

## PLANNING FOR MINE CLOSURES

Hank Pinkster<sup>1</sup>

*ABSTRACT:* Mine closure is not typically something associated with planning to develop a new mining operation, but it is at this stage as well as aayall other facets of it's life cycle that it must be considered.

BHPB Illawarra Coal operates 4 underground Coal Mines on the South Coast of NSW. In addition to these operational mines Illawarra Coal has responsibility for a number of disused mine entries that have to be rehabilitated. Some of the infrastructure associated with these operations dates back over 150 years and this in itself raises unique issues when it comes to rehabilitation.

Under the Mining Act 1992, environmental protection and rehabilitation are regulated by conditions included in all mining leases to ensure that all mining operations are safe, the resources are efficiently extracted, the environment is protected and rehabilitation achieves a stable, satisfactory outcome. The state and status of the numerous Illawarra Coal owned mine entries varies widely but approval from the Department of Mineral Resources (DMR) is required in all cases prior to their rehabilitation and subsequent removal from our asset base.

The future land use is a key driver in many cases as to what should occur with the respective sites and as to the relative timing for the rehabilitation to commence.

### INTRODUCTION

BHPBilliton (BHPB) Illawarra Coal operates several collieries that due to the age of the operations, did not contemplate in detail rehabilitation until the operations were well advanced or in some cases close to closure. In planning for rehabilitation a protocol has been developed to achieve the desired rehabilitation outcomes for all the relevant stakeholders. This paper overviews the processes, interactions and timings to be considered when planning for mine closure. By way of example two current rehabilitation projects are used to demonstrate the issues, procedures and interactions necessary in order to develop and implement an acceptable rehabilitation plan.

Mine closure is a continuous series of activities that begins with pre planning prior to the project's design and construction and ends with the achievement of long term site stability and the establishment of a self sustaining ecosystem (WMI, 1994). Given this, an important objective would be that all organisations be encouraged to develop comprehensive mine closure plans that return the mine sites to where practicable viable, self sustaining eco systems and that these plans are thoroughly and appropriately communicated, financed, resourced, implemented and monitored.

Legislation for mine rehabilitation is under the guidance of the Department of Mineral Resources. Under the Mining Act 1992, environmental protection and rehabilitation are regulated by conditions included in all mining leases, including requirements for the submission of a Mining Operations Plan (MOP) prior to the commencement of operations, and subsequent Annual Environmental Management Reports (AEMR).

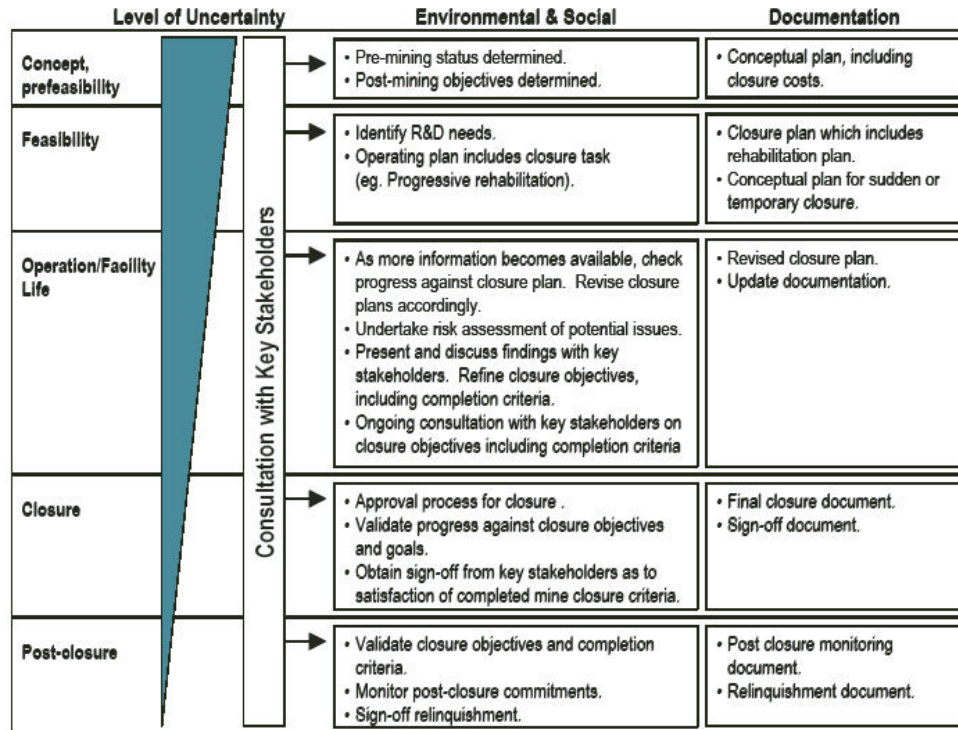
Collectively, the MOP and AEMR constitute the Mining, Rehabilitation and Environmental Management Process (MREMP), which has been developed by the Department of Mineral Resources. The MREMP aims to facilitate the development of mining in New South Wales and to ensure that all mining operations are safe, the resources are efficiently extracted, the environment is protected and rehabilitation achieves a stable, satisfactory outcome. Documentation on the subject of mine rehabilitation can be found from Government, industry and private sector groups. (ANZ Min Council 2000, DMR 2002, BHP Billiton 2002).

---

<sup>1</sup> Manager Mine Support Services, BHPBilliton Illawarra Coal

The closure planning process is summarised diagrammatically in Figure 1. This diagram clearly identifies that the planning for mine closure starts with the concept or pre feasibility stage of a project, where the level of uncertainty is high. Closure planning spans the life cycle of the project and as such the level of uncertainty continually reduces as the closure becomes more of a reality.

The following diagram describes an overview of closure planning:



**Fig 1 - Diagrammatic representation of the Closure Planning Process**

Courtesy BHPBilliton HSEC Guideline No G08, rev11

## REHABILITATION PLANNING METHODOLOGY

It is important to develop a plan for rehabilitation. An example of a staged rehabilitation process as used by BHPB Illawarra Coal is given diagrammatically in Figure 2. The following is a “blueprint” for the compilation of a Rehabilitation plan that has been developed during the experiences to date between BHPB and its consultants. It covers the considerations, documentation, interactions and detail required when formulating a rehabilitation plan from the conceptual stage through to the final relinquishment of the mining lease.

### MOP/AEMR/MREMP

Issues to be considered are:

- Care and Maintenance Plan;
- BHPB developed options for future usage and initial Risk assessment; and
- Mine Rehabilitation and Closure Plan and the Mining, Rehabilitation and Environmental Management Process as per DMR Guidelines

### Initial Stakeholders Presentation (ISP)

Firstly internal stakeholders need to develop the initial project concept with representatives from site, Environmental Dept, survey and media department. Subsequently the following stakeholders need to be involved.

### *Government Agencies*

Government agency meetings including site inspections so that identification of relevant studies to assist the rehabilitation process can be determined. Agencies could involve NPWS; DMR; Local Council; EPA; DIPNR; RTA; SCA; Department of Fisheries etc.

### *Community*

Consultative committees can be formed where relevant. Alternatively media releases can be used to inform and seek community input.

### *Unions*

Involvement and communication with site unions.

## **Initial Rehabilitation Plan (IRP)**

### *Undertake Relevant Studies*

These can incorporate for example the following:

- Site Survey;
- Site Soil Contamination Assessment;
- Geotechnical;
- Aboriginal Heritage;
- European Heritage;
- Flora & Fauna;
- Acoustic;
- Traffic investigation; and
- Drainage.

### *Prepare Initial Rehabilitation Plans (individual plans for each site)*

Typical format and content for a rehabilitation plan could include:

#### Section 1

Introduction;  
Background;  
Purpose of report;  
Consultation undertaken;  
Land Zoning; and  
Existing Approvals.

#### Section 2

Proposed Works

#### Section 3

Existing Environment, Impacts and Safeguards focusing on items such as:

- Land Use;
- Topography, Geology and Soils;
- Flora and Fauna;
- Drainage and water quality;
- Ecology;
- Visual;
- Infrastructure;
- Cultural and heritage;
- Traffic;
- Air Quality;
- Noise; and
- Waste and hazardous materials.

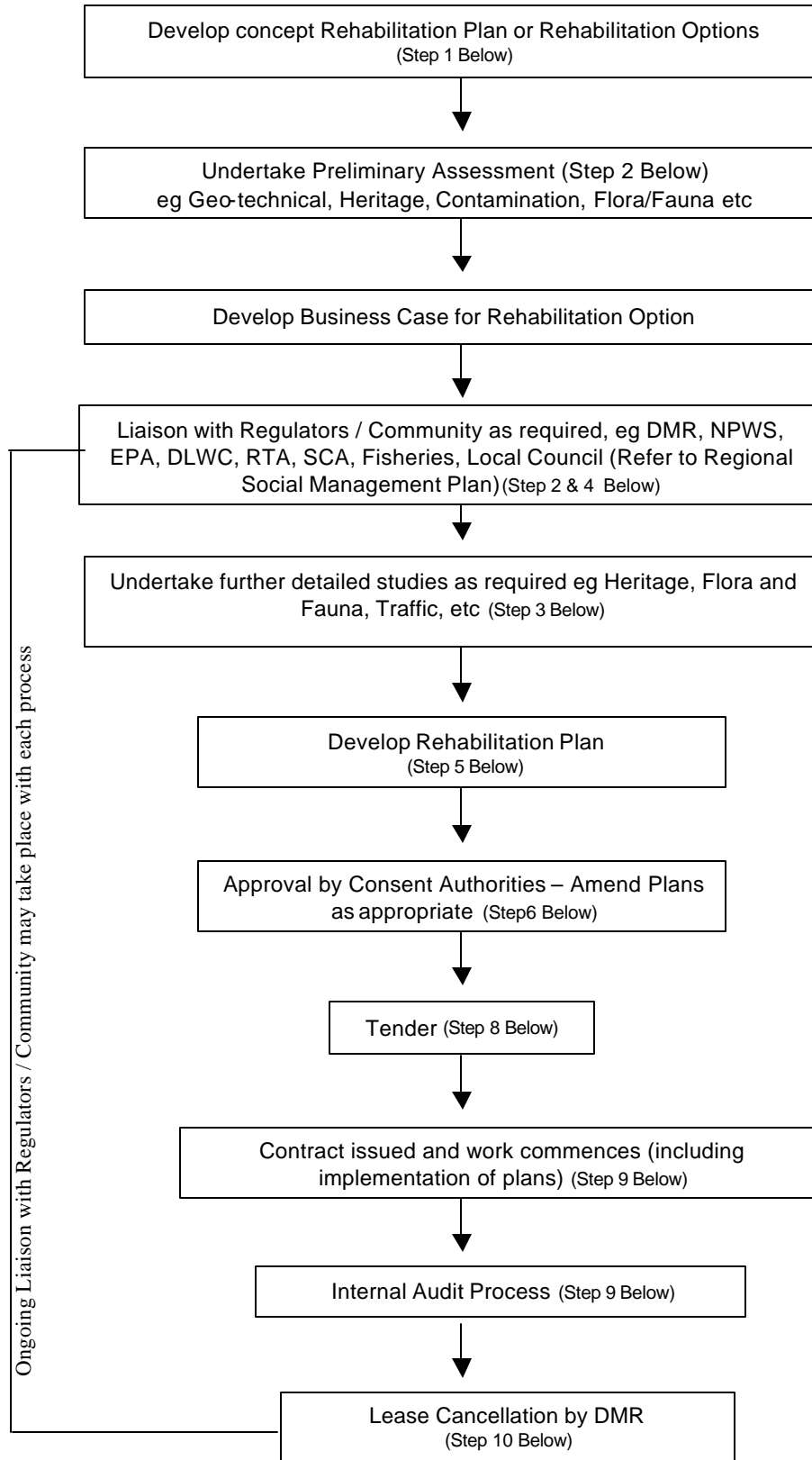


Fig 2 - Illawarra Coal Rehabilitation Process Flow Chart

#### Section 4

A summary of the following areas:

- Environmental Management;
- Management structure;
- Community liaison;
- Revegetation maintenance; and
- Risk Management.

#### **Ongoing monitoring**

#### **Stakeholder Review Of IRP**

This stakeholder review of the initial or draft rehabilitation plan can be achieved by the following mechanisms:

- Inter government agency presentations;
- Community presentations;
- Stakeholder responses addressed by BHPB; and
- Additional or expanded studies as or if required.

#### **Revised Initial Rehabilitation Plan (RRP)**

Following the stakeholder review of the initial rehabilitation plan it may be necessary to revise the plan based upon an assessment of stakeholder responses.

#### **RRP Approval**

Once the review of feedback is undertaken and modifications, if required are complete the plan can now be submitted for approval to Dept Mineral Resources.

#### **Prepare Detailed Construction Plan (DCP)**

With formal approval received and a review of the conditions of consent undertaken it is then necessary to:

- Incorporate conditions of consent into documentation,
- Prepare works procedures;
- Prepare construction drawings;
- Prepare contract documentation;
- Prepare Management Plans;
- Seek stakeholder input of DCP and subsequently address any responses; and
- Amend DCP where appropriate.

#### **Tender**

- Seek expression of interest from contractors for construction works
- Prepare list of selected tenderers
- Obtain competitive tender prices
- Assess tenders
- Let contract

#### **Construction**

- Undertake Risk Reviews
- Establish Work Procedures
- Carry out construction works
- Prepare works as executed documentation
- Certification of works by Engineers
- Sign off of works by DMR

#### **Relinquishment Of Mining Lease**

- Rehabilitation monitoring complete
- Sign off by DMR.

#### **Transfer Of Land Ownership (As /If Required)**

---

## EXAMPLES OF PLANNING FOR MINE CLOSURE

Illawarra Coals assets include operations that date back over a hundred and fifty years as well as newer operations that are only about thirty years old. A brief summary of the issues associated with these two differing cases are set out below.

### EXAMPLE 1 – KEMIRA COLLIERY

#### History of Operations

The Kemira Colliery was initially called the Albert Mine and mining commenced in 1848 when two tunnels were driven into the Balgownie and Wongawilli seams. In 1856, the Albert tunnels were abandoned, and a new tunnel was opened into the Bulli Seam (later called No. 1 Seam) a short distance higher on the slopes of Mt Keira. In 1861, a tramway was constructed which connected Mt Keira Mine to Wollongong Harbour. In 1883, No. 1 Shaft was sunk to the No 2 Seam to improve ventilation.

In 1937, Australian Iron and Steel purchased the Colliery to satisfy the increased demand for coal generated by the rapid expansion of the Port Kembla Steelworks. In 1955 the name changed to “Kemira”, derived from combining *Kem*-bla and *Ke-ira*. In 1956 the sinking of No 1 Calyx Shaft begun and in 1957 the sinking of No2 Calyx Shaft begun.

In 1969 the mine reached its peak manning level at 497 men. The Peak Yearly production was achieved in the year ending November 1979 with 770,684 tonnes of coal mined.

In 1982, the market conditions in the steel industry resulted in two-thirds of the workforce being retrenched and in 1991 mining ceased. At the time of closure the Colliery was Australia's longest operating underground coalmine. By the end of 1995 sealing had been completed at the mine's two tunnels and four shafts. Australian Iron and Steel became a wholly owned subsidiary of the BHP Group which later formed to BHP Billiton, the current owner of the property.

#### Site description

Figure 3 shows the layout of the site. The colliery pit top and platform are the primary focus of the rehabilitation works.

The mine platform consists of a long narrow bench with several buildings constructed on the platform, which serviced the mine during its operation. The now disused mine portal exits from the side of the hill approximately mid way along the platform.

#### Kemira Rehabilitation Strategy Objectives

The major objectives of this rehabilitation plan are as follows:

- Redirect and modify the drainage on the site so as to stabilise the site and control the flow to minimise scour;
- Recontour slopes to gradients that significantly improve long term stability;
- Continue the natural flow regime of the water courses which cross the site;
- Preserve the industrial and cultural heritage items of significance on the site;
- Minimise visual impact of the rehabilitation by revegetating the area disturbed by mining and recontouring activities;
- Restore and enhance the ecological integrity of the site as habitat for native vegetation and fauna;
- Complete the rehabilitation to the satisfaction of the Department of Mineral Resources so that BHP Billiton can relinquish the Coal Lease on the site;
- Achieve a sustainable outcome to make possible transfer of ownership of the site;
- Remediate the site to a standard appropriate for the recreational open space; and
- Ensure the site is clear of contaminants of concern that may pose an unacceptable risk of harm to human health and/or the environment.



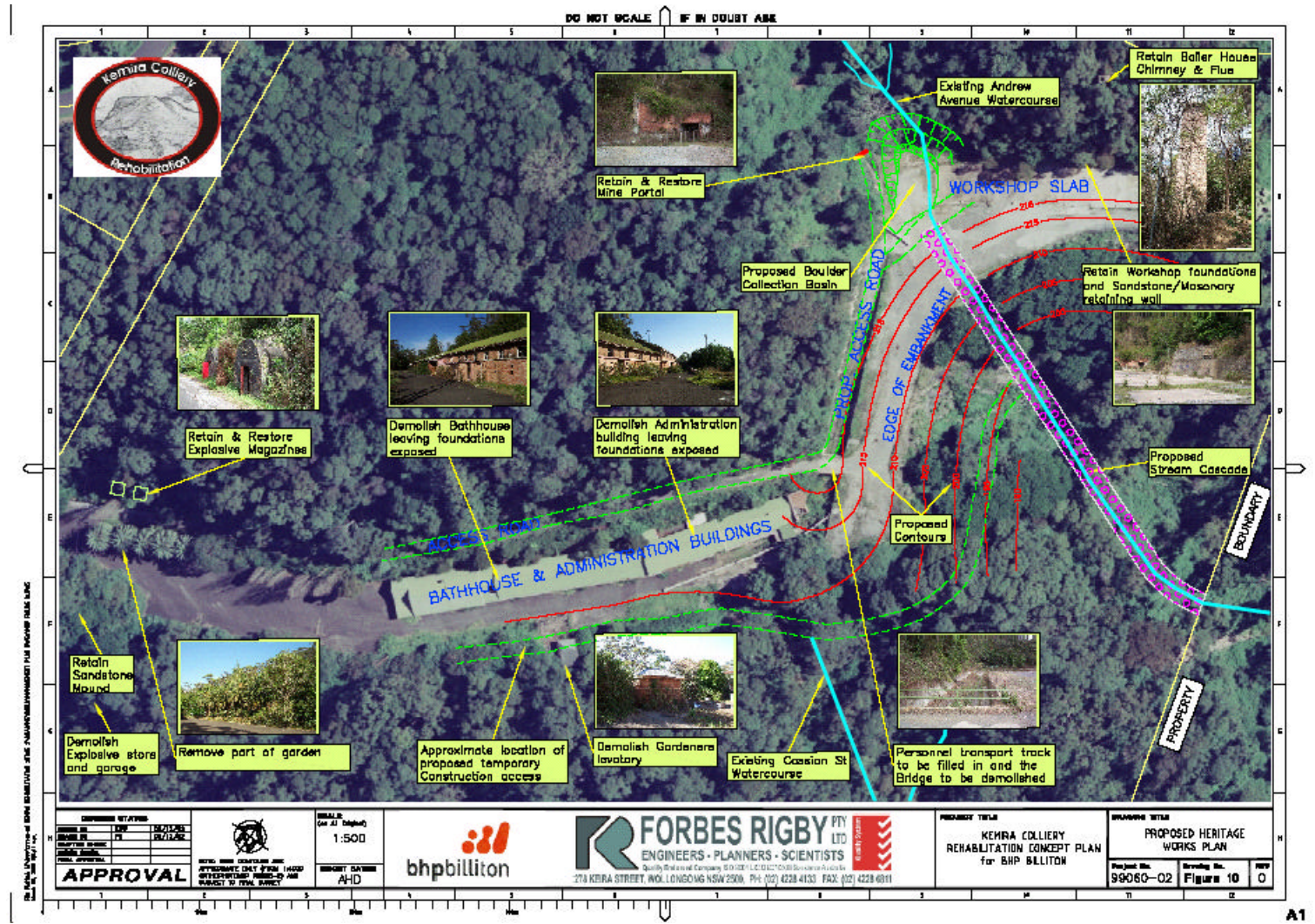


Fig 3 - Kemira Site Location and Summary of Rehabilitation Scope

qq.

Strategies employed to achieve these objectives will include, but not be limited to the following:

- Minimise potential of cross catchment flows between Andrew Ave and Cassian Street catchments;
- Stabilise the embankment area (northern area) by reducing the slope, removal of fill, establishing appropriate subsurface drainage and vegetation;
- Construct a stream cascade down the embankment to prevent scour;
- Revegetate all disturbed areas and implement a maintenance programme to ensure the longevity of established vegetation;
- Minimise impacts to downstream vegetation by managing on site and reducing sediment and pollutant loads leaving the site;
- Involve relevant stakeholders including government departments and members of the community in contributing to the plans for the site; and
- Implement a long-term maintenance strategy;

### **Project Works Overview**

The major tasks involved in the proposed rehabilitation programme are summarised below:

1. Site establishment including establishment of erosion and sediment control structures;
2. Demolition of existing buildings and structures and removal of debris;
3. Clear and mulch existing vegetation in a staged manner;
4. Excavate material from top of embankment and basin (starting from top and working down). This to occur in a staged manner with fill material sorted as required and taken to an off site location;
5. Construct gabion lined stream cascade;
6. Final landform profiling, and construction of permanent drainage works (eg contour drains);
7. Site re-vegetation and regeneration. This to be commenced as soon as possible once final land profiling to each area is completed;
8. Restore heritage structures remaining on site as appropriate; and
9. Remove temporary erosion and sediment controls once revegetation established.

It is estimated that the construction works will take approximately 30 weeks to complete.

The gabion stream can be seen in the left hand side of the picture in Figure 4 whilst the centre of the picture shows the finished land profile after placement of topsoil and geo fabric matting for stability. Subsequent steps will be the spraying of a seed mix and planting of selected tube stock.





**Fig 4 - Photo showing works in progress.**

The Risk Assessment identified 38 risks that needed specific management actions. The most significant risks that need to be managed during the construction works are associated with:

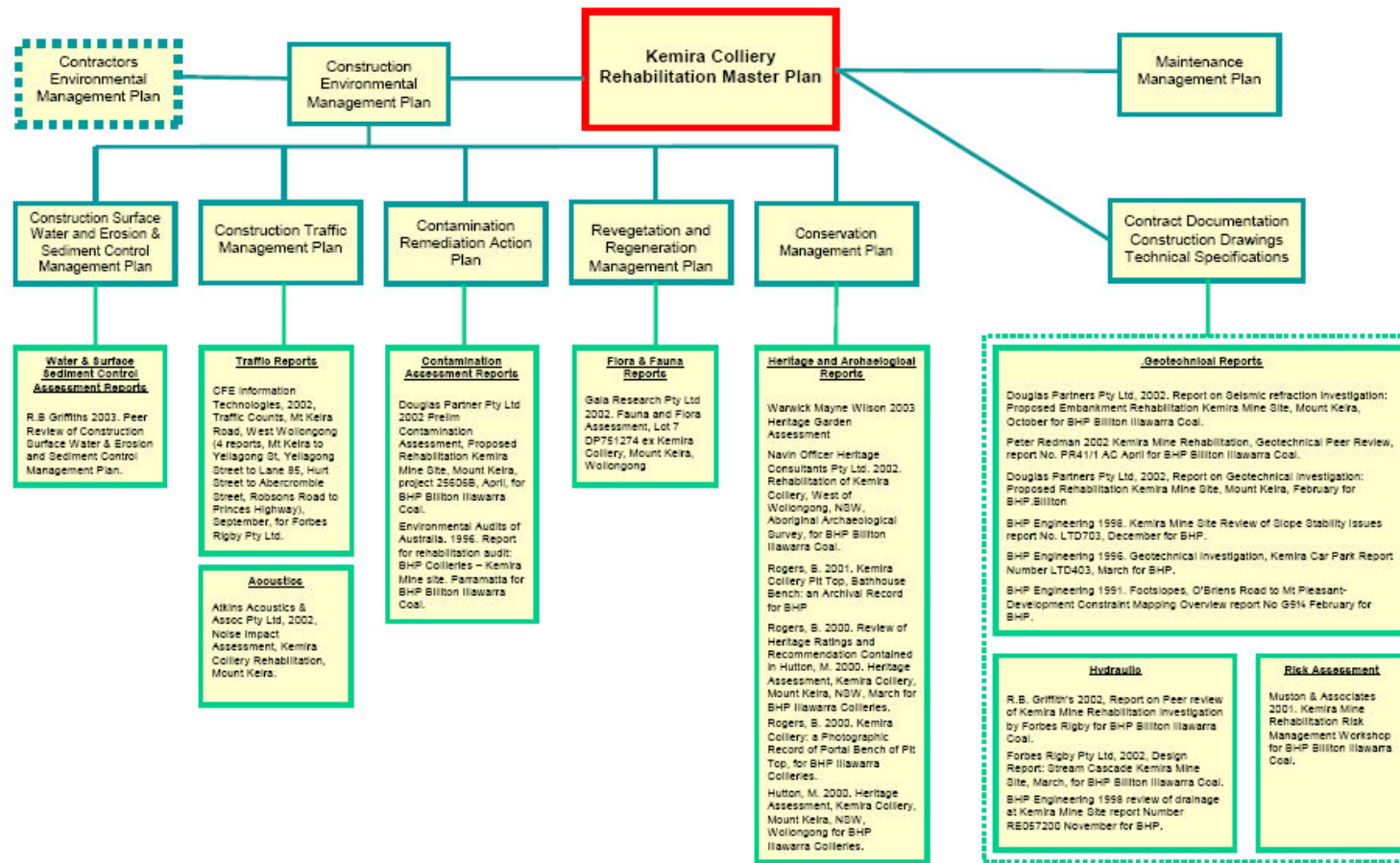
- The safety of road users while removing fill from the site;
- The safety of construction personnel on site during the works; and
- The effect of storm run off from the site on downstream property owners and residents.

The risk assessment identified the need for a variety of Management Plans to address controls over the identified impacts. The Construction Management Plans that have been developed include:

1. Surface Water and Erosion & Sediment Control;
2. Construction Traffic;
3. Remediation Action Plan;
4. Revegetation and Regeneration;
5. Conservation; and
6. Environmental Management Plan.

In addition a Maintenance Management Plan has been completed. A diagram illustrating the inter-relationship of documents is given in Figure 5.

**KEMIRA COLLIERY REHABILITATION DOCUMENT SUMMARY**



**Fig 5 - Interrelationship of Documents for Kemira Rehabilitation**

### Stakeholder Consultation

Stakeholder consultation has been primarily undertaken via the following mechanisms:

#### *Keiraville community meetings*

Community involvement with the Rehabilitation of Kemira Colliery began in 1998 with Illawarra Collieries involvement in the "Cassian Street/Keiraville Community" meetings held regularly in the Cassian Street cul-de-sac, Keiraville. These meetings are organised and chaired by Wollongong City Council. These meetings have been well attended by local community members and provide a forum for the exchange of information including plans for the Kemira site and concerns of the community.

#### *Government agencies*

In order to gain exposure to the project from a range of expertise, BHP Billiton has sought advice from a variety of agencies prior to submitting the Rehabilitation Plan to DMR for approval.

In January 2002, BHP Billiton facilitated a workshop seeking involvement in the Rehabilitation Plan from a range of government agencies. The agencies involved were:

- Department of Mineral Resources;
- Department of Land and Water Conservation;
- Environment Protection Authority;
- National Parks and Wildlife Service;
- Roads and Traffic Authority; and
- Wollongong City Council.

Subsequent workshops were held in May 2002, September 2002 and November 2002 to which all the above agencies were invited.

In addition to the above, many meetings have been held with appropriate agencies regarding the detail of individual Management Plans. Several amendments have been made to the plans in accordance with agency's comments.

#### *Broader Community Consultation*

Community consultation has been undertaken to inform people about and seek their input on the rehabilitation project at the Kemira Colliery. Consultation has sought to identify community preferences and identify matters of concern relating to the options regarding rehabilitation of the site. Throughout the various phases of the project, a variety of community consultation methods were used.

#### *Kemira Community Consultative Committee*

During the community consultation in June 2002, a number of people suggested a Community Consultative Committee be formed to assist in identifying and addressing concerns about the project. As a result a Committee was established in September 2002 and meetings are held approximately monthly.

Some of the specific objectives of the committee are to:

- Help identify, pre-empt and resolve issues of concern to minimise the impact of potential problems involved with the Rehabilitation Works;
- Assist members understand the project, including potential benefits and concerns;
- Consider ways of appropriately communicating information about the project to the wider community, and assisting with flow of information;
- Provide member of the community with relevant information regarding the Rehabilitation Works; and
- Assist in ensuring a transparent consultation process.

The group has representation from the following groups:

- NSW Member for Keira; Wollongong City Councillors; Neighbourhood Committee Number 5; Mt Keira residents; Keiraville residents; Illawarra Escarpment Coalition; Mt Keira Demonstration School P & C; and representatives from BHP Billiton.

- An independent facilitator chairs the Committee. The committee has been an effective forum to exchange information and concerns regarding the project. The Committee has been involved in the formation and detail of the Management Plans. External agencies have also been involved in committee meetings as required.

This group will continue to meet regularly throughout the construction works. If required, the group may continue to meet post-construction.

## EXAMPLE 2 - CORDEAUX COLLIERY

### Site location and description

Cordeaux Colliery consists of facilities at various locations. The sites include:

1. Cordeaux Pit Top site (including Cordeaux No 1 and No 2 Shafts);
2. Corrimal No 2 Shaft site;
3. Cataract Weir Pump Facility;
4. Corrimal No 3 Shaft Site;
5. Corrimal No 3 Shaft Coal Bins;
6. Cordeaux Re-injection Borehole Field; and
7. Wilton Spray Irrigation Area.

The pit top is located adjacent to Picton Road, approximately 20 km north west of Wollongong. All sites (with the exception of the Wilton Spray Irrigation Area) are within the Sydney Catchment Area, which forms part of the water supply system for Sydney and the Illawarra.

### History of Operations

Construction of the mine commenced in 1976 with the first coal being produced from the underground workings in 1980. In 1985, Cordeaux holed into Corrimal Colliery workings to officially merge the two collieries in January 1986. The Collieries Division of BHP Coal (*now BHP Billiton Illawarra Coal*) operated the mine continuously over the ensuing 21-year period until closure.

The economically minable Bulli Seam coal in the Cordeaux Colliery reserve area was depleted by the year 2001. The colliery ceased coal production on the 23 March 2001 and placed on care and maintenance on 14 April 2001.

The colliery was originally planned to be a two-seam operation at some time during its life. The Bulli Seam was the first to be worked with the Wongawilli Seam to be eventually mined and used as a blending component for coke making at the Port Kembla Steelworks. This plan was approved in 1995 and two sets of access drifts from the Bulli seam workings to the lower seam completed. The plan was subsequently put on hold due to market conditions and high mining costs.

Mining was undertaken using the longwall method, with up to two continuous miners preparing development roadways. The mine produced a high quality Bulli Seam product with an initial raw coal output of 31,300t in 1979 and a peak output of 2.97 Mt in 1994. The majority of coal produced at the mine (80%) went to BHP Port Kembla Steelworks and the remainder exported overseas. All coal from the mine was washed at the Steelworks.

The pit top covers approximately 8 ha of land on the Picton Road site and includes the majority of infrastructure required to support the mining operation. Men and materials entered the mine through a downcast shaft. Raw coal from the mining units was moved by conveyor through the workings and delivered to two 600t underground bins. Coal was then transferred from the bins to a bulk winder and brought to the surface via an up-cast shaft. On the surface, the bulk winder delivered the coal to a fully enclosed elevating conveyor that, discharged to two 1200t storage bins. Coal was bottom-loaded from the bins into trucks and transported on public roads to O'Brien's Drift.

The coal haulage route from Cordeaux to Port Kembla was along Mount Keira Road and Harry Graham Drive to O'Brien's Drift. The coal was conveyed through the drift to Kemira Valley Train Loading Facility then transported to the Steelworks along the BHP rail system to Port Kembla.

In addition to the two service shafts on the pit top, Cordeaux workings incorporate two remote ventilation shafts. Corrimal No 2 Shaft is used as a regulated intake while Corrimal No 3 upcast shaft provides additional ventilation for the workings via a mine fan mounted on the shaft. The locations of these shafts are shown on Figure 6.

#### **Proposed and Future Operations.**

The medium-term objective for Cordeaux Colliery is for the mine to remain on care and maintenance until longer-term options can be fully developed and implemented.

Under the care and maintenance program the pit top site shall remain virtually unchanged with all major buildings (excepting the Technical and External Services administration offices) and structures being retained. All non-fixed equipment and mine supplies on the pit top that are not considered necessary for the longer-term operations of the site will be progressively removed. The maintenance and upkeep of this infrastructure will continue until a decision on the ultimate future of the mine is made. During this period, the site will remain manned. Other than ongoing maintenance work the site will continue to be occupied by BHPBIC Technical & External Services personnel who are currently accommodated within Cordeaux mine's administration complex.

Recovery of underground mining equipment has ceased and ventilation seals at pit bottom have been completed and both Cordeaux ventilation shafts have been capped at the surface collar level. The steel capping structure is of a design that will prevent unauthorized entry and capable of being dismantled if a requirement to re-commission the shaft occurs. The mine ventilation fans have been turned off.

The longer-term objective for Cordeaux Colliery currently under consideration is to incorporate the workings into the future development of the new Dendrobium Mine. Preservation of the remaining Cordeaux coal reserve will ensure that a potential source of Wongawilli Seam (No 3 seam) coal is available to meet a 30-year supply contract to the Port Kembla Steelworks. The option would entail developing the remaining Cordeaux coal reserve for extraction through the Dendrobium workings.

The future development option for mining operations would require the re-commissioning of a significant portion of the existing pit top infrastructure and services to augment the support facilities operating for Dendrobium. The surface facilities that are likely to be incorporated in the development option include the up-cast ventilation shaft and fan, the man and materials winder and shaft and power, water and compressed air services. The bathhouse, workshop, bulk storage, yard storage and handling area, car park and sundry buildings may also be required for limited use.

#### **Department of Mineral Resources Requirements**

Rehabilitation of the Cordeaux Mine site is covered by the Mining Act 1992 and by lease conditions attached to the mine by the Department of Mineral Resources (DMR). The DMR encourages progressive rehabilitation of mine sites, and has a series of criteria to be met for rehabilitation works. Lease conditions require the preparation of an MOP, which incorporates a rehabilitation plan where appropriate.

The clauses in Consolidated Lease 768 pertaining to rehabilitation works include:

##### Consolidated Coal Lease No 768 Coal Mining Act, 1973 Part B Clause 70

*"Upon completion of mining operations and before vacating the area, the registered holder shall restore the surface working areas other than the sealed access roads and shall establish vegetation to the satisfaction of Sydney Catchment Authority when so directed."*

##### Consolidated Coal Lease No 768 Coal Mining Act, 1973 Part B Clause 82

*"At the conclusion of operation and before the lease is terminated, the registered holder will be required to remove such installations and works as may be determined by Sydney Catchment Authority and to restore the whole area with vegetation of a type specified by Sydney Catchment Authority to the satisfaction of the Minister."*



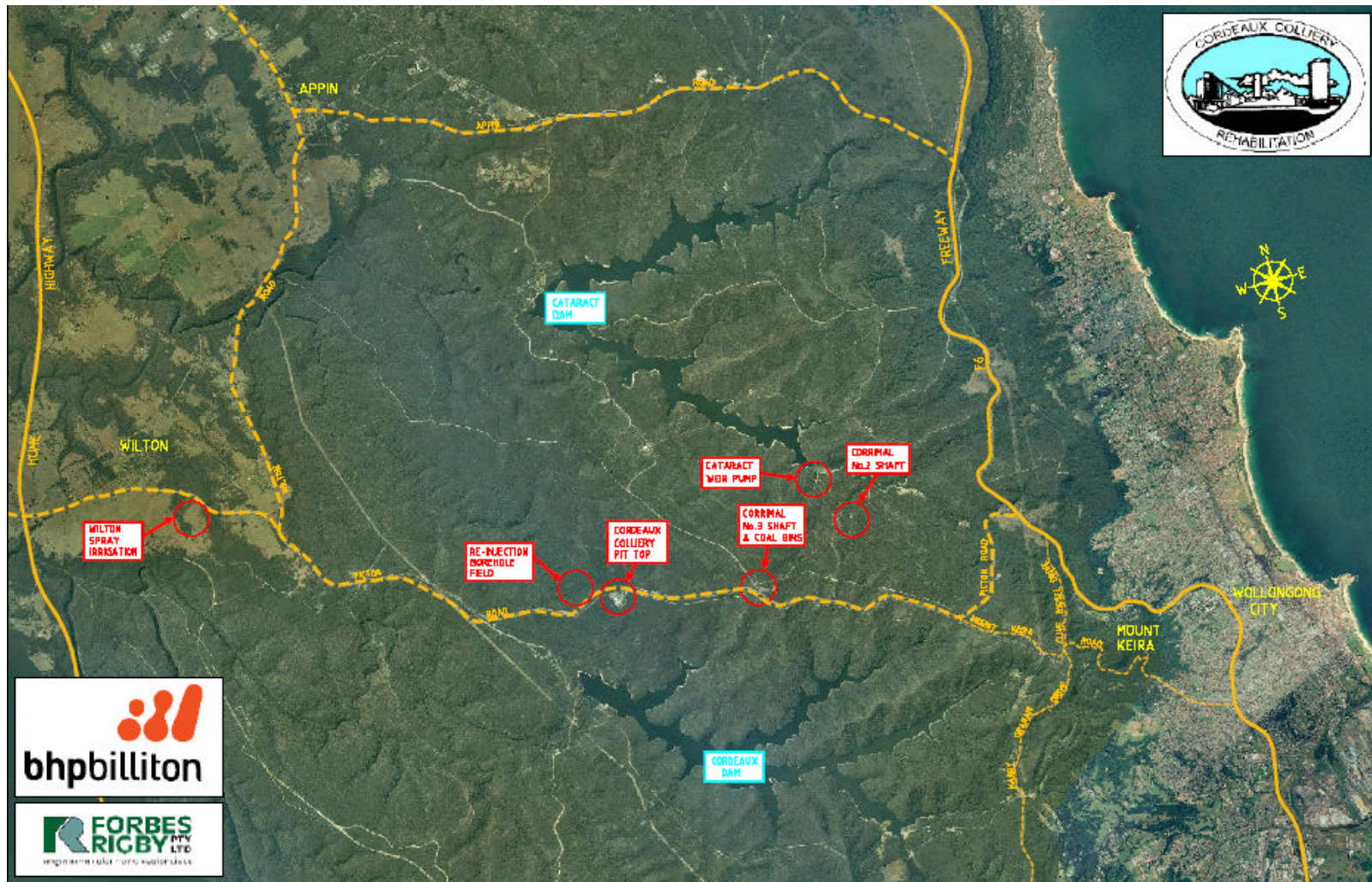


Fig 6 - Cordeaux Colliery Infrastructure Locations

## Conditions of Consolidated Coal Leases, 1985 Clause 25

*“Upon completion of operations on the surface of the subject area or upon the expiry or sooner determination of this lease or any renewal thereof, the registered holder shall remove from such surface such buildings, machinery plant, equipment, constructions and works as may be directed by the Minister and such surface shall be rehabilitated and left in a clean, tidy and safe condition to the satisfaction of the Minister.”*

**Proposed Rehabilitation Works**

Overviews of the proposed works planned for each of the Cordeaux Colliery sites are outlined below. Individual Rehabilitation Plans will be generated on a sitespecific basis.

*Cordeaux Colliery Pit Top Site*

Since coal mining ceased at Cordeaux the surface infrastructure has remained in operation to support the care and maintenance status of the mine. To meet the medium and long term objectives for the mine, the majority of existing surface facilities will be retained as part of the future option to re-establish coal extraction operations in the reserve. Redundant facilities will be demolished.

All site roads, paved areas, service reticulation, stormwater drains and bathhouse effluent systems will be retained.

*Corrimal No 2 Shaft site*

The proposed works for the rehabilitation of Corrimal No 2 Shaft encompass the shaft itself, the surrounding structures, the access track from the fire road and the adjoining shaft material emplacement. The buildings are in excess of 20 years old and are generally secure steel clad structures with concrete floors in reasonable to good condition.

Remediation work will be conducted in stages and include:

1. Upgrading of the existing access track leading to the Corrimal No 2 Shaft to facilitate heavy vehicle access to the site;
2. Demolition and removal of mine debris;
3. Exposure of shaft and preparation for filling by import of approved fill;
4. Sealing of shaft with engineer approved concrete capping as required by the DMR;
5. Revegetation of all disturbed areas rendering it non-trafficable to motor vehicles but accessible for long-term maintenance requirements.

*Corrimal No 3 Shaft Site*

A company decision is still to be finalised as to whether the No.3 shaft is required as an additional ventilation source for the future Dendrobium workings.

If it is decided that the Corrimal No 3 Shaft will not be required, then the No 3 Shaft will be backfilled and sealed as required by the DMR. If the shaft is required then a temporary cap will be placed.

*Corrimal No 3 Shaft - Coal Bins Site*

The two 1200 tonne coal bin structures, service pipelines and paved areas on the site adjacent to Picton Road will be demolished and all building materials removed/recycled.

*Cataract Weir Pump Facility*

The water supply pump and pontoon were dismantled and removed in June 2003. It is proposed to remove the overland pipeline and the transmission line to the No 3 Shaft site. When the overland pipeline and transmission line have been removed the 1.25 km long, access track will be left as is, at the request of the SCA, as an access road to the waters of the Cataract Dam



#### *Wilton Spray Irrigation Area*

All mine water distribution pipe-work, sprays and ancillary equipment on the Wilton irrigation site will be removed. As the 14 km long supply pipeline from Cordeaux is buried along its entire route it will be left in place and not recovered.

The 40 ha spray irrigation site is on open grass pastureland. Regeneration work on the site will include removal of lines and soil remediation. Once the soil treatment is complete and normal pasture growth is achieved any temporary erosion protection measures will be removed.

#### *Cordeaux Re-injection Borehole Field*

This site has already been rehabilitated with works completed to the satisfaction of the Sydney Catchment Authority.

#### *Final Land Use*

The Corrimal No 2 Shaft site, Corrimal No 3 Coal Bins, Weir Pump facility, Cordeaux Re-injection Borehole Field and associated access tracks and service corridors are established on leasehold land owned by the Sydney Catchment Authority. Consequently the former mine sites will be rehabilitated, coal leases relinquished and the lands once again become solely part of the Sydney Catchment Authority area. There are no alternative land use options proposed.

When the Wilton Spray Irrigation area was in use the land was subject to the dual purpose of disposal of excess mine water and stock grazing. Since the irrigation system ceased operation, intermittent stock grazing has been the sole land use for the area. This land use will continue.

The Cordeaux Colliery Pit top and No 3 Shaft site will remain on care and maintenance as part of the mining lease until final requirements have been determined. At which stage mining operations will either continue (with rehabilitation works being completed at the end of the next phase of mining operations) or the sites will be rehabilitated with the mining lease being relinquished.

#### *Closure and Rehabilitation Criteria*

The rehabilitation objectives include maintaining BHP Billiton Illawarra Coal HSEC standards, meeting DMR requirements in relation to lease relinquishment and satisfying the requirements of the landowner and relevant government authorities. The standard of rehabilitation to be achieved is specified in the coal lease and is conditional on the lease being relinquished.

#### *Ongoing Maintenance*

As part of the rehabilitation process ongoing maintenance management plans will be developed for all sites, with maintenance being carried out until revegetation has been successfully established and the lease relinquished or in the case of Cordeaux Colliery Pit Top and Corrimal No 3 Shaft site until mining operations commence again.

### **Environmental Management Controls**

#### *Air and Noise*

Air and noise pollution will be managed in accordance with current guidelines.

#### *Surface Water And Erosion And Sedimentation*

Measures will be taken to control the risk of surface waters and erosion and sedimentation impacts on the sites to be rehabilitated. The measures will be aimed at controlling the velocity and concentration of surface runoff water from rainfall events and flows in natural watercourses.

To control sedimentation impacts, when the mineshafts are being backfilled and capped and the site infrastructure is being removed, silt fencing will be erected along the lower side of each work area.

The "Track Stabilisation & Erosion Control Manual" as produced by Sydney Water will be utilised as a guideline when developing control strategies.

The risk of erosion and/or sedimentation resulting from the rehabilitation works will be minimised by the development and application of site-specific Erosion & Sedimentation Control Plans.

#### *Ground Water*

Controls will be put in place to appropriately manage potential groundwater pollution

#### *Contaminated Land*

Rehabilitation planning for the shaft sites will include investigations to identify any areas of land that may have been contaminated by past mining activities. If any areas of contamination are discovered the material will be either treated in-situ or removed and legally disposed of elsewhere, depending on the degree and type of contamination.

#### *Hazardous Materials*

Rehabilitation planning will include investigations to identify any hazardous materials present from past mining activities or in buildings. Where required, the removal and disposal of oils from machinery gearboxes or transformers etc will be handled off site at appropriate disposal depots. If hazardous products, such as asbestos or stored chemicals, are found during the health, safety and environmental risk analysis of the buildings, appropriately qualified contractors will be engaged to remove and dispose of these products.

A prerequisite of demolition and disposal will be compliance with requirements of the OH&S Act and subject to health, safety and environmental risk analysis prior to the commencement of any works.

The opportunity to recycle any of the building materials or whole structures will be canvassed with prospective demolition contractors.

#### *Flora and fauna*

All necessary flora and fauna studies will be carried out for the mine sites to be rehabilitated. Weeds will be controlled when required. Weed management will be incorporated as required into the maintenance activities to be undertaken.

#### *Landform and revegetation*

Land restoration issues associated with landform design, surface shaping, surface preparation and regeneration shall be fully addressed. The plan will ensure the restored sites are stable, will resist surface water and erosion and sedimentation impacts with revegetation using local native flora species that will provide suitable habitat for use by fauna species occurring in the region. The finished landform will be contoured to blend with the surrounding area.

All necessary flora and fauna studies will be carried out with rehabilitation works to meet the requirements of any studies completed.

A full ongoing maintenance programme for the restored sites will be developed to ensure ongoing maintenance, revegetation monitoring (and any necessary re-establishment) until the revegetation has successfully established and the mine lease can be relinquished.

#### *Blasting.*

It is not anticipated blasting will be undertaken in association with the rehabilitation works

#### *Visual, Stray Light.*

The mine site will not change in its general overall appearance and will not present an adverse visual impact. Nighttime security lighting of the site will not be altered. This degree of illumination is not expected to any adverse stray light impacts.

#### *Aboriginal Heritage*

A number of Aboriginal sites occur above the previously mined areas at Cordeaux. These sites were identified by archaeological survey and managed during extraction as required by the National Parks and Wildlife Service and the Department of Mineral Resources.

All necessary aboriginal and archaeological studies will be carried out. Studies undertaken to date have not found any aboriginal heritage place or artifact that would be affected by the works. Refer Navin Officer Pty Ltd Aboriginal Archaeology study.

#### *Natural Heritage*

All heritage studies necessary will be carried out for each site to be rehabilitated.

#### *Bushfire*

Bush fire management plans have been developed with the Local Bush fire Service. Protection measures are implemented and a hazard reduction programme is in place. The programme involves periodic burning off that is usually undertaken by the local Bush Fire Brigade or the Sydney Catchment Authority, on an as needed basis.

An Emergency Procedure is in place for controlling fire in or adjoining the Cordeaux pit top facilities and provides details on emergency contacts. This procedure is contained within the Fire Control Emergency System.

The Cordeaux pit top site has been used as a strategic base for fighting large fires in the surrounding catchments and farming lands. The closed status of the mine will not affect its future use for fire fighting.

#### *Public Safety*

All of the Cordeaux pit top area is contained within a chain wire cyclone mesh fence. The main entrance from Picton Road has a gate, which is locked when the site is unmanned.

All perimeter fences are signed to warn against unauthorised entry and potentially dangerous areas.

Visitors to site must register upon entry.

The entrance from Picton Road to the Corrimal No 2 and 3 Shaft sites is secured with a locked gate and chain wire fencing.

The Corrimal Nos 2 and 3 mine Shafts will be permanently sealed and all associated infrastructure, such as unused buildings, demolished and removed, as part of the mine closure plan. This will ensure that the rehabilitated mine sites do not pose any future public risk.

If it is the decision to temporarily cap the No 3 Shaft, a suitably designed access proof cap will be installed. The existing security fence would be retained.

#### *Risk Management Review*

Risk assessments will be undertaken for each site as required. BHPBilliton will conduct an internal risk management review to determine risks and hazards and the likely consequences of each identified risk/hazard.

The primary objectives of the reviews are to identify the major safety and environmental risks that could occur during construction works, and to identify the actions required to minimise the potential occurrence and/or consequences of these risks.

#### *Final Land Use*

The Corrimal No 2 Shaft site, Corrimal No 3 Coal Bins, Weir Pump facility, Cordeaux Re-injection Borehole Field and associated access tracks and service corridors are established on leasehold land owned by the Sydney Catchment Authority. Consequently the former mine sites will be rehabilitated, coal leases relinquished and the lands once again become solely part of the Sydney Catchment Authority area. There are no alternative land use options proposed.

When the Wilton Spray Irrigation area was in use the land was subject to the dual purpose of disposal of excess mine water and stock grazing. Since the irrigation system ceased operation, intermittent stock grazing has been the sole land use for the area. This land use will continue.

The Cordeaux Colliery Pit top and No 3 Shaft site will remain on care and maintenance as part of the mining lease until final requirements have been determined. At which stage mining operations will either continue (with rehabilitation works being completed at the end of the next phase of mining operations) or the sites will be rehabilitated with the mining lease being relinquished.

---

### *Stakeholder and Community Consultation*

The consultation process commenced in March 2003 with a formal presentation to government agencies of Cordeaux Colliery's Asset Preservation Plan outlining the proposed future rehabilitation of the Cordeaux sites. This presentation included the recently formed "interagency group" consisting of DMR, DSNR, EPA, NP&WS, SCA and WCC. Site inspections were held for all the sites for all interested parties.

This consultation process was continued with another presentation by BHPBIC updating progress to the interagency group in October 2003.

Future stakeholder and community involvement will include:

1. Agency review of site-specific rehabilitation plans,
2. Re-issue of the site specific plans incorporating where practical/possible comment from agencies,
3. On going presentations during the rehabilitation process (such as at the interagency meetings),
4. Site inspections as necessary for government agencies during the rehabilitation process,
5. Placement of posters/newsletters at the Appin shop front and in Wollongong City Council offices as appropriate, and
6. Provision of a 24-hour hotline for general queries from the community.

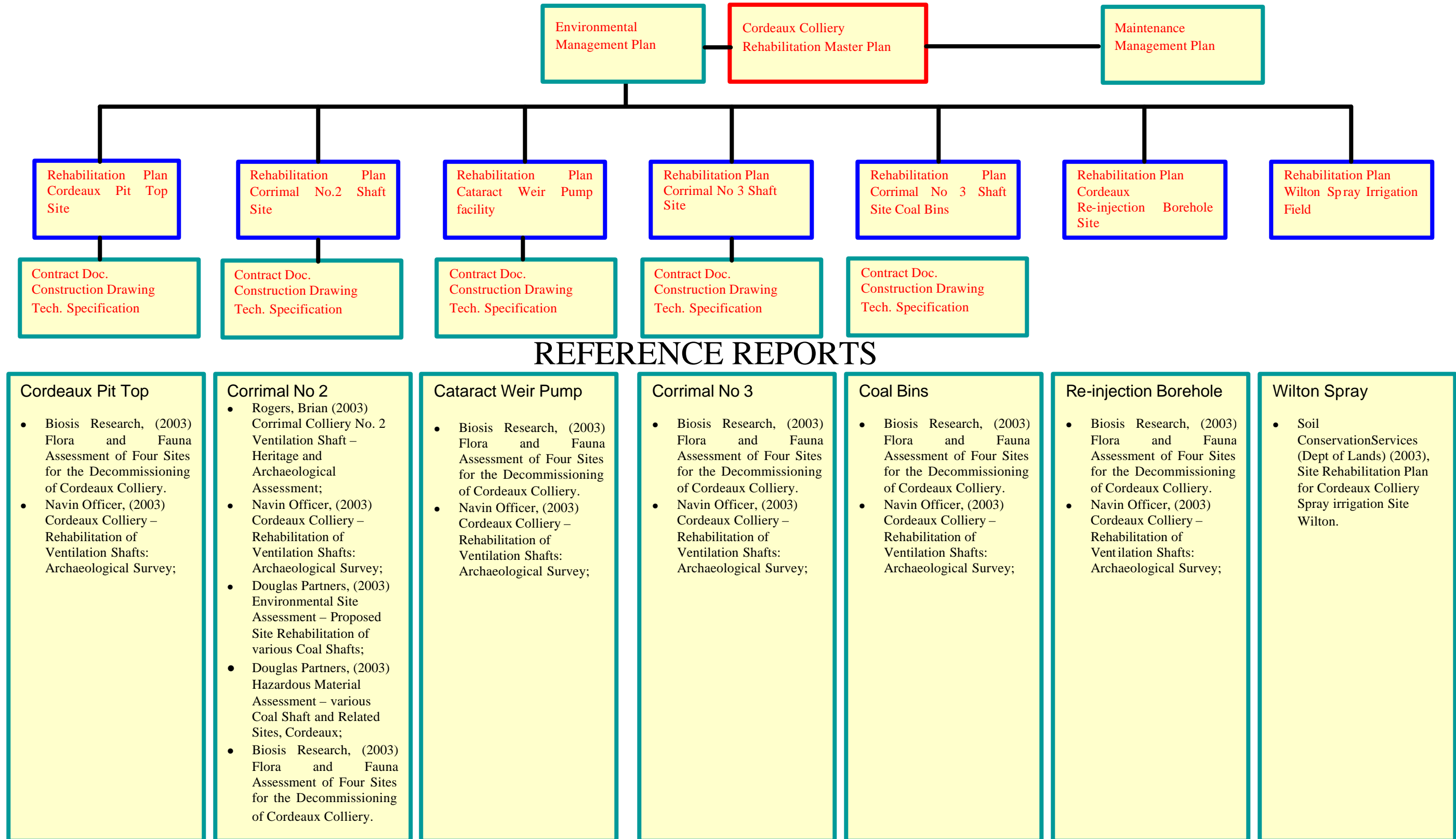
### **CONCLUSIONS**

Planning for mine site rehabilitation is a long and detailed process that should be accounted for from the design concept stage of any new operation and be kept in mind during all stages of the mines life cycle. The issues that need to be addressed in any rehabilitation process are as broad and need the same level of detailed investigations and planning as does the initiation of a project.

Experiences at BHPBilliton operations in the Illawarra show the benefits of planning for rehabilitation whilst the mine is still operating.

### **REFERENCES**

- Forbes Rigby / BHPBilliton document  
"Kemira Rehabilitation Master Plan, March 2003"
- Forbes Rigby / BHPBilliton document  
"Cordeaux Rehabilitation Master Plan, November 2003"
- BHP Billiton HSEC Guideline, "Decommissioning, Closure and Rehabilitation" Dec 2002.
- DMR Policy "Rehabilitation and Mine Closure", September 1998
- DMR Policy "Guidelines to the Mining, Rehabilitation and Environmental Management Process", December 2002.
- DMR Policy EDG11 "format and Guideline for the Preparation of a Mining Operation Plan Small Mine Version", February 2002.
- Australian and New Zealand Minerals and Energy Council, Minerals Council of Australia "Strategic Framework for Mine Closure", 2000.



FR Ref 103071 Doc Summary Rev 1 - 19 November 2003

Fig 7 - Cordeaux Colliery Document Summary