safety		Risk assessment has been undertaken in accordance with relevant guidelines and Australian Standards and risks reduced to levels agreed with the stakeholders.
<b>2. Brine Storage and Evaporation Dams</b>		
Landform stability	<i>Erosion control</i>	Erosion mitigation measures have been applied. Average soil loss per annum per domain unit is <40 tonnes/ha/yr (sheet erosion).
	<i>Surface Water Drainage</i>	Drainage control measures are installed. No water is observed leaching from the facility
Water quality		As for 1; no soil or water contamination is present.
Topsoil		As for 1.
Vegetation		As for 1
Fauna		As for 1.
Safety		Risk assessment has been undertaken in accordance with relevant guidelines and Australian Standards and risks reduced to levels agreed with the stakeholders.
<b>3. Mine Plant/Industrial Areas</b>		
Landform stability	<i>Slope gradient</i>	Areas have gradients of <4°.
	<i>Erosion control</i>	Erosion mitigation measures have been applied. Average soil loss per annum per domain unit is <40 tonnes/ha/yr (sheet erosion).
	<i>Surface Water Drainage</i>	Use of contour banks and diversion drains to direct water into stable areas or sediment control basins.
Water quality		As for 1.
Topsoil		As for 1.
Vegetation	<i>Land use</i>	Buildings, water storage, roads (except those used by the public) and other infrastructure have been removed unless stakeholders have entered into formal written agreements for their retention. Areas are readily accessible and conducive to safe management activities. Predicted economics and /or benefits have been defined and agreed by the stakeholders.
	<i>Surface cover</i>	As for 1.
	<i>Species composition</i>	Subject to proposed land use, comprise a mixture of native trees, shrubs and grasses representative of regionally occurring native woodland where possible OR palatable, nutritious pasture grass species are present.

Rehabilitation Element	Indicator	Criteria
	<i>Resilience to disturbance</i>	As for 1.
	<i>Sustainability</i>	More than 75% of individual grasses and trees / shrubs are healthy when ranked healthy, sick or dead.
Fauna	<i>Vertebrate species</i>	Representation of a range of species characteristics from each faunal assemblage group (e.g. reptiles, birds, mammals), present in the ecosystem type, based on pre-mine fauna lists and sighted within the three-year period preceding mine closure. The number of vertebrate species does not show a decrease over a number of successive seasons prior to mine closure.
	<i>Invertebrate species</i>	Presence of representatives of a broad range of functional indicator groups involved in different ecological processes.
	<i>Habitat structure</i>	Typical food, shelter and water sources required by the majority of vertebrate and invertebrate inhabitants of that ecosystem type are present, including: a variety of food plants; evidence of active use of habitat provided during rehabilitation such as nest boxes, and logs and signs of natural generation of shelter sources including leaf litter.
Safety		Risk assessment has been undertaken in accordance with relevant guidelines and Australian Standards and risks reduced to levels agreed with the stakeholders. Closure documentation includes the contaminated sites register which identifies contaminated sites and the treatment applied.
<b>4. Areas above Longwall Mining Areas</b>		
Landform stability	<i>Slope gradient</i>	Areas affected by mine induced subsidence have gradients that are consistent with the pre-mining and/or the surrounding topography and which are geotechnically stable (i.e. no increased risk of landslip or mass slope failure).
	<i>Erosion control</i>	Subsidence cracking has naturally closed/filled or been actively remediated and revegetated. Erosion mitigation measures have been applied.
	<i>Surface Water Drainage</i>	Drainage lines are vegetated and/or stable (non-eroding) Use of contour banks and diversion drains where required to prevent erosion of slopes and direct water into stable areas or storage dams. Areas of surface ponding are assessed and either remediated to enable drainage to occur (where there is a salinity risk) or retained in accordance with the Land Management Plan.
Water quality		As for 1.
Topsoil		As for 1.
Vegetation	<i>Land use</i>	Buildings, water storage, roads (except those used by the public) and other infrastructure have been removed unless stakeholders have entered into formal written agreements for their retention. Areas are readily accessible and conducive to safe management activities. Predicted economics and /or benefits have been defined and agreed by the stakeholders.
Fauna	<i>Vertebrate species</i>	Representation of a range of species characteristics from each faunal assemblage group (e.g. reptiles, birds, mammals), present in the ecosystem type, based on pre-mine fauna lists and sighted within the three-year period preceding mine closure. The number of vertebrate species does not show a decrease over a number of successive seasons prior to mine closure.
	<i>Invertebrate species</i>	Presence of representatives of a broad range of functional indicator groups involved in different ecological processes.
	<i>Habitat structure</i>	Typical food, shelter and water sources required by the majority of vertebrate and invertebrate inhabitants of that ecosystem type are present, including: a variety of food plants; evidence of active use of habitat provided during rehabilitation such as nest boxes, and logs and

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Rehabilitation Element	Indicator	Criteria
		signs of natural generation of shelter sources including leaf litter.
Safety		Risk assessment has been undertaken in accordance with relevant guidelines and Australian Standards and risks reduced to levels agreed with the stakeholders. Closure documentation includes the contaminated sites register which identifies contaminated sites and the treatment applied.

## 7 POST CLOSURE MONITORING AND MEASUREMENT

The following section outlines the current Monitoring and Measurement programs as well as providing direction on what future programs may be required both during the mine decommissioning period (i.e. between the cessation of mining and the closure of the mine) and the Post Closure period. Statutory compliance, monitoring, verification of environmental quality and the protection of water resources rank as the highest expectations to be met across the spectrum of community interests.

### 7.1 Current Monitoring and Measurement Programs

Narrabri Coal has an established monitoring network that monitors and reports environmental data for the site. The following monitoring is currently undertaken for the Narrabri Coal operation:-

- *Surface Water Monitoring Program;*
- *Groundwater Monitoring Program;*
- *Noise Monitoring Program;*
- *Air Quality Monitoring Program; and*
- *On-site Meteorological Monitoring.*

### 7.2 Groundwater Management Post Closure

The DPI Water recommended in the letter dated 1 September 2015 that they consider the *Conceptual Mine Closure Plan* should be revised to consider the requirements of the Aquifer Interference Policy for post closure.

#### Impact Assessment

Hydrosimulations completed a Groundwater Assessment for the Narrabri Mod 5 Environmental Assessment (August 2015). The NSW *Aquifer Interference Policy* (NSW Government, 2012) establishes minimal impact considerations for highly productive and less productive groundwater. From review of DPI Water mapping of highly productive groundwater in the vicinity of the NM, it is understood that the Namoi Alluvium and Southern Recharge Groundwater Source (GAB) are highly productive groundwater sources (Hydrosimulations August 2015).

At closure brine will be re-injected into longwall panels with this already simulated by groundwater specialists modelling this planned activity. Section 5.2.3 of the Mod 5 Groundwater Assessment - Hydrosimulations (2015) assessed potential impacts associated with brine re-injection post closure.

*The hydrographs confirm that the effects of injection are localised and confined essentially to the target layer 7 (Napperby Formation below the sill) and the overlying layer 6 (basalt sill) where pressures are expected to be artesian at the centre of the longwall panel, near-artesian at the northern end of the panel, and sub-artesian at the southern end of the panel. Overlying layer 5 (Napperby Formation) and layer 4 (Garrawilla Volcanics) show no appreciable effect from the injection. This accords with the findings of Aquaterra (2009), who noted that the water level rise during injection did not reach the Garrawilla Volcanics (layer 4).*

*Aquaterra (2009) also conducted particle tracking to show that no upward migration of saline water would occur from the injection site to the GAB aquifers and that lateral outflow of saline water would be confined to a distance of 1-2 km after 100 years.*

Section 6 of the Hydrosimulations Groundwater Assessment (August 2015) stated:

- *Potential impacts on the highly productive Upper and Lower Namoi Groundwater Sources Water Sharing Plan and NSW Great Artesian Basin Groundwater Sources Water Sharing Plan would be within the Level 1 trigger of the Aquifer Interference Policy.*
- *Drawdown of one privately owned bore in less productive groundwater sources is predicted. This bore would be managed according to the Narrabri Mine Water Management Plan.*

## **Management and Monitoring Post Closure**

Narrabri Mine currently has a series of piezometers to monitor groundwater levels and quality, with current monitoring schedules outlined in the Water Management Plan. Narrabri Mine records all water pumped into and out of the mine.

Prior to closure a Detailed Mine Closure Plan will be developed, with this including a review of all environmental aspects during the closure phase of the site. Monitoring of groundwater alluvials will be undertaken for 5 years post mining and will also be tracked during the operation with groundwater levels and groundwater model calibration. Brine re-injection levels will be recorded during closure and compared against groundwater levels and quality during the operational phase.

### **7.3 Decommissioning Monitoring and Measurement Programs**

Following closure of Narrabri Coal, the Integrated Monitoring Network will be maintained until all decommissioning and rehabilitation works at the site have been completed. At this point those elements of the network that related specifically to the Narrabri Coal operation will be reviewed and rationalised in consultation with the appropriate authorities and in accordance with the Project Approval.

Notwithstanding this, there may be the need to establish some additional monitoring sites depending on the nature of the decommissioning works, and in response to finding possible sources of pollutants to the environment that currently may not be known (i.e. hydrocarbon contamination). The type and location of this monitoring will be determined during the decommissioning phase of the mine site.

### **7.4 Post Closure Environmental Compliance Monitoring and Measurement Programs**

#### **7.4.1 General Environmental Monitoring**

After decommissioning works have been undertaken, whether progressive or final, a monitoring program will be designed to demonstrate that the completion criteria have been met and that the site is not resulting in any off site effects.

This period should also be used to plan for remedial action where monitoring demonstrates completion criteria are unlikely to be met. If progressive rehabilitation has been successful, with stabilisation and revegetation meeting completion criteria this last phase of closure may be shortened. It is, however, unlikely to be less than five (5) years in duration (ANZMEC/MCA 2000).

#### **7.4.2 Rehabilitation Monitoring**

Regular monitoring of the rehabilitated areas will be required during the initial vegetation establishment period and beyond to demonstrate whether the objectives of the rehabilitation strategy are being achieved and whether a sustainable, stable landform has been provided. All rehabilitation monitoring will; be undertaken in accordance with the *Rehabilitation Management Plan*.

## **8 RELINQUISHMENT OF THE MINING LEASE**

Prior to the cancellation of a mining lease (i.e. following successful mine closure), DRE must be assured that the site has been rehabilitated and that it complies with the conditions of the mining lease. It is anticipated that this will include the preparation of reports on the rehabilitation/environmental performance of the site based on the interpretation of monitoring data and comparison to targets and completion criteria that are established for the site.

The title holder will be required to complete a rehabilitation and closure report that must document rehabilitation implementation and outcomes and demonstrate that the requirements have been met. Upon receipt of the report and comments from the relevant stakeholders, an officer of the Department will undertake an inspection of the mine. The inspection may also include some of the stakeholders.

Subject to accepting that the mine rehabilitation and closure works are satisfactory to the DRE, the lease will be cancelled and the outstanding security deposit bond returned. On some occasions a small proportion of the bond may be retained to cover any ongoing or foreseeable maintenance requirements.

The DRE released guidelines for Rehabilitation Security Deposit Requirements for Mining and Petroleum Titles (DPI-MR, 2006) which indicate that the Securities will be released when DRE is satisfied that the titleholder has demonstrated that rehabilitation and closure criteria have been met. DRE encourages progressive rehabilitation and titleholders may request a security review to reflect a decrease in rehabilitation liabilities.

## 9 PROPOSED TIMING FOR MINE CLOSURE

**Appendix 2** shows the indicative timeframe for mine closure including decommissioning and rehabilitation of the site. It is based on the current Life of Mine Plan which has mine closure planned for 2031. It is anticipated that the activities associated with closure of the mine will extend to at least 2035. The progressive rehabilitation of the site will assist in minimising the total mine closure liability after the mine has ceased to generate income from coal production. It is possible that some of the Domains could be progressively relinquished; however this will need to be done in consultation with the DRE.

Notwithstanding this, there are a number of activities that cannot commence until after the completion of mining. These include the following key activities:

- Reprocessing of stockpile base material;
- Dismantling and removal of the CHPP and associated infrastructure;
- Dismantling and removal of the administration and pit top facilities;
- Rehabilitation of haul roads and internal access roads;
- Final capping of the Brine Dams; and
- Sealing of the portal void and filling of the box cut.

The project Gantt Chart will be refined further during the pre-feasibility stage of mine closure planning.

## 10 REVIEW OF THE MINE CLOSURE PLAN

This *Mine Closure Plan* will be reviewed every 5 years for adequacy by independent experts, and will be reviewed and revised where necessary within 3 months of submission of an audit, incident report or annual review. The review should also aim to consider the mine plan to incorporate any major changes to the mining operation that may have occurred during the year (i.e. new pit area, increased disturbance footprint, etc). Consideration should also be given to changes in technology, state and federal legislation as well as industry mine closure policy and/or guidelines.

The General Manager is responsible for the development and implementation of the mine closure strategy for Narrabri Coal. They may delegate responsibility for various aspects of the project depending on the technical input required.

A Detailed Mine Closure Plan will be developed for the site at least 5 years prior to closure. This Plan will be developed in consultation with DRE and stakeholders.



## 11 REFERENCES

- ANZMEC and MCA, 2000. *Strategic Framework for Mine Closure*. Australian and New Zealand Minerals and Energy Council and the Minerals Council of Australia, Canberra.;
- DGS, 2011. *Mine Subsidence Effect Predictions and Impact Assessment for the Proposed Longwalls 1 to 5 at the Narrabri Coal Mine, Narrabri*. Consultancy Report to Narrabri Coal Operations Pty. Ltd. By Ditton Geotechnical Services Pty. Ltd.
- DECCW, 2008. *Managing Urban Stormwater, Soils and Construction: Volume 2E: Mines and Quarries*. Department of Environment and Climate Change, Sydney.
- Department of Environment and Conservation, 2004. *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes*. Department of Environment and Conservation, Sydney.
- Department of Industry Tourism and Resources, 2006. *Leading Practice Sustainable Development Program for the Mining Industry – Mine Closure and Completion*. Commonwealth of Australia, Canberra.
- Department of Land and Water Conservation, 1997. *NSW Groundwater Policy Framework Document*. Department of Land and Water Conservation, Sydney.
- Department of Land and Water Conservation, 1998. *NSW Groundwater Quality Protection Policy*. Department of Land and Water Conservation, Sydney.
- Department of Land and Water Conservation, 2000a. *NSW Salinity Strategy - Taking on the Challenge*, Department of Land and Water Conservation, Sydney.
- Department of Land and Water Conservation, 2000b. *NSW Water Conservation Strategy*. Department of Land and Water Conservation, Sydney.
- Department of Land and Water Conservation, 2001. *NSW Groundwater Quantity Management Policy*. Department of Land and Water Conservation, Sydney.
- Department of Land and Water Conservation, 2002. *State Groundwater Dependant Ecosystem Policy*, Department of Land and Water Conservation, Sydney.
- Department of Mineral Resources, 1997a. *Borehole Sealing Requirements on Land: Coal Exploration, EDG01, Environmental Management Guidelines for Industry*.
- Department of Mineral Resources, 1997b. *Borehole Sealing Requirements on the Beds of Water Bodies: Coal Exploration, EDG02, Environmental Management Guidelines for Industry*.
- Department of Primary Industries – Mineral Resources, 2005. *Policy EDP11 Rehabilitation Security Deposits*, Department of Primary Industries – Mineral Resources, Sydney.
- DPI-MR, 2002. *Policy EDP 07: – Criteria for Cancellation or Non-Renewal of Mining Leases*. NSW Department of Mineral Resources - <http://www.dpi.nsw.gov.au/minerals/environment/pgf/policies-coal/edp07-Criteria-for-Cancellation-or-Non-Renewal-of-Mining-Leases.pdf>).
- DPI-MR, 2006. *Rehabilitation Security Deposit Requirements for Mining and Petroleum Titles*. Department of Primary Industries – Mineral Resources, Maitland.
- DPI-MR, 2007. *ESB26 Rehabilitation Cost Calculation Tool V1.7*. Department of Primary Industries – Mineral Resources - <http://www.dpi.nsw.gov.au/minerals/environment/mining/rehabilitation>
- DRE, September 2013 *Policy EDG 03: – Guidelines for Mining Operations Plans*.
- DTIRIS-RE *Policy EDP 05: – Rehabilitation and Mine Closure* (note: This policy has been withdrawn and is currently under review) [www.dpi.nsw.gov.au/minerals](http://www.dpi.nsw.gov.au/minerals).
- DTIRIS-RE *Policy EDG 14: – Reporting Requirements for Mine Closure and Lease relinquishment* (note: this policy is currently under review) [www.dpi.nsw.gov.au/minerals](http://www.dpi.nsw.gov.au/minerals).

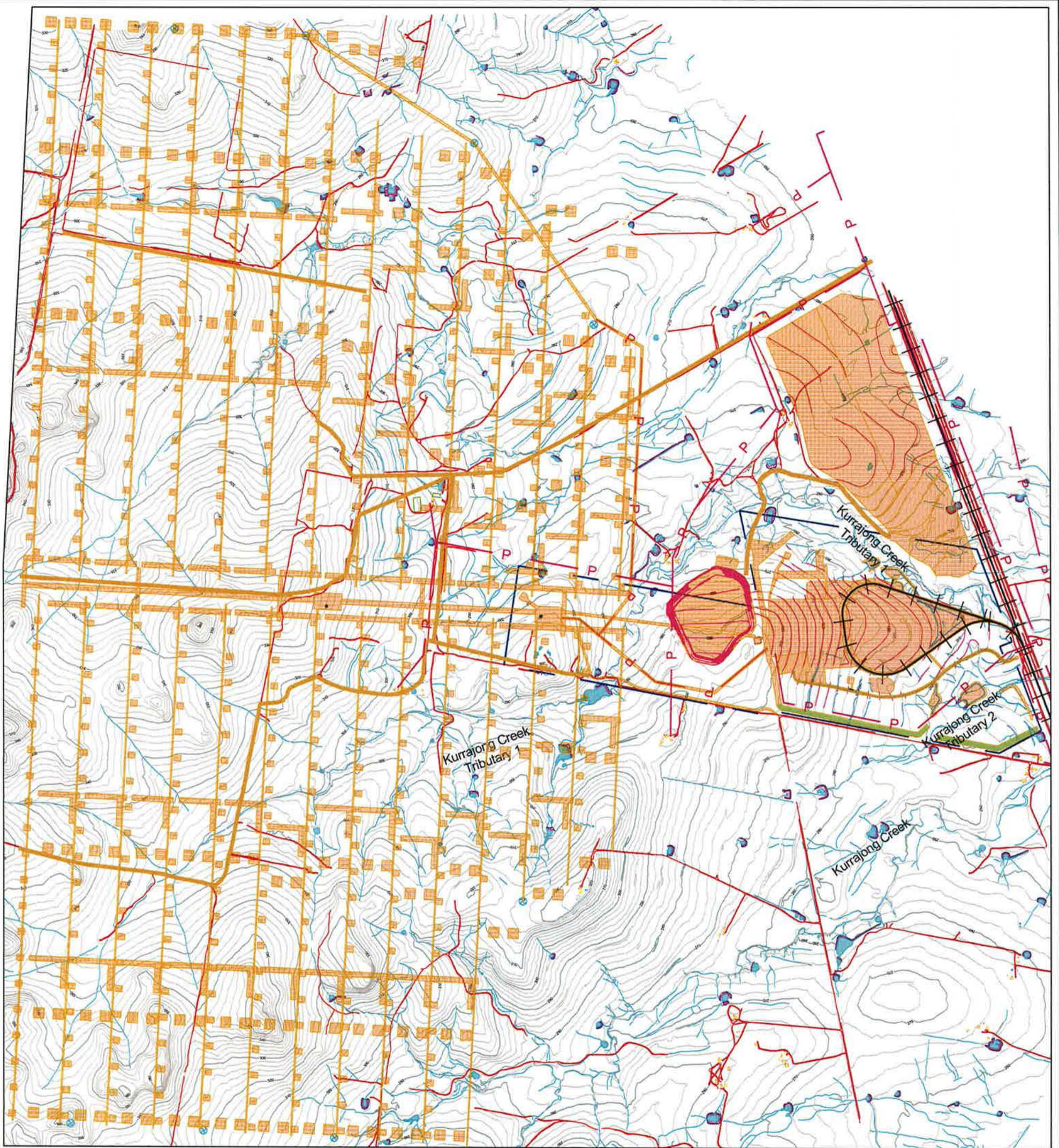
- DTIRIS-RE *Policy MDG6001: – Draft Guidelines for the Permanent Filling and Capping of Surface Entries to Coal Seams* [www.dpi.nsw.gov.au/minerals](http://www.dpi.nsw.gov.au/minerals).
- EPA 1997, *Environmental Guidelines: Assessment Classification and Management of Non-liquid Wastes*, NSW Environment Protection Authority, Sydney.
- EPA 1998. *Draft Environmental Guidelines for Assessment, Classification and Management of Liquid Wastes*. NSW Environment Protection Authority, Sydney.
- Environmental Protection Licence (EPL) No. 12789 issued under the Protection of the Environment Operations Act, 1997, granted by the Department of Conservation and Climate Change on 20 February 2008 for the mining of coal.
- Federal Department of Industry Tourism and Resources, 2006. *Leading Practice Sustainable Development Program for the Mining Industry – Mine Closure and Completion*, Commonwealth of Australia, Canberra.
- G.J Summerhayes, 1999. *The Rehabilitation of Coal mines and opportunities for Integrated Post Mining Land Uses, Part 2*, Invited Papers included in the Synoptic Plan for Integrated Landscapes, prepared by Andrew Neil for the NSW Department of Minerals Resources.
- Geoff Cunningham Natural Resources Consultants Pty Ltd, 2009. *Narrabri Coal Mine Stage 2 Longwall Project, Soils and Land Capability Assessment of the Mining Area*. Consultancy report prepared for Narrabri Coal Mine.
- GSS Environmental, 2009. *Narrabri Coal Mine - Mine Closure Plan*. Consultancy report prepared for Narrabri Coal Mine.
- ICMM, 2006. *Financial Assurance for Mine Closure and Reclamation*. International Council on Mining and Metals. London.
- Industry and Investment NSW, 2010. *ESG1 Rehabilitation Cost Estimate Guidelines*, Department of Industry and Investment, Sydney.
- McGlynn, J. 2006. *Guidelines to the Mining, Rehabilitation, and Environmental Management Process (EDG03 MREMP Guide V3)*. Department of Primary Industries – Mineral Resources. ([http://www.dpi.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0007/96118/edg03-Guidelines-to-the-Mining,-Rehabilitation-and-Environmental-Management-Process---MREMP-Guideline.pdf](http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/96118/edg03-Guidelines-to-the-Mining,-Rehabilitation-and-Environmental-Management-Process---MREMP-Guideline.pdf)).
- Minerals Council of Australia, 2000. *Australian Minerals Industry Code for Environmental Management*. Minerals Council of Australia, Canberra.
- Minerals Council of Australia, 2005. *Enduring Value – The Australia Minerals Industry Framework for Sustainable Development*. Minerals Council of Australia, Canberra.
- Mining Lease No. 1609 issued under the Mining Act, 1992, granted by the Minister for Mineral Resources on 18 January 2008 for the mining of coal.
- Narrabri Coal Pty Limited, 2007. *Part 3A – Environmental Assessment*.
- Narrabri Coal Pty Limited, 2007. *Environmental Management Strategy for the Narrabri Coal Mine*.
- Narrabri Coal Pty Limited, 2007. *Mining Operations Plan for the Construction and Continuous Miner Development of Stage 1 of the Narrabri Coal Mine*.
- Narrabri Coal Operations Pty Limited, 2011. *Mining Operations Plan for the Stage 2 Longwall Project of the Narrabri Coal Mine*.
- Narrabri Shire Council, 1992. *Narrabri Local Environment Plan*.
- Namoi Catchment Management Authority 2007. *Catchment Action Plan – Namoi Catchment Action Plan*, Namoi Catchment Management Authority, Gunnedah, NSW.
- NSW Government, 1997. *Weirs Policy* NSW Government, Sydney

- NSW Government, 1999. *Farm Dams Policy*, NSW Government, Sydney
- R.W. Corkery and Co. Pty. Limited, 2009. *Environmental Assessment for the Narrabri Coal Mine Stage 2 Longwall Project*. Consultancy report prepared for Narrabri Coal Mine.

# **APPENDIX 1**

# **PROPOSED FINAL LANDFORM**



- REFERENCE
- Pit Top Area
  - Power Line
  - Site Road Access
  - Site Rail Access
  - Existing Contour (m AHD)(Interval = 2m)
  - Creek/ Drainage Line
  - Dam/ Water Storage
  - Perimeter Amenity Bund Retained
  - Reconstructed Landform Contour (m AHD)(Interval = 2m)
  - Former Area of Disturbance

Date of Application:	23/08/2012
Compiled by:	7/03/2012
Checked by:	7/03/2012
Certified by: (Mine Surveyor)	23/08/2012

Plan 6  
**CONCEPTUAL FINAL  
 REHABILITATION FOR  
 LEASE RELINQUISHMENT**

## **APPENDIX 2**

# **INDICATIVE TIMEFRAME FOR MINE CLOSURE, DECOMMISSIONING AND REHABILITATION**

