Centennial Coal

Angus Place

Longwalls 900W and 910

Kangaroo Creek Management Plan

Angus Place Colliery

November 2013

This page has been intentionally left blank.

DOCUMENT OWNER AND ORIGINATOR: **Natalie Conroy** **Angus Place Environment and Community Coordinator**
APPROVED BY: **Brian Nicholls** **Angus Place Mine Manager** **Signature:** ..... **Date:** 26/11/2013
DISTRIBUTION: **Lotus Notes (Angus Place), Forestry Corporation of NSW, Department of Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy, SMP Interagency Committee.**

Title	Date Effective:	Revision Status:	Planned Review:
Longwalls 900W and 900 Kangaroo Creek Management Plan	26/11/2013	3.0	As per Section 15

This page has been intentionally left blank.

TABLE OF CONTENTS

Tables

Figures

Abbreviations

AEMR	Annual Environmental Management Report (now known as Annual Review)
AusRivAS	Australian River Assessment System
CCL	Consolidated Coal Lease
DgS	Ditton Geotechnical Services Pty Ltd
DP&I	NSW Department of Planning and Infrastructure
DTIRIS	NSW Department of Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy
EA	Environmental Assessment
EEC	Endangered Ecological Community
EPA	NSW Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environment Protection Licence
FCNSW	Forestry Corporation of NSW
ML	Mining Lease
Mtpa	Million tonnes per annum
nMDS	Non-metric multi-dimensional scaling
ROM	Run of mine
SCA	Sydney Catchment Authority
SIGNAL	Stream Invertebrate Grade Number Average Level
SMP	Subsidence Management Plan
TARP	Trigger Action Response Plan
TSC Act	*Threatened Species Conservation Act 1995*

1. INTRODUCTION

Angus Place Colliery (Angus Place) is an underground coal mining operation located approximately five kilometres north of the village of Lidsdale, eight kilometres northeast of the township of Wallerawang and approximately 15 kilometres northwest of the city of Lithgow in the Blue Mountains region of NSW. It is bordered by Springvale Colliery to the south, Ivanhoe Colliery to the northwest and Wolgan Valley and Newnes Plateau to the north and east, respectively. The regional locality of Angus Place is shown on **Figure 1**.

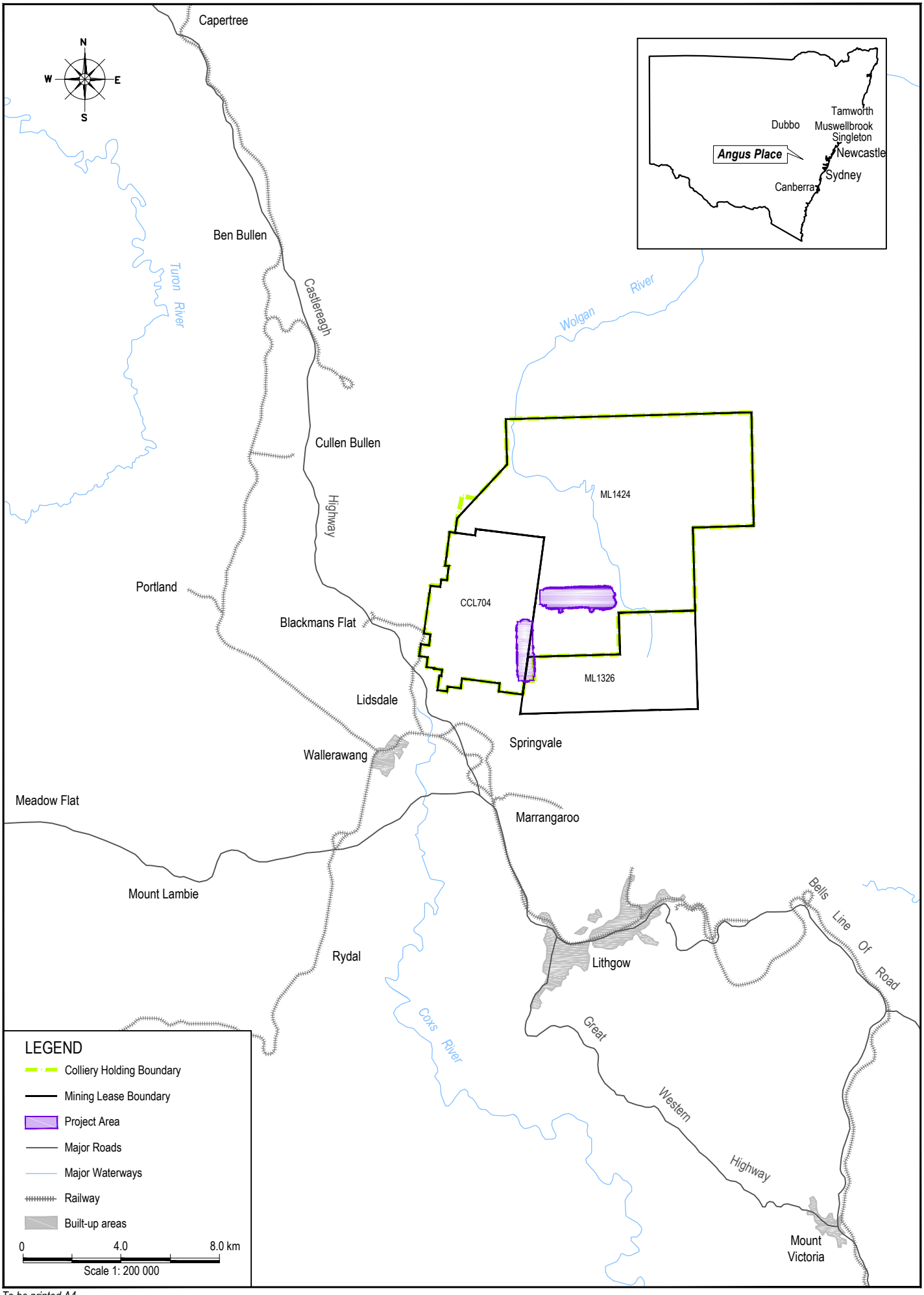
Angus Place has been in operation since 1979 and is operated by Centennial Angus Place Pty Ltd, a joint venture company owned in equal share between the Centennial Coal Company Ltd and SK Kores of Korea. Secondary extraction of coal is currently undertaken at Angus Place utilising the longwall method of mining within Mining Lease (ML) 1424 and Consolidated Coal Lease (CCL) 704.

Project Approval PA 06_0021 was granted by the then Department of Planning (now known as Department of Planning and Infrastructure (DP&I)) on 13 September 2006. This approval allowed for an extension of underground longwall mining operations (Longwalls 920 – 980) and an increase in run of mine (ROM) coal production to 3.5 million tonnes per annum (Mtpa). PA 06_0021 has been modified on two occasions. Modification 1 (Mod 1) was approved on 29 August 2011 and allowed for the development and extraction of two additional longwall panels (Longwall 900W and 910) as well as an increase in production limit to 4 Mtpa. Modification 2 (Mod 2) was approved in April 2013 and allowed for the development of underground roadways and the construction and operation of a Ventilation Facility (APC-VS2) and supporting infrastructure.

This *Longwalls 900W and 910 Kangaroo Creek Management Plan* (Kangaroo Creek Management Plan) has been developed to satisfy Condition 2a of the Angus Place Longwalls 930 - 980 Subsidence Management Plan (SMP) Approval issued by the then NSW Department of Primary Industries (now NSW Department of Mineral Resources (now the NSW Department of Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy (DTIRIS)) in December 2005. While the SMP Approval for Longwalls 930 – 980 does not relate to the subject Longwalls 900W and 910, this has been addressed to satisfy the typical conditions associated with an SMP Approval, specifically those already applicable at Angus Place. Regulatory requirements applicable to the development of this Plan are outlined in **Section 4**.

2. PURPOSE

The purpose of this Kangaroo Creek Management Plan is to outline the monitoring and management measures to be implemented to manage potential subsidence related impacts to Kangaroo Creek resulting specifically from the secondary extraction of Angus Place Longwalls 900W and 910. Required actions and responsibilities are defined to ensure detection and remediation of any potential damage from mining induced subsidence.



To be printed A4

Longwalls 900W and 910 Kangaroo Creek Management Plan
Regional Locality

FIGURE 1

G:\Drafting\Angus Place\CCC07-007\Figures\Final\CAD\Kangaroo Creek MP\Fg1_CCC07-007_Locality_131118.dwg

3. SCOPE

This Kangaroo Creek Management Plan applies to the Longwall 900W and 910 area (herein referred to as the Project Area). In accordance with the requirements of the *Guidelines for Applications for Subsidence Management Approvals* (2003), published by the NSW Department of Mineral Resources (now DTIRIS), this Project Area has been calculated by combining the areas bound by the following limits (see **Figure 2**):

- A 26.5° angle of draw line from the limit of proposed extraction; and
- The predicted limit of vertical subsidence, taken as the 20 mm subsidence contour resulting from the extraction of Longwalls 900W and 910.

The monitoring defined in this Kangaroo Creek Management Plan is required during the extraction of Longwall 900W and will continue for 12 months post extraction of the panel.

4. REGULATORY REQUIREMENTS

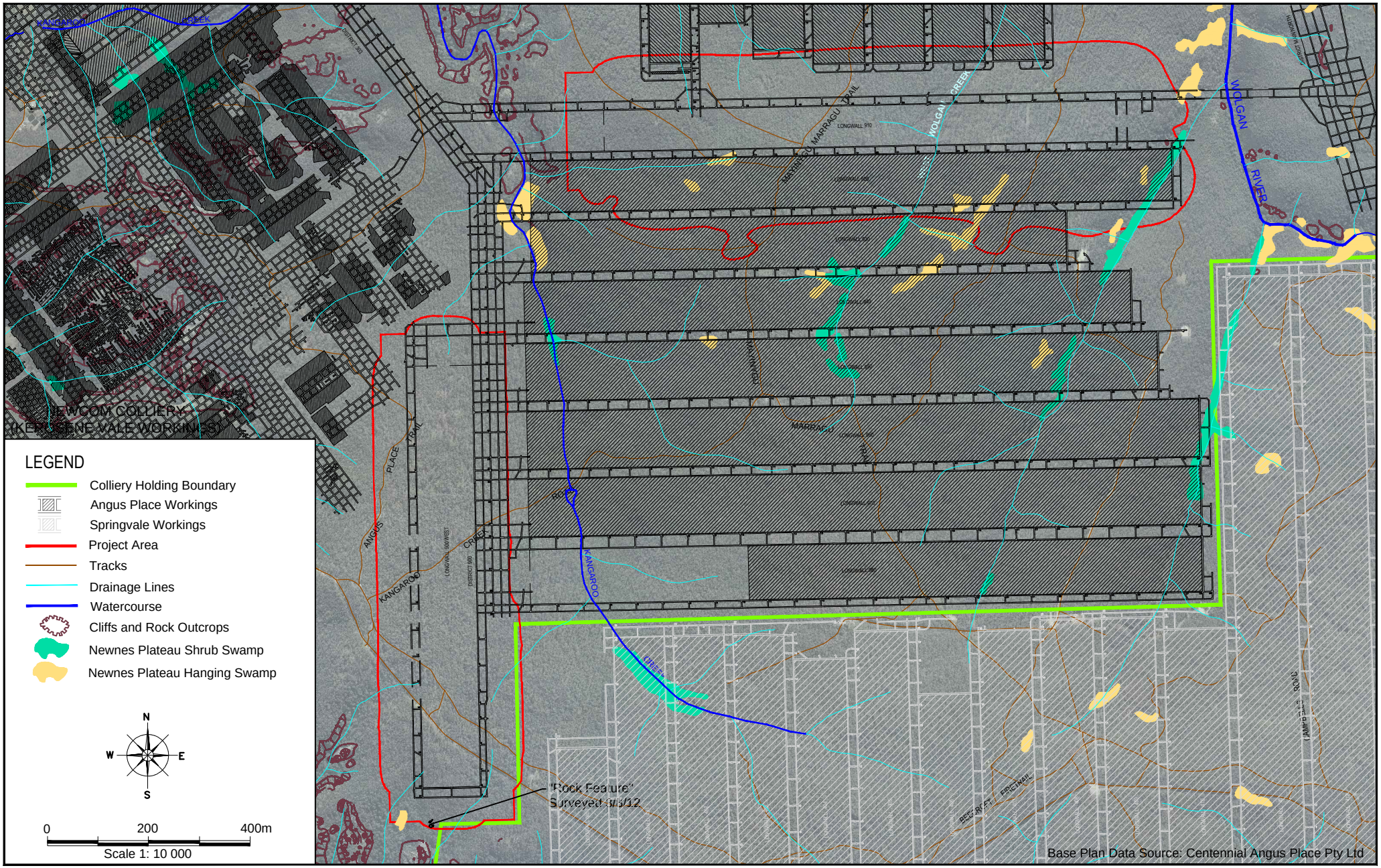
4.1. Project Approval and Statement of Commitments

Project Approval PA 06_0021 (as modified) includes two conditions relevant to the preparation and implementation of this *Kangaroo Creek Management Plan*. These conditions have been summarised in **Table 1**. This table also outlines the sections where these conditions have been addressed within this document.

There have not been any commitments made by Angus Place in the Statement of Commitments, as appended to PA 06_0021 (as modified) that are relevant to the preparation of this *Kangaroo Creek Management Plan*.

Table 1. Relevant Project Approval Conditions

<table>
<tr><th>Condition</th><th>Condition Requirement</th><th>Section Addressed</th></tr>
<tr><td>Schedule 3, Condition 3</td><td>The Proponent shall ensure that underground mining does not cause any exceedances of the performance measures in Table 1A, to the satisfaction of the Director General.
Table 1A:Subsidence Impact Performance Measures<table><tr><td colspan="2">Water</td></tr><tr><td>Natural watercourses.</td><td>No greater environmental consequences than predicted in EA – Mod 1.</td></tr></table></td><td>Section 9</td></tr>
<tr><td>Schedule 3, Condition 7</td><td>The Proponent shall ensure that the project does not result in any significant:
a) Reduction in pumping yield in privately owned groundwater bores;
b) Reduction in surface flows and groundwater base flow to upland swamps; and
(c) Reduction in surface flows and groundwater baseflow to waterbodies including Kangaroo Creek, Wolgan River, Lambs Creek and Coxs River
to the satisfaction of the Director-General.</td><td>Section 9</td></tr>
</table>



To be printed A4

GSS ENVIRONMENTAL
Environmental, Land and Project Management Consultants

Longwalls 900W and 910 Kangaroo Creek Management Plan
Project Area

FIGURE 2

G:\Drafting\Angus Place\CCC07-007\Figures\Final\CAD\Kangaroo Creek MP\Fg2_CCC07-007_Management Plan_131125.dwg

4.2. Mining Leases

The Project Area is associated with three mining tenements; ML1326, ML1424 and CCL704. Conditions relevant to the preparation of this Kangaroo Creek Management Plan have been provided in **Table 2**.

Table 2. Relevant Mining Lease Conditions

Mining Lease	Requirement	Section Addressed
ML1326 and ML1424	The lease holder shall carry out operations in such a way as to conform strictly to all provisions of the Sydney Water Catchment Management Act 1998 and the regulations thereunder applying to the prevention of pollution of the Warragamba Outer Catchment Area or the preservation of the purity of the water supply provided thereby or derived therefrom or for the protection of the property of the Sydney Catchment Authority [hereinafter referred to as 'the Authority'] on the Outer Catchment Area and also to all requirements of the Authority from time to time under the said Act or any of the regulations for the time being in force.	Sections 8 and 9
ML1326 and ML1424	If the lease holder shall at any time be using or about to use any process which in the opinion of the Authority is likely to pollute the Outer Catchment Area or the water supply, or to endanger any property of the Authority on the Outer Catchment Area the lease holder upon service of a notice in writing under the hand of the Minister to do shall: (i) Discontinue the use of such process immediately, or (ii) Thereafter refrain from adopting such process at any time, as the case may require.	Sections 8 and 9
ML1326 and ML1424	The lease holder shall provide and maintain to the satisfaction of the Minister efficient means to prevent to contamination, pollution, erosion or siltation of any stream or watercourse or Outer Catchment Area and shall observe any instruction given or which may be given by the Minister with a view to preventing or minimising the contamination, pollution or siltation of any stream watercourse or Outer Catchment Area.	Sections 8 and 9

4.3. Longwalls 930 – 980 SMP Approval

In accordance with the requirements of relevant mining tenements, Angus Place received SMP Approval from the then NSW Department of Primary Industries (now DTIRIS) in December 2005, allowing first workings and secondary extraction within Longwalls 930 – 980. This SMP Approval includes one condition relevant to the management of Kangaroo Creek at Angus Place. This condition and where it has been addressed within this Kangaroo Creek Management Plan has been listed in **Table 3**.

While the SMP Approval for Longwalls 930 – 980 does not relate to the subject Longwalls 900W and 910, **Table 3** has been included to demonstrate that the typical conditions associated with an SMP Approval, specifically those already applicable at Angus Place, have been addressed within this document. This section will be reviewed and revised (if necessary) following receipt of SMP Approval for the Project Area.

Table 3. Relevant SMP Approval Conditions

Condition	Condition Requirement	Section Addressed
2	The SMP is approved subject to the conditions set out in this document. The SMP, as modified by these conditions, must be implemented by the leaseholder. If there is any inconsistency between the approved SMP and the following conditions of this approval, the following conditions shall prevail to the extent of the inconsistency. The approved SMP also includes: a) 'Kangaroo Creek Management Plan' dated September 2006	This document

5. RELEVANT FEATURES AND PREDICTED IMPACTS

5.1. Relevant Features

Kangaroo Creek, which is a tributary of the Cox's River, runs in a north-northwest direction across the Angus Place Colliery Holding along the western boundary of Longwalls 930 - 980. Kangaroo Creek has been dammed above Longwall 970, with a waterhole and semi-permanent spring (which seeps into a Newnes Plateau Shrub Swamp) 500 m downstream of this dam. The creek continues to flow north before heading west where it flows past the Angus Place Colliery surface facilities and then to Long Swamp (Cox's River). Extraction of Longwalls 930 – 970 is complete, with Longwall 980 expected to finish in 2014.

It is important to note that Angus Place currently has licenced discharge points under its Environment Protection Licence (EPL 467) that allows the mine to discharge water into Kangaroo Creek at the base of the Newnes Plateau and well downstream of the mining area. Volume limits applied to this discharge point can be found within EPL 467.

The terrain above Longwalls 910 and 900W is gently undulated with broad crested gullies associated with the drainage paths to the north and east of the area. Ground slopes are generally less than 10° with some bedrock exposures near ephemeral drainage lines. Although Kangaroo Creek is outside of the Project Area, there are two first order tributaries of Kangaroo Creek located above Longwall 900W. The locations of first order tributaries associated with the Project Area are shown on **Figure 2**.

5.2. Predicted Impacts

Ditton Geotechnical Services (DgS) (2010) prepared a subsidence assessment for the Project Area as part of the Mod 1 Environmental Assessment (EA) titled *Angus Place Colliery, NSW Modification of Project Approval 06_0021 under Section 75W, Part 3A* (RPS, 2010). The assessment did not specifically assess the impacts of subsidence on Kangaroo Creek as it is not going to be directly affected by the secondary extraction of Longwalls 900W and 910; however it did assess the impacts to the first order tributaries that enter Kangaroo Creek.

Minor surface cracking and deformation is anticipated to occur within the tributaries of Kangaroo Creek as a result of mining (DgS, 2010). However, the long term geomorphologic impacts as a result of changes to longitudinal gradients and surface cracking are expected to be negligible and therefore no consequences are expected (GHD, 2010).

Minor transient surface cracking with widths less than 20 mm may develop behind the retreating secondary extraction face and along and across creek beds or watercourses that are undermined (DgS, 2010). Cracks that occur within the drainage gullies or creek beds may result in sub-surface re-routing of surface flows during storm periods and particularly those areas that have bedrock exposed.

However, the impacts in most cases should be self-healing, due to sediment bed load that is likely to accumulate in the cracks after several storm events occur.

5.2.1. Subsidence Assessment Review

As a component of the *Longwalls 900W and 910 Integrated SMP/Extraction Plan*, DgS completed a review of the *Subsidence Prediction and Impact Assessment* (DgS, 2010) to satisfy the requirement of Schedule 3, Condition 3C(e) of PA 06_0021 (as modified), which requires the proponent to:

> *Provide revised predictions of the potential subsidence effects, subsidence impacts and environmental consequences of the proposed second workings, incorporating any relevant information obtained since this approval.*

The report titled *Subsidence Assessment Review for the Longwalls 900W and 910 Integrated SMP/Extraction Plan, Centennial Angus Place Colliery* (DgS, 2013), incorporated relevant information obtained by Angus Place since the approval of PA 06_0021 (Mod 1) in August 2011, including subsidence monitoring data and observed subsidence effects following the completion of secondary extraction in Longwalls 960 and 970, and a change to the mining height within Longwalls 900W and 910.

The *Subsidence Prediction and Impact Assessment* (DgS, 2010) assessed potential subsidence effects based upon a mining height of 3.25 m. Angus Place will now mine Longwalls 900W and 910 at an extraction height up to 3.425 m. This change has been assessed by DgS (2013) who concluded that *the observed and predicted subsidence impacts and environmental consequences for LWs 960 and 970 have also been consistent with predictions for LWs 900W and 910, and as such, the predicted 'negligible' environmental consequences for LWs 900W and 910 are not expected to change from the previous assessment due to the 5% increase in mining height.*

It is therefore considered that the impact management strategies for the environment and site developments (e.g. access roads and Endeavour Energy 66kV power line) that were outlined in DgS, 2010 are still valid and do not require amendment" (DgS, 2013). The management measures as outlined in **Section 8** are consistent with the impact management strategies outlined in the *Subsidence Prediction and Impact Assessment* (DgS, 2010).

6. IDENTIFIED RISKS

On 25 July 2012 an SMP Risk Assessment was conducted to identify subsidence-related hazards that may affect the environment and community as a result of the extraction of Angus Place Longwalls 900W and 910. This risk assessment was completed in accordance with the requirements of the *Guideline for Applications for Subsidence Management Approvals* (Department of Mineral Resources, 2003) and the *Centennial Coal Risk Management Standard - Management Standard 004* (Centennial Coal, 2008).

Risks were identified and assessed through the review of known surface and sub-surface features within the Project Area. A risk ranking (low, moderate, significant, high or extreme) was assigned to each risk/hazard. There was one potential risk to Kangaroo Creek identified during the SMP Risk Assessment which was related to the potential for subsidence to negatively affect water courses (e.g. change in topography, ponding, loss of flow/redirection (low risk)). This risk and the recommended controls have been presented in **Table 4**.

Table 4. Risk to Kangaroo Creek

Risk	Current Controls	Risk Ranking	Recommended Controls
There is a risk to Angus Place from ::: Water courses negatively affected (e.g. change in topography, ponding, loss of flow/redirection) ::: Caused by: Subsidence Resulting in: Environmental impacts.	Drainage lines and Endangered Ecological Communities (EEC) identified in application area. All drainage lines ephemeral, no perennial flow.	Low	Review and update Kangaroo Creek Management Plan.
	Surface Water Assessment for the Part 3A Modification indicates impacts are unlikely.		Review Site Water Management Plan.
	Mining geometry design to minimise potential surface impact.		Review Newnes Plateau Management Plan.
	Site Water Management Plan.		Develop Temperate Highland Peat Swamps on Sandstone Management Plan.
	Redirection of surface water flow to sub-surface water flow is unlikely due to low levels of cracking predicted in DgS (2010).		Review Flora and Fauna Management Plan.

To further mitigate subsidence-related risks to Kangaroo Creek and the associated first order tributaries, Angus Place has implemented the 'recommended controls' listed in **Table 4**. This *Kangaroo Creek Management Plan*, the *Site Water Management Plan* and the *Flora and Fauna Management Plan* have all been reviewed as components of the *Longwalls 900W and 910 Integrated SMP/Extraction Pl*an. The *Temperate Highland Peat Swamps on Sandstone Management Plan* has also been developed in accordance with the requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Approval. The *Longwalls 930 – 980 Newnes Plateau Shrub Swamp Management Plan* has been superseded by the *Temperate Highland Peat Swamps on Sandstone Monitoring and Management Plan* and will subsequently not be revised to include Longwalls 900W and 910.

Additional details regarding the management and monitoring of subsidence related impacts to Kangaroo Creek within the Project Area have been detailed in **Sections 8** and **9**, respectively.

7. PERFORMANCE MEASURES AND INDICATORS

7.1. Performance Measures

Subsidence impact performance measures are specified in Schedule 3, Condition 3 of PA 06_0021 (as modified). The performance measure specifically relating to Kangaroo Creek management was that no greater environmental consequences than predicted in Mod 1 EA (RPS, 2010) were to occur to natural watercourses.

7.2. Performance Indicators

To establish compliance with the performance measure outlined in **Section 7.1**, Angus Place has developed a monitoring program. This monitoring program (see **Section 9**) will be used to demonstrate that the environmental performance satisfies the following performance indicators:

- Visual inspections of the site identify that subsidence related impacts are consistent with predicted impacts as outlined in **Section 5.2**; and
- Survey monitoring within the Project Area identifies that subsidence parameters (subsidence, tilt and strain) are within the limits of the prediction model.

8. MANAGEMENT MEASURES

8.1. Subsidence Management Strategy

The Angus Place overall strategy for subsidence management has been outlined below. These measures will be implemented to manage subsidence induced impacts to Kangaroo Creek and its first order tributaries above Longwall 900W, if required.

1. **Measure baseline information** – Established background data for Kangaroo Creek and the first order tributaries above Longwall 900W. Approximately four months prior to the commencement of a new longwall, Angus Place will undertake a pre-mining photographic survey

2. **Monitor the effects of mining** - Including aquatic ecology, subsidence monitoring, targeted photographic inspections and surface flows/quality.

3. **Regularly assess and interpret monitoring** – Monitoring data is analysed to identify any variations from predictions or unexpected anomalies.

4. **Reporting of monitoring results** – Results of the monitoring data will be summarised in the six-monthly Environmental Monitoring Reports (see **Section 14**). An annual summary will be provided in the Annual Environment Management Report (AEMR)/Annual Review and the End of Panel Reports. Incidents of cracking in the creek shall be reported to Forestry Corporation of NSW (FCNSW) and DTIRIS.

5. **Assess any impacts** – Where monitoring indicates the occurrence of abnormal conditions, additional assessment of impacts will be undertaken and a comparison of all available data to determine the cause of the impact.

6. **Identify and implement remedial actions** – Review of all available data and/or additional assessments may indicate that remedial action may be required based on the assessment of the observed impacts. Appropriate stakeholder consultation will be part of determining and implementing remedial actions.

7. **Refine monitoring techniques** – Monitoring technology and design will be regularly reviewed to take into account new developments in the science of environmental monitoring and reported research in the field.

8.2. Investigation

Any issues identified during environmental monitoring will result in a field inspection or an analysis of photographs of the first order tributaries or Kangaroo Creek will be undertaken by the Angus Place Environment and Community Coordinator. The objective of this investigation will be to determine any adverse consequences to water flows and any adverse consequences to stream banks.

Following this investigation, the Environment and Community Coordinator and the Technical Services Manager will determine if geotechnical expertise is required. If so, a full evaluation will be undertaken to determine whether the observed changes represent a temporary or permanent disruption to the drainage line. A detailed evaluation of subsidence and climatic data will be carried out.

Angus Place will consider additional monitoring that may be necessary to determine the cause and/or impact of the anomalous condition. A summary of the steps taken has been presented below:

1. Analyse monitoring data;

2. If monitoring results indicate abnormal conditions, focus resources to determine why the results are abnormal;

3. If abnormal results continue, consider instigating additional monitoring in consultation with relevant expert;

4. If additional monitoring continues to show abnormal results after the passage of the following longwall, consult with relevant expert consultants and relevant government agencies; and

5. Investigate fully the need to instigate engineering solutions (as a last measure) with relevant expert consultants and government agencies.

Some subsidence impacts may be temporary and the situation (or anomalous results) should be fully assessed after the following longwall has passed the subject area. For example, cracking may fill up naturally through the deposition of natural sediments and stream flow may continue unaffected. Prior to the implementation of any solution, it is important to note that in the unlikely event that engineering solutions may be required, they need to be fully investigated and appropriate approvals may need to be sought and granted.

9. MONITORING PROGRAM

9.1. Baseline Monitoring

Baseline monitoring of the Project Area will be undertaken prior to the commencement of secondary extraction within Longwall 900W. Baseline data will be obtained by Angus Place using a combination of the following methods:

- Installation of subsidence monitoring lines that will be used to monitor the angle of draw, subsidence, tilt and strain. The lines will be surveyed prior to secondary extraction in Longwall 900W to establish pre-mining data; and
- A visual inspection program will be undertaken by Angus Place that includes the use of photo monitoring points prior to the commencement of secondary extraction to establish the pre-mining condition of the two first order tributaries of Kangaroo Creek located in the Project Area.

Additionally, stream flow monitoring, conducted since early 2004, has been established upstream and downstream in Kangaroo Creek to monitor any subsidence effects resulting from the extraction of Longwalls 930 - 980. This baseline data will allow the comparison of surface water flows pre- and post-mining, so that any changes in surface water flows across the mining area can be monitored. A Pygmy Stream Flow Meter records the average stream flows in kilolitres per day, with monitoring conducted at two weekly intervals. In addition to the stream flow monitoring conducted in Kangaroo Creek, various water quality parameters have also been monitored since 2005. Details of surface water quality monitoring have been provided in **Section 9.3**.

9.2. Monitoring Subsidence Impacts

The first order tributaries of Kangaroo Creek will be inspected pre- and post-mining for evidence of any subsidence impacts. **Table 5** provides a summary of the subsidence monitoring program that will be undertaken to identify subsidence related impacts to the relevant first order tributaries and Kangaroo Creek. Additional detail pertaining to subsidence monitoring relevant to Kangaroo Creek can be found in the *Longwalls 900W and 910 Subsidence Monitoring and Reporting Program*.

Table 5. Subsidence Monitoring Program

Monitoring Method	Parameter	Frequency
Subsidence survey lines	Subsidence, tilt, strain and angle of draw	Prior and post secondary extraction within Longwall 900W
Visual inspections (including photo monitoring)	Presence or absence of temporary/permanent ponding and/or erosion	Monthly during secondary extraction within 500m of Longwall 900W. Inspections will continue for four consecutive months following the completion of secondary extraction within Longwall 900W. A final inspection will be undertaken 12 months after the completion of secondary extraction within Longwall 900W

9.3. Monitoring Surface Water Impacts

9.3.1. Layout of Monitoring Sites

Flow monitoring sites and surface water quality monitoring sites for Kangaroo Creek are shown in **Figure 3** and details presented in **Table 6**.

Table 6. Surface Water Monitoring Sites

Locality	Monitoring Aspect	Easting MGA Zone 56	Northing MGA Zone 56
Kangaroo Creek Upstream	Water Quality Monitoring and Flow Monitoring	230898	6306136
Kangaroo Creek Downstream	Water Quality Monitoring and Flow Monitoring	230231	6306109

Visual inspections and photographic monitoring are also carried out along Kangaroo Creek. This will provide information on the rock base of the creek.

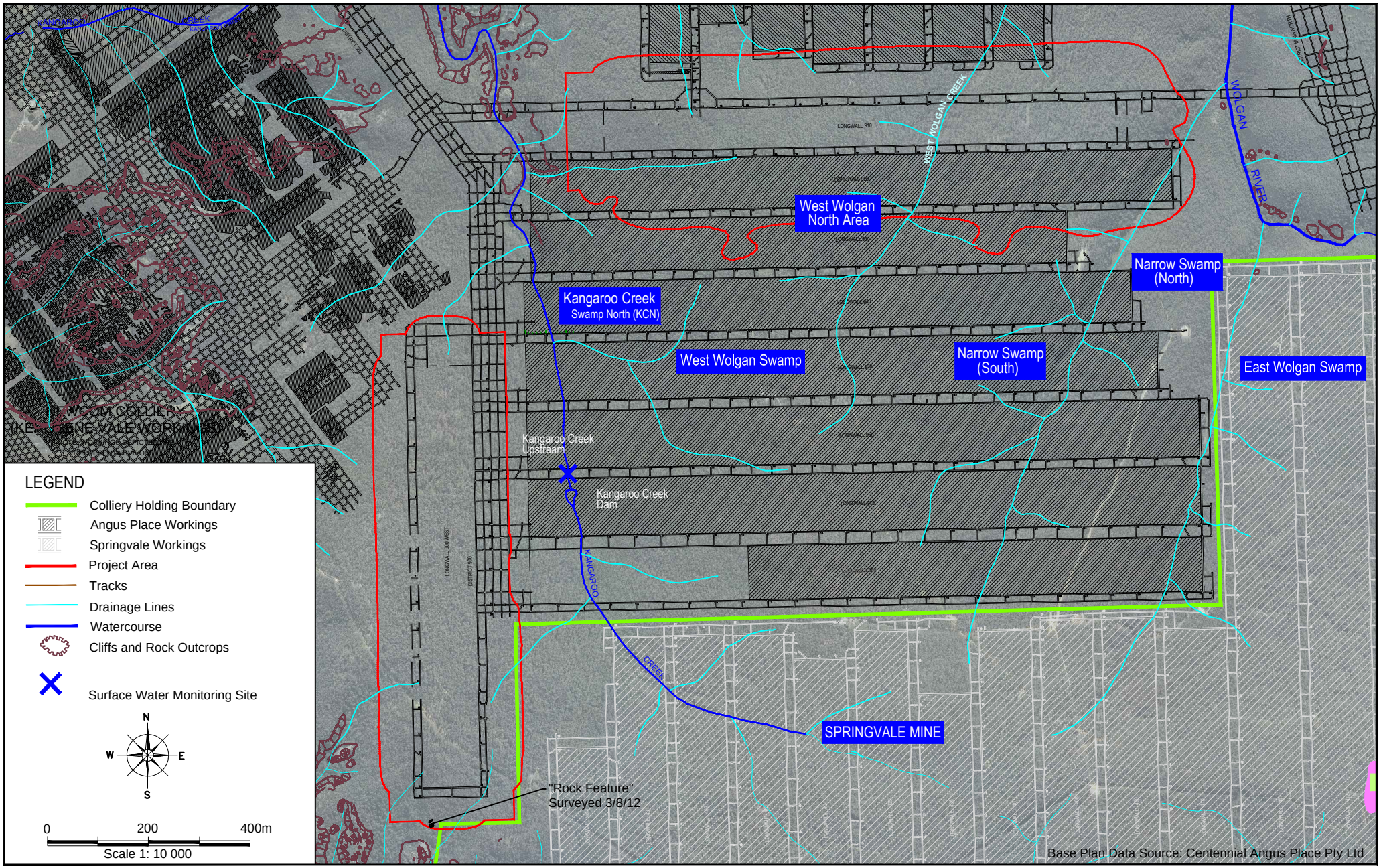
9.3.2. Parameters, Monitoring Methods and Frequency

Stream flows are currently monitored fortnightly for flow, pH, total suspended solids, electrical conductivity, manganese, iron, and temperature. If there is no flow, no water quality parameters are monitored.

A Pygmy Stream Flow Meter records the average stream flows in kilolitres per day. Water quality samples are taken manually and analysed in an appropriately registered laboratory.

9.3.3. Data Analysis

Stream flow monitoring results are reported to Angus Place following each monitoring period. These results are analysed and compared to the climatic monitoring results and previous stream flow monitoring results. This usually takes the form of a series of graphs.



To be printed A4

GSS ENVIRONMENTAL
Environmental, Land and Project Management Consultants

Longwalls 900W and 910 Kangaroo Creek Management Plan
Environmental Monitoring Locations

FIGURE 3

G:\Drafting\Angus Place\CCC07-007\Figures\Final\CAD\Kangaroo Creek MP\Fg3_CCC07-007_Environmental Monitoring_131125.dwg

9.4. Aquatic Ecology

Aquatic ecology monitoring will be carried out at two locations on Kangaroo Creek, known as Kangaroo Creek Upstream (KCup) and Kangaroo Creek Downstream (KCdn). The sites are surveyed twice annually. The aquatic invertebrate assemblage for each sample site is described in terms of the site taxa diversity (number of individual Australian River Assessment System (AusRivAS) taxa) and in terms of a site Stream Invertebrate Grade Number Average Level (SIGNAL) score. SIGNAL is a pollution tolerance index for stream macroinvertebrates. The indices are derived by correlation analysis of macroinvertebrate occurrence against water chemical analysis. The water chemistry attributes generally used are temperature, turbidity, conductivity, alkalinity, pH, dissolved oxygen, total nitrogen and total phosphorus (Marine Pollution Research, 2011).

Taxonomic identification of fish species are also made to the levels required by AusRivAS, and a standardised description of site condition is recorded.

Table 7 provides a summary of the aquatic ecology monitoring program for Kangaroo Creek. The locations of these sites are shown in **Figure 3**. Additional detail pertaining to aquatic ecology monitoring can be found in the *Flora and Fauna Management Plan*.

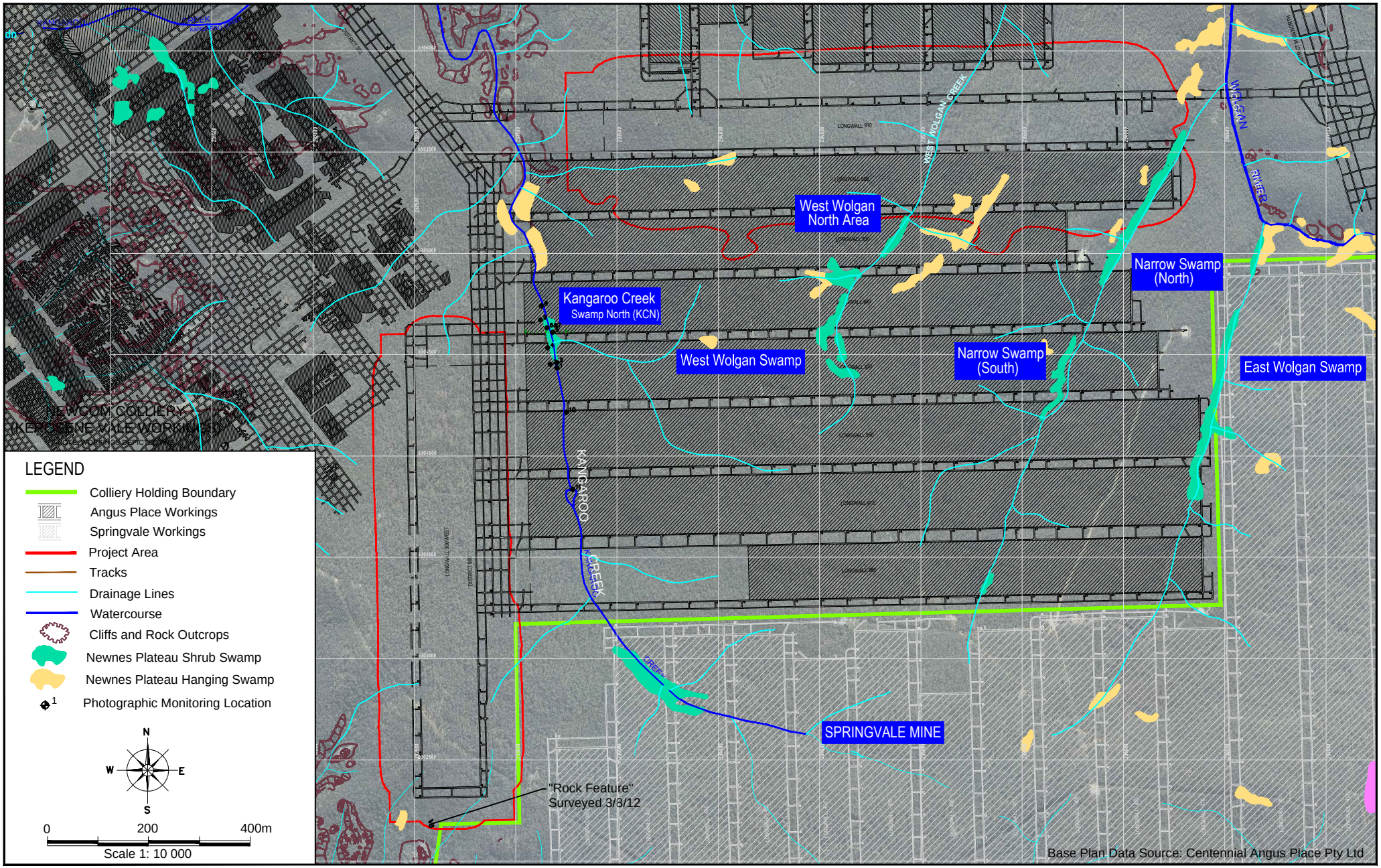
Table 7. Aquatic Ecology Monitoring Program

Site	Monitoring Aspect	Easting MGA Zone 56	Northing MGA Zone 56
Kangaroo Creek Upstream (KCup)	Aquatic macroinvertebrate data, fish surveys and description of site condition	232588	6306501
Kangaroo Creek Downstream (KCdn)	Aquatic macroinvertebrate data, fish surveys and description of site condition	230368	6306102

9.5. Newnes Plateau Shrub Swamps

There is one Newnes Plateau Shrub Swamp which is listed as being an Endangered Ecological Community (EEC) under the TSC Act. This vegetation community also corresponds with the Temperate Highland Peat Swamps on Sandstone EEC listed under the EPBC Act.

This Newnes Plateau Shrub Swamp, known as Kangaroo Creek Swamp, is monitored using photographic monitoring sites. Kangaroo Creek Swamp has a water hole located at the southern end of the mapped area and drains into the vegetation (as mapped) located in a relatively steep but narrow valley. The water hole is fed by a semi-permanent spring. The locality of the photographic monitoring sites has been shown on **Figure 4** and has been detailed on **Figure 5**.



To be printed A4

GSS ENVIRONMENTAL
Environmental, Land and Project Management Consultants

Longwalls 900W and 910 Kangaroo Creek Management Plan
Newnes Plateau Shrub Swamp Photographic Monitoring Sites

FIGURE 4

G:\Drafting\Angus Place\CCC07-007\Figures\Final\CAD\Kangaroo Creek MP\Fg4_CCC07-007_Swamp Photo Monitoring Locations_131125.dwg

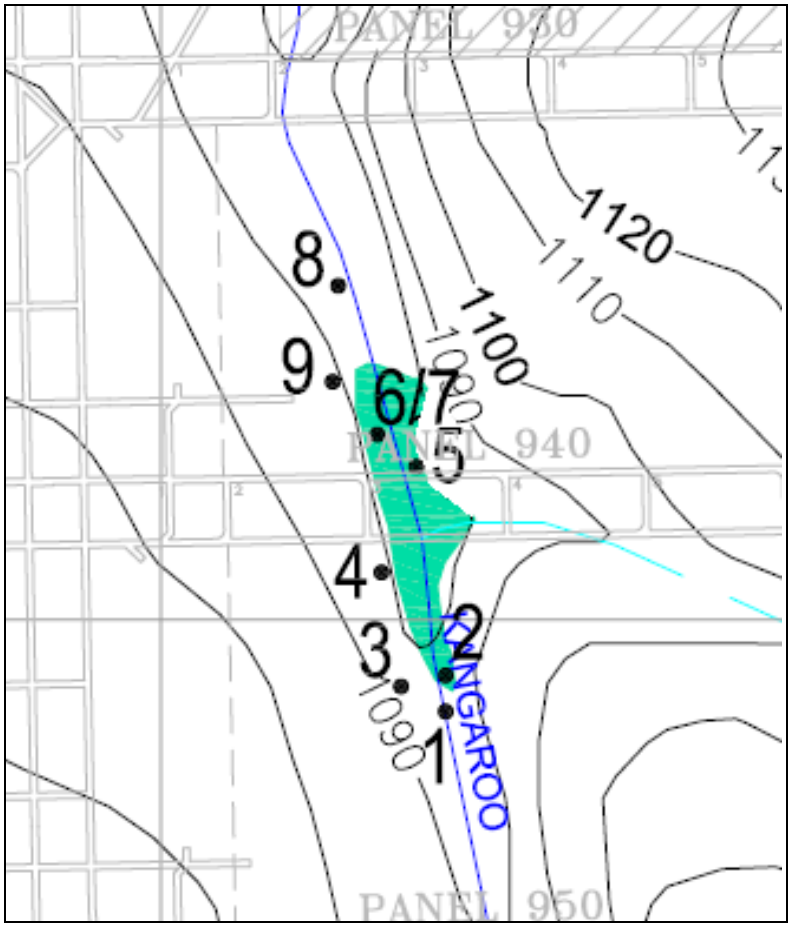


Figure 5 Photographic Monitoring Sites for Kangaroo Creek North Area

9.5.1. Parameters, Monitoring Methods and Frequency

During the photographic survey, a general inspection of the drainage line will be undertaken. Where anomalous activity is located, it will be photographed and added on to the photographic schedule and reported as appropriate. Photographic inspections of the swamps will be undertaken when the Longwall is undertaking secondary extraction within 500m of the site.

The photographic monitoring techniques have evolved in light of information published by the NSW Nation Parks and Wildlife Service (2003). Key points are presented below:

1. Attempt to take photos on a bright but cloudy day. This allows a clearer picture of vegetation rather than getting confused in too many shadows.
2. Use a permanent marker point which will not change or be hidden. Angus Place standard will be permanent tagging.
3. Take a copy of the previous photo monitoring report during photographic inspections. This will assist in obtaining the same view (photographed area).
4. Use the same camera at the same lens size and same settings.
5. Always record the date, time and location for every photograph.
6. Keep photo record sheets and field notes of every photograph.
7. Always check GPS co-ordinates.

8. Number every photograph taken, and relate these to every image number after downloading from the camera.
9. Keep copies of all notes taken.
10. Keep backup copies of all photographs.

9.5.2. Data Analysis

At the end of each monitoring period, photographs from previous monitoring periods will be compared. Particular attention will be focused on seasonal variation, climatic data and groundwater monitoring data which will be used to assist in the analysis of the results.

9.6. Rainfall

Rainfall and temperature is monitored continuously on the Newnes Plateau at the Springvale Colliery ventilation shaft (located above the Springvale Colliery). Data is downloaded every two months and is analysed in conjunction with other monitoring parameters.

10. CONSULTATION

This Kangaroo Creek Management Plan is to be implemented to the satisfaction of the land owner (FCNSW) and has been submitted to DTIRIS for approval.

11. ADAPTIVE MANAGEMENT

Angus Place has developed an adaptive management approach that is designed to avoid repetition of any unpredicted subsidence impacts and/or environmental consequences. This approach will include the monitoring and periodic evaluation of environmental consequences against the performance indicators defined in **Section 7.2**; the implementation of the contingency plan (see **Section 12**) in the event that a performance indicator is exceeded; and the review of this Kangaroo Creek Management Plan as necessary (see **Section 14**).

12. CONTINGENCY PLAN

A Trigger Action Response Plan (TARP) has been developed using the performance indicators for Kangaroo Creek management. In the event that subsidence monitoring and/or visual inspections identify that a performance indicator has been exceeded, Angus Place will implement the contingency measures as detailed in the TARP (see **Table 8**).

Potential engineering solutions for Kangaroo Creek (as referred to in **Table 8**) are explained in more detail in the *Temperate Highland Peat Swamps on Sandstone Monitoring and Management Plan*. A detailed assessment and investigation will be instigated prior to the implementation of any engineering solutions. This will be followed by a detailed review by relevant government agencies and expert consultants.

TARPs have also been developed for surface water and groundwater management, which are included in the *Site Water management Plan*.

Table 8. Kangaroo Creek Trigger Action Response Plan

Key Element	Trigger Response	Condition Green	Condition Amber	Condition Red
Subsidence Monitoring	Trigger	Survey monitoring within the Project Area identifies that subsidence parameters (subsidence, tilt and strain) are less than the limits specified by the prediction model.	Survey monitoring within the Project Area identifies that subsidence parameters (subsidence, tilt and strain) are up to, but do not exceed the limits of the prediction model.	Survey monitoring within the Project Area identifies that subsidence parameters (subsidence, tilt and strain) exceed the limits of the prediction model.
	Response	No response required. Continue monitoring program.	No response required. Continue monitoring program.	If subsidence within the Project Area exceeds the limits of the prediction model, notify the Director-General of DP&I, DTIRIS and relevant stakeholders of exceedance of subsidence predictions. Investigate exceedance of subsidence prediction model. Identify and implement remedial actions in consultation with relevant stakeholders, if necessary (e.g. undertake review of Kangaroo Creek Management Plan).
Photographic Monitoring	Trigger	No Physical Changes	a) Creek bed cracking b) New ponding c) Unexpected erosion	a) Significant changes in colour/quality of stream flow and/or complete flow loss b) Continued ponding of water and death of vegetation c) Continued erosion and death of vegetation
	Response	No response required	a) Field inspections, additional monitoring where necessary b) Field inspections, additional monitoring where necessary c) Install sediment and erosion controls	a) Grouting of rock bars, add water to drainage line b) Consider surface drains, subsurface drains, erosion protection measures, grouting of rock bars, bush regeneration techniques to manage and control erosion nick points, and revegetation using endemic species c) As above

13. ROLES AND RESPONSIBILITIES

The responsibility for implementation, monitoring and review of the Kangaroo Creek Management Plan lies with the Environment and Community Coordinator. The ultimate responsibility for the implementation of the Kangaroo Creek Management Plan lies with the Mine Manager, who shall make appropriate resources available. The roles and responsibilities for this Kangaroo Creek Management Plan are outlined in **Table 9**.

Table 9. Key Personnel and Accountabilities

Position	Responsibility
Mine Manager	• Ensuring that sufficient resources are available to implement and execute the requirements of this Plan; and • Reporting triggers/non-conformances to external stakeholders.
Environment and Community Coordinator	Implementation, monitoring and review of this plan, including: • The carrying out of inspections; • The installation and maintenance of signage; • Reporting triggers/non-conformances internally to the Mine Manager as appropriate; • Consulting with FCNSW (the land manager) regarding any Kangaroo Creek management issues arising from subsidence; • Consultation during the review process with relevant stakeholders and distributing this Kangaroo Creek Management Plan; • Coordinating any remediation work as required; • Inspecting areas susceptible to tensile and compressive strains and potential cracking; • Co-ordinating the generation and submission of formal reporting requirements outlined in this Plan (e.g. End of Panel Reports and the Annual Environmental Management Report (AEMR)/ Annual Review); and • Reviewing this Kangaroo Creek Management Plan.
FCNSW	• Undertake inspections as required with Environment and Community Coordinator; • Review and assist in preparation of appropriate rehabilitation / remediation / management procedures in consultation with Environment and Community Coordinator; and • Determine appropriate remedial measures in conjunction with Environment and Community Coordinator.

14. REPORTING

In accordance with the requirements of the *Draft Guidelines for the Preparation of Extraction Plans* (DP&I 2012), Angus Place will submit the following reports to the DP&I and DTIRIS during the secondary extraction of Longwalls 900W and 910:

- Bi-monthly Subsidence Impact Reports - These reports will be submitted following the regular monthly inspections if any new subsidence impacts are identified; and
- Six-monthly Environmental Monitoring Report - This report will include:
  - a comprehensive summary of all impacts, including a revised characterisation according to the relevant TARP and any proposed actions resulting from the relevant TARP;
  - an assessment of compliance with relevant performance indicators; and
  - a comprehensive summary of all quantitative and qualitative environmental monitoring results.

The AEMR/Annual Review will be made available on the Centennial Coal website and will include subsidence monitoring results, performance against subsidence predictions and identification of any subsidence related environmental impacts identified during the 12 month reporting period.

In accordance with the requirements of Schedule 5, Condition 6 of PA 06_0021 (as modified), Angus Place will notify the Director-General of DP&I, FCNSW and any other relevant agencies of any land management related incident resulting from the extraction of Longwalls 900W and 910 as soon as practicable after becoming aware of the incident. Within seven days of the incident, the Proponent shall provide the Director-General of DP&I and any relevant agencies with a detailed report on the incident.

Angus Place will also prepare an End of Panel Report to encompass all environmental and subsidence monitoring, including a comparison of actual impacts with predicted subsidence impacts. This report will be submitted to DTIRIS within three months of secondary extraction being completed in each longwall panel.

15. REVIEW

This Kangaroo Creek Management Plan will be reviewed in the event that the following occurs:

- Stakeholders raise issues that necessitate a review;
- There are changes to the management requirements (e.g. changes to related approvals);
- Where unpredicted impacts or consequences have required implementation of contingency actions under this plan; or
- Monitoring, incident, or audit processes demonstrate that a review is warranted.

Any amendments to the Kangaroo Creek Management Plan will be undertaken in consultation with relevant stakeholders. Following any changes a copy of the amended Kangaroo Creek Management Plan will be forwarded to the DTIRIS for approval.

16. REFERENCES

Catling, P.C and Burt, R.J (1995). *Studies of the ground-dwelling mammals of eucalypt forests in south-eastern New South Wales: the effect of habitat variables on distribution and abundance*. Wildlife Research 22, 271–288.

Centennial Coal (2008) *Centennial Coal Risk Management Standard - Management Standard 004*.

DgS (2010) *Subsidence Prediction and Impact Assessment, Report no ANP_002/1.*

DgS (2013) *Subsidence Assessment Review for the Longwalls 900W and 910 Integrated SMP/Extraction Plan, Centennial Angus Place Colliery.*

Department of Mineral Resources (2003) *Guideline for Applications for Subsidence Management Approvals*.

DP&I (2012) *Draft Guidelines for the Preparation of Extraction Plans.*

GHD (2010) *Angus Place Colliery 75W Modification Surface Water Assessment*.

International Environmental Consultants (IEC) (2002) *Environmental Review of Kangaroo Creek Swamp Monitoring Program*.

Marine Pollution Research (2011) *Angus Place Aquatic Ecology Monitoring Report*.

RPS (2010) *Angus Place Colliery, NSW Modification of Project Approval 06_0021 under Section 75W, Part 3A*

Centennial Coal

Angus Place

Angus Place Colliery

PO Box 42

Wallerawang NSW 2845