

WILPINJONG COAL PROJECT

MAIN REPORT

Section Five Environmental Protection Plan

TABLE OF CONTENTS

5	ENVIRONMENTAL PROTECTION PLAN	5-1
5.1	ENVIRONMENTAL MANAGEMENT AND MONITORING	5-2
5.1.1	Mining, Rehabilitation and Environmental Management Process	5-3
5.1.2	Environmental Management Plans	5-4
5.1.3	Environmental Monitoring	5-10
5.2	REHABILITATION AREAS	5-14
5.2.1	Principles and Objectives	5-14
5.2.2	Planning	5-14
5.2.3	Erosion and Sediment Control	5-14
5.2.4	Soil Removal, Handling and Replacement	5-14
5.2.5	Revegetation	5-15
5.2.6	Replacement of Aboriginal Objects	5-17
5.2.7	Studies and Trials	5-17
5.2.8	Final Landform Design	5-17
5.2.9	Monitoring, Maintenance and Reporting	5-22
5.3	REGENERATION AREAS	5-24
5.4	ENHANCEMENT AND CONSERVATION AREAS	5-24
5.5	MINE CLOSURE AND COMPLETION CRITERIA	5-25
5.5.1	Mine Closure Plan	5-26
5.5.2	Completion Criteria	5-26

LIST OF TABLES

Table 5-1	Effect of the Environmental Protection Plan on Woodland Areas
Table 5-2	Project Management Plans
Table 5-3	Overview of the Project Environmental Monitoring Programme
Table 5-4	Soil Resource Management Strategies
Table 5-5	Proposed List of Native Species to be used in Revegetation
Table 5-6	Key Completion Criteria for Project Components

LIST OF FIGURES

Figure 5-1	Proposed Environmental Monitoring Sites
Figure 5-2	Project Rehabilitation Areas, Regeneration Areas and Enhancement and Conservation Areas
Figure 5-3	Final Landform Photo-simulation
Figure 5-4	Conceptual Cross Section – Rehabilitated Landform

5 ENVIRONMENTAL PROTECTION PLAN

This section describes the Project Environmental Protection Plan (EPP). The EPP provides for environmental management of the Project area and surrounds, the rehabilitation of Project disturbance areas and the establishment, enhancement and conservation of areas of woodland vegetation. The Project EPP has been developed with due recognition of relevant state government discussion papers including the *Green Offsets for Sustainable Development* (NSW Government, 2002). The EPP encompasses:

- **Environmental Management and Monitoring (Section 5.1)** – comprising environmental management plans and monitoring programmes covering the Project life (i.e. mine construction, operation and closure). Some plan/programme elements would continue post-closure (e.g. surface water monitoring) until relevant completion criteria are met (Section 5.5.2). The findings of the EIS baseline studies and impact assessments have been utilised to focus the scope and content of the management plans and monitoring programmes.
- **Rehabilitation Areas (Section 5.2)** – comprising the rehabilitation and revegetation of areas disturbed by the Project. Rehabilitation and revegetation would be undertaken progressively as mining proceeds, with coal removal and the formation of a final (mine waste rock emplacement) landform behind the advancing face of the open cut. Rehabilitation and revegetation of infrastructure areas would also be undertaken progressively as infrastructure is decommissioned. The revegetation programme for Project rehabilitation areas provides for a combination of woodland and pasture outcomes.
- **Regeneration Areas (Section 5.3)** – to be established on areas of WCPL-owned land situated proximal to Project disturbance areas. The regeneration areas contain predominantly cleared agricultural land in which woodland vegetation would be established by the Project.

- **Enhancement and Conservation Areas (ECAs) (Section 5.4)** – to be established on areas of WCPL-owned land containing remnant vegetation and proximal grazing land, as well as known and potential Aboriginal cultural heritage sites. Enhancement of the ECAs would be achieved by the implementation of appropriate land management practices such as weed and pest control, management of livestock access to encourage natural regeneration and selective planting. Conservation of the ECAs would be achieved through a rezoning application.
- **Mine Closure and Completion Criteria (Section 5.5)** – comprising final mine closure activities and criteria which, once satisfied, would indicate achievement of EPP objectives in relation to the rehabilitation areas, regeneration areas and the ECAs.

Regarding the establishment, enhancement and conservation of vegetation in the Project area and surrounds, the EPP provides for:

- some 850 ha of the Project final landform to be revegetated with woodland vegetation and some 1,070 ha of the Project final landform to be revegetated to mixed woodland/pasture (Section 5.2);
- the establishment of some 350 ha of woodland vegetation in areas proximal to the Project disturbance area in regeneration areas (Section 5.3);
- the enhancement and conservation of some 295 ha of existing remnant vegetation within the ECAs, including greater than 80 ha of the WBYBBRG EEC (Section 5.4);
- the establishment of some 185 ha of woodland vegetation in the ECAs, including some 50 ha of the WBYBBRG EEC (Section 5.4); and
- improved connectivity of woodland vegetation between existing remnants (e.g. Goulburn River National Park and Munghorn Gap Nature Reserve) (Sections 5.2 to 5.4).

Table 5-1 summarises the net increase in woodland vegetation that would be achieved by the implementation of the EPP.

Table 5-1
Effect of the Environmental Protection Plan on Woodland Areas

Project Component	Approximate Area (ha)
Existing woodland vegetation cleared by the Project (Figure 3-7).	290*
Rehabilitation of Project final landforms with woodland vegetation (i.e. rehabilitation areas – Section 5.2). (Note: this does not include rehabilitation areas that would be revegetated with a mixture of woodland vegetation and pasture.)	850
Establishment of woodland vegetation in areas proximal to the Project through natural regeneration/selective planting (i.e. regeneration areas – Section 5.3).	350
Establishment of woodland vegetation in the ECAs (including 50 ha of the WBYBBRG EEC) through natural regeneration/selective planting (Section 5.4).	185
Net Increase in Woodland Vegetation	1,095

* Denotes the disturbance to existing remnant vegetation by the Project.

5.1 ENVIRONMENTAL MANAGEMENT AND MONITORING

This section provides an overview of the environmental management plans and monitoring programmes that would be implemented for the Project. The management and monitoring programmes should be viewed as provisional pending further input from relevant authorities during the assessment phase of the EIS. Further to the management plans and monitoring programmes described herein, Sections 5.2, 5.3, 5.4 and 5.5 present management and monitoring programmes specifically relevant to rehabilitation areas, regeneration areas, the ECAs and mine closure, respectively.

Environmental Management Responsibilities

Environmental management would be the responsibility of all Project employees, with co-ordination provided by an environmental team. The environmental team would be lead by an Environmental Manager, who would report directly to the General Manager.

Community Consultation

A formal community consultation programme commenced in February 2004 (Section 1.5.1) with the Minister for Mineral Resources appointing Ms Margaret MacDonald-Hill to chair a Project Community Consultative Committee (CCC) for the preparation and assessment phase of the Project EIS. The Project CCC comprises four community representatives, a representative from the MWRC, WCPL representatives and one representative from the DPI.

A new CCC would be established for the construction and operation phase of the Project as an on-going channel for communication between the local community and WCPL. The new CCC would comprise a similar membership to the current CCC and would meet to discuss mine progress, rehabilitation activities, to review the general environmental performance of the Project and to discuss any issues raised by the community.

An Aboriginal Cultural Heritage Liaison Committee would also be formed in accordance with the Aboriginal Cultural Heritage Management Plan (Section 5.1.2.10). This committee would specifically address the management of relevant Aboriginal cultural heritage and the on-going involvement of the Aboriginal community in this regard.

Community Contact Register

A community contact register would be established as a component of the community consultation programme. Community contacts would be primarily handled by the Environmental Manager. All contacts, and where appropriate WCPL's responses, would be recorded in the register. The register would detail the name of the contact, time, date, nature of the issue raised and any actions taken to address the issue where it was appropriate to do so.

Issues raised and any subsequent actions undertaken would be reported in the Annual Environmental Management Report (AEMR) (Section 5.1.1.2).

Induction and Environmental Awareness Programme

All Project employees and contractors would undertake an induction and environmental awareness programme prior to working independently on-site. As a component of this programme, employees would be given training in occupational health and safety requirements, an overview of the requirements of the EPP and an appreciation of the Aboriginal cultural heritage values of the Project area.

5.1.1 Mining, Rehabilitation and Environmental Management Process

The Mining, Rehabilitation and Environmental Management Process (MREMP) (DMR, 2002b) is a DPI-MR initiative and incorporates the Mining Operations Plan (MOP) and the AEMR as primary regulatory reporting documents. The MREMP is a framework that aims to facilitate the development of mining in NSW in a manner that ensures that mining operations are safe, the environment is protected, the resources are efficiently extracted and rehabilitation achieves a stable, satisfactory outcome (DMR, 2002b). The structure and content of the Project MOP and AEMR would be developed in accordance with MREMP guidelines (DMR, 2002b) and through consultation with various regulatory and advisory agencies including the DPI, DEC, DIPNR, and MWRC.

As part of the MREMP, a final Mine Closure Plan (MCP) would be developed in consultation with relevant authorities and the Project CCC prior to the completion of final mining operations (Section 5.5.1). As Project rehabilitation, regeneration and ECA initiatives would be undertaken progressively, the MREMP would be used throughout the mine life to both plan and track the performance of these activities as they are carried out. The MREMP would also be utilised to confirm completion criteria (Section 5.5.2) on a progressive basis.

5.1.1.1 Mining Operations Plan

The MOP would provide information in regard to mining, processing and rehabilitation operations, relevant lease and development consent conditions, licences and other approvals. The MOP would also describe:

- area(s) proposed to be disturbed;
- mining and rehabilitation method(s) to be used and their sequence;

- soil stripping, stockpiling and re-application, scheduling and management procedures;
- existing and proposed surface infrastructure;
- progressive rehabilitation design and schedules;
- areas of particular environmental sensitivity;
- relevant completion criteria;
- land and water management systems; and
- proposed resource recovery.

The MOP would be revised periodically as well as prior to any significant alteration to mining and rehabilitation operations.

5.1.1.2 Annual Environmental Management Report

An AEMR would be prepared to address the status of approvals, leases, licences and environmental risk management and control strategies.

For the preceding 12 month period, the AEMR would provide a summary of community consultation, mining operations as well as the progress of the rehabilitation areas, regeneration areas and the ECAs against completion criteria. Project environmental performance in relation to consent conditions, other approvals, lease conditions and relevant licences for the previous 12 month period would also be reported.

The AEMR would also include a review and any proposed changes in relation to environmental monitoring and management systems, environmental performance and completion criteria and would specify environmental, rehabilitation, regeneration and ECA objectives to be achieved during the ensuing 12 month period.

5.1.1.3 Environmental Management Strategy

An Environmental Management Strategy (EMS) would be prepared for the Project describing:

- operational procedures and environmental management plans to manage the environmental effects of the Project;
- assignment of responsibilities;
- verification and audit processes;
- environmental monitoring programmes;

- schedules for the development and implementation of environmental management plans and monitoring programmes;
- training programs;
- community consultation processes;
- complaint handling mechanisms including site contacts;
- strategies to use monitoring information to improve performance;
- strategies to achieve acceptable environmental impacts (including remedial response strategies); and
- measures to avoid and minimise the generation of wastes and promote waste re-use and recycling.

5.1.2 Environmental Management Plans

A number of environmental management plans would be developed for the Project. Management plans would be progressively prepared, prior to and/or during the development of the Project, so they can be implemented prior to a relevant action taking place.

A list of proposed Project management plans is presented in Table 5-2. The management plans are further described in the following sub-sections. A MCP would also be prepared for the Project, as described in Section 5.5.1. A Final Void Management Plan (FVMP) would be prepared as a component of the MCP and is also described in Section 5.5.1.

The final list of management plans for the Project and timeframes for their development would be provided in the EMS following consultation with relevant authorities.

5.1.2.1 Land Management Plan

A Land Management Plan (LMP) would be prepared for the Project and would describe measures to manage WCPL-owned land in a manner consistent with EPP objectives. In addition, the LMP would address grazing management, access controls and any potential land degradation impacts.

5.1.2.2 Erosion and Sediment Control Plan

An Erosion and Sediment Control Plan (ESCP) would be developed for the Project detailing methods for the control of erosion and sediment in disturbed areas. The ESCP would be prepared in a progressive manner prior to the development of each Project component involving land disturbance. The measures presented in the ESCP would aim to control soil erosion and sediment generation proximal to the source and thereby minimise the potential for Project activities to adversely affect downstream water quality.

The ESCP would be prepared in general accordance with the manual *Managing Urban Stormwater: Soils and Construction* (Department of Housing, 1998) and the *Draft Guidelines for the Design of Stable Drainage Lines on Rehabilitated Minesites in the Hunter Coalfields* (DLWC, 2002b).

**Table 5-2
Project Management Plans**

Management Plan	Section
Land Management Plan	5.1.2.1
Erosion and Sediment Control Plan	5.1.2.2
Bushfire Management Plan	5.1.2.3
Site Water Management Plan	5.1.2.4
Water Supply Borefield Plan	5.1.2.5
Cumby Creek Relocation Plan	5.1.2.6
Flora and Fauna Management Plan	5.1.2.7
Weed and Animal Pest Control Plan	5.1.2.8
Traffic Management Plan	5.1.2.9
Aboriginal Cultural Heritage Management Plan	5.1.2.10
Spontaneous Combustion Management Plan	5.1.2.11
Blast Management Plan	5.1.2.12
Mine Closure Plan	5.5.1
Final Void Management Plan	5.5.1

The design capacity of erosion and sediment control structures would be determined in consultation with relevant authorities based on catchment area, soil types, design life and associated environmental risk. The ESCP would include:

- identification of activities that have the potential to cause soil erosion and generate sediment;
- description of the location, function and capacity of erosion and sediment control structures;
- description of measures to control soil erosion and the potential for the migration of sediments to downstream watercourses;
- details of salinity management; and
- a programme to monitor the effectiveness of erosion and sediment control measures.

The ESCP would be revised as required in consultation with relevant authorities.

5.1.2.3 Bushfire Management Plan

A Bushfire Management Plan (BMP) would be developed to:

- identify bushfire management issues relevant to the local environment and WCPL-owned land;
- assess bushfire risk; and
- establish bushfire management measures (e.g. fire breaks and access tracks) and outline standard procedures to be followed in the event of a bushfire.

The *Goulburn River National Park and Munghorn Gap Nature Reserve Fire Management Plan* (DEC, 2004) indicates that co-operation with neighbouring landowners is required to achieve responsible fire management. WCPL would consult with DEC regarding fire management. WCPL would also consult with the MWRC and the Rural Fire Service in developing the BMP.

5.1.2.4 Site Water Management Plan

A Site Water Management Plan (SWMP) would be developed for the Project in consultation with relevant authorities. The SWMP would describe the Project site water management system, including:

- the predicted site water balance as well as details of the Project water supply system (e.g. water supply storage, pump and pipeline capacities and a Water Supply Borefield Plan [WSBP] – Section 5.1.2.5);
- procedures that would be implemented to:
 - ameliorate potential surface water impacts; and
 - establish priority water use (Section 2.9.2);
- details of surface water management structures including the design of the Cumbo Creek relocation (Cumbo Creek Relocation Plan [CCRP] – Section 5.1.2.6);
- location and design specifications for all clean water diversions, including channel design and stabilisation, sediment retention storages and other structures;
- details of internal drainage of the mine water circuit, including any bunding, drainage channels, dewatering pits, advance dewatering bores and storages;
- measures to manage waters that accumulate in mine workings, including the isolation and return of potential direct groundwater inflows from Wilpinjong Creek or Cumbo Creek alluvium (Section 2.4.8);
- surface water and groundwater monitoring programmes (Sections 5.1.3.6 and 5.1.3.7);
- investigation triggers and contingency/remediation plans for managing adverse impacts of the Project on surface water and groundwater including existing users; and
- details of strategies for the decommissioning of water management structures.

The SWMP would be reviewed and revised as required in consultation with relevant authorities and would be periodically updated over the mine life.

5.1.2.5 Water Supply Borefield Plan

A WSBP would be developed for the Project in consultation with relevant authorities and incorporated in the SWMP. The WSBP would include:

- details of borefield configuration and bore location;
- management and monitoring programmes to be implemented during the operation of the borefield;
- processes for validating measured groundwater drawdowns against those predicted to occur;
- a schedule of on-going borefield performance reviews through the mine life; and
- contingency measures to mitigate any adverse impacts on existing water supply bores, groundwater users or borefield users.

The borefield monitoring programme is described in Section 5.1.3.7.

5.1.2.6 Cumbo Creek Relocation Plan

A CCRP would be developed for the Project in consultation with relevant authorities and incorporated in the SWMP. The CCRP would include:

- design and specifications for creek relocation works;
- a construction programme for the creek relocation, describing how the work would be staged and progressively integrated with mining operations;
- a revegetation programme using appropriate native riparian species consistent with upstream regeneration works (Section 5.2.5);
- design of the block bund foundation to provide for the diversion of sub-surface flow associated with Cumbo Creek alluvium;
- water quality, ecological and geomorphic performance criteria for the creek relocation;
- a programme to monitor water quality and ecological and geomorphic integrity of the creek relocation; and
- a programme to inspect and maintain the creek relocation and revegetation works until they stabilise.

5.1.2.7 Flora and Fauna Management Plan

A Flora and Fauna Management Plan (FFMP) would be prepared to facilitate integration of flora and fauna management measures with Project construction and operation.

The FFMP would contain a number of management strategies to minimise the potential impacts of the Project on protected and threatened flora, fauna and their habitats. The FFMP would include a Vegetation Clearance Protocol (VCP) and a Threatened Species Management Protocol (TSMP), would describe management of the regeneration areas and the ECAs, and would include monitoring to assess the performance of the rehabilitation areas, regeneration areas and the ECAs, as discussed further below.

Vegetation Clearance Protocol

A VCP would be developed to minimise the impact of Project vegetation clearance activities on flora and fauna. Key components of the VCP would include the delineation of areas to be cleared of remnant vegetation, a pre-clearance survey, identification of fauna management strategies and specific procedures for vegetation clearance.

Delineation of Disturbance Areas

Areas to be cleared of remnant vegetation would be clearly delineated to prevent accidental damage during vegetation clearance activities or construction works.

Pre-clearance Survey

This component of the VCP would involve an inspection of trees for features with the potential to provide roosting and/or nesting resources for birds, bats and arboreal mammals (e.g. hollows). Spotlighting for arboreal mammals and observations of hollows and nests for nesting bird species may also be undertaken. Where feasible, this stage would be conducted with consideration of seasonal and temporal factors.

Fauna Management Strategies

This part of the VCP would involve the identification of management strategies to minimise the impact of clearing activities on resident fauna in the short-term and to minimise the loss of habitat in the long-term.

Short-term management strategies may include timing vegetation clearance to avoid nesting/breeding activities, capture and release of fauna and/or modification of the disturbance area, where feasible. Long-term management strategies may include the placement of nesting boxes in suitable habitat for birds and arboreal mammals, the relocation of habitat features salvaged from felled trees and the establishment of hollow-developing tree species.

Vegetation Clearance

Specific vegetation clearance procedures would be developed and would include:

- implementation of fauna management strategies as above;
- inspection of felled trees for the presence of fauna;
- salvage of habitat features (e.g. hollows) and collection of seed for use in the rehabilitation areas, regeneration areas and/or in the ECAs; and
- collection of harvestable timber for commercial purposes.

Threatened Species Management Protocol

A TSMP would be developed to facilitate implementation of threatened species management strategies to minimise potential impacts on threatened flora and fauna species. Key components of the TSMP would include site observations/surveys, threatened species management strategies and reporting.

Regeneration Areas

Regeneration areas would be established on areas of WCPL-owned land situated proximal to the Project disturbance areas/rehabilitation areas, as described in Section 5.3. The regeneration areas predominantly comprise cleared agricultural land. Woodland vegetation would be established in the regeneration areas through natural regeneration and selective planting.

Enhancement and Conservation Areas

Three ECAs would be established by the Project, as described in Section 5.4. The ECAs would be situated on areas of WCPL-owned land which contain both remnant vegetation and proximal grazing land. Management of the ECAs in relation to flora and fauna would be detailed in the FFMP.

'Enhancement' of the ECAs would be achieved by the implementation of appropriate land management practices, as described below. 'Conservation' of the ECAs would be achieved through a rezoning application, as described in Section 5.4.

To enable the most appropriate and effective enhancement strategies to be implemented, a habitat assessment of the ECAs would be undertaken to obtain additional information on existing habitat resources and characteristics. The enhancement strategies identified may include:

- appropriate fencing to prevent the uncontrolled entry of livestock and to encourage natural regeneration (e.g. fencing would not be undertaken where tree clearance would be required for fence construction);
- control measures to minimise the occurrence of weeds;
- control measures to minimise the occurrence of animal pests;
- limiting vehicular traffic; and
- selective planting of native vegetation (e.g. along Wilpinjong and Cumbo Creeks).

Monitoring Programme

A monitoring programme would be developed to assess the performance of the rehabilitation areas, regeneration areas and the ECAs. An overview of the proposed monitoring of the rehabilitation areas, regeneration areas and ECAs is provided in Sections 5.2, 5.3 and 5.4, respectively. As discussed in Section 5.1.3.8, an aquatic monitoring programme would also be developed to monitor the aquatic macroinvertebrate assemblages, *in-situ* water quality, characteristics and health of Wilpinjong and Cumbo Creeks.

5.1.2.8 Weed and Animal Pest Control Plan

A Weed and Animal Pest Control Plan (WAPCP) would be developed for the Project for WCPL-owned land. The WAPCP would include management strategies to control the potential adverse impacts of weeds and animal pests. Weeds would be controlled through mechanical removal and/or the application of approved herbicides. Animal pest control would be undertaken by a licensed contractor.

5.1.2.9 Traffic Management Plan

A Traffic Management Plan (TMP) would be prepared in consultation with the RTA and MWRC and would be updated when required (e.g. prior to the relocation of part of Ulan-Wollar Road, later in the mine life). The TMP would address:

- management of roadworks on public roads (e.g. the mine access road intersection); and
- temporary road closures on Wollar Road and Ulan-Wollar Road when blasting is undertaken within approximately 500 m of these roads.

The TMP would be prepared in accordance with AS 1742.3-2002 *Manual of Uniform Traffic Control Devices – Traffic Control Devices for Works on Roads* and/or the manual for *Traffic Control at Work Sites* (RTA, 2003) prior to commencement of works on the public road network, and would include:

- design of roadworks to be performed;
- an on-going programme of traffic flow monitoring to validate assessment and design assumptions;
- traffic control measures to be adopted during roadworks; and
- road closure management measures.

Consultation with the RTA and MWRC would continue as necessary throughout the construction and operational phases of the Project. Consultation with the MWRC and ARTC would also be undertaken with respect to the appropriate design of the relocated rail crossings on Ulan-Wollar Road (Section 2.3.9).

5.1.2.10 Aboriginal Cultural Heritage Management Plan

An Aboriginal Cultural Heritage Management Plan (ACHMP) would be prepared and would describe management procedures for Aboriginal cultural heritage sites at the Project.

The ACHMP would include:

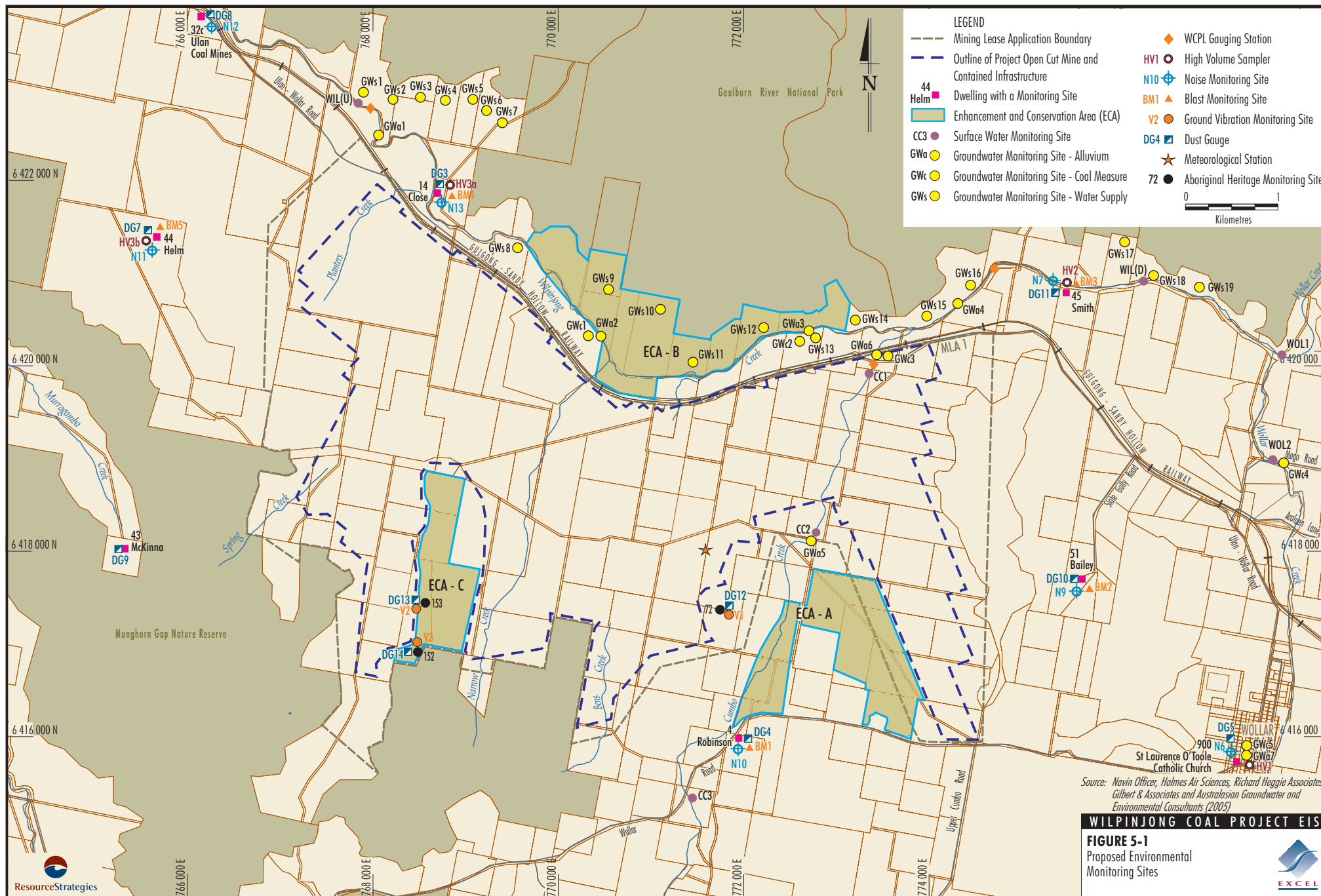
- a protocol for consultation with local Aboriginal groups including the establishment of an Aboriginal Cultural Heritage Liaison Committee and the participation of Aboriginal community representatives in cultural heritage salvage, monitoring and management works;

- details of statutory requirements to be met regarding the management of Aboriginal heritage under the NPW Act;
- a salvage programme for the recovery of artefacts from disturbance areas, an excavation and recording programme for selected sites and a plan of management for scarred trees;
- an artefact temporary storage and replacement programme (for retrieval of collected artefacts from a “keeping place” and then placement onto completed mine landforms as part of the rehabilitation programme);
- a monitoring and management protocol that defines actions to be followed in the event that human skeletal remains are encountered during development within Project disturbance areas;
- an access protocol so that Aboriginal people can access sites in the Project area in accordance with site occupational health and safety requirements;
- a schedule and design for a survey of the escarpments and associated debris slopes to the south-west of the Project disturbance area in the first two years of the Project operational phase;
- a monitoring programme for sensitive sites adjacent to the Project disturbance area, including pre-development baseline recording of sites 72, 152 and 153 (Figure 5-1);
- general land management measures to protect Aboriginal cultural heritage; and
- Aboriginal cultural heritage training for Project employees (e.g. through site inductions).

5.1.2.11 Spontaneous Combustion Management Plan

A Spontaneous Combustion Management Plan would be developed for the Project in consultation with the DPI-MR and would include:

- coal stockpile and emplacement management measures;
- monitoring potential causes of spontaneous combustion events; and
- actions that can be implemented in the event of spontaneous combustion.



5.1.2.12 Blast Management Plan

A Blast Management Plan would be developed for the Project and would include:

- a blast monitoring programme (including ground vibration and airblast overpressure) to verify blast predictions and to assist future blast designs;
- methods to reduce the potential for flyrock impacts;
- details of temporary closures of Wollar Road, Ulan-Wollar Road and the Gulgong-Sandy Hollow railway when blasting is undertaken within 500 m of the road or railway; and
- notification of occupants of the Close (14) dwelling when blasting is undertaken within 1,000 m of the dwelling.

5.1.3 Environmental Monitoring

An environmental monitoring programme would be developed for the Project. Table 5-3 provides an overview of the programme and Figure 5-1 shows the proposed location of each monitoring site. Monitoring results as well as monitoring site locations, parameters and frequencies would be reviewed annually through the AEMR process, in consultation with relevant authorities and the Project CCC.

This section provides an outline of each component of the monitoring programme with the exception of the monitoring programmes associated with rehabilitation areas, regeneration areas and ECAs, which are described in Sections 5.2, 5.3 and 5.4, respectively.

5.1.3.1 Meteorology

An automated meteorological station at the Project currently records temperature (at heights of 2 m and 10 m above ground level), relative humidity, net solar radiation, rainfall, wind speed, wind direction and sigma theta (the rate of change of wind direction). Meteorological data is continuously monitored and the data averaged over 10 minute periods. A meteorological station would continue to be utilised for the life of the Project.

5.1.3.2 Air Quality

The Project air quality monitoring programme would monitor dust deposition and concentrations of the PM₁₀ proportion of suspended particulates utilising a network of dust deposition gauges and three high volume samplers (measuring PM₁₀). The monitoring programme would incorporate mechanisms for responding to dust-related complaints.

The following dust deposition monitoring sites would be monitored on a monthly basis (Figure 5-1):

- DG3 – Close dwelling;
- DG4 – Robinson dwelling;
- DG5 – St Laurence O'Toole Catholic Church;
- DG7 – Helm dwelling;
- DG8 – Ulan Coal Mines-owned dwelling;
- DG9 – McKinna dwelling;
- DG10 – Bailey dwelling; and
- DG11 – Smith dwelling.

In addition, the Aboriginal Cultural Heritage Assessment (Appendix F) recommended that dust deposition monitoring be undertaken at three of the identified Aboriginal rock art sites. Accordingly, dust deposition gauges would be installed adjacent to Aboriginal rock art sites 72 (site DG12), 153 (site DG13) and 152 (site DG14) (Figure 5-1) and monitored monthly when mining operations are within 1 km of these sites.

The dust deposition gauges would be analysed for ash content and insoluble solids in accordance with AS 3580.10.1-1991 *Methods for Sampling and Analysis of Ambient Air – Determination of Particulates – Deposited Matter – Gravimetric Method*.

The existing high volume sampler at the St Laurence O'Toole Catholic Church (HV1) would be retained for monitoring (Figure 5-1). Two additional high volume samplers would be installed at the Smith and Close dwellings (HV2 and HV3a, respectively) (Figure 5-1). As the open cut progresses into Pit 5 during Year 13, the high volume sampler at HV3a would be relocated to the Helm dwelling (HV3b) (Figure 5-1) to maintain an appropriate offset distance from the dust source (i.e. to ensure that data obtained from this high volume sampler is representative of air quality to the west of the Project area).

Table 5-3
Overview of the Project Environmental Monitoring Programme

Monitoring Focus	Section	Proposed Monitoring Sites	Proposed Frequency
Meteorology <ul style="list-style-type: none"> Temperature. Humidity. Net solar radiation. Rainfall. Wind speed and direction. Sigma theta.¹ 	5.1.3.1	<ul style="list-style-type: none"> Automated meteorological station. 	<ul style="list-style-type: none"> Continuous.
Air Quality <ul style="list-style-type: none"> Dust deposition. High volume sampling (PM₁₀). 	5.1.3.2	<ul style="list-style-type: none"> DG3, DG4, DG5, DG7 to DG11. DG12, DG13 and DG14 at Aboriginal rock art sites. HV1, HV2, HV3a and HV3b. 	<ul style="list-style-type: none"> Monthly. Monthly (when mining within 1 km). Continuous six day cycle.
Noise <ul style="list-style-type: none"> Attended and unattended noise monitoring. 	5.1.3.3	<ul style="list-style-type: none"> N6, N7, N9, N10, N11, N12 and N13. 	<ul style="list-style-type: none"> Quarterly.
Blasting <ul style="list-style-type: none"> Ground vibration and airblast overpressure. Ground vibration. 	5.1.3.4	<ul style="list-style-type: none"> BM1, BM2, BM3, BM4 and BM5. V1, V2 and V3 at Aboriginal rock art sites. 	<ul style="list-style-type: none"> Every blast (when blasting within 3 km of the site). Every blast (when blasting within 1 km of the site).
Erosion and Sediment Control	5.1.3.5	Sediment control structures.	Inspected monthly and following significant rainfall events (i.e. greater than 20 mm in 24 hours).
Surface Water Quality <ul style="list-style-type: none"> pH, electrical conductivity (EC), total dissolved solids (TDS), total suspended solids (TSS) and sulphate (SO₄). EC. pH and EC. 	5.1.3.6	<ul style="list-style-type: none"> WIL(U), WIL(D), CC1 to CC3, WOL1 and WOL2. Wilpinjong Creek and Cumbo Creek gauging stations. Drainage from active tailings disposal areas (decant water). 	<ul style="list-style-type: none"> Monthly and following significant rainfall events (i.e. greater than 20 mm in 24 hours). Continuous. Monthly.
Surface Water Level/Flow <ul style="list-style-type: none"> Flow rate. 	5.1.3.6	<ul style="list-style-type: none"> Wilpinjong Creek and Cumbo Creek gauging stations, and drainage from active tailings disposal areas (decant water). 	<ul style="list-style-type: none"> Continuous.
Groundwater <ul style="list-style-type: none"> Water level, pH and EC. Volume of water extracted. Sodium (Na), magnesium (Mg), calcium (Ca), chloride (Cl), carbonate (HCO₃), SO₄ and total iron (Fe). 	5.1.3.7	<ul style="list-style-type: none"> GWa1 to GWa6, GWc1 to GWc3, GWs1 to GWs19 (i.e. sites along Wilpinjong and Cumbo Creeks). GWa7, GWc4 and GWc5 (i.e. sites along Wollar Creek and in Wollar Village). GWs1 to GWs19. GWa1 to GWa7 and GWc1 to GWc5. 	<ul style="list-style-type: none"> Monthly. Quarterly. Monthly. Bi-annually.
Aquatic Biology	5.1.3.8	Wilpinjong and Cumbo Creeks.	In accordance with the FFMP and the CCRP.
Weeds and Animal Pests	5.1.3.9	WCPL-owned land.	In accordance with the WAPCP.
Traffic Flows	5.1.3.10	Representative locations on Wollar Road and Ulan-Wollar Road.	In accordance with the TMP.

¹ Sigma theta is the rate of change of wind direction.

The high volume samplers would monitor PM₁₀ over a six day continuous cycle in accordance with the *Approved Methods for the Sampling and Analysis of Air Pollution in New South Wales* (EPA, 2001).

The results of the air quality monitoring programme would be used to manage dust emission controls, validate predictions made in the EIS and would be reported in the AEMR.

5.1.3.3 Noise

The Project noise monitoring programme would comprise quarterly unattended and attended monitoring. Noise would be monitored at the following locations (Figure 5-1):

- N6 – St Laurence O’Toole Catholic Church;
- N7 – Smith dwelling;
- N9 – Bailey dwelling;
- N10 – Robinson dwelling;
- N11 – Helm dwelling;
- N12 – Ulan Coal Mines-owned dwelling; and
- N13 – Close dwelling.

Noise monitoring would be conducted in accordance with AS 1055-1997 *Acoustics – Description and Measurement of Environmental Noise* and the NSW INP (EPA, 2000).

The monitoring programme would incorporate mechanisms for responding to noise-related complaints. The results of the noise monitoring programme would be used to optimise noise emission controls, validate EIS predictions and would be reported in the AEMR.

5.1.3.4 Blasting

Ground vibration and airblast overpressure would be monitored at the following sites (where relevant) for each blast event conducted within 3 km of the site (Figure 5-1):

- BM1 – Robinson dwelling;
- BM2 – Bailey dwelling;
- BM3 – Smith dwelling;
- BM4 – Close dwelling; and
- BM5 – Helm dwelling.

Vibrational peak particle velocity (mm/s) and air blast overpressure (dBL [Peak]) would be measured in accordance with AS 2187.2-1993 *Explosives – Storage, Transport and Use – Use of Explosives*. The monitoring programme would incorporate mechanisms for responding to blast-related complaints.

In addition, the Aboriginal Cultural Heritage Assessment (Appendix F) recommended that ground vibration monitoring be undertaken at three of the identified Aboriginal rock art sites. Accordingly, ground vibration monitoring would be undertaken adjacent to Aboriginal rock art sites 72 (site V1), 153 (site V2) and 152 (site V3) (Figure 5-1) for any blast that is conducted within 1 km of the site.

5.1.3.5 Erosion and Sediment Control

WCPL would conduct monthly inspections of all operational erosion and sediment control structures. Inspections of erosion and sediment control structures would also be conducted following significant rainfall events (i.e. greater than 20 mm in 24 hours).

The structures would be assessed for structural stability and effectiveness in controlling erosion and sediment migration. Appropriate remedial works would be implemented as required.

5.1.3.6 Surface Water

An outline of the surface water monitoring programme is provided in Table 5-3 and described below.

Surface Water Quality

The surface water monitoring programme for the Project would include monthly sampling at a network of surface water quality monitoring sites on Wilpinjong Creek, Cumbo Creek and Wollar Creek. Creek water quality samples would be analysed for a range of parameters including pH, electrical conductivity (EC), total dissolved solids (TDS), total suspended solids (TSS) and sulphate (SO₄). Significant rainfall events (i.e. greater than 20 mm in 24 hours) would also trigger surface water quality sampling of Wilpinjong, Cumbo and Wollar Creeks.

Monitoring of EC would also be conducted on a continuous basis at installed gauging stations on Wilpinjong and Cumbo Creeks (Figure 5-1).

The quality of drainage (pH and EC) from active tailings disposal areas (i.e. decant water) would also be monitored monthly.

Surface Water Level/Flow

Surface water flow rate (via water level) would be monitored continuously at installed gauging stations on Wilpinjong and Cumbo Creeks (Figure 5-1). Surface water flow from active tailings disposal areas (i.e. decant water) would also be monitored continuously.

The site water balance would be reviewed annually to optimise performance and validate predictions. These reviews would be linked to borefield performance reviews. The reviews would also facilitate the preparation of contingency/remediation plans for managing adverse impacts of the Project on surface water, where necessary (Section 5.1.2.4).

5.1.3.7 Groundwater

The borefield monitoring programme would be developed and detailed in the WSBP (Section 5.1.2.5). Data collected by the programme would provide input to borefield performance reviews and enable verification and refinement (where necessary) of the groundwater modelling results (Appendix B).

The following sites would be monitored by the programme (Figure 5-1):

- four alluvium bores (and two coal measure bores) along Wilpinjong Creek (sites GWA1 to GWA4, GWC1 and GWC2);
- two alluvium bores (and one coal measure bore) along Cumbo Creek (sites GWA5, GWA6 and GWC3);
- one coal measure bore along Wollar Creek (site GWC4);
- one alluvium bore (and one coal measure bore) in Wollar Village (sites GWA7 and GWC5); and
- 19 water supply bores (sites GWS1 to GWS19).

Monitoring of water level, pH and EC would be conducted on a monthly basis at the alluvium, coal measure and water supply bores along Wilpinjong and Cumbo Creeks and quarterly at the alluvium and coal measure bores along Wollar Creek and in Wollar Village. The volume of water extracted from water supply bores GWS1 to GWS19 would also be monitored monthly. The following suite of groundwater quality parameters would be analysed bi-annually for the alluvium and coal measure bores shown on Figure 5-1: sodium (Na); magnesium (Mg); calcium (Ca); chloride (Cl); carbonate (HCO_3); sulphate (SO_4); and total iron (Fe).

In addition to the above, groundwater monitoring would be undertaken at selected existing bores surrounding the Project area, in consultation with relevant landowners.

Groundwater monitoring, water level measurements and sample collection, storage and transportation would be undertaken in accordance with the procedures outlined in the *Murray Darling Basin Groundwater Quality Sampling Guidelines* (Murray Darling Basin Commission, 1997). Bore licences would be obtained from DIPNR prior to the installation of any of the abovementioned monitoring bores that are not currently developed.

5.1.3.8 Aquatic Biology

An aquatic monitoring programme would be developed to monitor the aquatic macroinvertebrate assemblages, *in-situ* water quality, characteristics and health of Wilpinjong and Cumbo Creeks. The ecological integrity of the Cumbo Creek relocation would also be monitored. The components of the aquatic monitoring programme would be detailed in either the FFMP or CCRP.

Consideration would also be given to monitoring creek features established in the final landforms later in the Project life to assess their provision of habitat for aquatic biota.

5.1.3.9 Weeds and Animal Pests

Regular inspections would be conducted of WCPL-owned land to detect areas that require the implementation of weed or animal pest management strategies in accordance with the WAPCP (Section 5.1.2.8).

5.1.3.10 Traffic Flows

Periodic monitoring of traffic flows on Wollar Road and Ulan-Wollar Road would be undertaken during the Project life to assess the contribution of the Project to local traffic flows. The frequency and locations of traffic flow monitoring would be detailed in the TMP (Section 5.1.2.9).

5.2 REHABILITATION AREAS

The proposed concepts for the rehabilitation and revegetation of areas to be disturbed by the Project are outlined below. As a prescribed condition under the *Mining Act, 1992*, rehabilitation is subject to regulatory authority agreement and approval.

5.2.1 Principles and Objectives

The following principles form the basis for Project rehabilitation planning and design:

- Integration of open cut mining and rehabilitation planning to minimise the area of disturbance at any one time.
- Progressive rehabilitation of disturbed areas, including partial rehabilitation of temporarily inactive mine waste rock emplacements.
- Creation of post-mining landforms that enhance the amenity of the local landscape and contribute to local and regional habitat corridors.
- Consideration of issues of public safety in the design of final landforms.
- Consultation with relevant authorities and stakeholders (e.g. DPI, DIPNR, DEC, MWRC and the Project CCC).
- Implementation of trials and design studies as necessary to maximise effectiveness of the rehabilitation programme.
- Routine monitoring to track the progression of the rehabilitation areas.

Rehabilitation objectives for the Project are as follows:

- To create safe, stable, adequately drained post-mining landforms that are consistent with the local surrounding landscape.
- To produce a net increase in woodland vegetation.

- To increase the continuity of woodland vegetation by establishing links between woodland vegetation in the rehabilitation areas, regeneration areas and existing remnant vegetation in the Munghorn Gap Nature Reserve, Goulburn River National Park and ECAs.
- To preserve the existing beneficial use of water resources.

5.2.2 Planning

Planning activities would encompass:

- the production and periodic updating of rehabilitation plans as part of the MOP (Section 5.1.1.1);
- the preparation and revision of goals and corresponding budgets by a site team that includes senior management representatives;
- the development of implementation schedules and specific "domain" based rehabilitation plans to guide the execution of the rehabilitation works; and
- annual reporting in the AEMR (Section 5.1.1.2).

5.2.3 Erosion and Sediment Control

As described in Section 5.1.2.2, an ESCP would be developed in consultation with relevant authorities prior to the commencement of vegetation clearance and soil stripping activities. The ESCP would address erosion and sediment control requirements for Project landforms until the landforms are stabilised.

5.2.4 Soil Removal, Handling and Replacement

As described in Section 2.4.4, topsoil and subsoil resources would be identified, stripped and wherever practicable, spread directly onto areas prepared for rehabilitation. Where direct spreading is not practicable, the stripped soil would be stockpiled and seeded with grasses to maintain soil viability prior to being re-spread.

Details of soil management strategies and practices including the methodology and timing of implementation would be included in the MOP (Section 5.1.1.1) and would address the components listed in Table 5-4.

Table 5-4
Soil Resource Management Strategies

Prior to Soil Stripping	During Soil Stripping and Stockpiling	Stockpiled Soil Awaiting use in Rehabilitation Works
<ul style="list-style-type: none"> Quantification of soil resources. Characterisation of the suitability of soil resources for rehabilitation works. Formulation of stripping and stockpiling guidelines including the nomination of appropriate depths, scheduling, location of areas to be stripped and stockpile locations. 	<ul style="list-style-type: none"> Minimisation of vegetation clearance. Selective stockpiling of soil according to soil type and salinity. Stockpiling of soils in a manner that does not compromise the long-term viability of the soil resource. 	<ul style="list-style-type: none"> Implementation of measures to ensure long-term viability of soil resources and manage soil salinity (Section 4.1).

Source: after Appendix M

Once completed mine landforms have been re-profiled, stripped subsoil and topsoil would then be spread to assist in vegetation establishment. If topsoil resources are unavailable or unsuitable, additional topsoil material would be stripped from disturbance areas where red podzolic soils occur (up to a further 30 cm – Appendix M) for use in rehabilitation works. Appropriate ameliorative measures (as described below) would also be applied where necessary.

Following soil application, the rehabilitation area would be shallow ripped with a chisel plough or similar implement to encourage infiltration, increase the volume of soil readily accessible to plant roots and to bind the topsoil/subsoil to underlying mine waste rock material.

WCPL would develop management strategies to ameliorate mine waste rock/soil materials used in rehabilitation where necessary. These ameliorative measures may include the use of lime, gypsum and/or fertiliser to improve the chemical and/or nutrient properties of the soil.

5.2.5 Revegetation

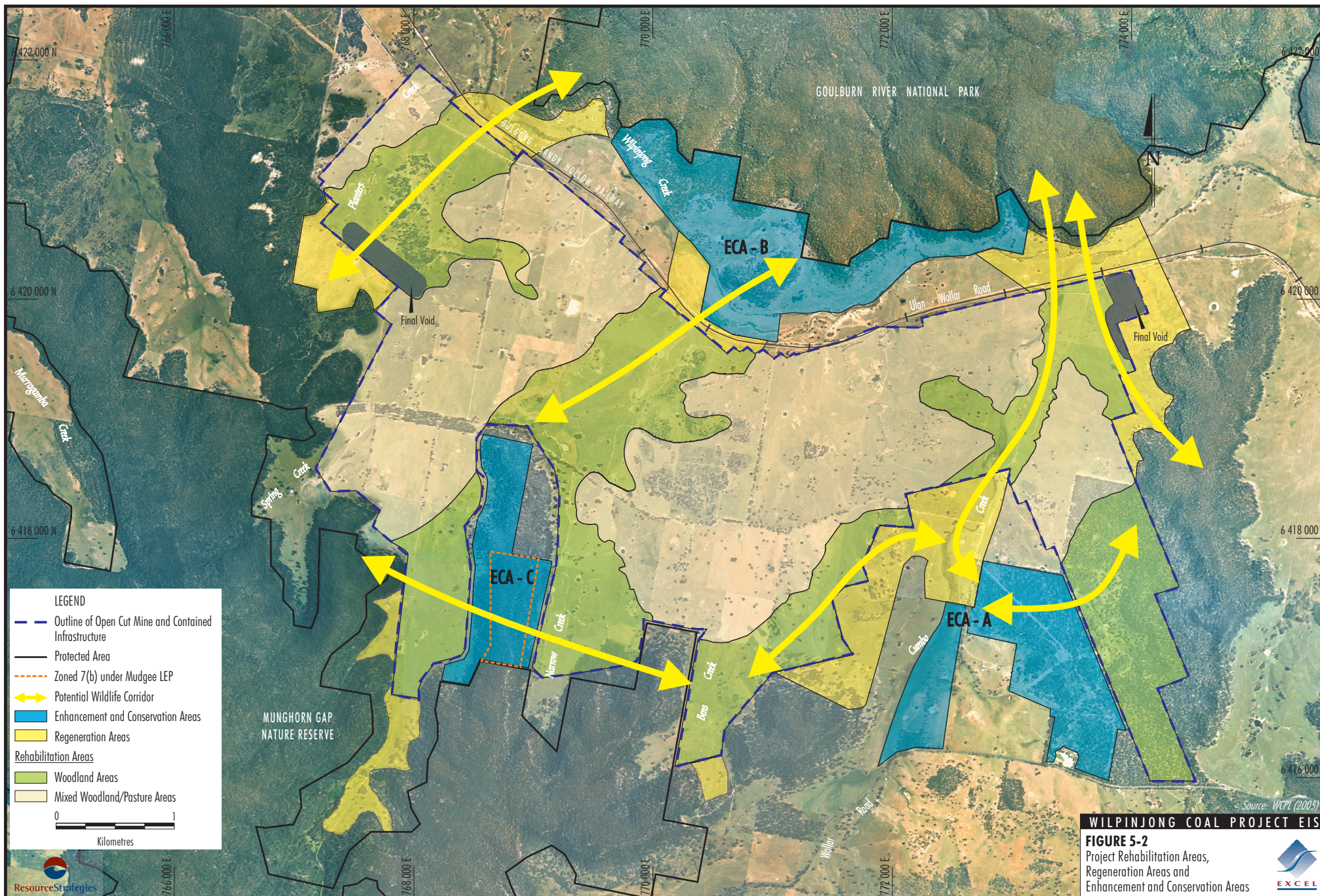
On completion of landform contouring, topsoiling and erosion and sediment control works, a vegetative cover would be applied as soon as practicable. Depending on the proposed post-mining landuse, this would involve sowing cover pasture species and seeding and planting of selected shrub and tree species.

Where rehabilitation areas are to be seeded, a suitable seedbed would be prepared using appropriate equipment to increase the chances for successful seedling establishment. Where necessary, pasture seed would be sowed with fertiliser. Areas seeded may be lightly scarified to assist shallow seed burial. Both seeding and direct planting techniques would be utilised for tree and shrub species. Seeding and planting activities would take into account seasonal factors and would be scheduled, where possible, prior to the expected onset of reliable rains.

Revegetation of Project disturbance areas would be conducted progressively as mining proceeds, with coal removal and the formation of final (i.e. completed mine waste rock emplacements) landforms behind the advancing face of the open cut. Rehabilitation and revegetation of infrastructure areas would also be undertaken progressively as infrastructure is decommissioned.

The revegetation programme for Project rehabilitation areas provides for a combination of woodland areas and mixed woodland/pasture areas, as described below and shown on Figure 5-2.

The revegetation programme for Project rehabilitation areas would establish some 850 ha of woodland vegetation over the long-term, and in association with the establishment of woodland vegetation in the regeneration areas (Section 5.3) and ECAs (Section 5.4), would contribute to an overall net increase in woodland vegetation of some 1,095 ha.



WILPINJONG COAL PROJECT EIS

FIGURE 5-2
Project Rehabilitation Areas,
Regeneration Areas and
Enhancement and Conservation Areas



In recognition of the importance of vegetation corridors to regional biodiversity, the rehabilitation programme has been designed to link the revegetated woodland areas to the regeneration areas or existing remnant vegetation (Figure 5-2).

Woodland Areas

The revegetation programme would aim to establish floristic diversity within the woodland areas. The revegetation programme would include the use of endemic plant species, characteristic of the vegetation communities to be disturbed by the Project. A proposed list of species for the woodland areas is provided in Table 5-5. Revegetation of the woodland areas would include the planting of species characteristic of the WBYBBRG EEC (e.g. White Box [*Eucalyptus albens*], Yellow Box [*E. melliodora*] and Blakely's Red Gum [*E. blakelyi*]).

Mixed Woodland/Pasture Areas

The areas proposed to contain a mixture of woodland and pasture (Figure 5-2) would be rehabilitated in a manner that results in patches of woodland within the pasture areas. Woodland vegetation would be revegetated with similar species to that described for the woodland areas above (Table 5-5).

The pasture areas would be revegetated using either native and/or improved pasture species. A proposed list of native grasses that could potentially be used in the revegetation of mixed woodland/pasture areas is provided in Table 5-5. Rehabilitation of the pasture areas would be conducted in consideration of guidelines such as those presented in the *Rehabilitation of Open Cut Coal Mines using Native Grasses: Management Guidelines* (DLWC, 2003) and of species which are commercially available.

Creek Features

The riparian zone of the permanent creek features formed within rehabilitation areas shown on Figure 4-1 would be revegetated. The revegetation programme would include the use of native flora species such as those included in Table 5-5 (e.g. *C. cunninghamiana*). Further detail on the revegetation of Cumbo Creek within Project disturbance areas is outlined in Section 5.1.2.6.

5.2.6 Replacement of Aboriginal Objects

In accordance with the ACHMP (Section 5.1.2.10), Aboriginal objects collected and temporarily stored in the "Keeping Place" would be replaced within rehabilitation areas in consultation with local Aboriginal groups and the DEC.

5.2.7 Studies and Trials

On-going site specific trials and studies would be conducted to examine options and to optimise revegetation techniques.

These trials and studies would be undertaken over the Project life and may include:

- revegetation trials addressing plant species selection;
- geochemical and physical evaluation of mine waste rock characteristics that may influence plant growth;
- trials of various surface treatments on mine waste rock emplacements to aid revegetation including the application of varying depths of subsoil and topsoil over mine waste rock and the applicability of these methods for the establishment of woodland vegetation;
- investigation of the effectiveness of direct seeding and manual planting techniques on various substrates and Project landforms;
- assessment of the efficiency of native grass, shrub and tree seed harvesting techniques; and
- examination of the application of fertilisers and herbicides during revegetation.

Proposed trials and studies would be outlined in the MOP (Section 5.1.1.1) with results reported in the AEMR (Section 5.1.1.2) as part of the MREMP.

5.2.8 Final Landform Design

Final landform concepts discussed in this section would be revised and refined throughout the Project life, utilising the outcomes of on-going consultation with relevant authorities, stakeholders and the results of trials.

Final landform design concepts would remain consistent with the objectives presented in Section 5.2.1.

Table 5-5
Proposed List of Native Species to be used in Revegetation

Scientific Name	Common Name
Trees	
<i>Allocasuarina luehmannii</i>	Bulloak
<i>Allocasuarina verticillata</i>	Drooping Sheoak
<i>Casuarina cunninghamiana</i>	River Oak
<i>Angophora floribunda</i>	Rough-barked Apple
<i>Eucalyptus albens</i>	White Box
<i>Eucalyptus blakelyi</i>	Blakely's Red Gum
<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark
<i>Eucalyptus melliodora</i>	Yellow Box
<i>Eucalyptus moluccana</i>	Grey Box
Shrubs	
<i>Acacia implexa</i>	Hickory Wattle
<i>Acacia decora</i>	Western Silver Wattle
<i>Acacia ulicifolia</i>	Prickly Moses
Grasses and Herbs	
<i>Austrodanthonia</i> sp.	A Wallaby Grass
<i>Themeda australis</i>	Kangaroo Grass
<i>Poa labillardieri</i>	Tussock Grass
<i>Austrostipa scabra</i>	Speargrass
<i>Austrostipa verticillata</i>	Slender Bamboo Grass
<i>Dichelachne micrantha</i>	Shorthair Plumegrass
<i>Elymus scaber</i>	Common Wheatgrass
<i>Lachnagrostis filiformis</i>	Blown Grass
<i>Aristida ramosa</i>	Wiregrass
<i>Bothriochloa macra/decipiens</i>	Redgrass/Pitted Bluegrass
<i>Chloris truncata</i>	Windmill Grass
<i>Chloris ventricosa</i>	Tall Windmill Grass
<i>Cymbopogon refractus</i>	Barbed Wire Grass
<i>Digitaria brownii</i>	Cotton Panic Grass
<i>Digitaria divaricatissima</i>	Umbrella Grass
<i>Eriochloa pseudoacrotricha</i>	Early Spring Grass
<i>Panicum effusum</i>	Hairy Panic

Final landform levels and slope would approximate the pre-mining topography (Figure 4-1). Final landforms would be designed with an allowance for the long-term settlement of mine waste rock and tailings. A final void would be located at the north-eastern extent of the final landform and another at the western extent.

Final landform drainage would be designed to integrate with the surrounding catchment and would include some permanent creek features formed within rehabilitation areas in locations similar to current creek lines (e.g. Planters Creek). The progressive development of the final landform over the Project life is shown on Figures 2-4 to 2-11 and creek features are shown on Figure 4-1.

Figures 5-2 and 5-3 illustrate the revegetation concepts for the final landforms. The revegetation concepts propose a balanced outcome recognising the alternative landuses that exist in the region, with the aim of establishing the potential for both sustainable agriculture and areas of woodland vegetation.

5.2.8.1 Mine Waste Rock Emplacements

Mine waste rock emplacements would cover an area of approximately 1,800 ha. Where long slopes are present, contour drains or deep staggered rips would be established to assist in initial surface stabilisation.

The surface of mine waste rock emplacements would be constructed to approximate (where practicable) the existing topographic form of the shallow valleys which drain the Project area. Mine waste rock emplacement surfaces would be formed to enhance rainfall absorption. Regular slopes and sharp transition angles would be varied and rounded to provide a more natural appearance.

A pattern of creek features (flow paths) would be formed over the final landforms comparable to the pre-mine regime. These reconstructed creek features would convey upslope runoff across the Project area to Wilpinjong Creek.

Revegetation of the mine waste rock emplacements is described in Section 5.2.5. A conceptual cross-section of a portion of the revegetated final landform is provided on Figure 5-4.

5.2.8.2 Tailings Disposal Areas

A description of tailings disposal methods is provided in Section 2.8.3. Completed tailings disposal areas would be decommissioned through a capping process in order to create a landform that is stable and can be rehabilitated and revegetated in the same manner as the mine waste rock emplacements described above.

Unless justified otherwise on the basis of tailings cover trials conducted during the life of the Project, a minimum 2 m cover layer would be used to restrict oxygen and water ingress to underlying tailings and prevent salts from rising to the soil surface.

The final cover design for the tailings disposal areas would be developed in consultation with the DPI. The cover design would consider site topography, prevailing climatic conditions and the availability of suitable fine textured material (e.g. highly weathered mine waste rock) as a cover material.

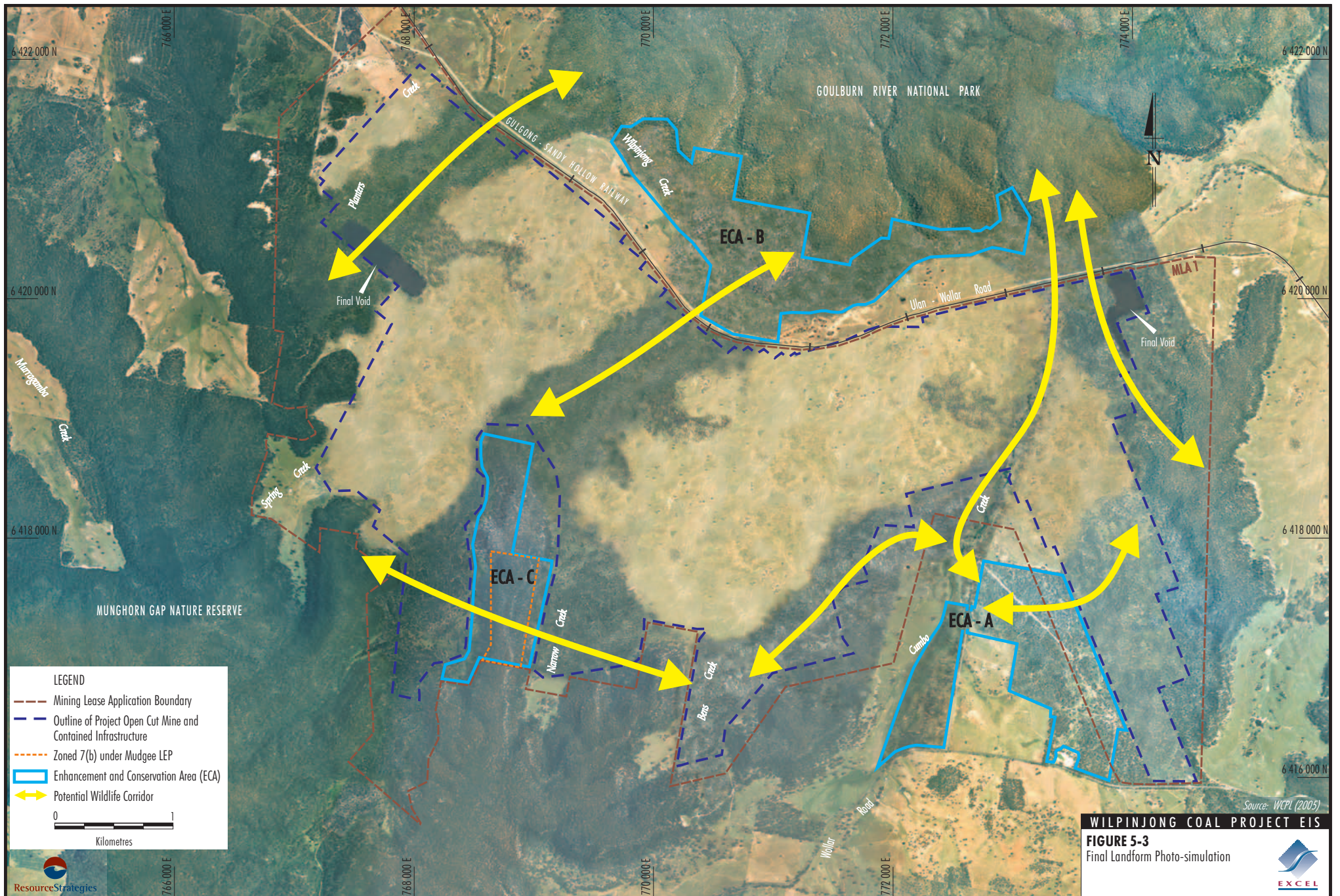
5.2.8.3 Surface Infrastructure

Infrastructure with no on-going beneficial use would be removed from the site at the completion of the Project. Foundation slabs of certain buildings may be retained for suitable end-use goals in agreement with relevant authorities and stakeholders. Alternatively, they would be excavated for disposal or buried in a void in an approved manner.

Process reagents and fuels unused at the completion of mining would be returned to the supplier in accordance with relevant safety and handling procedures.

Foundation soils would be chemically tested, contour ripped and chemically ameliorated, as required (in accordance with DEC requirements). Stockpiled soils would then be applied as necessary and stabilised. Revegetation would be undertaken with suitable native tree species or native/introduced pastures, consistent with the revegetation programme (Section 5.2.5).

Roads that have no specific post-mining use would be ripped, topsoiled and revegetated. Some access roads may be retained post-mining to enable access for use in bushfire and other land management activities.



Water management structures and sediment control structures would either be retained as water sources or decommissioned and rehabilitated.

5.2.8.4 Final Voids

At the completion of mining, the final landform would include two final voids (Figure 5-2).

Mine planning would target minimising the size of the final voids. The final surface catchment of the final voids would also be minimised by the use of contour landforms.

Perimeter bunding would be formed around the final voids in order to restrict access to steeper slopes. Any further final void access restrictions (e.g. fencing) for safety and exclusion of livestock would be designed and implemented in consultation with relevant authorities.

As described in Section 5.1.2, a FVMP would be developed as a component of the MCP in advance of mine closure and decommissioning in consultation with relevant authorities. Further details are provided in Section 5.5.

5.2.9 Monitoring, Maintenance and Reporting

Rehabilitation areas would be fenced to prevent the uncontrolled entry of livestock and to minimise vehicular traffic during the initial establishment phase.

Monitoring of rehabilitation areas would be conducted on a regular basis to ensure that the rehabilitation objectives are being achieved and to identify areas requiring maintenance works in order to maintain rehabilitation progress.

Routine monitoring of rehabilitation areas would include:

- checking soil erosion status and the effectiveness of erosion and sediment control measures (as part of erosion and sediment control monitoring – Section 5.1.3.5);
- monitoring mine landform runoff water quality (as part of the surface water monitoring programme – Section 5.1.3.6);
- monitoring establishment of vegetation; and

- identification of the presence of weeds or animal pests (as part of the weed and animal pest monitoring – Section 5.1.3.9).

Based on the monitoring results, maintenance works/contingency measures may include:

- repair of erosion (i.e. re-grading of eroded areas);
- repair of drainage paths and de-silting of sediment control structures;
- re-seeding or re-planting;
- application of fertiliser;
- application of lime or gypsum to control pH and improve soil structure;
- watering of drier rehabilitation areas during the initial vegetation establishment phase; and
- implementation of weed and animal pest control measures.

Monitoring and maintenance activities would be ongoing with the results assessed and utilised in the refinement of rehabilitation techniques.

Rehabilitation maintenance activities and rehabilitation progress would be reported in the AEMR (Section 5.1.1.2).

Revegetation Performance

As described above, visual monitoring of revegetation would be conducted on a regular basis to ensure vegetation is establishing and to determine the need for any maintenance and/or contingency measures (such as the requirement for supplementary plantings, erosion control and/or weed control).

The quality of rehabilitation (i.e. woodland areas including riparian vegetation) would be monitored using Ecosystem Function Analysis (EFA) or a similar systems-based approach. An overview of the EFA method is provided below as a general guide to the proposed approach to monitoring. EFA is a CSIRO developed method used to provide indicators of rehabilitation success and allows the assessment of ecosystem sustainability through the plotting of development trajectories. EFA aims to measure the progression of rehabilitation towards a self-sustaining ecosystem through the assessment of landscape function, vegetation dynamics and habitat complexity.

A number of permanent transects would be established in the rehabilitation areas. Corresponding transects would also be established in reference/analogue sites. The reference/analogue sites would provide data on the long-term goal for the rehabilitation areas. The information obtained would be used to track the revegetation progress, predict self-sustainable values and compare the rehabilitation areas with the reference/analogue sites.

The three components of EFA, viz. Landscape Function Analysis (LFA), Vegetation Dynamics and Habitat Complexity, are described below.

The LFA component of EFA provides an effective quantitative tool for management and monitoring. Data recorded as part of LFA monitoring is based on landscape processes and focuses on the dynamics of resource mobilisation, transport, deposition, utilisation and loss of soil condition. Parameters assessed as part of LFA monitoring typically include:

- soil cover;
- perennial grass basal cover and canopy cover;
- litter cover, origin and incorporation;
- cryptogam cover;
- crust condition;
- erosion type and severity;
- amount of deposited material;
- microtopography (surface roughness);
- surface resistance to disturbance; and
- soil type (slake and texture tests).

Data obtained for the parameters listed above provide useful information on soil stability (ability of the soil to withstand erosive forces and to reform after disturbance), infiltration/runoff (water availability for plants and material transport) and nutrient cycling (how effectively organic matter is cycled back into the soil). The functional status of the landscape can then be assessed.

The data collected by the LFA method has a predictive capacity when regular monitoring provides a time series record of ecosystem change or development.

The data can be used to determine whether the revegetation/rehabilitation area is on a trajectory toward becoming a self-sustaining ecosystem or whether further maintenance or remedial measures are required. Information obtained for soil stability, infiltration/runoff and nutrient cycling also provides an indication of what maintenance or remedial measures may be required.

The Vegetation Dynamics component of EFA provides a quantitative assessment of species composition, density and cover using either the Point Centred Quarter or Wandering Quarter techniques.

The Habitat Complexity component provides an index of the development of available habitats (e.g. shade, shelter and food resources) for fauna and includes rapid assessment measurements of vegetation cover, ground habitat (e.g. litter, logs, rocks) and the availability of water. The monitoring of habitat complexity is based on the assumption that more environmental niches for fauna develop as the diversity of vegetation and ground cover increases. Habitat complexity is assessed on the basis of five features: tree canopy cover; shrub canopy cover; ground vegetation cover; the amount of litter, fallen logs and rocks; and free water availability/soil moisture.

A number of flora survey quadrats would also be sampled to obtain additional flora data to that obtained by the Vegetation Dynamics component of EFA. The flora survey quadrats would be established in rehabilitation areas and at reference/analogue sites. The survey parameters would include flora species diversity and abundance. Consideration would also be given to monitoring fauna species usage of the rehabilitation areas.

The monitoring of revegetation performance in the rehabilitation areas would be detailed in the FFMP. Completion criteria for the rehabilitation areas are outlined in Section 5.5.2.

5.3 REGENERATION AREAS

Regeneration areas would be established on areas of WCPL-owned land situated proximal to the Project disturbance areas/rehabilitation areas as shown on Figure 5-2. These areas contain predominantly cleared agricultural land. Woodland vegetation would be established in the regeneration areas through natural regeneration and selective planting.

Consultation was undertaken with DIPNR in February 2005 regarding the Project regeneration areas (in association with consultation on the rehabilitation areas and ECAs). As a result of the consultation, regeneration areas were provided to the north-east of the Project to provide a woodland corridor between Goulburn River National Park and the remnant to the east. Regeneration areas were also provided to the south-east of the Project to provide a woodland corridor between ECA-A and the remnant vegetation adjoining Munghorn Gap Nature Reserve (Figure 5-2). Project regeneration areas (in association with the rehabilitation areas and ECAs) were subsequently presented to the DEC during a consultation meeting in March 2005.

Some 350 ha of woodland vegetation would be established in the regeneration areas over the long-term, and in association with the revegetation of Project disturbance areas (Section 5.2) and the establishment of woodland vegetation in the ECAs (Section 5.4), would contribute to an overall net increase in woodland vegetation of some 1,095 ha. The regeneration areas have been positioned to adjoin areas of existing remnant vegetation (i.e. Munghorn Gap Nature Reserve, Goulburn River National Park and the ECAs) and woodland rehabilitation areas, in order to increase the continuity of woodland vegetation in the region.

The establishment of woodland vegetation in the regeneration areas would include the revegetation of banks of Wilpinjong and Cumbo Creeks. The revegetation of the creek banks would include native flora species such as *Casuarina cunninghamiana* and would increase the quantity of riparian vegetation along these creeks.

Regeneration Performance

The quality of the woodland areas (including riparian vegetation) established in the regeneration areas would be monitored using the techniques described in Section 5.2.9 for the rehabilitation areas, namely, visual inspections, EFA and flora survey quadrats. Consideration would be given to monitoring fauna usage of the regeneration areas.

Management and monitoring of the regeneration areas would be described in the FFMP. Completion criteria for the regeneration areas are outlined in Section 5.5.2.

5.4 ENHANCEMENT AND CONSERVATION AREAS

Three ECAs would be established by the Project, namely, ECA-A, ECA-B and ECA-C (Figure 5-2). The ECAs cover a total area of approximately 480 ha. A portion of ECA-C includes WCPL-owned lands zoned as Zone 7(b) under the Mudgee LEP (Figure 5-2). Works within this area would be constrained to that permitted by the Mudgee LEP.

Consultation in regard to the ECAs was undertaken with DIPNR and DEC in February and March 2005, respectively. This consultation resulted in the expansion of the ECAs. Consultation in regard to the ECAs has also been undertaken with Aboriginal stakeholders. The Mudgee Local Aboriginal Land Council and Warrabinga Native Title Claimants Aboriginal Corporation have expressed support for the establishment of the ECAs (Appendix F).

The ECAs are situated on areas of WCPL-owned land which contain remnant vegetation and proximal grazing land, as well as known and potential Aboriginal cultural heritage sites.

The Aboriginal cultural heritage survey conducted within the ECAs has demonstrated that ECA-B and ECA-C contain Aboriginal archaeological sites of conservation value. In addition, ECA-A includes an area of the Cumbo Creek riparian corridor that is expected to have potential to contain large artefact scatters and *in-situ* deposits (Appendix F). The local Aboriginal community believe these areas provide a valuable opportunity to conserve a sample of sites from the Project area (Appendix F). Management of Aboriginal cultural heritage sites in the ECAs would be detailed in the AHCMP.

Specific flora and fauna attributes of each ECA are summarised in Tables 4-12 and 4-13 (Sections 4.7 and 4.8), respectively. The general flora and fauna attributes of the ECAs include:

- existing vegetation remnants (some 295 ha) (Figure 3-7), including some 80 ha of the WBYBBRG EEC that would be subject to enhancement and conservation;
- areas of predominantly cleared grazing land (some 185 ha – Figure 3-7), available for the establishment of woodland vegetation through natural regeneration/selective planting;
- the opportunity to establish some 50 ha of the WBYBBRG EEC in the areas comprising cleared grazing land. Potential constraints associated with the establishment of the WBYBBRG EEC in the ECAs are reduced by the occurrence of existing remnants of the WBYBBRG EEC in the ECAs (which would provide a source of seed) and the occurrence of similar landforms in areas of cleared grazing land which would have similar hydrology and soil types to the existing EEC remnants;
- known and potential habitat for threatened fauna species (e.g. Regent Honeyeater, Hooded Robin, Diamond Firetail, Brown Treecreeper, Large-eared Pied Bat, Little Bentwing Bat, Large Bentwing Bat, East-coast Freetail Bat and Yellow-bellied Sheathtail Bat);
- the opportunity to establish riparian vegetation along Wilpinjong and Cumbo Creeks through natural regeneration/selective planting (approximately 4 km of Wilpinjong Creek is situated within ECA-B and approximately 1.25 km of Cumbo Creek is situated within ECA-A as shown on Figure 5-2); and
- similar landforms to those represented within the Project disturbance area.

Further to the above, two of the three ECAs are located on the margins of Goulburn River National Park or Munghorn Gap Nature Reserve, which is considered beneficial in terms of the strategic role of the ECAs in the region.

The establishment and management of the ECAs would be documented in the FFMP. 'Enhancement' of the ECAs would be achieved by the implementation of appropriate land management practices such as weed and animal pest control, management of livestock access to encourage natural regeneration, and selective planting, as described in Section 5.1.2.7.

'Conservation' of the ECAs would be achieved through a rezoning application. WCPL would:

- conserve and manage the land in the ECAs in accordance with the FFMP;
- apply to rezone the land in the ECAs for the purpose of protecting the land for conservation; and
- exclude future open cut mining in the ECAs, unless, in the opinion of the Minister for Infrastructure and Planning, WCPL has demonstrated that there is a clear justification for this on social, economic and/or environmental grounds.

Performance of the ECAs

A flora and fauna monitoring programme would be developed for the ECAs to assess the performance of the management measures in enhancing/improving habitats for flora and fauna. The monitoring programme would be detailed in the FFMP. An overview of the monitoring programme is provided below.

Areas of woodland established in the ECAs would be monitored using the techniques described in Section 5.2.9 for the rehabilitation areas, namely, visual inspections, EFA and flora survey quadrats.

In areas of existing woodland vegetation, flora survey quadrats would be utilised to monitor flora species diversity and abundance. Terrestrial fauna surveys would also be conducted to monitor the usage of the ECAs by vertebrate fauna. Survey methodology and objectives would be detailed in the FFMP. Monitoring may include fauna species diversity and abundance, or alternatively, the use of indicator species to measure the effectiveness of the enhancement measures.

Completion criteria for the ECAs are outlined in Section 5.5.2.

5.5 MINE CLOSURE AND COMPLETION CRITERIA

This section provides an overview of the MCP (Section 5.5.1) and associated completion criteria (Section 5.5.2) for the Project.

5.5.1 Mine Closure Plan

Prior to the completion of mining operations, a MCP would be developed in consultation with relevant authorities and the Project CCC. The MCP would document the final mine closure process, final rehabilitation works and post-closure maintenance and monitoring requirements appropriate to established completion criteria.

The MCP would address long-term landuse for the site and would take into consideration:

- management of the ECAs in accordance with relevant commitments;
- experience and data obtained from progressive rehabilitation and revegetation activities;
- results of monitoring programmes;
- relevant regional planning strategies;
- integration with surrounding landuses (e.g. Munghorn Gap Nature Reserve and Goulburn River National Park); and
- performance against relevant completion criteria.

A FVMP would form a component of the MCP. Issues addressed by the FVMP would include:

- assessment of the hydrological behaviour of the final voids (e.g. long-term water quality and water balance);
- groundwater and surface water management (e.g. final landforming works to minimise surface water inflows to the voids);
- long-term geotechnical stability of the voids (e.g. profiling requirements);
- public safety;
- access requirements; and
- water quality monitoring requirements.

During the development of the FVMP, options for the future beneficial use of the final voids would be investigated.

WCPL would work with the MWRC to investigate the amelioration of adverse socio-economic effects that may occur due to the loss of Project employment at closure (Appendix I).

5.5.2 Completion Criteria

Completion criteria would be utilised to evidence achievement of EPP objectives including those relating to the rehabilitation areas, regeneration areas and the ECAs.

Upon cessation of mining operations, it would be expected that tenure of the mining lease would be maintained by WCPL until such time as these completion criteria are achieved along with any relevant statutory requirements (e.g. fulfilment of mining lease conditions). WCPL would then seek to relinquish the Project mining lease.

Key completion criteria for Project components are proposed in Table 5-6. These key completion criteria would be further developed and quantified in Project management plans and in the MCP in consultation with relevant authorities and stakeholders.

Table 5-6
Key Completion Criteria for Project Components

Project Component	Key Completion Criteria
Final Landforms	<ul style="list-style-type: none"> • Safe, stable, adequately drained post-mining landforms consistent with the local surrounding landscape. • Geomorphic stability of creek features comparable to existing creeks.
Tailings Disposal Areas	<ul style="list-style-type: none"> • Tailings disposal areas capped and stable final landform created as above.
Surface Infrastructure	<ul style="list-style-type: none"> • Infrastructure with no on-going beneficial use removed from the site or buried. • Land surfaces re-profiled and revegetated.
Final Voids	<ul style="list-style-type: none"> • Surface water inflows to the final voids minimised through appropriate landforming. • Final voids profiled for long-term stability. • Perimeter bunding formed.
Rehabilitation Areas	<ul style="list-style-type: none"> • Woodland/riparian areas on trajectory toward self-sustaining ecosystem.¹ • Woodland/riparian areas contain flora species characteristic of native vegetation communities.
Regeneration Areas	<ul style="list-style-type: none"> • Woodland/riparian areas on trajectory toward self-sustaining ecosystem.¹ • Woodland/riparian areas contain flora species characteristic of native vegetation communities.
Enhancement and Conservation Areas	
– Enhancement of existing remnant vegetation (including the WBYBBRG EEC).	<ul style="list-style-type: none"> • Habitats available to flora and fauna are enhanced/improved.
– Establishment of woodland vegetation (excluding the WBYBBRG EEC).	<ul style="list-style-type: none"> • Woodland (including riparian areas) on trajectory toward self-sustaining ecosystem.¹ • Woodland (including riparian areas) contain flora species characteristic of native vegetation communities.
– Establishment of the WBYBBRG EEC.	<ul style="list-style-type: none"> • EEC establishment areas on trajectory toward self-sustaining ecosystem.¹

¹ As determined by an EFA or similar systems-based monitoring approach.