Xstrata Mangoola Pty Limited

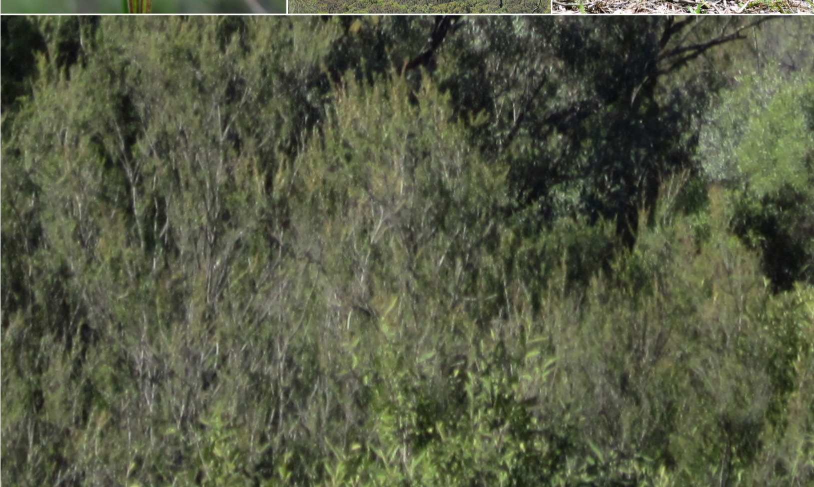
Mangoola Coal

Annual Environmental Management Report

1 July 2011 to 30 June 2012





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Name of Mine	Mangoola Coal		
Titles/Mining Lease	ML 1626		
MOP Commencement Date	1 June 2010	**MOP Completion Date**	31 December 2013
AEMR Commencement Date	1 July 2011	**AEMR End Date**	30 June 2012
Name of Leaseholder	Xstrata Mangoola Pty Limited		
Name of Mine Operator	Xstrata Coal NSW		
Reporting Officer	Tony Israel		
Title	Operations Manager		
Signature			
Date	28.9.12		

Prepared on behalf of:
Mangoola Coal

By: GSS Environmental
Date: September 2012

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1.0 INTRODUCTION

1.1 Background

Mangoola Coal (Mangoola) is owned and operated by Xstrata Mangoola Pty Ltd and is located near Wybong, NSW, approximately 20 kilometres (km) west of Muswellbrook, and approximately 10 km north of Denman in the Muswellbrook Local Government Area (LGA). A locality plan is presented in **Figure 1**. This Annual Environmental Management Report (AEMR) has been prepared for the 12 month reporting period of **1 July 2011 to 30 June 2012** (herein referred to as the reporting period).

Project Approval 06_0014 was granted in June 2007 for the construction of an open cut coal mine and associated infrastructure in the Wybong area. The mine, then owned by Centennial Coal and known as the Anvil Hill Project, was approved to extract up to 10.5 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal. Xstrata Coal purchased the mine in 2007 and changed the name to Mangoola Coal in 2008. Mining activities at Mangoola commenced in September 2010. The site also operates a Coal Handling and Preparation Plant (CHPP) and Train Loading Facility.

This AEMR has been prepared in accordance with the following:

- Schedule 5 Condition 4 of Project Approval 06_0014; issued under Section 75J of the *Environmental Planning and Assessment Act 1979* (The Act);
- The industry guideline prepared by the NSW Department of Trade and Investment, Regional Infrastructure and Services – Minerals Division (DTIRIS) (formerly the Department of Primary Industries – Mineral Resources), titled *Guidelines to the Mining, Rehabilitation and Environmental Management Process (Version 3, 2006);* and
- Mining Lease 1626.

In accordance with Schedule 5, Condition 4 of Mangoola's Project Approval 06_0014, copies of this AEMR will be made available to the Department of Planning and Infrastructure (DP&I), and relevant agencies including the Department of Trade and Investment, Regional Infrastructure and Services – Resources and Energy Division, the Office of Environment and Heritage (OEH) and the Mangoola Community Consultative Committee (CCC). A copy will also be made available for members of the public on the Mangoola Coal website in accordance with Schedule 5, Condition 10 of the Project Approval 06_0014.

This AEMR provides a summary of activities, environmental management and performance during the reporting period. Specifically this AEMR includes the following information:

- Operational aspects of Mangoola during the reporting period (**Section 2.0**);
- Environmental performance (**Section 3.0**);
- Community relations (**Section 4.0**);
- Rehabilitation activities during the reporting period (**Section 5.0**); and
- Activities planned for the 2012-2013 AEMR period (**Section 6.0**).

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Location Plan

FIGURE 1

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1.2 Location and Coal Resource

Mangoola is located in the upper Hunter Valley of NSW in an area which has historically been used for agriculture, typically grazing, since the 1800's and includes broad acre clearing, patches of regrowth and remnant vegetation. Other land uses typical of the locality include some more intensive agriculture (vineyards, dairies and fodder cropping) as well as residential dwellings associated with rural land uses.

Topographically the mine area is typified by undulating hills and lower slopes through the higher areas (250-285 m AHD) and rocky outcrops. Anvil Hill, located centrally within the mine area is the dominating topographical feature rising to a height of 285 m AHD, approximately 70 m above the surrounding land within the mine area. Anvil Hill comprises two knolls connected by a saddle, and whilst located centrally within the mine area, is not within the area of affectation of the mine.

Initial intensive exploration, undertaken by Powercoal and Centennial Coal from 1999 onward, identified a resource of some 180 million tonnes (Mt) of coal at relatively shallow depths in the Anvil Hill area. The identified seams of interest in order of descending depth are the Great Northern Seam, Fassifern Seams and the Upper Pilot Seam in the Newcastle Coal Measures.

Mangoola proposes to extract approximately 150 Mt of the identified coal resource in the mine area, extracting some 10.5 Mtpa of ROM coal at peak production over an expected project life of 21 years.

1.3 Consents, Leases and Licences

The Mangoola Coal operations are regulated by a range of leases, licences and approvals, which are summarised in the following sections.

1.3.1 Project Approval/s

Mangoola was granted Project Approval 06_0014 by the Minister for Planning on 7 June 2007 to extract coal from an undeveloped coal reserve of approximately 150 Mt. Project Approval 06_0014 allows for the extraction, processing and transportation of up to 10.5 Mtpa for a period of up to 21 years from the granting of a Mining Lease. Mining Lease 1626 was granted on 20 November 2008.

Project Approval 06_0014 is supported by the *Anvil Hill Project Environmental Assessment* (Umwelt, 2006) (Anvil Hill EA). Five modifications to the original Project Approval have been approved, as detailed below in **Table 1**.

Table 1- Mangoola Project Approval and Modifications

Approval	Title	Date Granted	Expiry
06_0014	Project Approval	7 June 2007	20 November 2029
06_0014 MOD 1	Minor Modification to Project Approval ("Early Works")	22 July 2008	20 November 2029
06_0014 MOD 2	Modification to Project Approval ("Pipeline Modification")	23 June 2009	20 November 2029
06_0014 MOD 3	Modification to Project Approval ("Mining Infrastructure Area and CHPP")	4 November 2009	20 November 2029
06_0014 MOD 4	Modifications to Mine Plans and Relocation of 500kVElectricity Transmission line	22 June 2012	20 November 2029
06_0014 MOD 5	Modification to Project Approval ("Night-time Works")	23 February 2010	20 November 2029

One modification, Modification 4 (MOD 4) was approved during the reporting period, on 22 June 2012, and was submitted to the DP&I in January 2010. This modification involved the following:

- Redesign of the mine plan following relocation of an electricity transmission line;
- Six extensions to the approved project disturbance area, totalling approximately 11.7 hectares (ha) including:
  - A 1.7 ha area where the raw water dam will inundate land at full supply;
  - A 8.4 ha area of identified additional coal resource; and
  - 4 areas totalling 1.6 ha associated with drainage for the rail loop.
- Addition of a temporary ROM coal stockpile;
- Changes to site water management, including operating the Raw Water Dam at its full supply level;
- Increasing employee numbers;
- Increase in maximum train movements;
- Construction of an acoustic barrier in the approved rail loop; and
- Incorporating a rail re-fuelling facility in the rail loop.

The Mangoola site is currently bisected by an Electricity Transmission Line (ETL) owned by Transgrid. On 10 January 2012, a Project Application (10_0002) was lodged by Transgrid to relocate the transmission line, and allow Mangoola to extract the coal beneath. The application was approved on 16 July 2012, following the approval of PA06_0014 MOD 4.

1.3.2 Leases

Mangoola currently covers three leases as shown in **Table 2.**

Table 2 - Mangoola Leases

Title	Date Granted	Expiry
Mining Lease 1626	20 November 2008	20 November 2029
Exploration Lease 5552	8 May 2006	07 November 2014
Assessment Lease 9	8 November 2004	07 November 2014

1.3.3 Licences

Environmental Protection Licence

Mangoola operates under a single Environmental Protection Licence (EPL) No. 12894, with an anniversary date of 7 July. Monitoring results are reported to the OEH as part of the Mangoola EPL Annual Return. Mangoola's 2012 Annual Return is attached as **Appendix A**. EPL 12894 was varied four times during the reporting period:

- 6 July 2011 Variation - Amendment to allow the extraction and loading of up to 10.5 Mtpa of ROM coal. Amendments also made to conditions relating to blasting limits, and monitoring and recording requirements to exclude Mangoola owned land and private agreements;

- 2 December 2011 Variation - Amendment to include the requirement for a Pollution Reduction Program for best practice particulate matter control. This plan was developed and submitted on 29 June 2012;

- 11 May 2012 Variation - Inclusion of Condition U2 with a requirement to prepare and submit a Groundwater Mitigation Report. This report was completed and submitted to the EPA in May 2012; and

- 19 June 2012 Variation - Amendment of Condition U2, removing the requirement for preparing a Groundwater Mitigation Report, and including a requirement for completion of groundwater interception and monitoring works. These works are expected to be completed by the end of 2012.

The environmental reporting and monitoring activities undertaken at Mangoola in accordance with EPL No.12894, in particular in relation to air quality, surface water and blasting, are discussed in **Sections 3.3**, **3.5** and **3.10** respectively.

Groundwater Licences

Mangoola currently holds the following groundwater licences shown in **Table 3.**

Table 3 - Mangoola Groundwater Licences

Licence	Details	Licence	Details
20BL 145419	Extraction Bore. Extraction limit 53 ML	20BL 023739	Extraction Bore. Extraction limit 10 ML
20BL 105208	Well. Extraction limit 219 ML	20BL 144011	Well.
20BL 105207	Well. Extraction limit 218 ML	20BL 166284	Extraction Bore
20BL 169276	Extraction Bore. Extraction limit 98 ML	20BL 168696	Test Bore
20BL 120934	Extraction Bore. Extraction limit 596 ML	20BL 168414	Test Bore
20BL 167327	Extraction Bore.	20BL 168135	Test Bore
20BL 114812	Bore. Extraction limit 120 ML	20BL 167192	Extraction limit 10 ML
20BL 105210	Well	20BL 167425	20WA207718. Not part of water sharing plan
20BL 105206	Well	20BL 011687	20CA208179 Hunter River alluvial water source.
20BL 031351	Well. Extraction limit 151 ML	20BL 143666	Extraction limit 131 ML
20BL 012875	Extraction Bore.	20BL 167328	Extraction limit 8 ML
20BL 141091	Extraction Bore	20BL 007696	Not subject to water sharing plan.
20BL 011685	Extraction Bore	20BL166011	Extraction Bore. Extraction limit 6 ML
20BL 011686	Extraction Bore. Extraction limit 5 ML	20SL049945	Extraction Bore. Extraction limit 28 ML
20BL 143405	Well	20BL172598	Extraction Bore. Extraction limit 700 ML
20BL 169066	Extraction Bore	20BL 167212	Extraction Bore. Extraction limit 1 ML
20BL 167003	Monitoring Bore	20BL 142497	Extraction Bore
20BL 168743	Test Bore	20BL 166460	Extraction Bore
20BL 128233	Extraction Bore	20BL 117574	Extraction Bore

Surface Water Licences

Mangoola currently holds the following surface water licences, as detailed in **Table 4.**

Table 4 - Mangoola Surface Water Licences

WAL	Water Use Approval	Annual Allocation (ML)	Details
691	20WA211008	50	Hunter Regulated River. Domestic, irrigation, stock
735	20WA211008	72	Hunter Regulated River. Irrigation
822	20WA211008	3	Hunter Regulated River. Irrigation
824	20WA211008	175	Hunter Regulated River. Irrigation
830	20WA211008	306	Hunter Regulated River. Industrial
933	20WA211008	43	Hunter Regulated River. Irrigation
1057	20CA 201470	509	Hunter Regulated River. Irrigation
1159	20WA211008	159	Hunter Regulated River. Irrigation
9061	20WA211008	6	Hunter Regulated River. Domestic, irrigation, stock
6317	20CA 202451	19	Wybong Creek Ground Water. Irrigation
9062	20WA211008	18	Hunter Regulated River. Domestic, irrigation, stock
823	20 WA211008	310	Hunter Regulated River. Irrigation
9986	20WA211008	5	Hunter Regulated River, Industrial
503	20 WA211008	159	Hunter Regulated River. Domestic, irrigation, stock
6577	20AL201870	8	Hunter Regulated River. Domestic, irrigation, stock
831	20WA211008	8	Hunter Regulated River. Industrial
6327	20CA 202482	30	Wybong Creek Ground Water. Industrial, Irrigation
6270	20CA 202547	30	Wybong Creek Surface Water. Irrigation
6272	20CA 202555	50	Wybong Creek Surface Water. Irrigation.
6276	20CA 02563	12	Wybong Creek Surface Water. Domestic Stock Irrigation
7292	20CA 202611	44	Wybong Creek Surface Water. Irrigation.
6294	20CA 202632	39	Wybong Creek Surface Water. Irrigation.
6308	20CA 202671	96	Wybong Creek Surface Water. Irrigation.
9343	20CA 203175	25	Wybong Creek Surface Water. Irrigation.
9987	20WA211008	82	Hunter Regulated River. Domestic and Stock
11085	20CA 203321	128	Wybong Creek Ground Water. Domestic Stock Irrigation
895	20 WA211008	8	Hunter Regulated River. Irrigation
6300	20WA 202648	5	Wybong Creek Surface Water. Diversion Works-Pumps
13083	20 WA211008	100	Hunter Regulated River. Domestic, irrigation, stock
11216	20 WA211008	86	Hunter Regulated River. Domestic, irrigation, stock
6576	20 WA211008	600	Hunter Regulated River. Domestic, irrigation, stock
1349	20 WA211008	8	Hunter Regulated River. Domestic, irrigation, stock
692	20AL200579	8	Hunter Regulated River. Domestic, irrigation, stock

WAL	Water Use Approval	Annual Allocation (ML)	Details
6275	20CA 202563	5	Wybong Creek. Domestic, Stock and Irrigation
3607	-	69	Wybong Creek Water Source (Groundwater)

Radiation Licence

Mangoola holds Radiation Licence RL42108 which expires 28 April 2013.

Aboriginal Heritage Impact Permit

Mangoola holds Aboriginal Heritage Impact Permit (AHIP) 1110275, which expired on 26 February 2011, with works being completed prior to the expiry date.

1.4 Mining Operations Plan Status

In March 2012 the Mangoola Mining Operations Plan (MOP) Amendment B was approved by the DTIRIS - Resources and Energy Division. The amendment related to extending the MOP term to December 2013 to allow continuation of mining and associated activities in North Pit until a determination was made on PA06_0014 MOD 4. MOD 4 was approved on 22 June 2012, and it is anticipated that the MOP will be revised and resubmitted in the following reporting period.

1.5 Performance Summary

A review of environmental performance, both generally and in relation to the conditions of EPL 12894, is summarised below. This performance is further discussed in the relevant sections on environmental management activities and environmental monitoring in **Section 3.0**. The performance of the mine can be summarised as being within licence requirements with the following exceptions:

- EPL Condition M2.1 – EPL points 4 (dust) and 6.7 (water) were not sampled for the full reporting period. Assorted dates throughout the reporting period were missed for a number of different reasons, including external power supply issues, a faulty filter, dry conditions (no flow/no sample), no access (too wet), and insufficient water for sampling; and

- EPL Condition U2 – On 9 March 2012 groundwater seepage downstream of the embankment of the Raw Water Dam was observed and identified that it was flowing offsite in the Sandy Creek catchment area. This incident is discussed further in **Section 3.5.3**.

Mangoola aims at complying with all licence requirements, as well as implementing practices to monitor, mitigate and minimise any health, safety, environment and community impacts resulting from its operations. To assist with this, Mangoola has adopted the Xstrata Coal Sustainable Development Policy, as reproduced in **Appendix B**. Mangoola Coal's performance details for the reporting period are summarised in the Annual Return **Appendix A**.

Mangoola received 593 complaints during the reporting period, compared with 457 complaints in the last reporting period. The increase in complaints was mostly attributed to noise complaints, in response to the increase in mining operations during the reporting period, compared to the previous reporting period which included the change from day time to 24/7 operation. Formal and informal communications continued with stakeholders including local residents/property owners, Aboriginal stakeholders, key industry and government representatives and employees and contractors.

The Mangoola CCC met on four occasions during the reporting period and has met regularly since inception in 2007. The committee meeting continued to be a valuable means of discussing issues and communicating mine information to key stakeholders in the community. Further details regarding the outcomes of the CCC meetings are detailed in **Section 4.0.**

1.6 Mine Contacts

The relevant mine contacts for Mangoola are listed in **Table 5.**

Table 5 - Mine Contacts

Mangoola Contacts		
General Manager Trevor Wells Tel: 02 6549 5500 Email: twells@xstratacoal.com.au	**Operations Manager** Tony Israel Tel: 02 6549 5501 Email: tisrael@xstratacoal.com.au	**Environment and Community Manager** Ben Clibborn Tel: (02) 6549 5503 Email bclibborn@xstratacoal.com.au

General Contact Details	
Address	Xstrata Mangoola Pty Limited PO Box 495 MUSWELLBROOK NSW 2333 Wybong Road, Muswellbrook, 2333
Phone Number	(02) 6549 5500
Fax Number	(02) 6549 5655
24 Hour Community Hotline	1800 014 339
Website	www.xstratacoalmangoola.com.au

1.7 Actions required from previous AEMR review

A site inspection was conducted by the DP&I on 17 January 2012 as part of its review of the 2010-2011 AEMR. The Department found that the 2010-2011 AEMR generally satisfied the requirements of Mangoola's Project Approval 06_0014; however three comments were made, which are detailed in **Table 6.** The status of these actions is discussed in the relevant sections of this AEMR.

Table 6 - Actions required from last AEMR

Action Required	**Where dealt with in this AEMR**
Delineate air quality monitors utilised for compliance from those used for management purposes in future AEMRs.	**3.3**
Investigate extending the concrete bunding area (in the vicinity of the workshop) to ensure that all chemicals are placed within bunds and are placed in such a manner that captures any potential spills.	**3.18.2**
All rehabilitated areas are to be inspected and appropriate action undertaken to ensure areas of seeding are effective.	**5.2**

1.8 Compliance

This AEMR has been prepared to address all relevant conditions of the Mangoola Coal Project Approval 06_0014 and the Statement of Commitments (SoC) which have been triggered during the reporting period (provided in **Appendix B**). The requirements relating to the AEMR as set out in

Project Approval 06_0014 are reproduced in **Table 7**, which also indicates where each condition is addressed in this AEMR.

Table 7 - Relevant Project Approval Conditions

Condition	AEMR Section
Project Approval 06_0014, Schedule 3, Condition 10 **NOISE**	
The Proponent shall: (a) implement all reasonable and feasible best practice noise mitigation measures; (b) investigate ways to reduce the noise generated by the project, including off-site road and rail noise and maximum noise levels which may result in sleep disturbance; and (c) report on these investigations and the implementation and effectiveness of these measures in the AEMR, to the satisfaction of the Director-General.	**3.11**
Project Approval 06_0014, Schedule 3, Condition 49 **TRAFFIC and TRANSPORT**	
The Proponent shall: (a) keep records of the: • amount of coal transported from the site each year; and • number of coal haulage train movements generated by the project (on a daily basis); and (b) include these records in the AEMR.	**2.8**
Project Approval 06_0014, Schedule 3, Condition 59 **GREENHOUSE GAS**	
The Proponent shall: (a) monitor the greenhouse gas emissions generated by the project; (b) investigate ways to reduce greenhouse gas emissions generated by the project; and (c) report on greenhouse gas monitoring and abatement measures in the AEMR, to the satisfaction of the Director-General.	**3.20**
Project Approval 06_0014, Schedule 3, Condition 60 **WASTE MINIMISATION**	
The Proponent shall: (a) monitor the amount of waste generated by the project; (b) investigate ways to minimise waste generated by the project; (c) implement reasonable and feasible measures to minimise waste generated by the project; (d) ensure irrigation of treated wastewater is undertaken in accordance with DECC's *Environmental Guideline for the Utilisation of Treated Effluent*; and (e) report on waste management and minimisation in the AEMR, to the satisfaction of the Director-General.	**2.7**
Project Approval 06_0014, Schedule 5, Condition 4 **ANNUAL REPORTING**	
Within 12 months of this approval, and annually thereafter, the Proponent shall submit an AEMR to the Director-General and relevant agencies. This report must:	**This document**
(a) identify the standards and performance measures that apply to the project;	**3.0**
(b) describe the works carried out in the last 12 months;	**2.0**

Condition	AEMR Section
(c) describe the works that will be carried out in the next 12 months;	**6.0**
(d) include a summary of the complaints received during the past year, and compare this to the complaints received in previous years;	**4.4**
(e) include a summary of the monitoring results for the project during the past year;	**3.0**
(f) include an analysis of these monitoring results against the relevant: • impact assessment criteria/limits; • monitoring results from previous years; and • predictions in the EA;	**3.0**
(g) identify any trends in the monitoring results over the life of the project;	**3.0**
(h) identify any non-compliance during the previous year; and	**3.22**
(i) describe what actions were, or are being, taken to ensure compliance	**3.0**
Project Approval 06_0014, Schedule 5, Condition 10 **ACCESS TO INFORMATION**	
Within 3 months of the approval of any strategy/plan/program required under this approval (or any subsequent revision of these strategies/plans/programs), or the completion of the audits or AEMRs required under this approval, the Proponent shall: (a) provide a copy of the relevant document/s to the relevant agencies and the CCC;	**1.1**
(b) put a copy of the relevant document/s on the Proponent's website.	**4.5**
Project Approval 06_0014, Appendix 3, Statement of Commitment 6.5.16 **BLASTING and VIBRATION**	
Blast monitoring results will be reported in the AEMR.	**3.10**
Project Approval 06_0014, Appendix 3, Statement of Commitment 6.7.8 **GROUNDWATER**	
Analyses of the monitoring data will include comparison against model predictions, establishment of triggers for remedial action, expert review as required, and reporting to regulatory agencies at appropriate intervals. The monitoring results and the analyses will be reported in the AEMR.	**3.6**

1.9 Mining Lease Conditions

Table 8 lists the conditions of the Mining Lease 1626 that contain reporting requirements covered by this AEMR.

Table 8 - Mining Lease Reporting Requirements

Mining Lease Condition	AEMR Section
4. The lease holder must lodge Environmental Management Reports (EMR) with the Director-General annually or at dates otherwise directed by the Director-General.	**This document**
5. The EMR must:	
Report against compliance with the MOP;	**1.4**
Report on progress in respect of rehabilitation completion criteria;	**5.0**
Report on the extent of compliance with regulatory requirements; and	**3.22**
Have regard to any guidelines adopted by the Director-General.	**This document**
6. Additional environmental reports may be required on specific surface disturbing operations or environmental incidents from time to time, as directed in writing by the Director-General and must be lodged as instructed.	**3.21**

2.0 OPERATIONS DURING THE REPORTING PERIOD

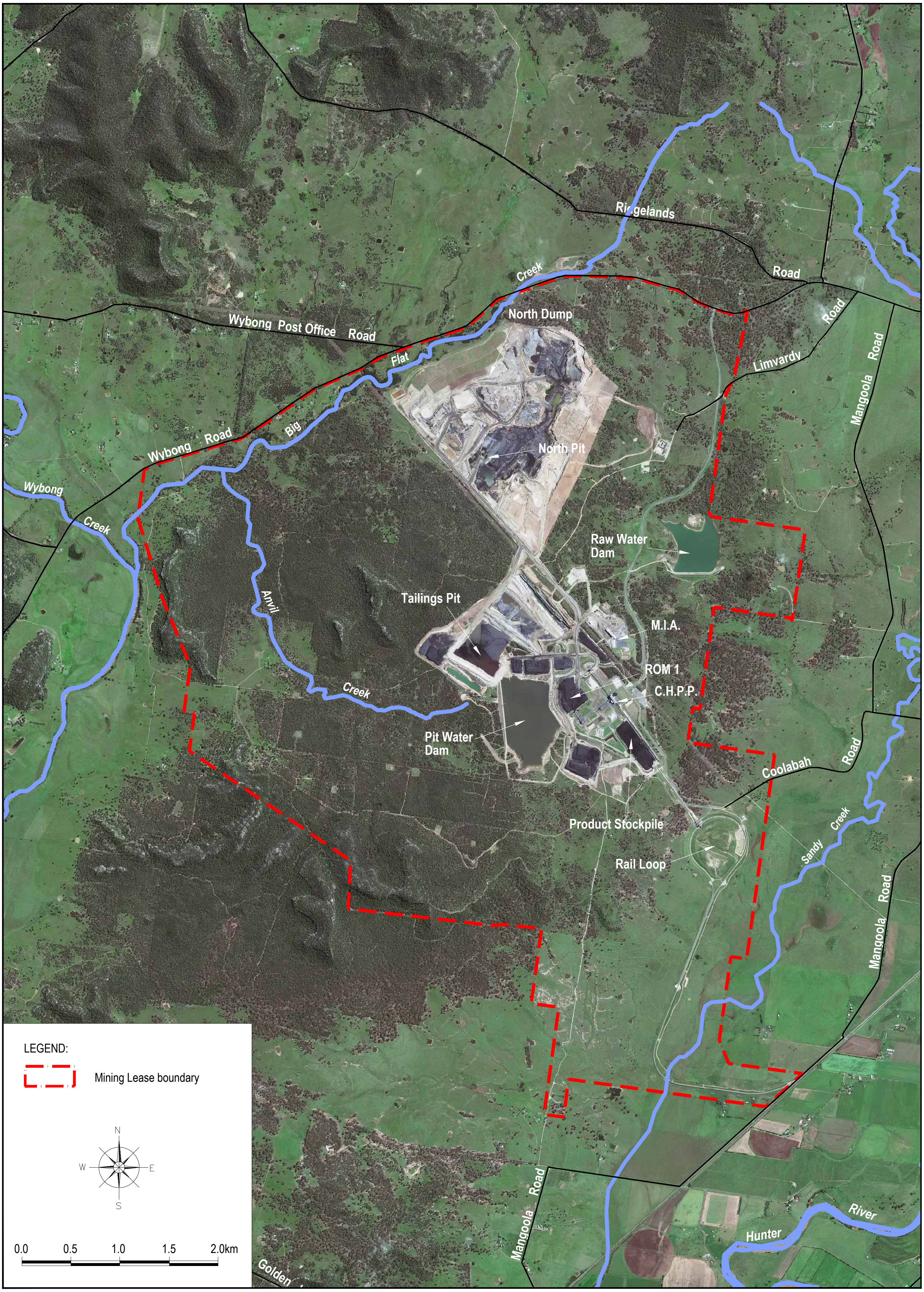
2.1 Overview

Open cut mining continued at Mangoola during the reporting period. Truck and shovel mining methods are used to handle overburden and coal, with the operation proposed to extract and process up to 10.5 Mtpa of ROM coal over the expected project life of 21 years. The operation includes a rail loop and train loading infrastructure, coal stockpiling and reclaim area, CHPP, and mine facilities and offices. Product coal is loaded and transported to market via the rail loop connected to the Muswellbrook – Ulan railway. **Table 9** summarises the key components of operations at Mangoola. The general site layout is presented in **Figure 2**.

Table 9 - Mine Features and Components

Component	Comment
Mine operations	Open cut mine extracting and processing up to 10.5 Mtpa of ROM coal using truck and shovel mining methods to handle overburden and coal.
Proponent	Xstrata Mangoola Pty Ltd (Purchased from Centennial Hunter Pty Ltd (Centennial Coal))
Project Life	Expected project life of 21 years.
Coal Washing	Operation of CHPP capable of handling up to 10.5 Mtpa of ROM coal, at an average processing rate of 1,800 tonnes per hour. Rejects to be mainly placed within mined areas with initial disposal in purpose built tailings dam and then managed in mined areas as the mine progresses.
Employment	Operational workforce of up to 240 employees at peak production.
Surface Infrastructure	Consisting of a: • Rail loop, • Coal stockpiling and Reclaim area, • Train loading infrastructure. • Coal Handling and Preparation Plant (CHPP) • Mine Infrastructure Area (MIA) consisting of mine facilities and offices.
Hours of Operation	24 hours a day, seven days a week.
Product Coal Transport	Loaded and transported to market via the rail loop connected to the Muswellbrook – Ulan railway.
Mine access	Only road access is via Wybong Road.

Activities undertaken during the reporting period included open cut mining, exploration drilling, and rehabilitation. Further detail on these activities is provided in the sections below.



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Site Layout

FIGURE 2

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2.2 Exploration

Exploration drilling undertaken during the reporting period across the site is as follows:

- Eight non-core holes (~95mm) were drilled within Mining Lease 1626 to delineate coal seam lithology in the northern region of the lease and;
- Six core holes (92mm) were drilled and sampled to determine coal quality in the northern region of mining lease 1626.

The details of this drilling program are summarised in **Table 10** below.

Table 10 - Mangoola Exploration Drilling Summary 2011-2012

BORE ID	TD (m)	Date Drilled	Comments
XM0001	45.00	28-Jun-12	-
XM0005	60.00	15-Jun-12	-
XM0106	30.00	26-Jun-12	Grouted 6 Jul 2012
XM0107	30.00	26-Jun-12	Grouted 6 Jul 2012
XM0108	36.00	25-Jun-12	Grouted 6 Jul 2012
XM0110	36.00	26-Jun-12	-
XM0111	24.00	27-Jun-12	-
XM0112	27.00	27-Jun-12	-
XM5000	57.61	23-May-12	Grouted 15 Jun 2012
XM5001	48.13	25-May-12	Grouted 1 Jun 2012
XM5002A	39.25	31-May-12	Grouted 12 Jun 2012
XM5002B	36.48	26-Jun-12	-
XM5003	40.09	28-Jun-12	Grouted 5 Jul 2012
XM5006	60.82	14-Jun-12	Grouted 3 Jul 2012

2.3 Land Preparation

During the reporting period 138.21 ha of land were cleared for the purpose of mining operations, totalling 908.13 ha cleared by Mangoola to date. Land clearing is undertaken in accordance with the Mangoola Coal environmental management framework. Areas are assessed prior to clearing to minimise potential ecological, water management, sediment and erosion, and cultural heritage impacts in accordance with the pre-clearing requirements.

2.4 Construction

Construction activities at Mangoola were completed during the previous 2010-2011 reporting period. No construction activities were undertaken during the 2011-2012 reporting period.

2.5 Mining

Coal extraction continued during the reporting period, with 11,313,898 tonnes of ROM coal being produced. The project approval limit of 10,500,000 tonnes of ROM coal is a calendar year limit. Mining operations during the reporting period continued in the North Pit, working in a north-east to south-east direction to Strip 10. Waste produced was run to out of pit dumps that reached a maximum height of 210RL during the reporting period.

Plate 1 – Extent of Mining Operations November 2011

2.6 Coal Processing

During the reporting period 11,092,995 tonnes of ROM coal were processed through the CHPP. 1,509,398 tonnes of tailings were produced during the reporting period, resulting in a tailings yield of 14%.

2.7 Waste Management

Waste at Mangoola is managed in accordance with a Waste Management System (WMS) (incorporating waste reuse and recycling). The WMS has been developed in accordance with the requirements of the *Protection of the Environment Operations Act 1997* (POEO Act).

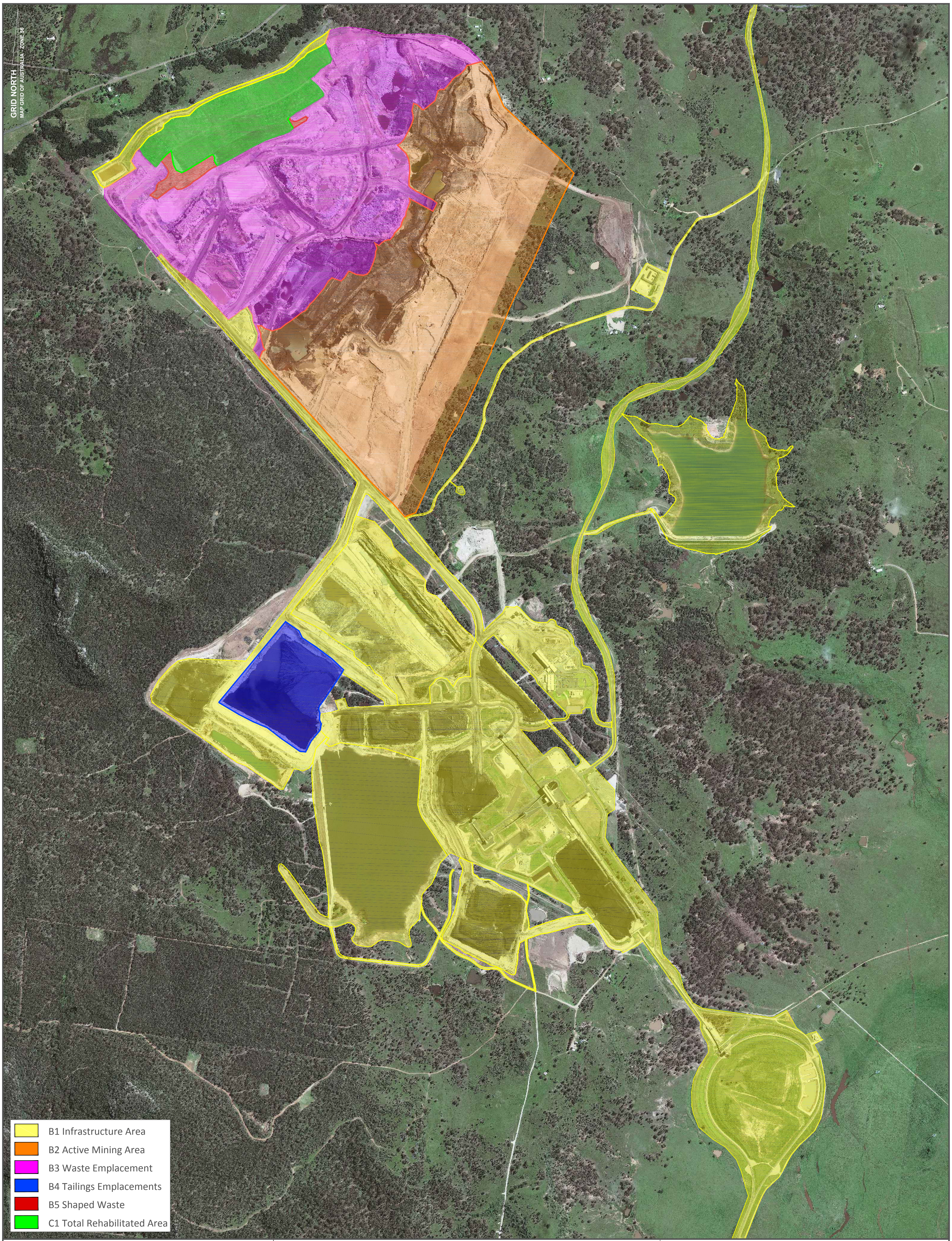
A waste contractor undertakes the collection and recording of waste material, with as much material as possible being recycled. A summary of the recorded waste collected at Mangoola during the reporting period is presented in **Table 11.**

During the previous reporting period 4,323 tonnes of waste were produced with 3,716 tonnes being recycled (86% recycled). In the current reporting period 1,007 tonnes of waste were produced, with 815 tonnes of this being recycled (81% recycled). The decrease in waste recorded during the current reporting period is due to the completion of the construction phase of the operation in the previous reporting period.

As detailed in **Table 11** the major waste streams during the reporting period were effluent, waste oil, and mixed solid waste. No regulated waste was produced at Mangoola during the reporting period.

Table 11 - Summary of Waste Generation for Major Waste Streams

Waste Stream (kg)	Jul-2011	Aug-2011	Sep-2011	Oct-2011	Nov-2011	Dec-2011	Jan-2012	Feb-2012	Mar-2012	Apr-2012	May-2012	Jun-2012	Total
Hazardous Recycled													
Lead Acid Batteries	-	-	1,202	845	-	993	811	-	441	818	737	957	**6,804**
Waste Oil	36,300	22,500	39,000	23,200	26,200	17,500	56,900	15,200	53,800	35,800	42,000	47,200	**415,600**
Oily Water	-	-	-	-	-	-	-	1,000	2,000	-	-	-	**3,000**
Waste Coolant	2,100	-	3,000	2,500	1,800	2,000	2,000	1,700	-	-	-	8,600	**23,700**
Oil Filters	2,314	2,328	2,172	1,230	2,472	1,000	3,628	1,142	3,406	1,116	2,516	3,712	**27,036**
Waste Grease	368	-	-	-	512	-	-	-	1,310	-	-	-	**2,190**
Empty Drums	8	-	-	-	-	-	-	-	262	3,870	-	226	**4,366**
Contaminated Sludge	-	-	-	-	-	-	-	-	-	2,100	-	-	**2,100**
Effluent	29,000	15,500	70,000	22,000	9,000	15,010	-	16,500	13,000	8,000	13,500	24,300	**235,810**
Non-Hazardous Recycled													
Paper and Cardboard	835	795	1,450	1,045	882	985	920	1,285	1,435	1,165	1,045	1,710	**13,552**
Commingled	-	-	-	-	74	-	-	-	-	-	-	-	**74**
Scrap Steel	1,000	10,360	-	9,480	-	-	8,320	11,380	12,100	-	6,100	8,800	**67,540**
Timber	2,700	-	2,370	4,300	780	-	-	700	1,580	820	-	-	**13,250**
Confidential Documents	-	-	-	-	-	75	-	-	-	-	-	-	**75**
Hazardous Disposal													
Oily Rags / Absorbents	454	436	448	78	306	158	566	184	1,166	158	574	632	**5,160**
Medical/Sanitary Waste	-	-	48	37	32	30	29	22	38	40	31	34	**341**
Chemical Anchors	-	-	128	-	-	-	-	-	-	-	-	-	**128**
Non-Hazardous Disposal													
Mixed Solid Waste (MSW)	11,755	13,870	12,115	18,685	11,473	13,575	16,105	18,715	17,935	10,815	19,245	21,935	**186,223**
Contained Onsite													
Oily Water	-	-	-	-	-	-	-	-	-	-	12,000	-	**12,000**
Totals													
Total Offsite Waste (kg)	**86,834**	**65,789**	**131,933**	**83,400**	**53,531**	**51,326**	**89,279**	**67,828**	**108,473**	**64,702**	**85,748**	**118,106**	**1,006,949**
Recycled Waste	**74,625**	**51,483**	**119,194**	**64,600**	**41,720**	**37,563**	**72,579**	**48,907**	**89,334**	**53,689**	**65,898**	**95,505**	**815,097**



SITE : MANGOOLA		Xstrata Mangoola Pty Ltd ABN 54 127 535 755 Wybong Road Muswellbrook NSW 2333 Australia P.O. Box 495 Muswellbrook NSW 2333 Australia Telephone 61 2 6542 6600 - Facsimilie 61 2 6543 4318	TITLE: Rehabilitation Summary 2012
DEPARTMENT : TECHNICAL SERVICES	DATUM: MGA/AHD		DRAWING No. : 120910-NTH-EN-150-NW-R0 **FIGURE 3**
DRAWN : SURVEY	DATE : 06-09-2012	SIGN:	REV. 1
SCALE : NOT TO SCALE			SHEET A

xstrata coal
Mangoola Coal

2.8 Ore and Product Stockpiles and Coal Transport

At the end of the reporting period the volume of the ROM stockpile was 473,927 tonnes, and the volume of the product stockpile was 560,684 tonnes.

During the reporting period 8,530,954 tonnes of coal were transported by rail to the port of Newcastle. There were 1,018 train movements during the period, equating to an average of 2.8 train movements generated by Mangoola on a daily basis.

2.9 Water Management

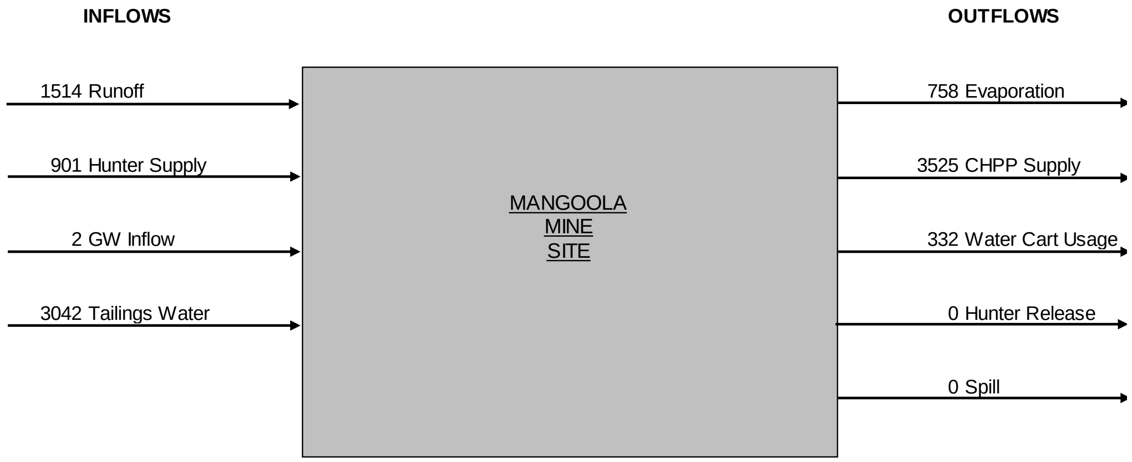
Routine inspections of water management structures were undertaken on a weekly basis and after rain events exceeding 20mm in 24 hours. Maintenance was undertaken as identified during these inspections. Water management infrastructure is illustrated on **Figure 2**.

Mangoola currently operates two water extraction pumps within one pump station (20WA211008), to provide water for its operations from the Hunter River in accordance with its water extraction permits. The extraction limit for 20WA211008 is 2537 ML. The Xstrata Colinta Pastoral Company (Colinta) is allocated a further 846 ML of Hunter River Water, which may be transferred for use in the mine in times of drought. The total water extracted from the Hunter River during the reporting period by Mangoola was 901.08 ML. Colinta drew 31.39 ML for irrigation purposes during the reporting period.

Water extraction by pumping from the Hunter River during the current reporting period represents a decrease from the 1,918 ML extracted during the previous period. This is a result of the cessation of pumping from the Hunter River in October 2011 due to the high water levels on site.

A total of 3,525 ML of pit water was pumped out of the mine to the CHPP during the reporting period.

Specialist consultants Gilbert and Associates were engaged to develop a site water balance for Mangoola. Water held/captured onsite at Mangoola by the various dams during the reporting period is shown below in **Figure 4** and **Table 12.**



INFLOW-OUTFLOW (ML)	**843**
Recorded volume stored on site at start of AEMR period (ML)	1497
Recorded volume stored on site at end of AEMR period (ML)	2173
Recorded change in storage	675

5458 TOTAL

4615 TOTAL

Figure 4 – Mangoola 2011-2012 Site Water Balance (Gilbert and Associates)

Table 12 - Volume of water held and source at Mangoola

Volume held by dams (ML)				
	Start of Reporting Period	**End of Reporting Period**	**Change During Reporting Period**	**Storage Capacity**
Water held on site	1497.2	2173.7	675.4	4150
Controlled discharge water (salinity trading schemes)	0	0	0	-

Plate 2 – Water Management Structures at Mangoola

2.10 Hazardous Substances Management

All hazardous substances are managed as per the Mangoola Hazardous Substances Management System (MAN SD GDL 0005). All substances are required to be approved for site use by the Health and Safety (H&S) Department and Environment and Community Department. Approval for use is based on health effects, storage requirements, emergency response and disposal requirements.

Material Safety Data Sheets (MSDS) are available on the Mangoola intranet through the ChemAlert system and in hard copy in registered folders. A complete inventory of hazardous substance is available through the ChemAlert system.

Dangerous goods stored onsite during the reporting period included the use of 10,197 tonnes of explosives. Mangoola stores explosives onsite (emulsion and boosters). All explosives are handled in accordance with MAN MIN PLN 0002 Mangoola Explosives Management Plan. Approximately 28.76 ML of diesel was used during reporting period for the entire site.

2.11 Land Acquisition

No properties were acquired by Mangoola during the reporting period.

3.0 ENVIRONMENTAL MANAGEMENT AND PERFORMANCE

3.1 Environmental Management System

The Xstrata Mangoola Sustainable Development (SD) Management System provides the objectives, principles and practices which support Mangoola in achieving high standards in SD Management. The Mangoola SD Management System has been developed based on the Xstrata Plc 17 SD Standards which form the framework for the SD Management System.

Various guidelines, procedures, management strategies and registers have also been developed, along with statutory required management plans and monitoring programs as listed in **Table 13.**

During the reporting period, Mangoola Coal's Aboriginal Cultural Heritage Works Policy, Biodiversity Offset Management Plan, Groundwater Monitoring Program, Blast Monitoring Field Sheet, Community Complaints Form, Crisis Management Plan, Ground Disturbance Permit, Water Discharge Approval Form, Working in Remote Areas Form, and Salvage and Translocation of the Tiger Orchid (*Cymbidium canaliculatum*) Form were either issued or updated.

All environmental monitoring programs, plans, procedures and forms are directly related to the Mangoola Biodiversity, Environment and Landscape Functions Procedure (MAN SD PRO 0024). All of the monitoring locations described in the monitoring programs are shown **Figure 5** (Air Quality Monitoring), **Figure 7** (Surface Water Monitoring), **Figure 12** (Groundwater Monitoring) and **Figure 13** (Noise and Blast Monitoring).

Table 13 - Management system guidelines and standards

Document No	Document Type	Document Title
GUIDELINES		
MAN SD GDL 0007	Guideline	Mangoola Coal Contractors, Suppliers and Partners
MAN SD GDL 0008	Guideline	Social and Community Engagement
PROCEDURES		
MAN SD PRO 0006	Procedure	Mangoola Coal Dust Trigger Response
MAN SD PRO 0013	Procedure	Pre Clearing Survey
MAN SD PRO 0014	Procedure	Habitat Tree Felling
MAN SD PRO 0015	Procedure	Tree Hollow Size
MAN SD PRO 0016	Procedure	Mangoola Coal Hollow Salvage
MAN SD PRO 0017	Procedure	Nest Box Salvaged Tree Installation
MAN SD PRO 0018	Procedure	Salvage and Reinstatement of Habitat Features Other than Tree Hollows
MAN SD PRO 0019	Procedure	Nest Box Design
MAN SD PRO 0020	Procedure	Planting of Specific habitat Feature
MAN SD PRO 0021	Procedure	Tiger Orchid Salvage and Translocation
MAN SD PRO 0022	Procedure	Mangoola Coal Aboriginal Stakeholder Consultation
MAN SD PRO 0023	Procedure	Mangoola Coal Working in Remote Areas
MAN SD PRO 0024	Procedure	Biodiversity Environment and Landscape Functions
MAN SD PRO 0025	Procedure	Mangoola Coal Mobile and Transportable Equipment and Site

Document No	Document Type	Document Title
		Access Inspection
MAN SD PRO 0045	Procedure	Community Complaints Procedure
MAN SD PRO 0046	Procedure	Blasting Hotline Info Change Approval Procedure
MAN SD PRO 0073	Procedure	Noise Management Procedure
MANAGEMENT PLANS		
MAN SD PLN 0001	Plan	Crisis Management Plan
MAN SD PLN 0006	Plan	Environmental Section Annual Plan
MAN SD PLN 0014	Plan	Mangoola Coal Environmental Management Strategy (EMS)
MAN SD PLN 0015	Plan	Mangoola Coal Air Quality Monitoring Program (AQMP)
MAN SD PLN 0016	Plan	Mangoola Coal Noise Monitoring Program (NMP)
MAN SD PLN 0017	Plan	Mangoola Coal Blast Monitoring Program (BVMP)
MAN SD PLN 0018	Plan	Mangoola Coal Environmental Monitoring Program (EMP)
MAN SD PLN 0019	Plan	Mangoola Coal Site Water Management Plan (SWMP)
MAN SD PLN 0020	Plan	Mangoola Coal Site Water Management Plan Appendix 1: Site Water Balance (SWB)
MAN SD PLN 0021	Plan	Mangoola Coal Site Water Management Plan Appendix 2: Erosion and Sediment Control Plan (ESCP)
MAN SD PLN 0022	Plan	Mangoola Coal Site Water Management Plan Appendix 3: Surface Water Monitoring Plan (SWMP)
MAN SD PLN 0023	Plan	Mangoola Coal Site Water Management Plan Appendix 4: Ground Water Monitoring Plan (GWMP)
MAN SD PLN 0024	Plan	Mangoola Coal Site Water Management Plan Appendix 5: Surface and Ground Water Response Plan
MAN SD PLN 0026	Plan	Mangoola Coal Aboriginal Cultural Heritage Management Plan (ACHMP)
MAN SD PLN 0027	Plan	Mangoola Coal Bushfire Management Plan
MAN SD PLN 0028	Plan	Mangoola Coal Bushfire Management Poster
MAN SD PLN 0033	Plan	Mangoola Coal Stakeholder Engagement Strategy
REGISTERS		
MAN SD REG 0008	Register	HSEC Department Inspection Schedule
MAN SD REG 0009	Register	Mangoola Coal Induction Pre-requisite Register
MAN SD REG 0010	Register	Stakeholder Register
POLICIES		
MAN SD POL 0002	Policy	Aboriginal Cultural Heritage Works at Mangoola Coal Conditions of Engagement
FORMS		
MAN SD FRM 0027	Form	Ionising Radiation Work Permit
MAN SD FRM 0028	Form	Isolation and Testing Check Sheet
MAN SD FRM 0032	Form	Mangoola Coal Erosion and Sediment Control Monitoring Checklist

Document No	Document Type	Document Title
MAN SD FRM 0034	Form	Mangoola Coal Daily Weather Observation Form
MAN SD FRM 0046	Form	Ground Disturbance Permit
MAN SD FRM 0047	Form	Pre Clearing Surveys
MAN SD FRM 0048	Form	Habitat Tree Felling
MAN SD FRM 0049	Form	Tree Hollow Records
MAN SD FRM 0050	Form	Ground Disturbance Permit Compliance Form
MAN SD FRM 0051	Form	Mangoola Coal Water Discharge Approval
MAN SD FRM 0052	Form	Grid Mesh Removal Permit
MAN SD FRM 0052	Form	Mangoola Coal Noise Complaint Report
MAN SD FRM 0055	Form	Level Two Pre-Qualification Assessment
MAN SD FRM 0056	Form	Level Three Pre-Qualification Assessment
MAN SD FRM 0057	Form	Temporary Induction Details Form
MAN SD FRM 0059	Form	Mangoola Coal Supervisor Daily Checklist
MAN SD FRM 0060	Form	Mangoola Coal Works to Proceed Form
MAN SD FRM 0061	Form	Mangoola Coal Mobile and Transportable Equipment Site Delivery Requirements
MAN SD FRM 0062	Form	Mangoola Coal Mobile and Transportable Equipment Pre-Delivery Requirements
MAN SD FRM 0083	Form	Face to Face Consultation Form
MAN SD FRM 0084	Form	Business Registration Form
MAN SD FRM 0085	Form	Witness Statement Form
MAN SD FRM 0087	Form	Permission to Land at Mangoola Coal
MAN SD FRM 0090	Form	Community Complaints Form
MAN SD FRM 0092	Form	Community Incident Report Form
MAN SD FRM 0134	Form	Noise Alarm Response
MAN SD FRM 0135	Form	Attended Noise Monitoring Response Form
MAN SD FRM 0151	Form	Working in Remote Areas
MAN SD FRM 0173	Form	Blast Monitoring Field Sheet
MAN SD FRM 0174	Form	Salvage and Translocation of the Tiger Orchid (*Cymbidium canaliculatum*)
EXTERNAL		
MAN SD EXT 0006	External	Mangoola Coal Environmental Protection Licence
MAN SD EXT 0007	External	EPL Variation
MAN SD EXT 0008	External	Notice of Modification - EPA
MAN SD EXT 0013	External	Managing Urban Stormwater Book – Section 1
MAN SD EXT 0014	External	Managing Urban Stormwater Book – Section 2
MAN SD EXT 0015	External	Managing Urban Stormwater Book – Section 3
MAN SD EXT 0016	External	Managing Urban Stormwater Book – Section 4

Document No	Document Type	Document Title
MAN SD EXT 0017	External	Managing Urban Stormwater Book – Section 5
MAN SD EXT 0018	External	Managing Urban Stormwater Book – Section 6
MAN SD EXT 0019	External	Managing Urban Stormwater Book – Section 7
MAN SD EXT 0020	External	Managing Urban Stormwater Book – Section 8
MAN SD EXT 0021	External	Managing Urban Stormwater Book – Section 9
MAN SD EXT 0022	External	Managing Urban Stormwater Book – Section 10
MAN SD EXT 0023	External	Managing Urban Stormwater Book – Section 11
MAN SD EXT 0024	External	Managing Urban Stormwater Book – Section 12
MAN SD EXT 0025	External	Managing Urban Stormwater Book – Section 13
MAN SD EXT 0026	External	Managing Urban Stormwater Book – Section 14
MAN SD EXT 0027	External	Managing Urban Stormwater Book – Section 15
MAN SD EXT 0028	External	Contractor Risk Assessment Tool
MAN SD EXT 0030	External	Sustainable Development Management System for Construction Projects

The information collected through the implementation of the Xstrata Mangoola SD Management System is discussed in the following section of this AEMR.

3.2 Meteorological Data

3.2.1 Overview

In accordance with Schedule 3, Condition 28 of Project Approval 06_0014, and condition 7.1 of EPL 12894, Mangoola continued to operate to the Wybong (WSN) meteorological station throughout the reporting period. This monitor is located to the north of the site, along Wybong Post Office Road.

This station logs data every five minutes and sends the data to a web database by Next G telemetry for near real time access. The web database is also updated every five minutes. The weather station has the following sensor configuration:

- Air temperature at two and 10m vertical height and delta T (temperature difference between these heights for inversion prediction);
- Humidity;
- Rainfall;
- Wind speed;
- Wind direction;
- Sigma theta;
- Barometer; and
- Solar radiation.

Meteorological data recorded during the reporting period is provided in **Appendix D,** with a summary presented in the tables below.

Ongoing meteorological data collection allows prevailing weather conditions to be assessed in real-time and management decisions to be made accordingly. In particular, meteorological conditions which may exacerbate impacts associated with noise or dust generating activities can be identified allowing the works program to be modified so as to minimise impacts from such activities.

3.2.2 Rainfall

The monthly recorded rainfall for the Wybong weather station during the reporting period, and a comparison against the previous reporting period is shown in **Table 14.**

Table 14 - Monthly Rainfall data for the Wybong Meteorological Station

	Rainfall (mm)		
Month	**2011-2012**	**2010-2011**	**Change since last reporting period**
July	6.9	55.6	-48.7
Aug	26.6	21.8	4.8
Sept	84.6	28.8	55.8
Oct	50.4	64.3	-13.9
Nov	170.3	87.0	83.3
Dec	40.4	123.3	-82.9
Jan	43.6	54.4	-10.8
Feb	90.1	21.8	68.3
Mar	83.2	30.0	53.2
Apr	21.9	33.3	-11.4
May	14.1	71.2	-57.1
Jun	32.8	51.4	-18.6
Totals	**664.9**	**1045.8**	**-380.9**

Cumulative rainfall during the reporting period showed a significantly lower rainfall than the previous reporting period with a difference of 380.9mm at the Wybong meteorological station. The highest monthly rainfall was 170.3mm in November 2011.

3.2.3 Temperature

The monthly maximum and minimum temperatures for the Wybong meteorological station is presented in **Table 15.**

Table 15 – 2m Temperature Data for Wybong Meteorological Station

	2m Temperature (°C)	
Month	**Minimum Temperature 2011-2012**	**Maximum Temperature 2011-2012**
July 2011	-3.8	21.2
August 2011	-1.4	25
September 2011	-0.6	31.2
October 2011	3	30.4
November 2011	7.8	35.8
December 2011	7	30
January 2012	7.8	30.6
February 2012	11.5	32.2
March 2012	6.8	31.8
April 2012	4.7	30.5
May 2012	-3.4	28.4
June 2012	-3.8	22

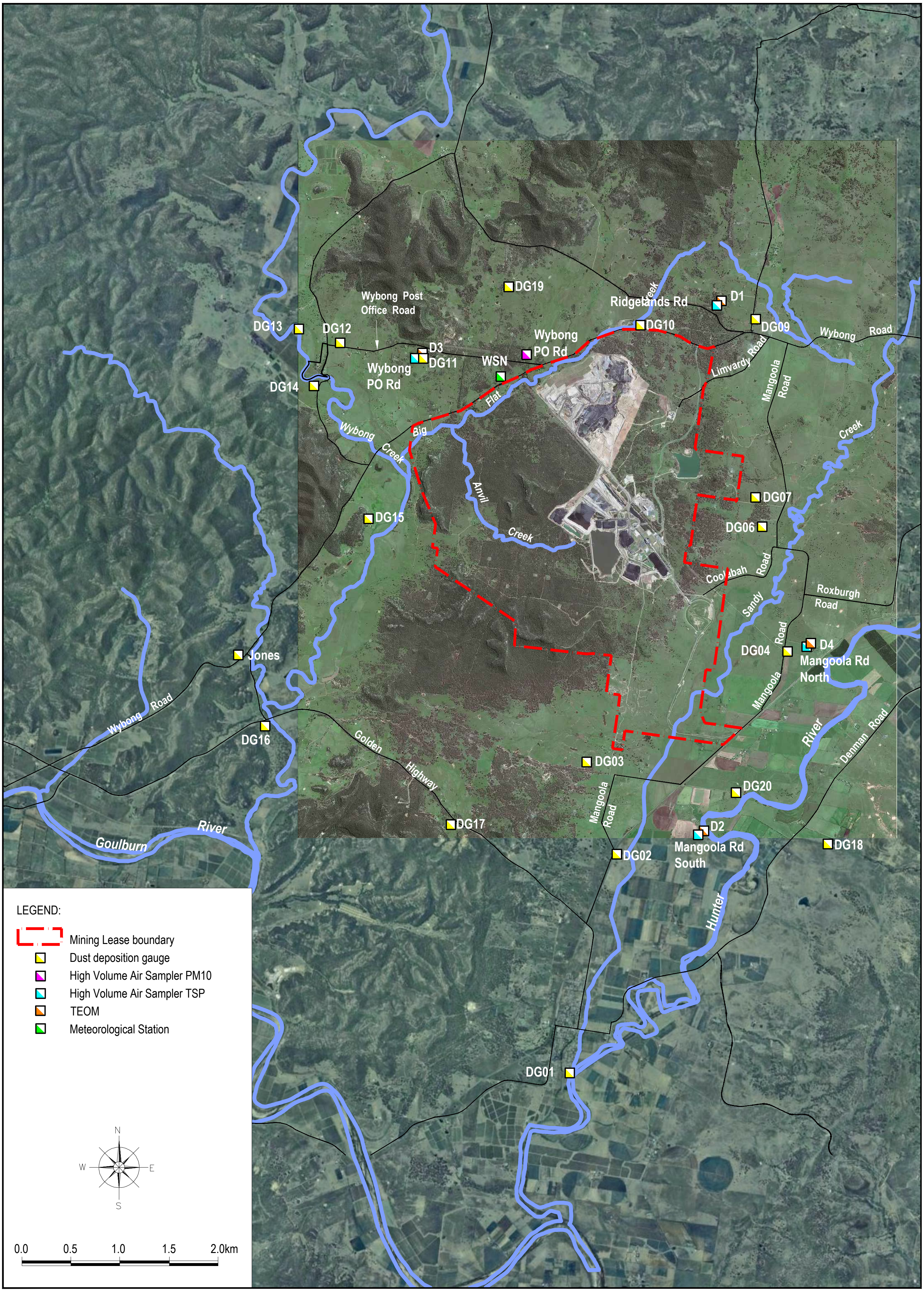
The lowest temperature experienced at the Wybong meteorological station during the reporting period was -3.8°C in both July 2011 and June 2012. The highest temperature recorded was 35.8°C, during November 2011.

3.2.4 Wind

The monthly average wind speed for the Wybong meteorological station is shown in **Table 16**.

Table 16 – Wind Speed Data for Wybong Meteorological Station

Month	Mean Wind Speed (km/h) 2011-2012
July 2011	9.5
August 2011	6.0
September 2011	8.5
October 2011	7.4
November 2011	8.7
December 2011	9.9
January 2012	10.3
February 2012	6.8
March 2012	7.7
April 2012	5.9
May 2012	5.4
June 2012	7.0
Annual Mean	**7.7**



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GSS ENVIRONMENTAL
Environmental, Land and Project
Management Consultants

Air Quality Monitoring Locations

FIGURE 5

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The highest mean wind speed recorded at the Wybong meteorological station was 10.3 km/h during January 2012. The lowest mean wind speed was 5.4 km/h during May 2012.

The Wybong meteorological station annual wind rose for the reporting period is presented in **Figure 6**.

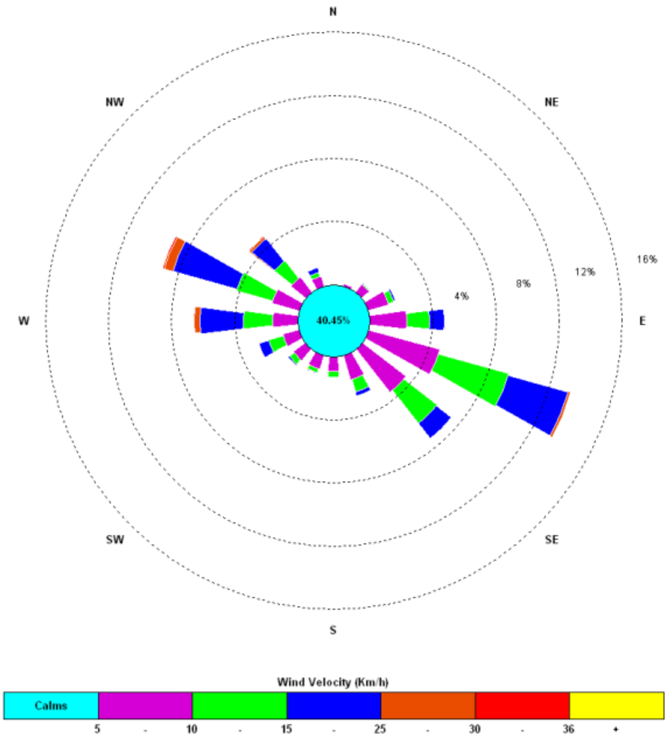


Figure 6 – Annual Wind Rose for Wybong Meteorological Station

3.2.5 Further Improvements

The Wybong meteorological station is continually monitored both remotely and via site visits to ensure monitoring conditions have not been impacted by severe weather events, power failures or animal interference.

The ongoing maintenance program ensures that the weather data being collected will provide a reliable tool for environmental management and planning of operations at Mangoola.

3.3 Air Quality

3.3.1 Environmental Management

Mangoola operates under an approved Air Quality Monitoring Program (AQMP), which describes monitoring requirements associated with operating the mine.

Mangoola operates the following monitoring equipment for the measurement of air quality:

- 19 depositional dust gauges known as DG01 – DG04, DG06-DG07, DG09-DG20 and 'Jones' (depositional dust gauges DG09 and Jones are locations chosen in consultation with the Muswellbrook Shire Council);
- Four Tapered Element Oscillating Microbalance (TEOM) dust monitors measuring PM_{10} known as D1-4. These are required under EPL 12894.

- One High Volume Air Sampler (HVAS) dust monitor known as the Wybong Post Office Road monitor, measuring PM_{10} over one 24 hour period every six days. HVAS sampling has been undertaken since 2002, and is and is required under EPL 12894; and

- Four Total Suspended Particulates (TSP) dust monitors, known as Mangoola North, Mangoola South, Ridgelands Road and Wybong Road.

Schedule 3, Condition 24 of the Project Approval stipulates the criteria for $PM_{10,}$ TSP and deposited dust, as presented in **Table 17.**

Table 17 - Project Approval Air Quality Criteria

Pollutant	Maximum Goal	Averaging Period
TSP	90 $\mu g/m^3$	Annual mean
PM_{10}	50 $\mu g/m^3$	24-hour maximum
	30 $\mu g/m^3$	Annual mean
Deposited Dust	4 g/m^2/month (maximum increase in dust level of 2 g/m^2/month)	Annual mean

HVAS PM_{10} and TSP are monitored every six days for a continuous 24 hour period in accordance with the DEC (now OEH) Guideline '*Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (2005)*' and Australian Standards AS2724.3 and AS3580.10.1. Standard units are reported as $\mu g/m^3$.

TEOM PM_{10} is monitored continuously and is a requirement of Mangoola's EPL 12894. The TEOM data is used to complement HVAS data, and alerts Mangoola personnel when dust levels are approaching the relevant criteria. Standard units are reported as $\mu g/m^3$.

Depositional dust is monitored monthly in accordance with AS/NZS 3580.10.1 (2003). Samples are collected every 30 ± 2 days from 20 locations. Results from dust deposition gauges are expressed as insoluble solids, comprising of combustible matter (or organic matter) and ash residue. Ash residue is considered to be more representative of the dust component while the remainder, typically organic matter, includes bird droppings, leaf or grass litter and insects. Standard units are reported as g/m^2/month.

Air quality monitoring locations are illustrated on **Figure 5**.

Mangoola continued using RST (Reynolds Soil Technologies) RT9 product on all active haul roads, dumps and the pit floor during the reporting period. The RT9 is an agglomerating agent, which reduces fine surface dust and also extends the effective usefulness of water as a dust suppressant. It is designed to also help maintain road surfaces and assist with less road maintenance. Improvements have been achieved in dust control, as well as reducing water usage and causing longer times to empty water carts. Trials of two dust suppressant products (PetroTac and RT8) were undertaken around the workshop unsealed hardstand area (an area of 22,500m^2) during December and November 2011. Both products returned positive results and no additional water was required for dust suppression.

Plate 3 – RT8 Dust Suppression Trials at Mangoola

In December 2011, Mangoola's EPL was amended to include a requirement to develop a Pollution Reduction Program for best practice particulate matter control. This plan was developed and submitted on 29 June 2012.

3.3.2 Environmental Performance

Depositional Dust Gauges

Depositional dust gauge data collected in the reporting period is presented in **Appendix E,** and is summarised in **Table 18.** The data presented in **Table 18** is corrected for contamination of samples, and presents annual average deposition rate of insoluble solids as g/m^2/month.

Table 18 - Depositional Dust Gauge Results July 2011 – June 2012

Gauge	Location Description	No. Of Samples Collected	No. of valid samples	Lowest Result (g/m^2 month)	Highest Result (g/m^2 month)	Annual Mean* (g/m^2 month)
DG01	Yarrawa Rd, Denman	12	9	0.8	6.5	2.7
DG02	Mangoola Rd	12	9	1.6	5.5	3.2
DG03	Mangoola Rd	12	11	0.2	2.6	1.2
DG04	Mangoola Rd	9	8	0.5	3.4	2.1
DG06	Mangoola Rd	11	8	0.7	6.6	2.2
DG07	Mangoola Rd	11	8	0.8	4	2.0
DG09	Castlerock Rd	12	10	1.1	3.4	2.4
DG10	Wybong Rd	12	12	0.7	4.2	2.1
DG11	Wybong Post Office Rd	12	11	0.5	2.3	1.2

Gauge	Location Description	No. Of Samples Collected	No. of valid samples	Lowest Result (g/m^2 month)	Highest Result (g/m^2 month)	Annual Mean* (g/m^2 month)
DG12	Wybong Post Office Rd	12	8	0.4	3.6	1.6
DG13	Yarraman Rd	12	9	0.4	3.4	2.3
DG14	Yarraman Rd	12	6	1.1	3.9	2.9
DG15	Wybong Rd	12	12	0.6	2	1.2
DG16	Golden Highway	12	12	0.3	2.1	1.0
DG17	Golden Highway	12	7	1.2	4.8	2.5
DG18	Denman Rd	12	9	0.3	3.4	1.8
DG19	Ridgelands Rd	12	12	0.8	3.9	2.0
DG20	Near Hunter River, Mangoola Rd	12	7	0.7	3.4	2.2
Jones	3220 Wybong Rd	12	12	0.2	1.7	0.8

**Depositional Dust Criteria 4g/m^2/month Max Annual Average*

On 10 occasions during the reporting period the monthly depositional dust reading increased by more than 2g/m^2/month from the previous month, however for all monitoring locations, the annual mean dust deposition did not exceed 4 g/m^2/month, as shown in **Table 18** above.

TEOM (PM_{10})

TEOM results for PM_{10} concentrations collected during the reporting period are presented in **Appendix E**, and are summarised in **Table 19** below.

Table 19 - TEOM Results July 2011 – June 2012

Gauge	EPA ID no.	Alternate Name	Location Description	No. Samples Collected	Min Result (µg/m^3/24h)	Max Result* (µg/m^3/24h)	Annual Mean** (µg/m^3)
D1	1	DC02	96 Ridgelands Road	366	0.5	43.1	12.3
D2	2	DC04	22 Bells Lane	366	0.2	32.4	9.9
D3	3	DC01	275 Wybong PO Road	366	0.6	32.7	10.2
D4	4	DC03	830 Mangoola Road	357	1.0	42.6	12.3

**TEOM 24h Max Criteria 50 µg/m^3/24h*
***TEOM Annual Mean Criteria 30 µg/m^3/24h*

As shown in **Table 19,** the mean dust deposition did not exceed the 50 µg/m^3 24 hour maximum limit, or the 30 µg/m^3 annual average at any of the TEOM monitoring locations.

HVAS (PM_{10} and TSP)

HVAS results for PM_{10} and TSP concentrations collected during the reporting period are presented in **Appendix E**, and are summarised in **Table 20** below.

Table 20 - Mangoola HVAS Data 2011-2012

Site	Mangoola North TSP (µg/m³)			Mangoola South TSP (µg/m³)			Ridgelands Road TSP (µg/m³)			Wybong Road TSP (µg/m³)			Wybong Road PM_{10} (µg/m³)		
	Low	Mean	High	Low	Mean	High	Low	Mean	High	Low	Mean	High	Low	Mean	High
Jul-11	15	22.8	29	4	11.6	16	6	15.3	29	4	10.0	27	2.0	5.3	10
Aug-11	11	23.2	38	6	16.6	26	7	30.4	47	7	21.2	34	1.0	8.8	15
Sep-11	6	36.0	72	3	21.2	46	5	34.0	80	5	18.4	49	2.0	8.0	22
Oct-11	26	47.2	74	15	37.3	67	20	47.4	70	16	43.8	70	5.0	16.4	30
Nov-11	27	51.2	69	21	37.5	54	26	55.8	83	23	53.0	74	15.0	26.2	33
Dec-11	29	41.0	55	23	30.6	40	35	53.2	71	38	49.8	70	17.0	22.4	33
Jan-12	30	49.4	97	19	38.0	67	31	57.2	107	34	62.6	130	17.0	25.2	38
Feb-12	9	19.0	25	7	19.0	32	8	25.8	39	7	23.8	37	5.0	12.6	22
Mar-12	8	33.0	60	11	25.2	43	15	31.4	55	9	32.8	62	6.0	12.8	22
Apr-12	39	50.4	72	20	34.8	67	15	42.2	66	15	35.2	66	6.0	17.2	39
May-12	28	39.8	53	10	21.2	40	11	31.2	68	7	18.6	38	4.0	10.8	19
Jun-12	14	20.6	29	6	13.8	23	4	17.4	31	2	16.8	30	5.0	7.3	12
Annual Mean*	**35.9**			**24.7**			**36.4**			**31.8**			**14.4**		
MAX	**97**			**67**			**107**			**130**			**39**		
MIN	**6**			**3**			**4**			**2**			**1**		

**TSP Annual Mean Criteria 90 µg/m³*

As shown in **Table 20**, no exceedences of TSP or PM_{10} criteria occurred during the reporting period.

3.3.3 Reportable Incidents

The results of all air quality monitoring at Mangoola during the reporting period were within the relevant Project Approval and EPL criteria, with the exception of the 10 occasions where monthly depositional dust reading increased by more than 2g/m²/month from the previous month. However, as shown in **Table 18** above, for all monitoring locations, the annual mean dust deposition did not exceed the 4 g/m²/month maximum.

There were 17 complaints received during the reporting period relating to dust, compared to the 25 complaints received in the previous reporting period. Further detail on the Mangoola Coal complaints procedure is provided in **Section 4**.

3.3.4 Further Improvements

The Pollution Reduction Program for best practice particulate matter control developed during the reporting period identified a number of actions to reduce particle emissions at Mangoola in future reporting periods. These included:

- Modifying operations during adverse conditions (including coal loading and unloading, hauling operations, overburden loading and dumping, and dozer operations);
- Establishing and introducing and on-going implementation of visual triggers for truck operators to reduce speed, cease of loading/unloading coal, cease loading and dumping overburden, and cease or modify dozer operations;

- Establishing a procedure for identification of general exposed areas and overburden emplacement areas suitable for interim stabilisation and monitoring the effectiveness of interim stabilisation efforts;

- Implementing improvements to chemical stabilisation measures for unpaved roads; and

- Periodic objective monitoring to demonstrate dust control efficiency and demonstrate that an overall haul road dust control efficiency of 80% is being achieved.

3.4 Erosion and Sediment Control

3.4.1 Environmental Management

Prior to land disturbance for any aspect of the mine, appropriate erosion and sediment controls are designed and constructed according to the Erosion and Sediment Control Plan as well as the guidelines *Managing Urban Stormwater: Soils and Construction* (Landcom 2004) (the Blue Book) Volume One and Volume 2E Mines and Quarries (DECC, 2008). Recommendations from the *Draft Guidelines for Establishing Stable Drainage Lines on Rehabilitated Mine Sites* (DLWC 1999) are also implemented.

Where possible, runoff from the undisturbed catchment has been diverted around the disturbance areas via diversion drains and banks to discharge into natural watercourses. Runoff from disturbed areas is retained on site in sediment dams and allowed to settle prior to discharge into the natural system. Mangoola has constructed a series of interconnected and strategically located sediment control dams across the greater mine site. Drains, diversion banks and channels are compacted and stabilised as they are constructed. Sediment and erosion controls are designed to ensure effective management of clean surface water and sediment laden runoff. Sediment mobilisation and erosion is minimised by:

- Installing erosion and sediment controls prior to disturbance of any land;

- Limiting the extent of the disturbance to the minimum that is practical;

- Reducing the flow rate of water across the ground particularly on exposed surfaces and in areas where water concentrates;

- Progressively rehabilitating disturbed land and constructing drainage controls to improve stability of rehabilitated land;

- Protecting natural drainage lines and watercourses by the construction of erosion control devices such as diversion banks and channels and sediment retention dams. Steep gradients will require the installation of rock riprap, geotextile fabric sediment filters or other suitable measures;

- Restricting access to rehabilitated areas, and

- Ongoing monitoring of surface water quality as shown on **Figure 7**.

All erosion and sediment controls are inspected at a minimum of weekly intervals and within 24 hours of a major rainfall event (i.e. greater than 20 mm in 24 hours). Regular inspections and maintenance is undertaken as required to replace damaged sediment control structures and maintain other temporary measures.

In addition to the above sediment and erosion control measures, annual channel stability monitoring is undertaken at Mangoola. The outcomes are reported in the "*Annual Mangoola Channel Stability*

Report (Year 4) (AMCSR). This report is prepared in accordance with Schedule 3 Condition 34(e) of the Mangoola Coal Project Approval 06_0014.

The methodology described in the AMCSR is aimed at mapping the location and severity of any impact on streams as a result of mining operations. The procedure is implemented by traversing the stream bed, beginning at the headwaters and proceeding downstream. Boundaries between different stream conditions are recorded on a GPS (preferred) or distance measuring wheel. During this process, eight visual indicators are used to assess the erosion state of the drainage line.

A baseline channel stability survey of Big Flat Creek, Anvil Creek and Sandy Creek was carried out in June 2008. This survey used the CSIRO Ecosystem Function Analysis – Ephemeral Stream Assessment. A standard assessment pro forma was created and used to score each stream at 50m intervals establishing similar stream reaches in the process. This pro forma can be found in Appendix Two of the AMCSR. Channel cross-sections were also taken at representative points within each identified reach to analyse the shape of the channel bed.

Mangoola operates under the approved Dam Dewatering and Associated Pipeline Management Procedure. The purpose of this Procedure is to ensure that a secure system of work is in place to prevent discharge or overflow of water from sediment dams, offsite discharge from general pit dewatering works and that the associated pipelines are suitably located and satisfactorily maintained and protected against damage, so as to prevent/mitigate any harm to the environment.

3.4.2 Environmental Performance

In June 2012 Mangoola engaged specialist consultants to prepare a temporary construction phase Erosion and Sediment Control Plan (ESCP) to accommodate the future North Pit stripping works (strips 11-13) on site. The ESCP was prepared to protect the runoff water quality and to minimise localised erosion at the site. The design was undertaken in accordance with the key principles outlined within ‘Australian Rainfall and Runoff’ (1987) and the ‘Blue Book’ (Managing Urban Stormwater: Soils and Construction Vol. 1, 4th edition and Vol. 2E Mines and Quarries (Landcom, 2004 and DECCW, 2008)). The ESCP provided recommendations for sediment dam sizing, and dirty water drain sizing. All sediment and erosion control works completed during the reporting period were undertaken in accordance with the Mangoola Coal Erosion and Sediment Control Plan.

During the reporting period, a number of areas around the site were hydromulched to prevent erosion and sedimentation on site. These included 1.57 ha along the Haul Road B outer bank, one ha of the Pit Water Dam wall, and 2.8 ha within Rail Loop and Rail Loop Dam. Mechanical maintenance works and hand seeding were also undertaken across 1.8 ha of the ROM 5 diversion drain.

The 2011 Channel Stability Annual Inspection noted no observed changes in the Ephemeral Stream Assessments for Big Flat Creek, Anvil Creek and Sandy Creek. The 10 representative cross sections (2 less than previously reported, due to Reach One of Anvil Creek being removed in association with construction works) also showed no significant changes in channel shape, except for Reach Two on Anvil Creek, which had been altered. No significant changes in stream stability that would infer erosion or sedimentation occurring within the stream system were evident.

Erosion was reported to be still prevalent along Anvil Creek however the remediation of this is not required due to future mining activity. The trapping of sediment in the meantime is desirable to reduce the sediment load entering Big Flat Creek. Big Flat Creek was found to be in a generally healthy condition except for Reach 2, which requires remedial works to avoid degradation in coming years.

Sandy Creek was found to have limited native vegetation present and is being significantly impacted upon by stock grazing. Management of stock access to the creek was recommended to encourage regeneration and stabilisation of this system, and installation of an erosion control structure to halt an upstream headcut erosion site was also suggested.

3.4.3 Reportable Incidents

There were no reportable incidents in relation to erosion and sediment control during the reporting period.

3.4.4 Further Improvements

Erosion and sediment controls will continue to be used in disturbance areas during current and future works. The controls will be in accordance with the Blue Book and the Mangoola Coal Erosion and Sediment Control Plan (Site Water Management Plan –Appendix 2) effective November 2008.

The annual Ephemeral Stream Assessments will continue during the next reporting period and be reported in the next AEMR.

3.5 Surface Water Management

3.5.1 Environmental Management

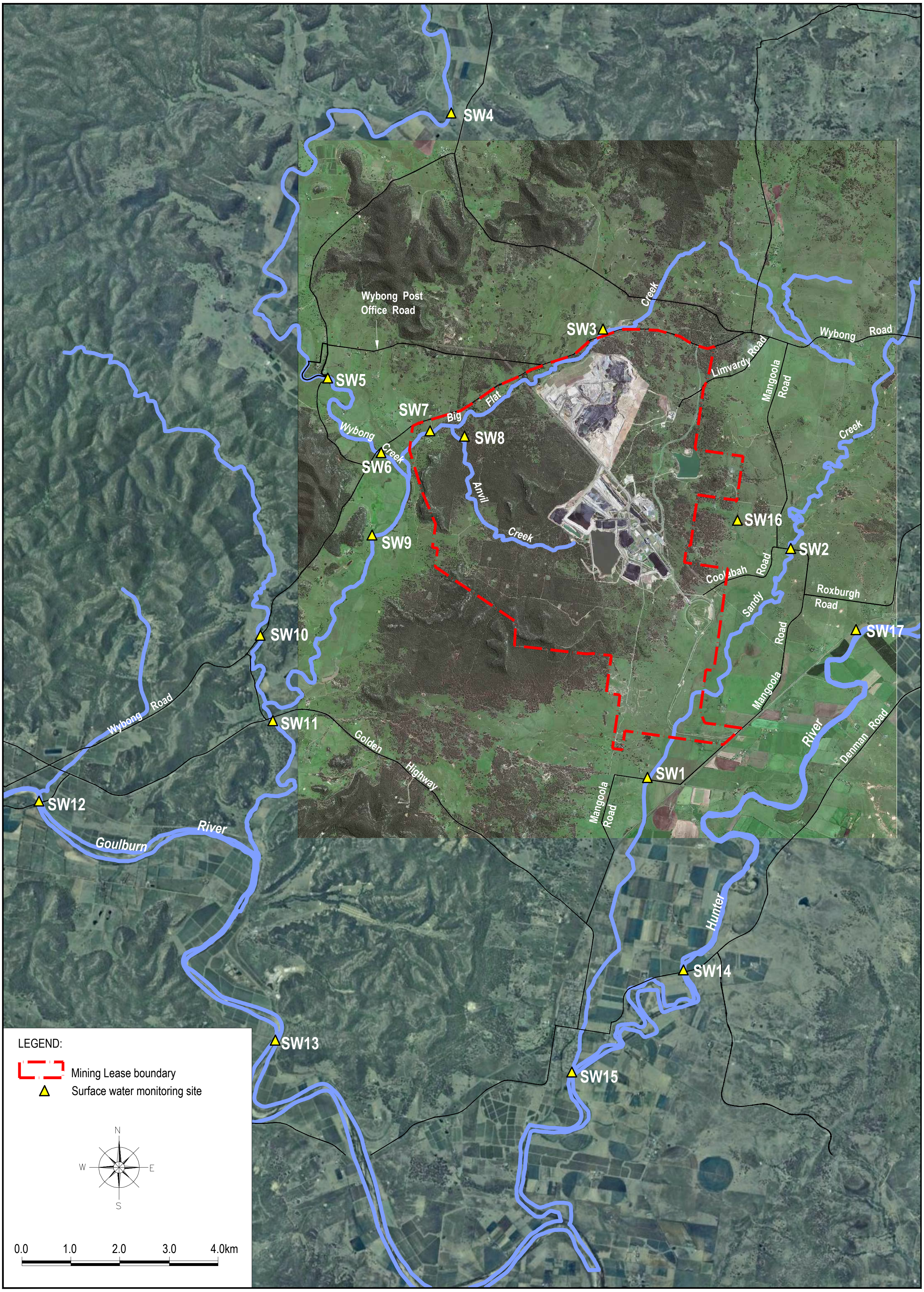
Surface water quality continued to be monitored onsite at Mangoola and in the surrounding waterways during the reporting period. Surface water monitoring locations are shown on **Figure 7** and comprise 17 sites (SW1 – SW17). Water samples were collected and analysed on a monthly basis from these locations to examine the water quality. The analysis of water samples includes pH, Electrical Conductivity (EC), Total Dissolved Solids (TDS) and Total Suspended Solids (TSS).

Surface water monitoring points SW8, SW16, SW3 and SW4 represent EPL monitoring points No's 6-9 respectively. There are no EPL surface water monitoring criteria limits listed in EPL 12894 or PA06_0014.

Stream health monitoring was also completed during the reporting period at nine sites across Sandy Creek, Wybong Creek and Big Flat Creek. The monitoring program assessed macroinvertebrate community structures, as well as water quality and catchment riparian health.

3.5.2 Environmental Performance

Figures 8 to 11 present the EC, pH, TDS TSS monitoring results for the reporting period respectively. Detailed results of background surface water quality monitoring collected during the reporting period are presented in **Appendix F**.



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Surface Water Monitoring Locations

FIGURE 7

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Figure 8 - Electrical Conductivity results at Mangoola Coal Surface Water Monitoring Stations during the reporting period

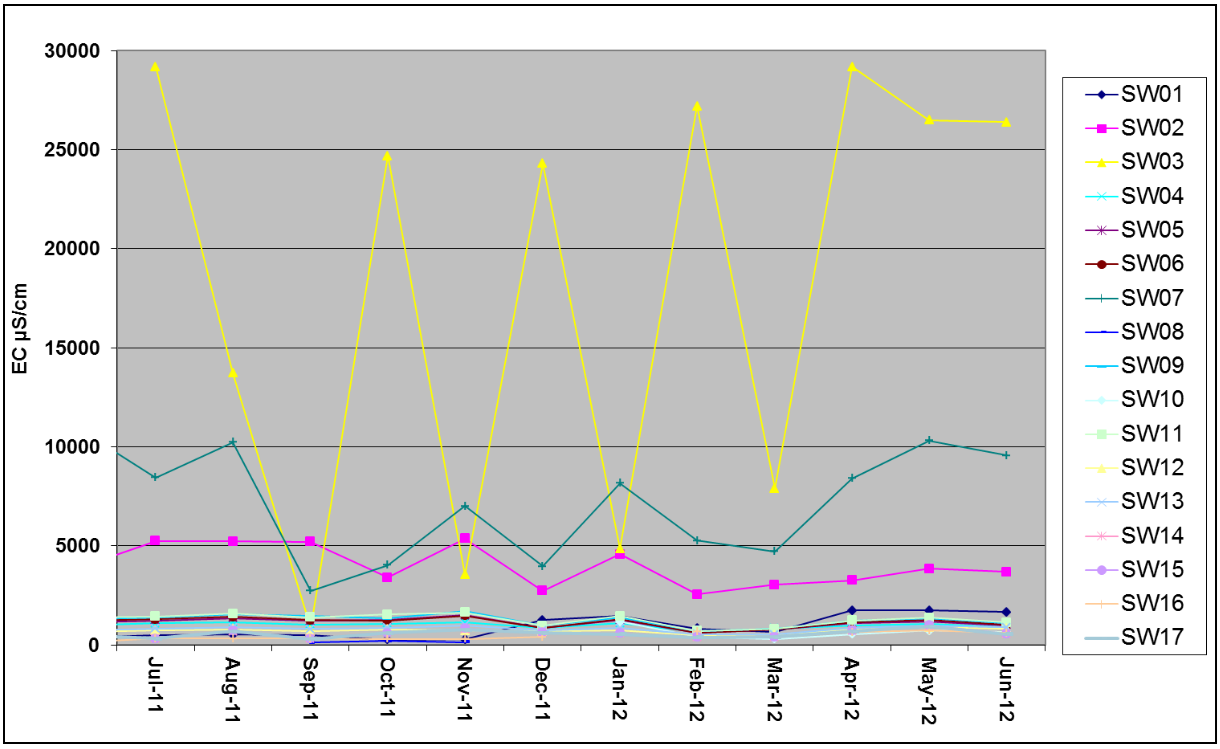


Figure 9 - pH results at Mangoola Coal Surface Water monitoring stations during the reporting period

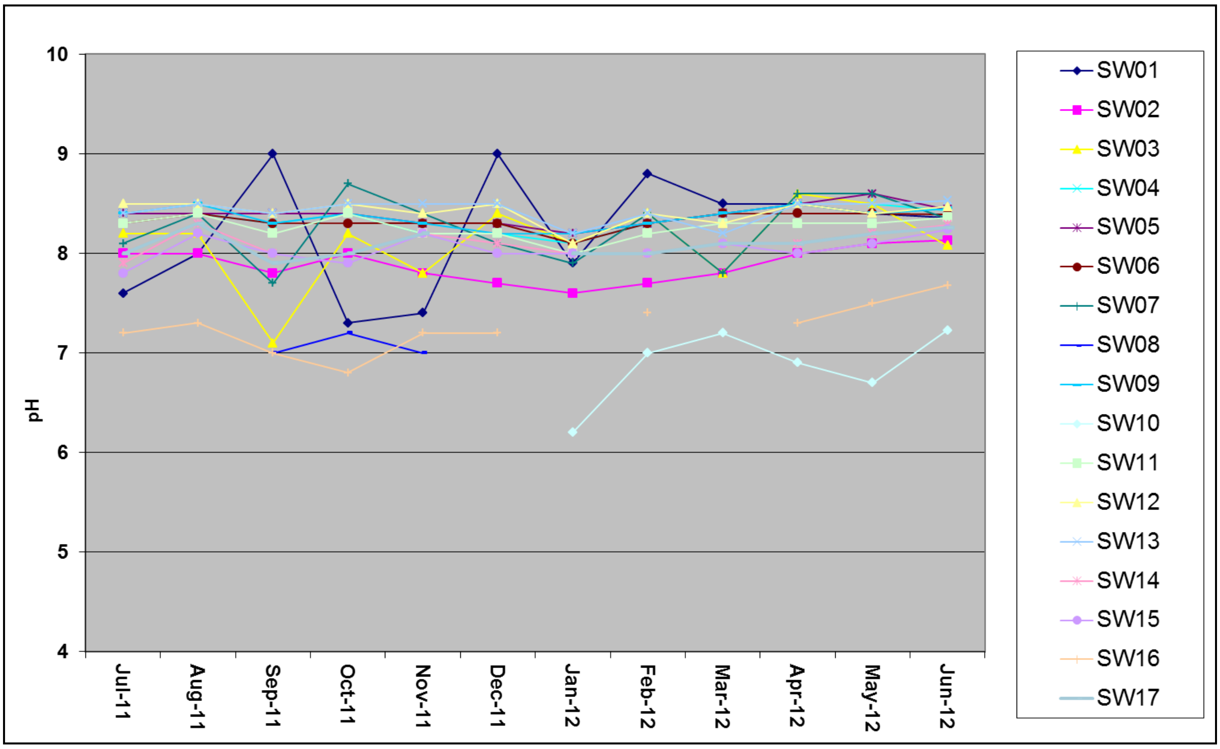


Figure 10 - TSS results for Mangoola Coal Surface Water Monitoring Stations during the reporting period

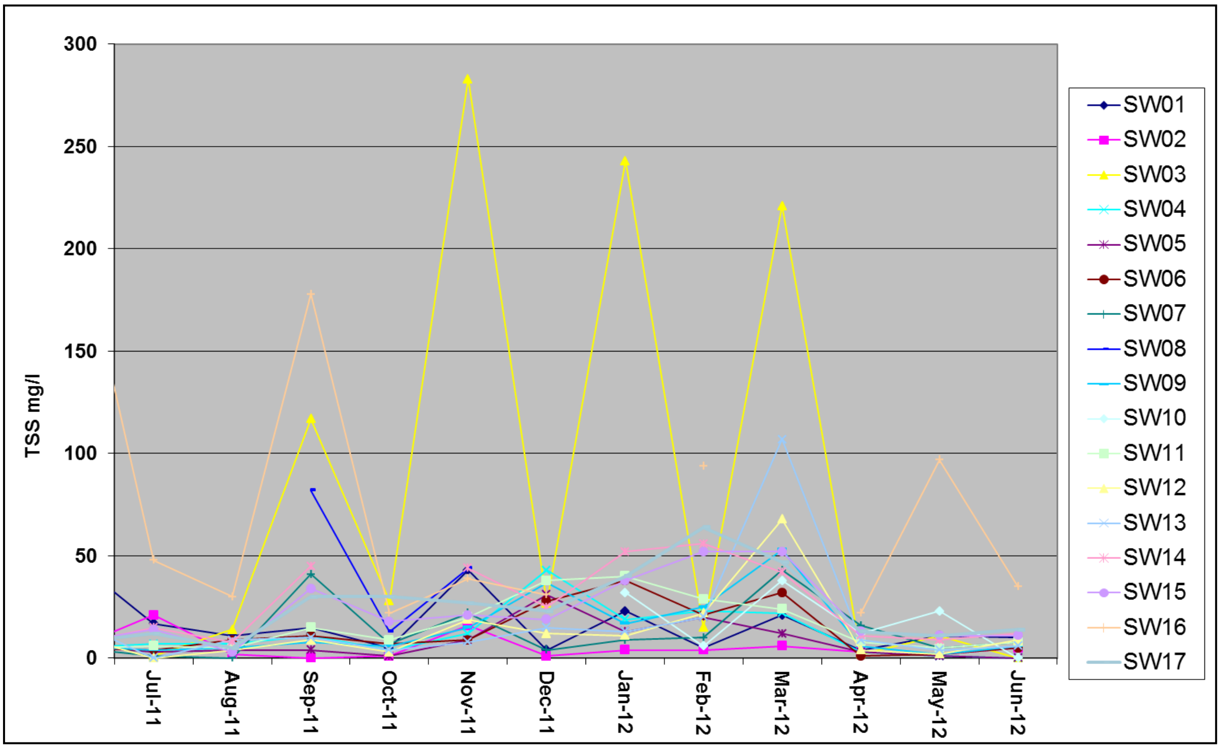
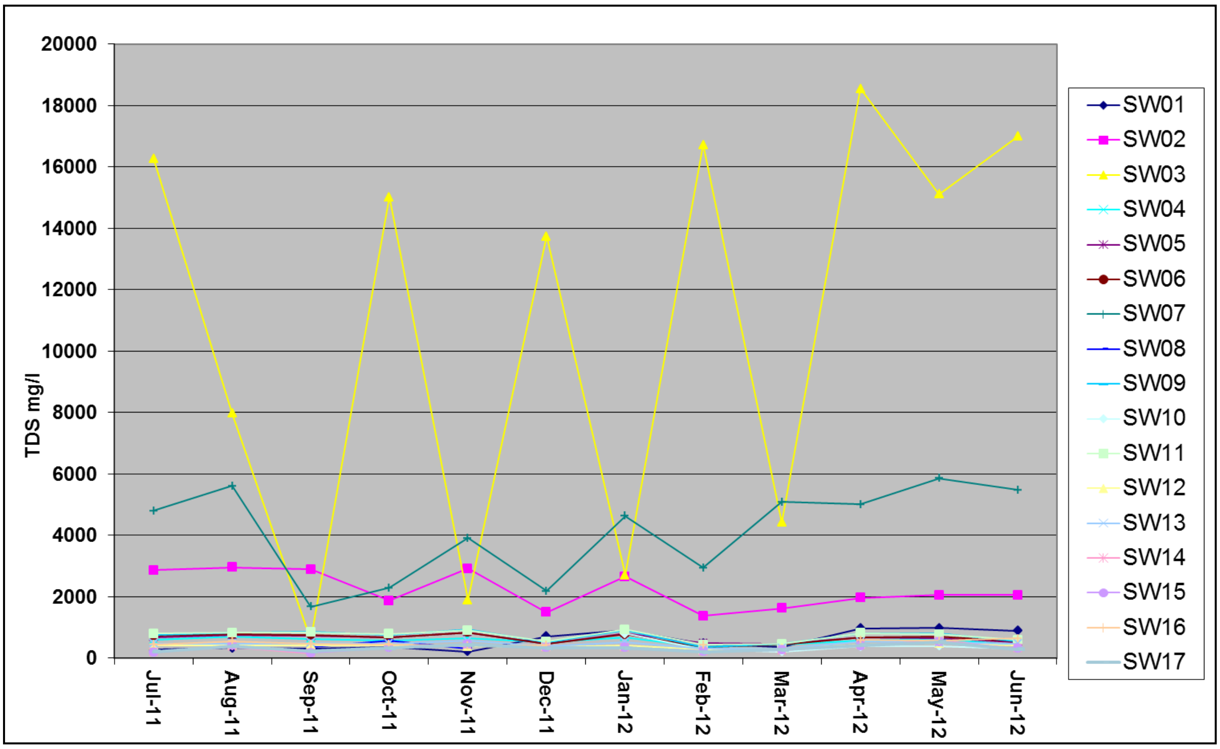


Figure 11 - TDS results for Mangoola Coal Surface Water Monitoring Stations during the reporting period



As can be seen from **Figure 8**, EC results at SW02, SW03 and SW07 show periodically elevated levels of salinity. When compared to **Figure 11** it can be concluded that the high salinity corresponds with a higher level of TDS, as would be expected. Although these EC, TSS and TDS levels are periodically elevated, they are within the historical ranges stated in the Mangoola Surface Water Monitoring Plan, and are similar to the ranges reported in the previous AEMR.

Monitoring sites SW02 and SW03 are located upstream of the Mangoola Mining Lease boundary, and therefore the elevated salinity is not attributed to operations at Mangoola. It should also be noted that SW07, while located within the Mangoola Coal Mining Lease boundary, is downstream of SW03.

Monitoring point SW02 had a maximum recorded EC of 5,380µS/cm during the reporting period. This is lower than the 2010-2011 maximum of 6,470µS/cm; and it is within the historical range at this monitoring point, of 16-6,990µS/cm. Monitoring point SW03 had a maximum recorded EC of 29,200µS/cm during the reporting period. This is higher than the 2010-2011 maximum of 22,600µS/cm; however it is within the historical range at this monitoring point, of 96-50,500µS/cm. SW07 had a maximum recorded EC of 10,320µS/cm during the reporting period, which is lower than the 2010-2011 maximum of 12,500µS/cm, and within the historical range of 144-48,500µS/cm.

Figure 9 shows surface water pH levels were slightly alkaline across the site averaging a pH of 8.1, which is consistent with background pH levels.

TSS and TDS levels during the reporting period are shown in **Figure 10** and **Figure 11** respectively. TSS was elevated at SW03 across the reporting period, with a maximum TSS of 283mg/L, which is below the 2010-2011 maximum of 3,310mg/L, and within the historical range of 2-8,800mg/L. TSS was also elevated periodically at SW16 with a maximum value of 178mg/L, which is below the 2010-2011 maximum of 920mg/L, and within the historical TSS range of 12-4,615mg/L. In 2011 stock were excluded from land near the SW16 in an effort to reduce the TSS levels recorded at this monitoring point. Areas of erosion near this monitoring point were also managed as part of the overall land management plan. These actions have resulted in a decrease in average TSS at SW16 from 308mg/L to 60mg/L.

Elevated TDS levels were recorded at SW03, with a maximum recorded TDS level of 18,560mg/L, which was higher than the 2010-2011 maximum of 13,200mg/L, however is within the historical range of between 260-31,700mg/L. SW07 had a maximum recorded TDS of 5,860mg/L, which was lower than the 2010-2011 maximum of 7,260mg/L, and within the historical range of 200-40,300mg/L. SW02 had a maximum recorded TDS of 2,960mg/L, which was lower than the 2010-2011 maximum of 4,070mg/L, and also within the historical range of 20-3,940mg/L.

Water flows

Water flows at each of the 17 sampling locations varied throughout the reporting period, with a mix of perennial and ephemeral flow regimes. Further detail on each sampling location is as follows:

- Water was consistently flowing throughout the year at SW02, SW04, SW05, SW06, SW09, SW11, SW12, SW13, SW14, SW15, SW17;
- SW01 had no flow for the majority of the reporting period, except for September and March;
- SW03 had no flow for most of the reporting period, except for August, September, November, January and March;
- SW07 was flowing for the majority of the reporting period, except for the month of April;
- SW08 was dry for the majority of the reporting period and only flowing in September and November, with still pools in October;

- SW10 was dry until December, had still pools in January, then flowed from February until June;

- SW 16 is a dam which is part of a tributary of Sandy Creek.

Stream Health Monitoring

Stream health monitoring was completed in June and November 2011 at nine sites across Sandy Creek, Wybong Creek and Big Flat Creek. The monitoring program assessed macroinvertebrate community structures, as well as water quality and catchment riparian health.

The results of the water quality monitoring surveys indicated that most water quality values were comparable to previous survey periods. Increased conductivity at some sites was attributed to the reduced water volumes present within the waterway resulting in shallow isolated pools along the reach of the site. Turbidity was relatively consistent across all sites. The results did not indicate that any significant impacts or changes in water quality had occurred relative to baseline data collected.

Riparian Channel and Environmental (RCE) Index and Visually Based Habitat Assessment (HABSCORE) results were reported to be consistent with previous season survey results, indicating that most sites continue to provide suboptimal habitat for aquatic species. Overall the survey results were similar to previous pre-mining monitoring surveys, and the results did not indicate that any significant impacts or changes in macroinvertebrate assemblages or habitat quality had occurred relative to baseline data collected.

3.5.3 Reportable Incidents

No non-compliances occurred in relation to surface water quality during the reporting period.

There were two water-related environmental incidents during the 2011-2012 reporting period as detailed below.

On 9 March 2012 groundwater seepage downstream of the embankment of the Raw Water Dam was observed and it was identified that it was flowing offsite in the Sandy Creek catchment area. An assessment by specialist consultants disclosed that the seepage was coming from “shallow groundwater being flushed from the sandstone formations within both abutments (of the dam wall)”. The seepage presented as a ‘wetting front’ of saturated ground and is coincident with the outcropping sandstone ridge. The Raw Water Dam holds Hunter River water for assorted mine operational purposes.

All relevant agencies (EPA, DP&I, DTIRIS Mineral Resources, Muswellbrook Council, WorkCover NSW, and Ministry of Health) were immediately advised and a report was provided to the EPA dated 18 May 2012 outlining actions to be taken. Groundwater seepage flow was dammed and water management works to reduce seepage commenced in May 2012. A pump was installed on the catchment dam to pump the majority of the seepage water to the Mangoola Raw Water Dam and reduce the flow of seepage into the Sandy Creek catchment area. The seepage water will continue to be directed to the dam, and returned to the Raw Water Dam until it is determined that the residual groundwater has been flushed from the formations and is replaced with fresh water from the Hunter River source. Groundwater bores are planned to be drilled to monitor the rate of seepage before the end of 2012. This incident is detailed in the EPL Annual Return (Appendix A) and results will be reported in the following AEMR.

On 28 February 2012 the Hunter River pump PMP9621 ran for 25 minutes to top up the booster tank which resulted in 255kL being pumped without the formal approval process being carried out. This incident was also reported as Category 1 (Negligible, reversible environmental impact, requiring very minor or no remediation). State Water was notified of this incident and a water order application form was submitted after the event to balance Mangoola's account with State Water. A Hunter River Pumping Operational Procedure has since been developed.

One incident in relation to sewage also occurred during the reporting period. On 17 August 2011 it was found that the Sewage Treatment Plant (STP) had lost power and there had been some minor leakage from the waste pits. An inspection by the Environment and Community Coordinator identified no obvious flow paths to the adjacent MIA dam, which is contained within the mine water management system and does not discharge offsite. No further clean-up was required and the incident was reported as a nil Category incident (below Category 1). To ensure future STP faults are addressed in a timely manner to prevent reoccurrence, Citec has been updated with an alarm feature to notify Maintenance and CHPP Control if the STP is not operational, and an automated SMS will now be sent to the Maintenance Contractor if the plant goes offline.

No complaints were received during the reporting period relating to surface water management.

3.5.4 Further Improvements

Mangoola is continuing to implement the Site Water Management Plan (SWMP) MAN SD PLN 0019 for the site, as required by Schedule 3, Condition 31 of the Project Approval. There are no planned amendments to the current surface water monitoring network or regime.

3.6 Groundwater Management

3.6.1 Environmental Management

Mangoola continued to monitor background groundwater quality within and surrounding the site during the reporting period. Groundwater monitoring locations are shown on **Figure 12** and comprise 50 locations (GW1-50).

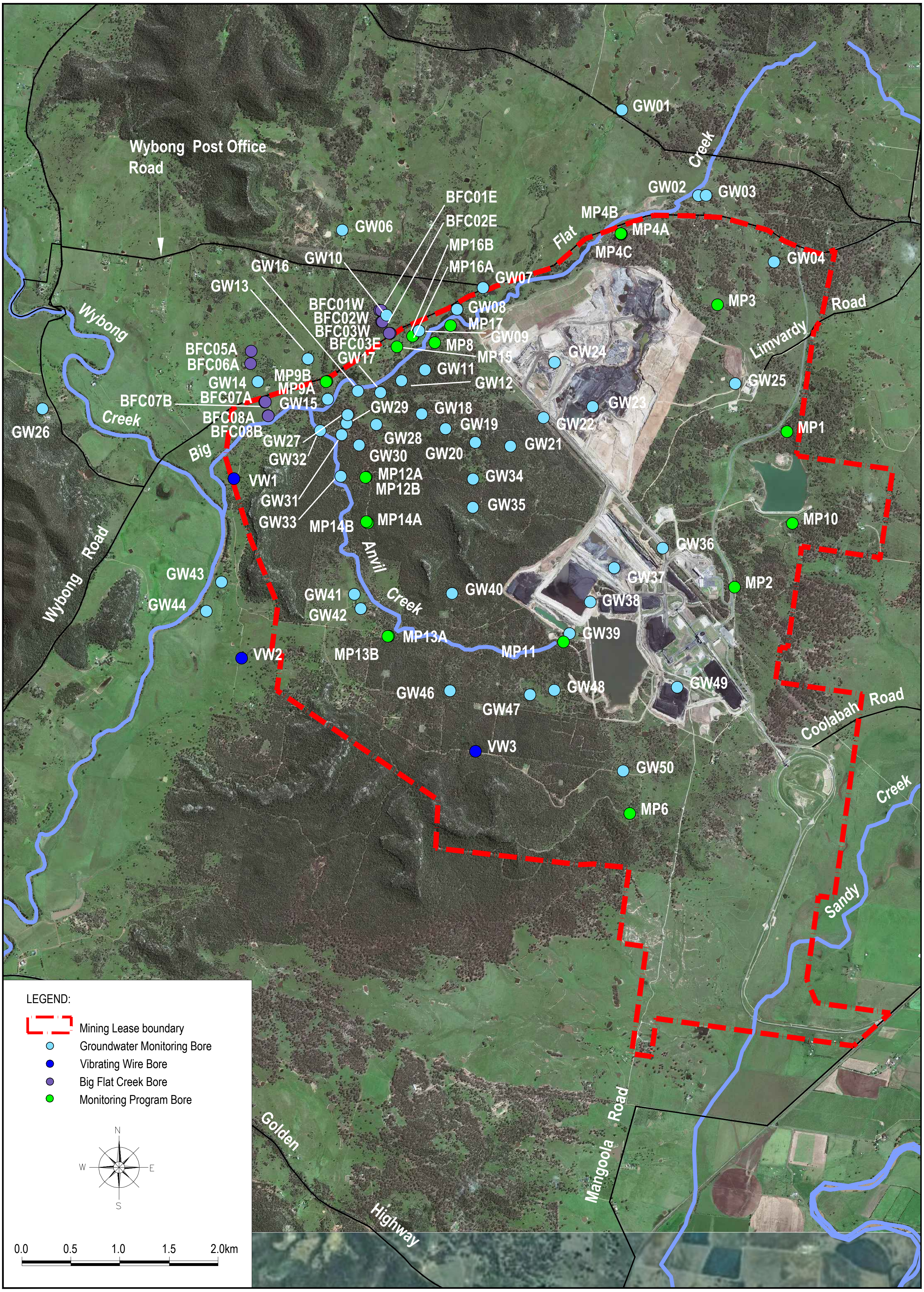
All groundwater monitoring locations are sampled and analysed on a bi-monthly basis for pH, EC, and Standing Water Level (SWL). A full chemical speciation analysis is conducted at each monitoring location annually. All groundwater sampling is undertaken in accordance with AS/NZS 5667.1 (1998).

In April 2012 the Mangoola Groundwater Monitoring Plan was revised. The changes involved updates to maps with equipment and monitoring locations, the inclusion of a table giving specific piezometer details, as well as an update on completion of the alluvial works along Big Flat Creek.

In September 2011 Mangoola undertook a comprehensive analysis of three representative boreholes, which were selected by Mangoola as being GW07-D (alluvials), GW18 (Fassifern), and GW46 (alluvials). The results of this analysis are included in **Table 23**. It is also noted that of the original eight holes planned for analysis, only three are now viable, and in future monitoring periods unviable holes will be replaced by the following holes: GW04 (coal measures), GW14 (Fassifern), GW33 (deep alluvium), GW34 (Fassifern) and GW02 (coal measures).

In May 2012, Mangoola's EPL was amended to include a requirement to prepare and submit a Groundwater Mitigation Report. This report was completed and submitted to the EPA in May 2012 and outlined proposed works to ensure groundwater seepage from the raw water dam area is managed in an environmentally satisfactory manner and does not impact on the receiving land or waters. These works are expected to be completed by the end of 2012, and results will be reported on in the following AEMR.

In May 2011, Mangoola commenced a groundwater drilling program with strategically located hole sites being targeted. The holes are part of a regional suite of holes designed by a groundwater specialist, who has modelled the groundwater regime throughout the area. All holes will contain piezometers. Nine holes were drilled as part of the Mangoola Groundwater Drilling Program during the 2011-2012 reporting period.



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Groundwater Monitoring Locations

FIGURE 12

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All holes have been geophysically logged and several contain two or three piezometers each. Installation of data loggers commenced following the completion of the reporting period.

During the same week, the three strings of piezometers were installed in the three vibrating wire holes, each string containing five piezometers (sensors). The Groundwater Drilling Program is summarised in **Table 21**.

Table 21 - Mangoola Groundwater Drilling Program Summary

Drill Hole No.	Depth (m)	Piezometers Installed	Borehole Licence No.
MP3	70	1	20BL172568
MP11	50	2	20BL172573
MP6	80	2	20BL171865
VW3	130	-	20BL171866
MP13	70	3	20BL171868
MP14	70	3	20BL171864
MP12	70	3	20BL171859
MP17	50	fully grouted	20BL171789
MP8	50	fully grouted	20BL171867

3.6.2 Environmental Performance

Appendix G presents the results of groundwater monitoring undertaken during the reporting period. The pH and EC (µS/cm) levels for the bores in each aquifer are presented in **Table 22.**

Table 22 - Groundwater Monitoring Data

Bore ID (inc. past reference)	EC (µS/cm)			pH		
	Min	Max	Annual Mean	Min	Max	Annual Mean
GW01-D (Calm 05 Deep)	10850	10850	10850	7.0	7.0	7.0
GW01-S (Calm 05 Shallow)	14170	14170	14170	7.2	7.2	7.2
GW02 (BM Bore)	12510	14900	14165	8.7	8.9	8.8
GW03-S (BM Piezo shallow)	Dry/Too low to sample			Dry/Too low to sample		
GW03-D (BM Piezo deep)	2510	26510	15960	6.7	6.9	6.8
GW04* (BR Bore (GW023072))	6760	8590	7663	6.9	7.2	7.0
GW06 (Roger Keegan-well)	138	200	167	6.9	7.6	7.1
GW07-S (CALM04 - shallow)	10010	14290	11168	7.5	8.1	7.9
GW07-D (CALM04 - deep)	8930	21320	15133	7.2	7.8	7.5
GW09 (Hogan well)	6910	6910	6910	7.4	7.4	7.4
GW10-A1 (CGN199 A1)	Blocked			Blocked		
GW10-A2 (CGN199 A2)	992	2192	1365	7.4	7.7	7.6
GW10-P1 (CGN199 P1)	11070	14700	12680	7.1	7.9	7.5
GW10-P2 (CGN199 P2)	6630	7610	7298	7.8	8.0	7.8

Bore ID (inc. past reference)	EC (µS/cm)			pH		
	Min	Max	Annual Mean	Min	Max	Annual Mean
GW11 (PAHOH40)	10770	13420	12115	6.7	6.9	6.8
GW12 (PAH50)	11220	13540	12570	6.9	7.1	7.0
GW13 (Pitman)	124	190	166	7.2	9.0	8.4
GW14 (CGN198)	3170	3950	3583	7.6	7.9	7.8
GW15 (CGN020 - bottom)	4600	11160	6530	6.8	7.2	6.9
GW16 (CGN053)	16890	21090	19120	6.8	6.9	6.8
GW17 (CGN156)	4480	11350	8400	6.8	7.0	6.9
GW18 (PAHOH25)	75	348	171	5.8	6.7	6.3
GW19 (PAHOH37)	5850	7080	6433	6.5	6.7	6.6
GW20 (PAHOH20)	4420	5420	4970	6.2	6.5	6.4
GW22 (PAHOH39)	2850	3480	3183	5.7	6.9	6.5
GW26* (GW078396)	2053	2366	2226	7.3	7.5	7.4
GW27 (CGN155)	13590	16200	14643	6.6	7.1	6.8
GW28 (CGN148)	9470	11440	10438	6.5	6.6	6.6
GW29 (CALM02)	21620	33700	28473	6.7	6.9	6.8
GW30 (CGN054)	9360	12090	11165	6.7	7.1	6.9
GW31 (CGN160)	9550	21830	15138	6.5	6.8	6.7
GW32 (CGN092)	17980	25270	21855	6.6	6.9	6.8
GW33 (CGN059)	11460	15140	13353	6.8	6.9	6.8
GW34 (PAHOH36)	2065	2514	2347	6.8	7.0	6.9
GW35 (PAH49)	1588	2130	1888	6.3	6.8	6.7
GW40 (CGN033)	3400	4970	4188	5.8	7.0	6.6
GW41 (K Bore)	12510	19100	14523	6.3	7.3	7.0
GW43 (Ray Well)	273	273	273	8.0	8.0	8.0
GW44 (Ray Bore (GW078502))	6080	7620	6810	6.7	7.0	6.8
GW46 (HW Bore)	5990	7790	6910	6.1	7.1	6.8
GW47 (CGN186)	7620	12110	9420	6.4	6.9	6.7
GW48 (PAHOH01)	13310	13310	13310	6.5	6.5	6.5
GW50 (CGN191)	8740	8740	8740	6.9	6.9	6.9
Jennarr well (Jennar well)	1106	2026	1613	7.2	7.7	7.4
MP1-A	5.02	5.65	5.31	7.3	8.0	7.7
MP1-B	5.57	6.73	5.89	10.1	11.2	10.6
MP2-A	16.48	20.23	17.77	7.0	7.4	7.2
MP2-B	15.51	18.96	17.24	7.0	7.7	7.5
MP3-A	8.60	10.84	9.77	7.1	9.6	8.6

Bore ID (inc. past reference)	EC (µS/cm)			pH		
	Min	Max	Annual Mean	Min	Max	Annual Mean
MP3-B	10.69	12.68	11.46	7.2	7.9	7.4
MP6-A	9.72	11.22	10.48	6.7	8.2	7.3
MP6-B	6.45	10.37	8.09	10.1	11.4	10.6
MP8-B	13.99	15.71	14.92	7.0	7.0	7.0
MP10-A	14.30	16.48	15.56	6.3	6.7	6.5
MP10-B	10.45	13.03	11.85	6.1	6.7	6.5
MP11-A	10.60	16.94	13.50	6.8	7.2	6.9
MP11-B	10.40	13.53	11.70	7.3	7.9	7.6
MP12-A	6.81	7.43	7.21	7.0	7.2	7.1
MP12-B	9.65	10.16	9.88	9.7	11.0	10.0
MP12-C	2.89	3.56	3.17	7.4	7.8	7.6
MP13-A	10.92	16.93	14.01	6.9	7.3	7.0
MP13-B	6.43	7.86	7.21	6.4	7.2	6.8
MP13-C	9.13	10.65	9.87	9.9	11.0	10.2
MP14-A	2.08	3.73	2.89	6.8	7.4	7.2
MP14-B	3.05	3.57	3.37	6.4	6.9	6.7
MP14-C	2.07	3.69	3.24	6.7	7.6	7.1
MP17-B	1.92	20.92	8.02	7.0	8.2	7.7
VW3	1.72	2.21	2.06	6.5	7.2	6.9

**Groundwater monitoring points GW04 (GW023072) and GW26 (GW078396) represent the EPL monitoring points 10 and 11 respectively.*

The results of the groundwater monitoring program over the reporting period found the highest level of salinity was at bore GW29 with an EC of 33,700µS/cm. This result is reflective of the stratum draining through this bore site. GW29 was also the bore with the highest salinity in the previous reporting period.

Measured pH levels are between 5.7 and 11.4 for all sites. These levels are consistent with the background variability of groundwater pH across the groundwater monitoring network, but are slightly higher than the range recorded in the previous reporting period (4.5-9.1).

Results of the representative borehole analysis undertaken in September 2011 are presented in **Table 23** below:

Table 23 – Representative Borehole Analysis

	CALM04 Deep (GW07-D)	PAHOH025 (GW18)	HW Bore (GW46)
pH	8.16	5.95	6.99
EC (µS/cm)	10700	75	8000
TDS (mg/L)	6140	No Data*	4490
Alkalinity (mg/L)	591	14	883
Silicon (mg/L)	9.7	1.6	8.79
Sulfate (mg/L)	112	<1	98
Chloride (mg/L)	3230	12	2030
Calcium (mg/L)	53	3	99
Magnesium (mg/L)	260	1	454
Sodium (mg/L)	1790	7	893
Potassium (mg/L)	41	3	53
Aluminium (mg/L)	<0.01	0.21	<0.01
Arsenic (mg/L)	0.002	<0.001	<0.001
Barium (mg/L)	0.387	0.010	0.325
Lithium (mg/L)	0.007	<0.001	0.133
Manganese (mg/L)	0.006	0.398	0.939
Rubidium (mg/L)	0.008	0.002	0.055
Selenium (mg/L)	<0.01	<0.01	<0.01
Strontium (mg/L)	4.46	0.056	3.470
Zinc (mg/L)	0.006	0.012	0.011
Boron (mg/L)	0.23	<0.05	0.060
Iron (mg/L)	<0.05	0.670	13.5
Total P (mg/L)	0.03	0.38	0.18

** TDS at GW18 unable to be determined.*

Results in **Table 23** above are generally consistent with 2010 Borehole analysis data.

3.6.3 Reportable Incidents

One reportable incident regarding groundwater management occurred during the reporting period.

On 9 March 2012 groundwater seepage downstream of the embankment area was observed and identified that it was flowing offsite in the Sandy Creek catchment area. Groundwater seepage flow was dammed and water management works to reduce seepage commenced in May 2012. The incident was initially reported as a surface water incident and is therefore discussed in further detail in **Section 3.5.3**. The results of the water management works will be reported on in the following AEMR.

3.6.4 Further Improvements

Mangoola is continuing to implement the Site Water Management Plan (SWMP, MAN SD PLN 0019), as required by Schedule 3, Condition 31 of the Project Approval.

The groundwater monitoring program will be upgraded with three vibrating wire boreholes, each containing five piezometers at specific target zones as recommended by specialist groundwater consultants.

Installation of a second suite of holes has commenced to delineate the Big Flat Creek alluvial limits, and will continue in the following reporting period. Two transects have been drilled, one with four sites one with three sites. Most sites have two holes, one to the bottom of the alluvials, and one into the bedrock (approximately 50m). Piezometers have been installed in these holes.

Four additional holes were drilled along Big Flat Creek (MP4, MP9, MP15 and MP16) all 50-70m deep. No monitoring has occurred for this suite of holes during the reporting period.

3.7 Contaminated Polluted Land

Beyond the four minor spills reported in **Section 3.18**, which were immediately cleaned up, there were no other contaminated and/or polluted land issues at Mangoola during the reporting period.

3.8 Threatened Flora and Fauna

3.8.1 Environmental Management

Biodiversity Offset Management Program

In January 2012 the Mangoola Biodiversity Offset Management Program (BOMP) was developed to provide a schedule of land management works that are to be undertaken by Mangoola within the Biodiversity Offset Areas and Corridors, in order to enhance the quality and quantity of native vegetation and improve habitat connectivity. The BOMP was developed in accordance with the Rehabilitation and Offset Management Plan (ROMP).

Clearing

Clearing activities at Mangoola have been designed to minimise impacts to any threatened flora and fauna species and vegetation communities. Suitably qualified personnel inspect all disturbance areas as part of the Pre-Clearing Procedure discussed in **Table 24** to ensure that no unapproved impact on any threatened species of flora or fauna will occur. Clearing activities are to cease if any suspected threatened vegetation community or flora or fauna species or their required habitats are encountered during clearing, and the Environment and Community Coordinator contacted immediately. Any fauna found during clearing is to be captured and relocated by suitably qualified persons, as required.

Pre-clearance surveys were conducted during the reporting period prior to any activity that involved clearing land or felling trees. Tree hollow surveys were also undertaken in association with clearing for mining activities. Pre clearing procedures used at Mangoola are summarised in **Table 24.**

Table 24 - Mangoola Clearing Procedures

Mangoola Procedure	Description
Ground Disturbance Permit MAN SD FRM 0046	A separate Ground Disturbance Permit (GDP) form is required if ground disturbing works are proposed which must be approved by the HSEC Department. MAN SD FRM 0046 aims to identify and adequately assess any potential issues for the specific area requested in relation to (at least): land ownership; community relations; flora and fauna; cultural heritage (both Aboriginal and Non-Aboriginal) and sediment and erosion control.
Excavation Works Work Permit XCN SD EXT2135 - 8.4.011	An Excavation Permit is to be completed for any work involving the excavation or filling of trenches, ditches, shafts, wells, tunnels and pier holes, the use of caissons and cofferdams, and constructing fences (posts and star pickets) outside of active mining areas.
Pre Clearing Survey MAN SD PRO 0013	Where clearing is proposed, a pre-clearing survey must be conducted in accordance with this procedure. A specific pre-clearing survey form accompanies this procedure (MAN SD FRM 0047) to provide a checklist and a pre-clearing report template which focuses on the identification and forward management of habitat trees and threatened species, seed collection, etc.
Habitat Tree Felling MAN SD PRO 0014	Where habitat trees are identified during the Pre-Clearing Survey, the Habitat Tree Felling Procedure describes the steps and responsibilities associated with removing habitat trees. A specific Habitat Tree Felling Form (MAN SD FRM 0048) accompanies the procedure and provides a checklist and reporting template to manage fauna within the habitat tree prior to clearing.
Classification of Tree Hollow Sizes MAN SD PRO 0015	This procedure facilitates record keeping in relation to a cleared tree hollow size. Classification is kept in relation to tree hollows within felled hollow bearing trees using the Habitat Tree Hollow Records Form (MAN SD FRM 0049). This will facilitate an understanding of pre-clearance tree hollow density within the cleared areas. These records will be kept to enable comparison of pre-mining and post-mining rehabilitation to show tree hollow achievements in the rehabilitation area.
Site Visit MAN SD PRO 0001	This procedure stipulates that a site visitor must complete a Site Visitor Induction prior to commencing any work, inspection or visit. This is designed to identify, highlight, assess and manage any potential health, safety, environment and community hazards.
Salvage and Reinstatement of Tree Hollows MAN SD PRO 0016	This procedure facilitates the management of intact hollows (post clearing) identified for re-use in the offset areas and/or post-mining revegetation areas as either nest box or ground installation. The proposed and final location of the tree hollow is recorded in the Tree Hollows Record Form (MAN SD FRM 0049).
Nest Box – Salvaged Tree Installation MAN SD PRO 0017	This procedure facilitates a consistent approach for the installation of nest boxes and salvaged hollows to achieve reinstatement success.

ROMP and Annual Ecological Monitoring

Schedule 3 Condition 42 of the Mangoola Coal Project Approval 06_0014 requires the development and implementation of a Rehabilitation and Offset Management Plan (ROMP). The ROMP was submitted during the previous reporting period in March 2011 and is awaiting approval. Part of the ROMP includes an ecological monitoring plan for flora and fauna in the project disturbance area and offset areas. This includes annual seasonal ecological monitoring. Results of this monitoring are presented in **Section 3.8.2**.

The ROMP also specifies that over the initial three years of operations at Mangoola, strategies are required to meet the "*salvaging, transplanting and/or propagating of threatened flora and native grassland, based on additional survey and research*". This requires detailed knowledge about the grasslands, and therefore, a grassland classification and mapping project was instigated in 2009 and continued through to spring 2011, encompassing over 2,000 ha to date. Results of the survey are presented below in **Section 3.8.2**.

The University of Newcastle's Centre for Sustainable Ecosystem Restoration (CSER) continued the Mangoola Ecological Restoration and Reconstruction Research Program (MERRRP) during the reporting period. The MERRRP is an integrated program which aims to provide research that will help develop sustainable, resilient plant communities that naturally occur within the surrounding area, and develop the potential for threatened biota to inhabit the area. Trials undertaken as part of this research included reconstructing functional soils (including ACARP C12033), test growth medium suitability, analysis of soil macro-nutrients, soil biological analysis, investigating topsoil substitutes, and community reconstruction.

Research during 2011-2012 involved characterisation of the condition of the site prior to mining to assess costs and benefits for the ecological functioning of the area in the future. Sites have been sampled for soil chemistry, the ability to form plant-microbe associations, and for the native and exotic species composition present and the soil seed bank. Also, during the reporting period a preliminary analysis of the contribution of soil parameters to plant niche definition commenced, with an initial focus on orchids and herbaceous species. Research was also undertaken on microbes associated with natural nutrient acquisition and cycling. The studies of site floristics and seed bank increased the total number of species discovered to date by 32.

Orchids

Two threatened terrestrial orchids and an endangered population of epiphytic orchid are present on lands at Mangoola, being *Diuris tricolor*, *Prasophyllum sp aff petilum* (Wybong) and *Cymbidium canaliculatum*. Targeted surveys for these species began in 2009, and continued in 2010, 2011 and 2012. Monitoring for both terrestrial and epiphytic orchid groups during the reporting period also included collecting soil samples for terrestrial orchid seed banks, and collecting root samples for mycorrhizal culture. A strategy for the translocation of terrestrial and epiphytic orchids has been developed.

3.8.2 Environmental Performance

Clearing

Approximately 138.21 ha of vegetation were cleared during the reporting period to allow for mining operations to proceed. Data directly related to the clearing conducted at Mangoola during the reporting period in relation to fauna is outlined in **Table 25.**

Table 25 - Clearing Results during Reporting Period

	Description	Number of hollows	% of total
Number of Hollows Cleared	Very Small – Small <50mm	251	28%
	Medium 51mm – 100mm	334	37%
	Large 101mm – 300mm	229	26%
	Very Large <301mm	85	9%
Total		**899**	**100%**
Fauna			
Number of fauna deaths related to clearing	15		
Number of fauna that escaped during clearing	43		
Number of fauna that were relocated during clearing	134		

As can be seen from **Table 25,** 65% of the tree hollows removed were classed as being medium or small-to very small. 899 hollows were removed as part of pre-clearing works. During the reporting period 134 animals were relocated during pre-clearing surveys, and 15 fauna deaths were identified as a result of the tree removal.

Nest box installation

Mangoola has committed to a program of placing suitably designed nest boxes or salvaged tree hollows within the biodiversity offset areas, corridors, and any areas subject to revegetation or regeneration as soon as the vegetation is suitably established. Nest box installation continued during the reporting period, with 395 boxes being installed to date.

A total of 99 nest boxes were installed during the fourth round of this program, which took place from January to April 2012. The nest boxes were all installed by appropriately trained staff. The content of these boxes will be monitored biennially, and the condition of each box monitored annually, for the life of the mine, as well as for a determined period following closure, to determine whether or not they are providing an effective ameliorative measure for the loss of hollows.

During 2012, Southern Cross University prepared a nest box program report, evaluating the program (Johnston, 2012). Sixty-five nest and bat boxes were surveyed throughout the offset areas with a range of existing hollow densities. In total, 18 boxes (28%) showed evidence of occupation; 13 by possums, three by gliders, one by birds and one with a microbat. Higher occupation rates (40%) were recorded in woodland with the lowest existing hollow density and the majority of boxes in this woodland showed evidence of chewing around the entrance holes.

Grassland Survey and Classification

As discussed above, survey and classification of grasslands at Mangoola continued in the reporting period, totalling approximately 2000 ha surveyed to date. Numerical classification of 168, 0.01 ha sampling plots has delineated seventeen definable floristic groups (15 communities and two sub-communities). Eight of these can be considered primarily of exotic origin, while the remaining nine are predominantly native. The overall condition of grasslands within the area under study ranged from very poor to good. All grasslands present have been impacted upon and shaped by past agricultural activities, and all have been broadly referred to as 'derived grasslands' in the past (Eastcoast Flora Survey, 2012).

Three plant species of National or State significance occur within the grasslands. Based on the available data, the threatened terrestrial orchids *Diuris tricolor* and *Prasophyllum sp. Wybong* occur within three grassland types, and three woodland communities. The Mangoola grassland report represents the first serious attempt at a numerically-based grassland classification in the Hunter Valley.

Within State and Federal threatened species legislation, there are ten grassland communities listed as threatened, but only two of these (Native Vegetation on Cracking Clay Soils of the Liverpool Plains: TSC Act; White Box - Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland: EPBC Act) potentially include the grasslands at Mangoola. Survey and classification of grasslands at Mangoola will continue in future reporting periods.

Targeted Terrestrial Orchid Surveys

In September-October 2011, targeted surveys for the threatened terrestrial orchids *Diuris tricolor* and *Prasophyllum sp aff petilum* (Wybong) were undertaken across a 354 ha search area, all of which is to be disturbed by mining operations. The surveys recorded a total of 1,381 plants, namely 657 Diuris and 724 Prasophyllum (East Coast Flora Surveys, 2012). Given the separation distance of adjacent transects, it was assumed that the same numbers of plants were overlooked as were detected during surveys, implying a total population of at least 1314 *Diuris* and 1448 *Prasophyllum* within the search area. Combined with surveys completed in previous seasons across a combined search area of 1,879 ha, the Mangoola population of detected *Diuris tricolor* was recorded as 3,938, and the *Prasophyllum sp aff petilum* (Wybong) population was recorded as 2,802 (6,740 for both species combined).

Translocation of orchids occurring in areas to be disturbed for mining began with a pilot study in 2010, which during 2011 showed 49 of 389 (12%) translocated plants flowering. A further 1,278 orchids were also translocated into four fenced enclosures during September 2011, and will be monitored in coming seasons.

Plate 4 – *Diuris tricolor* at Mangoola

Salvage and Translocation of the Tiger Orchid

Due to the presence of the epiphytic tiger orchid (*Cymbidium canaliculatum*) (a listed endangered population in the Hunter Catchment) within the Approved Project Disturbance Area (and broader Mangoola Mine holdings), Mangoola developed a salvage and translocation document for the species in 2011.

The document consolidates relevant information and procedures relating to the salvage and translocation of the tiger orchid, and also provides an update of the progress of the salvage program, including the number of individuals salvaged to date, the process employed, their location and health and recommendations for recipient sites for these and future salvaged tiger orchids.

ROMP and Annual Ecological Monitoring

Flora Monitoring

As part of the ROMP, a total of 31 flora monitoring sites are located in a variety of landscape management units and are sampled annually across the site. Surveys undertaken during 2011 demonstrated an increased number of native and weed plant species across most plots when compared to 2007, when monitoring commenced. A total of 272 plant species (including 71 weed species) were recorded in 2011, compared to the 124 species (41 weed species) in 2007. In part, this can be attributed to varying rainfall and soil moisture conditions experienced over this time, particularly for periods immediately prior to monitoring.

The threatened grass *Bothriochloa biloba* was recorded within four designated monitoring plots during the 2011 monitoring period, in response to good seasonal conditions in recent years. *Acacia pendula* records remained unchanged in those locations known, but exhibited vigorous suckering growth with the removal of grazing pressure.

Fauna Monitoring

Fauna surveys were undertaken at 11 monitoring sites over three sampling periods (autumn, winter and spring 2011). For each sampling period all sites were surveyed, and the results are summarised in **Table 26** below.

A winter fauna survey was also undertaken in May 2012, in which 11 fauna monitoring surveys sites were sampled for microchiropteran bats, small and larger mammals and nocturnal birds.

Table 26 - Number of Species Recorded During 2011 Ecological Monitoring

Fauna Group	**Monitoring Year**			
Birds	**2008**	**2009**	**2010**	**2011**
Bird Species Recorded by Census	35	69	64	54
Birds Species recorded Opportunistically	37	35	45	52
Bird Species Total	64	92	115	106
Threatened Bird Species	7	9	8	6
Mammals				
Total Native Mammals Recorded	23	25	22	25
Total Threatened Mammals	4	7	6	5
Total Introduced Mammals	4	7	6	6
Reptiles	12	20	10	7
Frogs	6	12	8	7
Mollusc	3 sites	5 sites	6 sites	5 sites

Spring 2011 Fauna Monitoring

Bird census counts conducted at each of the 11 monitoring sites recorded 54 species in 2011, which compares to similar historical bird species diversity (64 in 2010, 69 in 2009 and 67 in 2008).

Comparison of bird species between broad habitat types reveal the grassland habitats recorded the lowest diversity, whilst the mature woodland recorded highest overall diversity.

A total of 25 native and six introduced mammals were recorded in 2011, which compares to 22 and six in 2010, 25 native and seven introduced mammal species recorded in 2009, and 25 native and four introduced mammals recorded in 2007-2008.

A total of seven reptile species were recorded in 2011, compared to 10 species in 2010, 20 in 2009 and 12 species in 2008. The sites supporting the highest quality and most diverse reptile habitat are those remnant woodland sites in close proximity to rock outcrop areas.

Seven frog species were detected in 2011, compared to eight species in 2010, 12 frog species in 2009 and six in 2008. The most widespread and abundant habitat for frogs at Mangoola Coal is the small and large farm dams and temporary soaks in open grassland areas.

Evidence of a camaenid taxon mollusc species was recorded at five sites in 2011, four sites in 2010 and two sites in 2009 and 2008. In total, 10 of the 11 monitoring sites support populations of the un-described land snail, which contrasts with only three sites known prior to 2008. The species is present in all broad habitat types, remnant woodland, riparian woodland and open grassland.

Winter 2012 Fauna Monitoring

Captures of microbats by trapping was low in May 2012, with only six individuals belonging to four species captured. One threatened species; the South-eastern Long-eared Bat *Nyctophilus corbeni* was captured. In addition to captures, a total of 372 call sequences of microchiropteran bats were captured by echolocations recordings. In total, 12 microchiropteran bat species were detected by the combination of trapping and echolocation call recordings.

Trapping for terrestrial mammals recorded 23 captures, including three species of small terrestrial, and one arboreal mammal species. The most abundant small mammal captured was the native Yellow-footed Antechinus *Antechinus flavipes*.

A small number of captures of two introduced species, the House Mouse and Black Rat, were recorded. Four captures of the arboreal Common Brushtail Possum was recorded. This species was also detected at a number of sites by nocturnal spotlight searches. Other native fauna species detected by spotlight searches include the Common Ringtail Possum, Sugar Glider, two tree frog species, the Tawny Frogmouth and Swamp Wallaby.

Introduced mammal species observed by spotlight searches include Fallow Deer and Red Fox. One large forest owl, the Masked Owl, responded to playback calls broadcast at one site near Anvil Hill. This threatened large forest owl has previously been recorded near Anvil Hill in 2009 during playback census surveys.

3.8.3 Reportable Incidents

No reportable incidents regarding flora and fauna occurred during the reporting period. Four minor incidents relating to inappropriate clearing occurred during the reporting period, and were entered into XstraSafe and are detailed below.

A Category 1 incident (Negligible, reversible environmental impact, requiring very minor or no remediation) relating to inappropriate clearing occurred on 16 May 2012. A five-tonne digger started to dig a trench inside the 550kV powerline easement without the required permit. The operator had been informed that the job was not to take place but commenced the work without instruction.

Three nil Category (lower than Category 1) incidents were also reported, all relating to the use of minor access tracks not covered by current Ground Disturbance Permits (GDP's). For each of these incidents, the requirement for current GDP's was discussed with the employees and contractors involved, and communicated to all staff.

3.8.4 Further Improvements

The grasslands survey and classification mapping project, as well as monitoring of orchids and the translocation strategy will continue in 2012-2013, with results to be reported in the next AEMR.

3.9 Weed and Pest Management

3.9.1 Environmental Management

Weed Management

The Mangoola Rehabilitation and Offset Management Plan (ROMP) outlines broad aims and objectives relating to Weed Management within the Approved Disturbance Area, offset areas and buffer lands. Six noxious weed species have been recorded in these areas and a further five have been identified as environmental weeds.

Commitments made in the Anvil Hill EA and relevant legislation requires the control of weeds at Mangoola. Weed Action Plans for 2011 and 2012 were developed which describe the results of weed management works undertaken in the previous 12 months, and present the planned weed control works for following 12 month period. The primary targets during the reporting period included the control of African Boxthorn, Blackberry and St Johns Wort infestations. Other weeds targeted included Green Cestrum, Mother of Millions, Prickly Pear, Galenia, and various annual and perennial weeds.

In response to two letters from the Upper Hunter Weeds Authority, Mangoola targeted African boxthorn (*Lycium ferocissimum*) at three property lots in the buffer land along Mangoola Road. Weed control will continue in these lots, and surrounding areas, to control this species. The weed control activities undertaken at Mangoola during the reporting period are summarised in **Table 27**.

Feral Animal Management

Feral animal management at Mangoola was undertaken during the reporting period in accordance with the Mangoola Vertebrate Pest Action Plan, and consisted of two main areas: control and monitoring. A number of control activities were undertaken in accordance with the needs which were identified by Mangoola staff, and in consultation with residents. An outline of the feral animal management activities undertaken at Mangoola during the reporting period may be found in **Table 28.**

A Vertebrate Pest Control Program was undertaken during the reporting period, and followed on from similar works undertaken in the previous reporting period. Pre control monitoring was conducted to evaluate target species abundances and active areas, to which 1080 baiting and a soft jaw trapping program was undertaken to target the wild dogs (*Canis lupus familiaris*) and foxes (*Vulpes vulpes*) in the area.

Sandpad monitoring was used to calculate species abundance, densities and movements of both native and pest vertebrates in a vast array of vegetative ecosystems. Following the OEH and the Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) guidelines, 27 sandpads were established across the Mangoola biodiversity regions. Motion camera monitoring was undertaken at ten locations. The results of the abundance scoring are provided in **Table 29.**

3.9.2 Environmental Performance

Weed Management

During the reporting period contractors were engaged to undertake weed management works throughout the mine area in accordance with the Weed Action Plan. A record of the weed management and control activities undertaken during the reporting period is summarised in **Table 27**.

Table 27 - Weed Control during Reporting Period

Date	Species Targeted	Weed Control Activities
Winter 2011	African Boxthorn (*Lycium ferocissimum*) Mother of Millions (*Bryophyllum delagoense*) Various Annual Weeds (Northern Access Road)	Cut and Paint Foliar Spray Foliar Spray
Spring 2011	African Boxthorn (*Lycium ferocissimum*) Blackberry (*Rubus fruticosus*) Green Cestrum (*Cestrum parqui*) Various Annual Weeds	Foliar Spray Foliar Spray Cut and Paint Foliar Spray
Summer 2011-2012	St Johns Wort (*Hypericum perforatum*) African Boxthorn (*Lycium ferocissimum*) Mother of Millions (*Bryophyllum delagoense*)	Foliar Spray Foliar Spray Foliar Spray
Autumn 2012	African Boxthorn (*Lycium ferocissimum*) Blackberry (*Rubus fruticosus*) Green Cestrum (*Cestrum parqui*) Pricky Pear (*Opuntia stricta*) Galenia (*Galenia pubescens*) Various Annual Weeds	Foliar Spray Foliar Spray Cut and Paint Foliar Spray Foliar Spray Various Methods

Feral and Pest Animal Management

Feral animal control activities were conducted across the site during the reporting period. Activities involved culling of kangaroo, deer, rabbit, fox and the use of 1080 baits to target wild dogs and foxes, as described in **Table 28**. Baiting methods conducted align with the Code of Practice and Safety Operations Procedures – Ground Baiting of Wild Dogs and Foxes with 1080 (DPI, 2004).

Table 28 - Feral Animal Control during Reporting Period

Date	Feral Animal Control Activities
14-23 November 2011	38 1080 Bait Stations set up, one with a motion sensor camera. Checked on three occasions over two weeks. 26 baits taken, resulting in an overall consumption rate of 22.8%.
14-23 November 2011	Nine soft jaw leg hold traps set up and monitored daily over the two weeks. One fox caught.
January 2012	Kangaroo Cull (including opportunistic pest species)
March-May 2012	Vertebrate pest control – sand pad, camera, 1080, traps.
May-July 2012	Kangaroo Cull (including opportunistic pest species)

A soft jaw leg-hold trapping program was also undertaken in autumn 2011, with one fox successfully captured and humanely controlled. Mangoola conducted open range shooting for kangaroos during the reporting period. A total of 226 kangaroos were culled, along with five foxes, one cat, six deer, six rabbits and five hares.

Abundance scoring of the sand plot records is presented in **Table 29.**

Table 29 - Abundance Scoring

Abundance Scoring – 27 locations across site		
Date of Monitoring: 25/10/2011-27/10/2011		
Target Species	**% Plot nights**	**Spring 2011**
Wild Dog	4.9	Scarce
Fox	41.9	High
Kangaroo	38.3	High
Rabbit	18.5	High
Cat	3.7	Low

The abundance scoring results indicate that:

- Foxes, kangaroos and rabbits are in high abundance across the site;
- Cats are in low abundance across the site; and
- Wild dogs are in scarce abundance at each site.

The results of the abundance scoring will allow future targeted feral animal control works to be formulated based on the occurrence of recorded species.

3.9.3 Reportable Incidents

No reportable incidents regarding weeds and feral animal management occurred during the reporting period.

3.9.4 Further Improvements

Weed Management

Mangoola plans to implement a Weed Control Register to document when and where each control method is implemented. The weed control works implemented during the 2011-2012 reporting period will continue during the 2012-2013 reporting period. A 2013 Weed Action Plan will be formulated, and the implementation and results of this plan will be reported in the following AEMR.

Feral Animal Control

Abundance scores from the information gathered during the reporting period will be used to plan future control works during the following reporting period. In future reporting periods Mangoola will investigate the following management strategies:

- Undertake a spring 2012 and autumn 2013 1080 baiting program to continue suppression on dogs and foxes evident in the broader area;
- Undertake a cat and pig trapping component with the use of cage traps with various lures and attractants;
- Accompany baiting stations with motion cameras to observe animal’s interactions and behaviours towards the baits and attractants;

- Continue the soft-jaw leg-hold trapping component in the spring 2012 and autumn 2013 control program;

- Undertake an Open Range Shoot control program to target all invasive pests in the Mangoola landholdings, and

- Continue to follow the Mangoola Vertebrate Pest 2011-2012 Action Plan for a suitable management strategy developed specifically to target the vertebrate pests inhabiting the area.

3.10 Blasting and Vibration

3.10.1 Environmental Management

Blasting at Mangoola is undertaken in accordance with the Project Approval conditions and the EPL, and monitored in accordance with the Blast Monitoring Program (BMP). The BMP incorporates the relevant conditions of the Project Approval as well as the requirements of *ANZECC 'Technical basis for guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration*, and *AS 2187.2-2006 'Explosives – Storage and Use – Use of Explosives*'. During the reporting period Mangoola Coal operated a Blasting Hotline and notification register to ensure stakeholders were informed of blasting on site.

Prior to blasting and in accordance with the BMP, meteorological data from the meteorological station described in **Section 3.2** are reviewed to ensure that blasting is undertaken in appropriate weather conditions. In particular, wind speed, wind direction and the presence of temperature inversions are all taken into account when preparing blasting times.

Blast overpressure and vibration were monitored at seven monitoring locations during the reporting period, with a monitor at the location 'Private Residence NE' commencing monitoring during the reporting period. The seven permanent monitoring locations are as follows:

- Private Residence S;

- Private Residence NW;

- Private Residence NE;

- Rock Shelter (Tailings Pit);

- Rock Shelter (North Pit);

- 'The Book' Rock Formation and Anvil Rock, and

- Castle Hill Slab Hut.

Temporary blast monitoring was also undertaken during the reporting period, at the nearest Transgrid Pylon in relation to the blast location.

The locations of these monitors are shown in **Figure 13** except for the Transgrid Pylon monitor, as this was placed at different pylons throughout the reporting period, depending on which was closest to the blast. The monitoring locations represent the closest residential receivers (Residential Receivers S, NE and NW), the nearest Transgrid Tower (to the blast), as well as items of European heritage or Aboriginal heritage to ensure that blasting is monitored within acceptable limits at these sensitive locations. These locations have been chosen in consultation with OEH as detailed in the BMP.

3.10.2 Environmental Performance

Mangoola worked to prevent unexpected downtime of the overpressure and vibration monitoring equipment experienced during the reporting period, specifically by ensuring that battery operated monitoring equipment is adequately powered during blast events.

The following mitigation measures are implemented with regard to the management of blasting during the reporting period:

- No blasting within 500 m of Wybong Road;
- Vibration and overpressure was measured for each blast at representative locations;
- No impacts to Anvil Rock and the Book, items of European heritage or Aboriginal heritage (other than those approved in the EA) to occur; and
- Notifications for road closures provided via advertisement and the blasting hotline as required by conditions of the Project Approval.

Blast Overpressure

During the reporting period there were an average of nine blast events per month with all blasts taking place between the hours of 9:09am and 2:34pm. This meets the criteria of Schedule 3, Conditions 15 and 16 of the Project Approval which requires blasting to occur between the hours of 9am and 3pm. A total of 108 blast events occurred during the reporting period.

Schedule 3, Condition 12 of the Project Approval, as well as condition L3.1 of EPL 12894, provide the criteria for allowable blast overpressures as measured at any privately owned residence. These are detailed in **Table 30.**

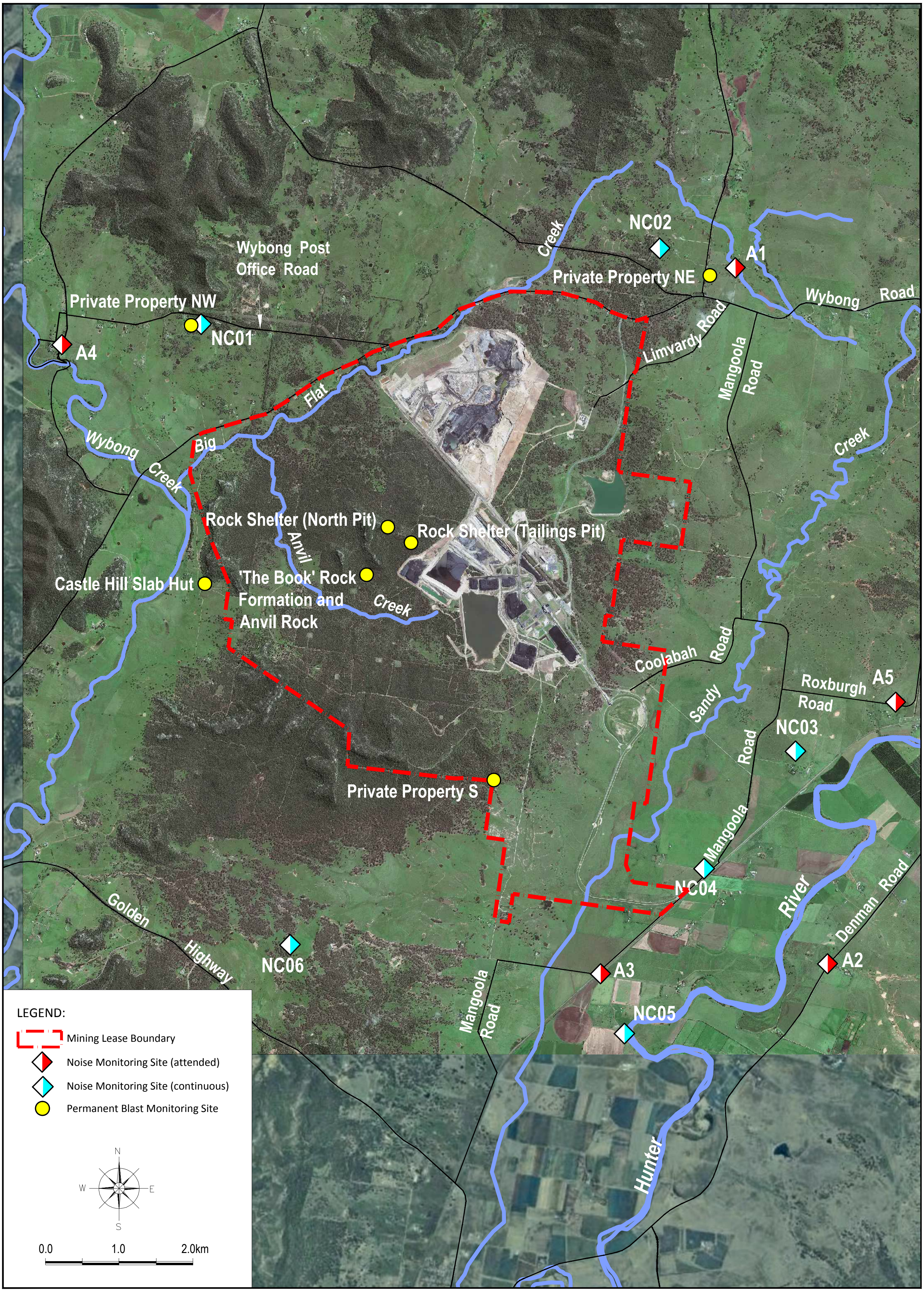
Table 30 - Blast Overpressure criteria

Air blast overpressure (dB(L in peak)	Allowable Exceedences
115	5% of the total number of blasts over a period of 12 months
120	0

In July 2011, Mangoola's EPL conditions relating to blast vibration and overpressure limits, monitoring and recording requirements were amended to exclude Mangoola owned land and private agreements. Blast overpressure results at all monitoring locations for the reporting period is included as **Appendix H**, with the results recorded at the nearest privately owned residence summarised in **Table 31** below.

Table 31 - Blast Overpressure summary table

Location	Minimum Overpressure (dBL)	Average Overpressure (dBL)	Maximum Overpressure (dBL)
Private Residence S	74.60	91.50	107.89
Private Residence NE	82.06	99.59	112.08
Private Residence NW	88.92	104.43	116.56



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Noise and Blast Monitoring Locations

FIGURE 13

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During the reporting period there were no occasions where the overpressure criterion of 120dBL for private residences was exceeded. The threshold of 115dBL was exceeded on two occasions at Private Residence NE, on 10 November 2011 (116.56dBL) and on 6 June 2012 (116.3dBL); however this equated to 1.9% of the total number of blasts within the 12 month period, which is within the 5% limit.

Blast Vibration

Ground vibration monitoring also took place during the reporting period with vibration measurements being recorded at the stations listed in **Section 3.10.1**. The blast vibration criteria for blasting at Mangoola is listed in Schedule 3, Condition 13 of the Project Approval, as well as condition L3.2 of EPL 12894, and are presented in **Table 32.**

Table 32 - Blast Vibration Criteria

Receiver	Peak Particle Velocity Criteria (mm/s)	Allowable Exceedance
Residence on privately owned land	5	5% of the total number of blasts over a period of 12 months
	10	0%
Castle Hill (Heritage Slab Hut)	5 (Interim)	0%
500kV Transmission Lines	50 (negotiated to 100mm/s)	0%
Aboriginal Rock Shelters	40 (Interim)	0%
Anvil Rock and “The Book” Rock Formation	40 (Interim)	0%

Mangoola has negotiated an agreement with Transgrid to permit ground vibrations at the towers of up to 100mm/sec. The DP&I were notified of the agreement. Whenever a result exceeding 50mm/sec is recorded, it is reported as a technical exceedance to the DP&I. Whenever 100mm/sec is exceeded, both the DP&I and Transgrid are notified, and Mangoola prepares an Incident Report.

Ground vibration monitoring data for the reporting period is included as **Appendix H**, and is summarised in **Table 33** below.

Table 33 - Blast Vibration Summary Table

Location	Minimum vibration (mm/s)	Average vibration (mm/s)	Maximum vibration (mm/s)	Exceedences (Y/N)?
Private Residence S	0.01	0.087	0.37	N
Private Residence NW	0.00	0.064	1.29	N
Private Residence NE	0.00	0.318	1.55	N
Castle Hill Slab Hut	0.00	0.109	0.44	N
Tailings Pit Rock Shelter	0.00	0.684	2.53	N
North Pit Rock Shelter	0.00	0.522	3.31	N
The Book Rock Formation and Anvil Rock	0.00	0.377	1.39	N
Nearest Transgrid Pylon	0.00	11.3	124	Y

There were no exceedences of blast vibration criteria at residences on privately owned land, Castle Hill, Aboriginal rock shelters, or The Book Rock Formation and Anvil Rock. There was one exceedance of the 100mm/s vibration limit at a Transgrid pylon during the reporting period, which is discussed in **Section 3.10.3** below.

Rock shelter Monitoring and Anvil Hill Rock Structures

Baseline recording of the 19 Aboriginal rock shelter sites and two culturally significant rock formations (Anvil Rock and 'The Book') by a qualified, independent geotechnical expert is a requirement of the Project Approval for the Mangoola Coal Mine (refer to Project Approval Schedule 3 Condition 14) to enable development of site specific ground vibration impact assessment criteria. Baseline monitoring was completed during the previous reporting period, and further inspections of the rock shelters were conducted during the 2011-2012 reporting period. These inspections involved updating field records with the condition of each shelter and structure. This information was utilised in conjunction the operational blasting results from the current reporting period to determine appropriate criteria.

3.10.3 Reportable Incidents

One reportable incident regarding blasting and vibration occurred during the reporting period, involving an exceedance of the agreed vibration conditions on 4 November 2011. Vibration results were recorded as 124mm/s on BVE003 (Transgrid Pylon 69), exceeding the 100mm/s limit agreed with Transgrid as well as the 50mm/s consent condition. The incident was identified as a Category 2 incident in the Mangoola Incident Reporting System (minor, reversible environmental impact requiring minor remediation). Transgrid and DP&I were immediately notified, and blasting of shots that were predicted to exceed 40mm/s were suspended. A Penalty Infringement Notice was received from DP&I for $3000. An investigation into the incident found that blasting and blasting prediction had been taking place at Mangoola without secondary quality control processes to identify any errors in shot design.

Seventeen complaints relating to blasting (including blast dust, blast vibration and blast overpressure) were received during the reporting period. Two additional complaints were received in relation to blast odours and one was received in relation to blast fume. Further detail on the Mangoola Coal complaints procedure is provided in **Section 4.**

3.10.4 Further Improvements

In response to the Transgrid blast vibration exceedance incident, the blast prediction procedure was updated so that if the predicted blast vibration level is above 60mm/s the blast design will be reviewed by a supervisor, and any shot that cannot be designed to below the 60mm/s vibration level must be subject to a written risk assessment before it can be authorised to proceed. All personnel involved in blast design were trained in the new procedure. Non-destructive testing was also carried out on all Transgrid suspension towers near the blasting area.

Mangoola plans to investigate installing structural measures to stabilise the Anvil Hill rock structures. This is planned to commence during the following reporting period.

3.11 Operational Noise

3.11.1 Environmental Management

Mangoola has developed a noise monitoring program in consultation with the OEH, which consists of both attended and unattended monitoring to meet the requirement of the Project Approval as well as EPL 12894. The Mangoola Noise Monitoring Program MAN SD PLN 0016 was resubmitted during the reporting period.

Whilst the Project Approval outlines specific impact assessment criteria for 71 locations, it is not considered feasible to monitor noise at all of these locations. A number of attended monitoring sites have therefore been selected that represent the nearest privately owned residences, from where the noise levels at all 71 locations can be inferred using a validated noise compliance model.

The selected attended monitoring locations are illustrated on **Figure 13**. Monitoring locations and noise impact criteria at the time of monitoring is detailed in **Table 34** below.

Table 34 – Attended Noise Monitoring Locations and Criteria

Monitoring Location ID	Description / Area	Monitoring Location Justification	Day LAeq	Evening LAeq	Night LAeq	Night LA1, 1 min
A1	1925 Castlerock Road	Nearest private residence for NAR construction and early works.	35	34	39	45
A2	Opposite 1711 Denman Road	Nearest private residence on western side of the Hunter River.	36	36	39	45
A3	Corner of Mangoola Rd and Bells Lane	Nearest private residence to rail loop.	37	37	39	45
A4	Yarraman Rd	Nearest private residence outside acquisition zone.	39	39	37	45
A5	741 Roxburgh Road	Nearest private residence to the south-east.	33	32	37	45

Attended monitoring was conducted on a quarterly basis at these five locations during the reporting period, and was undertaken in accordance with the *Industrial Noise Policy* (EPA, 1999) and Australian Standard AS 1055 *'Acoustics, Description and Measurement of Environmental Noise'*.

In addition to the attended monitoring, Mangoola has also established six permanent unattended noise monitoring locations that have been situated after considering local topography, locations of nearest privately owned residences and the predominant wind-direction (north west to south east). The locations of the unattended noise monitoring sites are illustrated on **Figure 13**, and described in **Table 35.**

Table 35 – Unattended Noise Monitoring Locations

Monitoring Location ID	Description/Area	Monitoring Location Justification
NC01	275 Wybong Post Office Rd	Nearest private residence.
NC02	96 Ridgelands Rd	Nearest private resident to the north-east
NC03	830 Mangoola Rd	Reference site to monitor noise from the operation
NC04	699 Mangoola Rd	Nearest private residence to the rail loop
NC05	22 Bells Lane	Nearest private residence to the south
NC06	Bells Lane West	Nearest private residence to the south-west

In addition to conducting noise monitoring, Mangoola has implemented a number of mitigation measures with regard to the management of noise to minimise potential noise impact on nearby receivers, and to comply with the conditions of the Project Approval.

- Personnel and contractors are to be vigilant at all times in identifying and controlling operations and activities that might result in the generation of excessive noise. Noisy operations or equipment which are identified as affecting privately owned residences are to be reported to the supervisor promptly;
- All personnel and contractors have received training in the importance of noise minimisation and in noise control procedures;
- Replacing reversing beeper with ‘quackers’ to all earthworks equipment at the rail loop;
- Implementing varied work practices for best noise mitigation outcomes, for example varied start times and strategic operating locations of certain equipment; and
- Incorporating weather conditions into consideration of daily planning of works.

The definitions for Day, Evening and Night used in the data reporting are explained below:

- Day – The period from 7am to 6pm on Monday to Saturday, and 8am to 6pm on Sundays and Public Holidays;
- Evening – The period from 6pm to 10pm; and
- Night – The period from 10pm to 7am on Monday to Saturday and 10pm to 8am on Sundays and Public Holidays.

3.11.2 Environmental Performance

During the current reporting period Mangoola complied with all noise monitoring criteria outlined in the Project Approval.

Attended environmental noise monitoring was undertaken on a quarterly basis over the reporting period by Global Acoustics. Monitoring was undertaken in July and October 2011, and January and April 2012, at the five monitoring locations. The duration of each measurement was 15 minutes.

Atmospheric conditions resulted in the Project Approval criteria not always being applicable, however where this criteria was applicable, Mangoola Coal complied with all of the relevant day, evening and night consent $L_{Aeq\ (15\ minute)}$ noise limits and night $L_{A1\ (1\ minute)}$ noise limits, during the reporting period.

It is noted that noise monitoring criteria only apply in certain weather conditions in accordance with the Project Approval. Noise emission limits apply for the following meteorological conditions:

- Wind speeds of up to 3 m/s at 10 m above ground level; or
- Temperature inversion conditions of up to 3ºC/100m, and wind speeds of up to 2m/s at 10 metres above ground level.

A summary of Mangoola’s attended monitoring results for the reporting period is included in **Table 36.**

Table 36 – Attended Noise Monitoring Results

Location	Start Date	Start Time	LA_1 dB	LA_{10} dB	LA_{eq} dB	LA_{90} dB
MEASURED NOISE LEVELS – 8-15 JULY 2011 (Q3)						
A1 – Castlerock Rd	8/07/2011	9:18	48	44	41	36
A2 – Denman Rd	8/07/2011	11:11	81	68	68	36
A3 – Bells Lane	8/07/2011	10:38	45	37	36	28
A4 – Yarraman Rd	8/07/2011	7:57	49	39	37	23
A5 – Roxburgh Rd	8/07/2011	10:12	56	44	43	30
A1 – Castlerock Rd	14/07/2011	19:48	46	38	35	27
A2 – Denman Rd	14/07/2011	21:04	67	52	52	24
A3 – Bells Lane	14/07/2011	20:35	38	32	30	25
A4 – Yarraman Rd	14/07/2011	19:20	34	32	30	28
A5 – Roxburgh Rd	14/07/2011	20:13	41	35	32	26
A1 – Castlerock Rd	14/07/2011	23:29	58	36	44	27
A2 – Denman Rd	15/07/2011	1:53	52	50	44	26
A3 – Bells Lane	15/07/2011	1:23	37	32	28	23
A4 – Yarraman Rd	14/07/2011	22:22	36	33	32	30
A5 – Roxburgh Rd	15/07/2011	1:00	34	30	29	27
MEASURED NOISE LEVELS – 5-11 OCTOBER 2011 (Q4)						
A1 – Castlerock Rd	5/10/2011	7:38	49	42	41	34
A2 – Denman Rd	5/10/2011	10:58	68	59	56	34
A3 – Bells Lane	5/10/2011	10:26	44	39	36	28
A4 – Yarraman Rd	5/10/2011	8:31	56	44	47	35
A5 – Roxburgh Rd	5/10/2011	9:58	60	42	52	32
A1 – Castlerock Rd	5/10/2011	18:44	50	43	41	30
A2 – Denman Rd	5/10/2011	20:20	62	52	49	32
A3 – Bells Lane	5/10/2011	19:39	53	52	51	49
A4 – Yarraman Rd	5/10/2011	18:15	53	43	40	29
A5 – Roxburgh Rd	5/10/2011	19:14	44	36	35	31
A1 – Castlerock Rd	10/10/2011	23:40	39	38	37	35
A2 – Denman Rd	11/10/2011	2:52	60	45	47	33
A3 – Bells Lane	11/10/2011	2:02	41	39	36	32
A4 – Yarraman Rd	10/10/2011	22:25	38	36	34	32
A5 – Roxburgh Rd	11/10/2011	1:31	38	34	33	29
MEASURED NOISE LEVELS - 9-20 January 2012 (Q1)						
A1 – Castlerock Rd	20/01/2012	8:31	44	40	37	31
A2 – Denman Rd	20/01/2012	10:03	68	55	55	36

Location	Start Date	Start Time	LA_1 dB	LA_{10} dB	LA_{eq} dB	LA_{90} dB
A3 – Bells Lane	20/01/2012	9:33	50	44	41	35
A4 – Yarraman Rd	20/01/2012	7:25	46	39	37	34
A5 – Roxburgh Rd	20/01/2012	8:55	56	51	45	29
A1 – Castlerock Rd	9/01/2012	19:37	51	39	39	35
A2 – Denman Rd	9/01/2012	21:31	55	46	44	37
A3 – Bells Lane	9/01/2012	21:01	46	44	43	41
A4 – Yarraman Rd	9/01/2012	20:04	53	52	49	40
A5 – Roxburgh Rd	9/01/2012	20:38	56	47	45	38
A1 – Castlerock Rd	10/01/2012	22:04	44	43	42	41
A2 – Denman Rd	11/01/2012	2:50	37	32	30	25
A3 – Bells Lane	11/01/2012	2:10	40	37	35	32
A4 – Yarraman Rd	10/01/2012	22:54	51	50	46	39
A5 – Roxburgh Rd	11/01/2012	1:34	52	50	46	32
MEASURED NOISE LEVELS – 2-12 April 2012 (Q2)						
A1 – Castlerock Rd	12/04/2012	7:11	49	42	40	34
A2 – Denman Rd	12/04/2012	10:23	69	58	56	33
A3 – Bells Lane	12/04/2012	9:55	47	37	36	28
A4 – Yarraman Rd	12/04/2012	8:12	49	40	38	30
A5 – Roxburgh Rd	12/04/2012	9:12	55	44	42	31
A1 – Castlerock Rd	2/04/2012	20:01	57	48	46	40
A2 – Denman Rd	2/04/2012	21:24	61	52	51	38
A3 – Bells Lane	2/04/2012	20:54	55	52	51	50
A4 – Yarraman Rd	2/04/2012	19:35	50	49	47	44
A5 – Roxburgh Rd	2/04/2012	20:26	42	40	39	38
A1 – Castlerock Rd	3/04/2012	23:29	48	37	37	29
A2 – Denman Rd	4/04/2012	2:56	34	31	30	27
A3 – Bells Lane	4/04/2012	1:54	45	43	42	40
A4 – Yarraman Rd	3/04/2012	22:25	48	48	43	33
A5 – Roxburgh Rd	4/04/2012	1:28	34	32	31	29

Appendix I presents noise monitoring results for the reporting period in the annual monitoring report completed by specialist noise consultants.

3.11.3 Reportable Incidents

No reportable incidents regarding noise occurred during the reporting period. Two minor noise-related environmental incidents were reported internally during the reporting period. One involved a 2dB exceedance of the 33dB noise limit on 11 May 2012. The exceedance was found to be related to environmental conditions and a second measurement recorded no exceedance. The exceedance was recorded as a Category 1 incident (negligible, reversible environmental impact, requiring very minor or no remediation).

A Nil Category incident (below Category 1) also occurred on 23 January 2012 in relation to a contractor loader operating with a reverse beeper rather than a low frequency alarm. In response this incident, site procedures were updated to clearly state the requirement for reversing alarms on all equipment types.

A total of 522 noise related complaints were received during the reporting period, which is a significant increase on the 364 complaints received during the previous reporting period. The previous reporting period included the time when night time mining works commenced. These complaints reflect the mine operating at full production, compared to the previous reporting period which incorporated some of the construction phase. Mangoola has implemented a number of noise mitigation measures as discussed in **Section 3.11.1** above. It is also noted that the results of all attended noise monitoring during the reporting period were below the consent criteria where atmospheric conditions were applicable. Complaints are discussed in **Section 4.1**.

3.11.4 Further Improvements

Mangoola will continue to implement the noise monitoring program and investigate noise reduction measures and best practice noise mitigation techniques during the next reporting period, with the outcomes reported in future AEMRs.

3.12 Visual Mitigation

3.12.1 Environmental Management

All works occurring onsite are undertaken in a manner which ensures that there is minimal impact on visual amenity. Mangoola is committed to minimising ongoing visual impacts as a result of its operations. In order to ensure visual impacts are minimised a variety of methods are implemented. These include:

- Tree screen planting;
- Consideration of infrastructure and building placement having regard to visual impacts;
- Establishment and ongoing maintenance of visual bunds to improves the visual amenity of the site;
- Direction and design of lighting to be low impact where applicable;
- The implementation of training and awareness initiatives to educate employees about visual impacts and minimisation; and
- Lighting shielding and direction so as to prevent light spillage.

3.12.2 Environmental Performance

Mangoola continuously monitors visual impacts and implements appropriate measures to ensure off site visual impacts are limited.

As per Schedule 3, Condition 55A in Project Approval 06_0014 and the Statement of Commitments (6.13.1), Mangoola has provided vegetation screening along Mangoola Road. Mangoola has also planted a vegetation screen extending from Limb of Addy Hill, and a vegetation screen along the noise wall at the rail loop. Replanting, watering activities and further maintenance activities are ongoing as required.

Schedule 3 Condition 53 of the Project Approval requires the preparation of a report that identifies residences likely to experience significant visual impacts during the construction and operation of

Mangoola. For residences that are identified, Condition 54 requires Mangoola to advise residences that they are entitled to mitigation measures to reduce the visibility of the mine from their properties. Condition 55 then requires the site to implement visual impact mitigation measures upon receipt of written request from an owner of a residence. Notification letters were sent to stakeholders entitled to visual mitigation on 4 July 2011 to advise them of their rights. Specialist consultants were engaged by Mangoola to prepare Visual Impact Mitigation Assessments addressing the consent requirement to use landscaping and vegetative treatments to mitigate the visual impact of the Mangoola mine from neighbouring residents. Reports were prepared for four neighbouring properties, and visual mitigation works were undertaken as per project approval requirements.

Tree planting was also completed during the reporting period, along Mangoola Road and at three nearby residences.

3.12.3 Reportable Incidents

No reportable incidents regarding visual mitigation occurred during the reporting period.

Two complaints relating to visual amenity and 22 relating to lighting at the site were received during the reporting period. Further detail on the Mangoola Coal complaints procedure is provided in **Section 4.**

3.12.4 Further Improvements

Mangoola will continue to monitor visual impacts and implement appropriate measures to ensure off site visual impacts are limited. These include the following ongoing measures:

- Only the minimum area necessary will be disturbed at any time. Rehabilitation of affected areas will be undertaken as soon as practicable after works;
- Screening will continue to be established along key project area boundaries including along sections of the rail loop in order to screen views into prominent areas of the project;
- Night lighting will be located and used appropriately in order to both provide a safe work place and reduce potential impacts from night lighting.

As part of the ongoing community consultation process described in **Section 4.0,** ongoing consultation with surrounding landowners provides a means to ensure that the implemented visual treatments are installed to the required standard, or if maintenance or additional measures are required.

3.13 Aboriginal Heritage

3.13.1 Environmental Management

The management of Aboriginal cultural heritage is undertaken in accordance with the Aboriginal Cultural Heritage Management Plan (ACHMP) as approved 2 January 2009. The ACHMP provides management requirements specific to each of the stages of mining activity as well as those that are applicable throughout all stages. The ACHMP defines Stage One as extending from approval to Year one Mining, with Stage two continuing to Year five Mining. This AEMR relates to activities undertaken in Stage two. Activities relating to Aboriginal cultural heritage periodically arise and are undertaken in accordance with the requirements of the ACHMP and other relevant legislation, guidelines and requirements.

Based on current information, there are 363 Aboriginal archaeological sites recorded within or adjacent to the Mangoola Coal project area, 129 of which were salvaged from within the Mangoola Coal approved disturbance area. These sites are mainly artefact scatters or isolated finds (326 in total) but also include 29 rockshelters (19 of which are located within the existing Mangoola Coal

Aboriginal Cultural Heritage Offset Areas and 10 of which are within an area proposed as an additional Aboriginal Cultural Heritage Offset Area), three scarred trees (all of which are associated with the Mangoola Coal project area), four sites with potential archaeological deposit (all of which are associated with the Mangoola Coal project area) and a set of grinding grooves (located adjacent to the Mangoola Coal project area). A relatively high proportion of these sites are located within identified Aboriginal Cultural Heritage Offset Areas (ACHOAs) within the Mangoola Coal project area which are set aside for long-term security, in accordance with Condition 40 of the Project Approval. In order to assist with the management of Aboriginal Cultural Heritage, Mangoola Coal maintains a database of all identified Aboriginal archaeological sites, with information utilised in the Ground Disturbance Permit (GDP) process, as described in **Table 24**.

Mangoola recognises the obligations of Aboriginal people to take an active role in the management of cultural heritage and consults with the relevant Aboriginal parties in relation to Aboriginal cultural heritage management, as discussed below. In addition, all Mangoola employees undertake Aboriginal cultural heritage awareness training as part of the Xstrata Coal NSW generic induction and the Mangoola Coal site familiarisation process.

Relevant Aboriginal Parties

The relevant Aboriginal parties consulted in relation to the management of Aboriginal Cultural Heritage at Mangoola are listed in **Table 37.**

Table 37 - Registered Aboriginal Stakeholder Groups for Mangoola Coal

Reference	Name of Group	Date Registered for Mangoola Coal Project
1	Aboriginal Native Title Consultants (ANTC)	Dec-04
2	Giwiirr Consultants (GC)	Dec-04
3	Hunter Valley Aboriginal Corporation (HVAC)	Dec-04
4	Hunter Valley Cultural Consultants (HVCC)	Dec-04
5	Lower Wonnarua Tribal Consultancy Pty Ltd (LWTC)	Dec-04
6	Ungooroo Aboriginal Corporation (UAC)	Dec-04
7	Upper Hunter Heritage Consultants (UHHC)	Dec-04
8	Upper Hunter Wonnarua Council Inc (UHWC)	Dec-04
9	Valley Culture (VC)	Dec-04
10	Wanaruah Custodians (WC)	Dec-04
11	Wanaruah Local Aboriginal Land Council (WLALC)	Dec-04
12	Wattaka Wonnarua CC Service (WWCCS)	Dec-04
13	Wonnarua Culture Heritage (WCH)	Dec-04
14	Wonnarua Elders Corporation (WEC)	Dec-04
15	Wonnarua Nation Aboriginal Corporation (WNAC)	Dec-05
16	Yarrawalk (Y)	Apr-06
17	Muswellbrook Cultural Consultants (MCC)	Dec-06
18	Mingga Consultants (MC)	Jul-07
19	Wonn 1 Contracting (WC-AF)	Sep-07
20	Hunter Valley Cultural Surveying (HVCS)	Oct-07

Reference	Name of Group	Date Registered for Mangoola Coal Project
21	Culturally Aware (CA)	Oct-07
22	Ungooroo Cultural and Community Services (UCCS)	Feb-08
23	St Clair Aboriginal Corporation (SCAC)	Feb-08
24	Cacatua Cultural Consultants (CCC)	Feb-09
25	Hunter Valley Natural and Cultural Resources Management (HVNCRM)	Feb-09
26	Yinarr Cultural Services (YCS)	Feb-09
27	Bullen Bullen Heritage Consultants (BBHC)	Mar-09
28	Gidawaa Walang Cultural Heritage Consultancy	May-09
29	Hunter Traditional Owners (HTO)	May-09
30	Black Creek Aboriginal Corporation (BCAC)	Jul-09
31	Lower Hunter Wonnarua Council Inc. (LHWC)	Dec-04
32	Wanaruah Custodians Aboriginal Corporation (WCAC)	Dec-04

Aboriginal Party Consultation Meetings

In accordance with the ACHMP, Mangoola organised two Aboriginal party consultation meetings within the reporting period. These were held on 9 September 2011 and 28 February 2012 and were attended by representatives of the relevant Aboriginal parties (refer to **Table 37**). In accordance with the intent of the ACHMP, these meetings provide a forum to discuss a range of matters relating to management of Aboriginal cultural heritage and present the relevant Aboriginal parties with the opportunity to have input into the management process and remain up-to-date with the progress of operations. Copies of all presentations, minutes, and actions arising from the meetings from these meetings were sent to registered Aboriginal parties. Therefore, any registered Aboriginal party who did not have a representative attend on the meeting day or days received all relevant information.

In addition to the regular six-monthly meetings, Mangoola organised an additional workshop meeting on 19 June 2012 to discuss the Aboriginal cultural values and requirements of an additional potential ACHOA .

Table 38 - Aboriginal party attendance at six monthly meetings

Date	Meeting and Date	Attendance
09/09/11	Seventh six-monthly meeting	Aboriginal Native Title Consultants
		Bullen Bullen Heritage Consultants
		Cacatua Culture Consultants
		Carrawonga Consultants
		Deslee Talbott Consultants
		Giwiirr Consultants
		Hunter Valley Aboriginal Corporation
		Hunter Valley Cultural Consultants
		Hunter Valley Natural Cultural Resource Management
		Mingga Consultants

Date	Meeting and Date	Attendance
		Muswellbrook Culture Consultants
		Roger Noel Matthews Consultants
		Ungooroo Aboriginal Corporation
		Upper Hunter Heritage Consultants
		Wanaruah Local Aboriginal Land Council
		Wonnarua Culture Heritage
		Yarrawalk
		Yinnar Cultural Services
28/02/12	Eighth six-monthly meeting	Aboriginal Native Title Consultants
		Cacatua Culture Consultants
		Deslee Talbott Consultants
		Hunter Valley Aboriginal Corporation
		Hunter Valley Cultural Consultants
		Roger Noel Matthews Consultants
		Ungooroo Aboriginal Corporation
		Upper Hunter Heritage Consultants
		Valley Culture
		Wanaruah Local Aboriginal Land Council
		Wonn1 Contracting
		Yinnar Cultural Services
19/06/12	Aboriginal Cultural Heritage Offset Areas workshop	Giwiirr
		Lower Wonnarua Tribal Council
		Ungooroo Aboriginal Corporation
		Wonn1
		Wonnaura Local Aboriginal Land Council
		Wonnarua Nation Aboriginal Corporation
		Yinaar Culture Services

3.13.2 Environmental Performance

During the reporting period, activities relating to Aboriginal Cultural Heritage consisted of:

- Inspection of a potential Aboriginal Cultural Heritage Offset Area (ACHOA), with this area to be considered as a potential offset for impacts associated with proposed relocation of a 500kV Electricity Transmission Line (ETL) and medication to the project approval;

- Inspection of a proposed access track from Wybong Road to the existing 500kV ETL through the BFC ACHOA;

- Monitoring of 18 identified rockshelters located within the ACHOAs (an additional rockshelter was identified during this process);

- Inspections for piezometer locations;
- Inspections of a proposed location for a dust camera;
- Inspections for the proposed relocation of ACHOA blast monitors;
- Inspections to allow continued access to a private pump site on Wybong Creek;
- Inspections of a proposed fence for ecological offset areas;
- Inspections of areas proposed for replanting within ecological offset areas;
- Inspection of the area south of the Raw Water Dam for a proposed water seepage interception system;
- Baseline recording of the newly identified rockshelter within the ACHOAs; and
- Removal and relocation of scarred tree SC-ST-03.

Each of these Aboriginal Cultural Heritage activities are discussed further below.

Inspection of Proposed Additional Aboriginal Cultural Heritage Offset Area

As part of the consultation and requirements for the proposed 500kV ETL relocation and Mangoola mine modification, a suitable ACHOA is required. A potential land based offset area was identified and subject to a preliminary inspection to assess whether the area was likely to have Aboriginal Cultural and Archaeological values that warranted it being established as an additional ACHOA. The inspections were completed on 5 September 2011 and 8 September 2011 by archaeologists and Aboriginal party representatives and a total of 10 rockshelter sites (WC50-WC59) were identified, as shown in **Table 51**. The results of the inspection were discussed at the Mangoola Coal Aboriginal party meeting on 9 September 2011 and the Aboriginal party representatives identified that a workshop should be held to further consider the Aboriginal cultural values and suitability of the potential offset area. This workshop was held on 19 June 2012. During the workshop, Aboriginal party representatives requested an expansion of the area of land included in the potential offset area. Aboriginal party representatives who participated in the potential ACHOA inspection are listed in **Table 39** below.

Table 39 – Aboriginal party representatives involved in potential ACHOA Inspection

Date	Name	Organisation
05/09/11 – 08/09/11	Arthur Fletcher	Wonn1
	Norm Archibald	Wonnarua Local Aboriginal Land Council
	David French	Hunter Valley Natural and Cultural Resources Management
19/06/12	Arthur Fletcher	Wonn1
	Annette Dunstan	Ungooroo Aboriginal Corporation
	Barry Stair	Giwiirr
	Steven Campbell	Yinaar Culture Services
	Tom Miller	Lower Wonnarua Tribal Council
	Rhonda Griffiths	Wonnarua Nation Aboriginal Corporation
	Noel Downs	Wonnarua Local Aboriginal Land Council

Inspection of a Proposed Access Track from Wybong Road to the Existing 550kV ETL through the Big Flat Creek ACHOA

The approved Mangoola project disturbance boundary includes a 500kV transmission line that is operated and managed by Transgrid. While the transmission line is still active, Transgrid require access through the associated easement to regularly inspect the transmission line, with the intention being that the inspection is undertaken sequentially from tower to tower. As a result of ongoing mining activities, it was no longer viable to conduct a sequential inspection using the existing inspection access track. Transgrid requested that Mangoola provide an alternate access track so that Transgrid are able to carry out inspections of the 500kV transmission line from Wybong Road and Big Flat Creek through the approved project disturbance area. This includes a section of the Big Flat Creek ACHOA.

A proposed option for the track was identified using an existing driveway and Big Flat Creek crossing at a property on Wybong Road. An inspection of this track was undertaken and identified four new artefact scatters within the Big Flat Creek ACHOA (refer to **Table 51**). It was recommended that construction of the proposed access track should not be undertaken unless impacts were altered to avoid harm to Aboriginal objects. The Aboriginal party representatives who participated in the inspection of the proposed access track are listed in **Table 40** below.

Table 40 - Aboriginal Party Representatives Involved in Transgrid Access Track Inspection

Date	Name	Organisation
26/09/11	Adam Sampson	Cacatua Cultural Consultants
	Nerida Sanders	Hunter Valley Aboriginal Corporation

Monitoring of Rockshelters within ACHOAs

In accordance with the requirements of the ACHMP, monitoring of the condition of the 18 rockshelter sites located in the ACHOAs was undertaken between 27 and 29 September 2010. Monitoring involved inspection of each rockshelter site to record any changes in its condition or the distribution of artefacts within the rockshelter but also incorporated detailed geotechnical monitoring in relation to potential blasting impacts. During the monitoring an additional rockshelter (WC60) was identified, as listed in **Table 51**. Aboriginal party representatives who participated in the rockshelter monitoring are listed in **Table 41** below.

Table 41 - Aboriginal party representatives participating in rockshelter monitoring

Date	Name	Organisation
27/0911- 28/09/11, 30/09/11	Paulette Ryan	Hunter Traditional Owners
27/09/11- 30/09/11	Adam Sampson	Cacatua Culture Consultants
27/0911- 28/09/11	Nerida Saunders	Hunter Valley Aboriginal Corporation

Inspections for piezometer locations

Cultural heritage inspections of proposed piezometer locations situated within or associated with the Big Flat Creek ACHOA were undertaken on 8 December 2011. Ten piezometer locations were inspected, with nine of the locations being assessed as having low archaeological potential and a low likelihood of harm to Aboriginal objects and the tenth location (MP9) assessed as having a moderate likelihood of harm to Aboriginal objects. One surface artefact was identified, and was assessed as being part of the continuous scatter of artefacts on the north bank of Big Flat Creek, rather than a new site. It was recommended that MP9 be relocated to a previously ripped and replanted area that did not require further inspection. Aboriginal party representatives who participated in the inspection of piezometer locations are listed in **Table 42** below.

Table 42 - Aboriginal Party Representatives Participating in Piezometer Location Inspection

Date	Name	Organisation
08/12/11	Norm Archibald	Yinarr Cultural Services
	Deslee Matthews	Deslee Talbott Consultants

Inspections of a Proposed Location for a Dust Camera

Under PA06_0014, Mangoola is required to monitor and manage dust generated by mining operations. Mangoola proposed to monitor dust levels by installing a dust camera on land adjacent to Wybong Road and facing the mining area but outside of the approved mining area and any ACHOAs. Proposed ground disturbance was minimal, with most being surface infrastructure only. The inspection of the proposed dust camera location was undertaken on 22 March 2012. No new Aboriginal archaeological sites were identified during the inspection. Aboriginal party representatives who participated in the inspection of the dust camera location are listed in **Table 43** below.

Table 43 – Aboriginal Party Representatives Participating in Dust Camera Inspection

Date	Name	Organisation
22/03/12	Annette Dunstan	Ungooroo Aboriginal Corporation
22/03/12	Tara Mason	Valley Culture

Inspections for the proposed relocation of ACHOA blast monitors

Blast monitors are installed with the Mangoola project area to measure the effects of mine blasting, including levels of vibration in the vicinity of rockshelters. During the February 2012 six-monthly meeting the results of the blast monitoring were presented to the registered Aboriginal parties and it was identified that vibration had not exceeded limits in the vicinity of the rockshelter sites. However, as mining moves closer to Anvil Hill having a blast monitor closer to the rockshelters located in this area will give a more accurate indication of vibration levels at the shelters. During this consultation meeting, it was agreed to relocate the Anvil Hill blast monitor closer to the rockshelters. The inspection of the proposed blast monitor location was undertaken on 22 March 2012. No new Aboriginal archaeological sites were identified during the inspection. It was recommended that the blast monitor be relocated to the inspected location, where no surface artefacts were present and where there would be limited impact to the view from the Anvil Hill rockshelters. Aboriginal party representatives who participated in the inspection of the blast monitor location are listed in **Table 44** below.

Table 44 – Aboriginal Party Representatives Participating in Blast Monitor Relocation Inspection

Date	Name	Organisation
22/03/12	Annette Dunstan	Ungooroo Aboriginal Corporation
	Tara Mason	Valley Culture

Inspections to Allow Continued Access to a Pump Site on Wybong Creek

An existing access track that extends from Wybong Road through the Big Flat Creek ACHOA to a private water pump and a Transgrid power pole is subject to continued use by four wheel drive vehicles. Consequently, the track was inspected to ensure that ongoing use would not result in harm to any Aboriginal objects that may be present. The track has been constructed by using imported fill material and is visible on aerial maps dating from 2004. The track was inspected on 22 March 2012. No surface artefacts were identified during the inspection. It was recommended that the existing access track could continue to be used but that no vehicles were to access the Big Flat Creek ACHOA outside the formed track. Aboriginal party representatives who participated in the access track inspection are listed in **Table 45** below.

Table 45 – Aboriginal Party Representatives Participating in Access Track Inspection

Date	Name	Organisation
22/03/12	Annette Dunstan	Ungooroo Aboriginal Corporation
	Tara Mason	Valley Culture

Inspections of a Boundary Fence for Ecological Offset Areas

In accordance with PA06_0014, Mangoola is required to erect a boundary fence along the eastern boundary of the ecological offset areas. These areas were not previously assessed for Aboriginal cultural or archaeological values and therefore inspections of the proposed boundary fence were required in accordance with the requirements of the ACHMP. Inspections of the fence line were undertaken to ensure that installation of the fence did not impact on any Aboriginal objects. Nine new Aboriginal archaeological sites were identified during the inspections (refer to **Table 51**). The fence line was adjusted in the field in consultation with the Aboriginal party representatives on site to avoid impacts to the new sites and where possible existing fence lines were utilised. Aboriginal party representatives who participated in the boundary fence inspections are listed in **Table 46** below.

Table 46 – Aboriginal party representatives participating in boundary fence inspections

Date	Name	Organisation
20/03/12 - 22/03/12	Annette Dunstan	Ungooroo Aboriginal Corporation
20/03/12 - 22/03/12	Tara Mason	Valley Culture
20/03/12 - 21/03/12	Shane Wilkins	Cacatua Culture Consultants

Inspections of Areas Proposed for Replanting within Ecological Corridors

As required under PA06_0014, and in order to enable and encourage fauna in the area to utilise the ecological offset areas, Mangoola is required to undertake revegetation works within the approved ecological offset areas to create corridors to adjoining vegetated lands outside of the Mangoola project area. These areas were not previously assessed for Aboriginal cultural or archaeological values and therefore inspections of the proposed planting areas were required in accordance with the ACHMP. Two areas, the Western Corridor and the Northern Corridor were inspected. Five new Aboriginal archaeological sites were identified during the inspections (refer to **Table 51**). It was recommended that hand auguring be undertaken in proposed planting areas adjacent to Wybong Creek, and that the area 50 metres up slope from a former meander of Wybong Creek not be mechanically planted. Ripping of the remaining planting areas was suitable provided that the identified archaeological sites were temporarily fenced and were not subject to harm as a result of planting activities. Aboriginal party representatives who participated in these inspections are listed in **Table 47** below.

Table 47 – Aboriginal Party Representatives Participating in Offset Area Planting Inspections

Date	Name	Organisation
19/03/12- 25/03/12	Annette Dunstan	Ungooroo Aboriginal Corporation
	Tara Mason	Valley Culture
	Shane Wilkins	Cacatua Culture Consultants

Inspection of the area south of the Raw Water Dam for a proposed water seepage interception system

In order to temporarily manage excess surface water identified within an existing ecological offset (referred to as HEO2), Mangoola proposed to place pumps next to two small former farm dams that will then pump excess water through 30 centimetre diameter collapsible pipes upstream into the existing raw water dam within the approved disturbance area. All proposed temporary works were surface works only, with no subsurface disturbance. The inspection was undertaken on 11 April 2012. Two new sites were identified during the inspections (refer to **Table 51**). It was recommended that the works could proceed as surface works only, as they did not propose impacts to the new sites. Aboriginal party representatives who participated in these inspections are listed in **Table 48** below.

Table 48 – Aboriginal Party Representatives Participating in Inspection of the Area South of the Raw Water Dam

Date	Name	Organisation
11/04/2012	Maree Waugh	Wonnarua Nation Aboriginal Corporation

Baseline Recording of the Newly Identified Rockshelter

During the 2011 annual rockshelter monitoring, an additional rockshelter with artefacts (WC60) was identified on Wallaby Rocks. At the time a baseline recording of the shelter could not be undertaken, however prior to the 2012 annual monitoring a baseline record was required. The baseline recording was undertaken using the same methodology as the original baseline recordings of the previous 18 rockshelters and will be incorporated into ongoing rockshelter monitoring. Aboriginal party representatives who participated in these inspections are listed in **Table 49** below.

Table 49 – Aboriginal Party Representatives Participating in Baseline Recording of Rockshelter

Date	Name	Organisation
2012	Maree Waugh	Wonnarua Nation Aboriginal Corporation

Removal and Relocation of Scarred Tree SC-ST-03

SC-ST-03 was identified within the approved mining area in 2012 and was assessed by an arboriculturalist as likely to be cultural in origin. In consultation with the relevant Aboriginal parties, it was determined that SC-ST-03 should be removed and potential display options for the tree should be considered. The process for its removal was developed by a specialist conservator and was discussed at the Aboriginal party consultation meeting in September 2011. It was agreed that the process would involve excavating around the tree, determine whether there would be any issues with removal, apply temporary conservation measures and remove tree. Following removal it was agreed that the conservators would provide further advice on display options. The removal of the tree was undertaken from 22 to 24 May 2012 with the Aboriginal party representatives listed in **Table 50** below.

Table 50 – Aboriginal Party Representatives Participating in Removal of SC-ST-03

Date	Name	Organisation
22/05/12- 25/05/12	Annette Dunstan	Ungooroo Aboriginal Corporation
22/05/12- 25/05/12	Barry Stair	Aboriginal Native Title Consultants

Newly Recorded Sites

As discussed above, a number of new sites were identified over the course of Aboriginal cultural heritage activities conducted during the reporting period. These sites are listed in **Table 51** below.

Table 51 – New Sites Identified During Reporting Period

AHIMS #	Site Name	Site Type	Works being undertaken when site was identified
37-2-4120	WC50	Rockshelter	Aboriginal Cultural Heritage Offset Area inspection
37-2-4121	WC51	Rockshelter	Aboriginal Cultural Heritage Offset Area inspection
37-2-4122	WC52	Rockshelter	Aboriginal Cultural Heritage Offset Area inspection
37-2-4123	WC53	Rockshelter	Aboriginal Cultural Heritage Offset Area inspection
37-2-4124	WC54	Rockshelter	Aboriginal Cultural Heritage Offset Area inspection
37-2-4125	WC55	Rockshelter	Aboriginal Cultural Heritage Offset Area inspection
37-2-4126	WC56	Rockshelter	Aboriginal Cultural Heritage Offset Area inspection
37-2-4127	WC57	Rockshelter	Aboriginal Cultural Heritage Offset Area inspection
37-2-4128	WC58	Rockshelter	Aboriginal Cultural Heritage Offset Area inspection
37-2-4129	WC59	Rockshelter	Aboriginal Cultural Heritage Offset Area inspection
37-2-4130	WC60	Rockshelter	2011 annual rockshelter monitoring
37-2-4116	BFC92	Artefact scatter	500kV access track across Big Flat Creek
37-2-4117	BFC93	Artefact scatter	500kV access track across Big Flat Creek
37-2-4118	BFC94	Artefact scatter	500kV access track across Big Flat Creek
37-2-4119	BFC95	Artefact scatter	500kV access track across Big Flat Creek
-	SC76	Isolated artefact	Ecological offset areas eastern boundary fence
-	SC77	Isolated artefact	Ecological offset areas eastern boundary fence
-	SC78	Isolated artefact	Ecological offset areas eastern boundary fence
-	SC79	Artefact scatter	Ecological offset areas eastern boundary fence
-	SC80	Isolated artefact	Ecological offset areas eastern boundary fence
-	SC81	Isolated artefact	Ecological offset areas eastern boundary fence
-	SC83	Artefact scatter	Ecological offset areas eastern boundary fence
-	SC84	Artefact scatter	Ecological offset areas eastern boundary fence
-	SC85	Artefact scatter	Ecological offset areas eastern boundary fence
-	SC86	Artefact scatter	Ecological offset area fauna corridor planting
-	WC61	Artefact scatter	Ecological offset area fauna corridor planting
-	WC62	Isolated artefact	Ecological offset area fauna corridor planting
-	WC63	Artefact scatter	Ecological offset area fauna corridor planting
-	WC64	Artefact scatter	Ecological offset area fauna corridor planting

Aboriginal Archaeological Sites Database

In addition to the above on site works, Mangoola maintains records of all identified Aboriginal archaeological sites located within the Mangoola Coal project area and immediate surrounds. These records form part of the Xstrata Mangoola Geographical Information System (GIS) and are regularly updated following the identification of new sites and/or any changes in the status of sites. The Mangoola GIS is used as a primary point of reference in assessing applications for a Ground

Disturbance Permit and for all considerations of potential interactions with Aboriginal archaeological sites.

3.13.3 Reportable Incidents

There were no reportable incidents in relation to Aboriginal Heritage during the reporting period.

3.13.4 Further Improvements

The ACHMP will continue to be implanted as updated as necessary in future reporting periods.

3.14 European Heritage

3.14.1 Environmental Management

Prior to any disturbance of any Non-Aboriginal heritage item, a GDP is completed, which includes consideration of all EA and Project Approval commitments, to ensure that no impact on European heritage occurs on site.

3.14.2 Environmental Performance

During the reporting period the *Mangoola Blast Affectation Area Conservation Management Strategy – Historical Heritage Items* continued to be implemented within the Mangoola Blast Affectation Area.

Mangoola also provided financial support to the Denman Historical Village, which collects and exhibits items relating to the history and culture of the Upper Hunter.

3.14.3 Reportable Incidents

No reportable incidents regarding European Heritage occurred during the reporting period.

3.14.4 Further Improvements

Mangoola is currently in the process of gaining all the approvals and conducting the necessary inspections (including Phase One environmental and asbestos investigations), photography and recordings, as per Muswellbrook Council Approval requirements, and seeking suitable contractors before commencing the demolition of numerous empty/dilapidated residences and associated farm sheds and property buildings on Mangoola owned land.

3.15 Spontaneous Combustion

3.15.1 Environmental Management

Management of spontaneous combustion is undertaken in accordance with the Mangoola Spontaneous Combustion Management Plan. This Management Plan details the monitoring and control measures implemented by Mangoola to reduce the incidence and impacts of spontaneous combustion, and include the following:

- Stockpile inspection regime: Inspections of coal stockpiles to look for any signs of heating are conducted daily by the shift supervisor, and bi-weekly by the mine geologist. Infra-red thermography surveys are also conducted fortnightly. The results of inspections are recorded on the stockpile inspection sheet kept in the supervisor’s office and reported through to senior production staff;

- Thermocouples are installed where practical in stockpiles with a high potential for spontaneous combustion, as assessed by the mine geologist. These are removed prior to reclamation of the stockpile;

- Mine employees are trained to identify spontaneous combustion indicators and the reporting process required when an indicator is identified or suspected;
- Areas that are heating/spontaneously combusting are given priority for processing through the CHPP, and
- In the event that coal is to be stockpiled for a long period of time (greater than three months) the pile is track rolled and battered down. In addition, the stockpile inspection regime is enacted and results of the inspection recorded on the stockpile inspection sheet.

In the case of a spontaneous combustion event occurring, an event specific approach will be taken to control the situation; however some common controls include the following:

- All personnel working in the area will be issued with a gas analyser and trained in its use;
- No refuelling is to take place in active spontaneous combustion areas, and
- Machinery to be working in active spontaneous combustion areas is to have a hot work inspection before entering the area.

3.15.2 Environmental Performance

No instances of spontaneous combustion were detected at Mangoola during the reporting period. Implementation of the measures outlined above **Section 3.15.1**, in conjunction with the Mangoola Spontaneous Combustion Management Plan has been effective in preventing Spontaneous Combustion on site.

3.15.3 Reportable Incidents

There were no reportable incidents involving spontaneous combustion during the reporting period.

Three complaints were received during the reporting period regarding perceived spontaneous combustion; however investigations found no evidence of spontaneous combustion on these occasions. Further detail on the Mangoola Coal complaints procedure is provided in **Section 4**.

3.15.4 Further Improvements

Mangoola will continue regular stockpile monitoring and implementation of the Spontaneous Combustion Management Plan, to ensure effective management of spontaneous combustion.

3.16 Bushfire

3.16.1 Environmental Management

Potential risks associated with bushfire are managed through the implementation of monitoring and control strategies as documented in the Mangoola 2012-2016 Bushfire Management Plan. This management plan was developed in June 2012, in consultation with the NSW Rural Fire Service, other emergency services (police, ambulance), the Muswellbrook Shire Council and both the Mangoola and Wybong Rural Fire Brigades.

The objectives of the Bushfire Management Plan are to:

- Reduce fire ignition potential;
- Prevent the spread of fire within and beyond the site;

- Protect the flora, fauna and vegetation communities within Mangoola Coal from inappropriate fire regimes and unplanned fire events;

- Utilise fire as a management tool to maintain and enhance native ecosystems, where applicable in the future, and

- Identify potential fire management zones across Mangoola Coal and establish actions to reduce the risks from fire and its impact to Health, Safety, Environment and Community (HSEC).

To fulfil these objectives, the Bushfire Management Plan contains a Management and Monitoring Program, as summarised in **Table 52**, and an Action Plan which is summarised in **Table 53**.

Table 52 - Summary of Bushfire Management Zones

Zone	Aim	Management	Monitoring
Asset Protection Zones	To provide a fuel free zone around the asset in question and all-weather access for emergency vehicles	Mechanical, or manual hazard reduction (or grazing) Slashing at least twice a year before and during and after the Bush Fire Danger Period (BFDP) is recommended	Monthly from September – March, once annually outside of the BFDP
Strategic Fire Advantage Zones	To provide a fuel reduced zone around the primary operational and biodiversity conservation areas to reduce the rate of spread and intensity of fires	Manual/mechanical fuel reduction to be undertaken only in specific areas if required. The intent is not to clear vegetation within these zones but to take advantage of the already reduced fuel load to aid fire prevention strategies. Hazard reduction burning will be undertaken within SFAZ compartments on an infrequent basis to provide a mosaic of time since fire within the various vegetation types across the Mine site. Maintenance of fire trails.	Annually. This can be adjusted to suit weather conditions if required.
Land Management Zone	To manage land primarily for conservation	Maintain and establish stock fencing around these areas Establish and maintain fire trail network using existing trails to provide access and control lines. Exclude fire in the short term due to seed bank requirements and to avoid damage to rehabilitation works. Cool mosaic burns, divided into 10 - 50 ha (not within 2012-2016)	Monitoring regime as part of regeneration works

Table 53 – Bushfire Management Plan Action Plan

Action	Year
Minimise the risk of fire ignition.	Ongoing
Incorporate an annual maintenance schedule for all roads and trails into the normal works program.	Annual and post heavy rains as required

Action	Year
Undertake community consultation to foster fire prevention and cooperation between Mangoola Coal and the local community.	Annual and as needed
Construct or upgrade trails in areas with inadequate access.	2010
Review fuel loads and any required fuel reduction.	Annual
Assess the layout of additional mining infrastructure when a Plan is available to ensure adequate sighting and APZs are implemented.	As needed
Ember protection upgrades for onsite refuge building	By BFDP 2012
Ember protection upgrades for Residences 1-4 inclusive	By BFDP 2013
Undertake hazard reduction burn in SFAZ Compartment 9	By BFDP 2013
Undertake ecological burn in south-western LMZ	By BFDP 2015
Creation of a monitoring, inspection and maintenance program.	Completed
Confirm adequacy of water supply and onsite fire fighting resources.	Annual
The BMP report and poster are to be reviewed every five years or whenever significant landscape changes occur due to wildfire or Mine development	2016 or as needed
Ensure that a current copy of the report and the BMP Poster be held by the local RFS, FRNSW and LEMC.	2010
Undertake an annual incident training program prior to the start of the fire danger season.	Annual
Undertake an internal review after an emergency response incident has concluded to assess the effectiveness of the response.	Post Emergency

3.16.2 Environmental Performance

During the reporting period there were no recorded bushfires. In June 2012, the RFS completed an inspection of the rail loader. The outcomes of this inspection found that no actions were required. This will be conducted annually, being instigated by the RFS. There were no additional changes to the inspection or monitoring plan undertaken during the reporting period.

3.16.3 Reportable Incidents

No reportable incidents regarding bushfire management occurred during the reporting period.

3.16.4 Further Improvements

Mangoola will continue to implement the Bushfire Management Plan, including the monitoring and inspection program, and will record the effectiveness of this plan against recorded bushfire events in the next AEMR.

3.17 Mine Subsidence

Mangoola is an open cut mine and hence subsidence is not an issue. No impacts of mine subsidence resulting from redundant mine workings affect the site.

3.18 Hydrocarbon Management

3.18.1 Environmental Management

Bulk fuel facilities are managed in accordance with Australian Standard AS 1940, as well as the XCN standard relating to Hydrocarbon Management (XCN SD ANN 0041). Fuel facilities are fully bunded, with emergency measures in place to manage any minor spills. There is no potential for off-site contamination once fuel is received on-site as all handling and transport is within the contained water management system.

Any hydrocarbon spills which may occur are reported via the Environmental Incident reporting system, and investigations carried out as required. When spills occur they are managed with one of the spill kits available onsite, before being transported offsite by an authorised contractor.

3.18.2 Environmental Performance

The 2011 AEMR inspection conducted by the DP&I requested that Mangoola investigate extending the concrete bunding area in the vicinity of the workshop, to ensure that all chemicals were placed within bunds in such a manner that would capture any potential spills. A review of this request found that all Intermediate Bulk Containers (IBCs) with the potential for spills are located within bunds that have the capacity to handle any spills associated with these containers. The steel containers observed outside the bunds by the DP&I contain grease, however it is not possible for these containers to spill without the grease being deliberately pumped out, therefore it was not deemed necessary for these containers to be bunded.

3.18.3 Reportable Incidents

No reportable incidents regarding hydrocarbon management occurred during the reporting period. During the reporting period four minor hydrocarbon spills occurred and were reported internally in the environmental incident record system. These spills were minor in nature, with the largest totalling approximately 180 litres. The majority of the spills occurred as a result of equipment failure or damage. All spills were contained on site, with no offsite pollution occurring as a result of these minor spills. Three of these incidents (150-180L spills) were recorded as Category 1 incidents (negligible, reversible environmental impact, requiring very minor or no remediation), and one 10L oil leak was recorded as nil Category incident (lower than Category 1). All spills that occurred were promptly cleaned up and remediated.

3.18.4 Further Improvements

Spills will continue to be reported in the Mangoola environmental incident system and investigated as necessary. Where spills are found to have resulted from a failing of procedures, a review will be undertaken to determine how such spills can be avoided in the future, and recommendations implemented as appropriate.

3.19 Public Safety

3.19.1 Environmental Management

Mangoola is committed to preventing risks to public safety as a result of operations at the mine. To this end, ongoing reviews of potential public safety issues are undertaken on a regular basis around the mine area.

Day-to-day monitoring of public safety at Mangoola is undertaken through the use of a variety of technologies. All site visitors are directed to the main office and are required to report and log on to an electronic visitors book. Each visitor is required to provide details including their name, company, name of staff members they are visiting, phone numbers and their arrival time, and are required to logout using the same system when they are leaving site. Visitors are issued with a sticker and pass number that must be possessed at all times whilst on site. This electronic log in system allows

Mangoola to effectively monitor the number of people visiting the site, make contact with these people if necessary and also maintain records of visit duration.

A variety of other measures are implemented to minimise the potential for public safety incidents at the site. These include the following:

- Implementation of a security system to ensure public and employee safety is maintained during all aspects of the operation. These systems and procedures have been established in accordance with the relevant requirements under the *Coal Mines Regulation Act 1982, Occupation Health and Safety Act 1983, Mining Act 1992* and conditions stipulated in the Coal and Mining Leases;

- During hazardous activities such as blasting, sentries are posted throughout the site to prevent unauthorised entry into the blasting zone;

- Security fencing surround the perimeter of the site;

- Security patrols, and

- Employee and contractor inductions regarding mine safety and environmental management issues prior to commencement of work at the site.

3.19.2 Environmental Performance

There was one road closure due to blasting during the reporting period, at Wybong Road in July 2011.

3.19.3 Reportable Incidents

No reportable incidents regarding public safety occurred during the reporting period.

3.19.4 Further Improvements

Fencing will be continually reviewed in following reporting periods to identify fences in poor condition. These will be replaced as necessary.

3.20 Greenhouse Gas and Energy

3.20.1 Environmental Management

Schedule 3, Condition 59 of the approval (06_0014) states the following in relation to greenhouse gas emissions.

The Proponent shall:

a) monitor the greenhouse gas emissions generated by the project;

b) investigate ways to reduce greenhouse gas emissions generated by the project; and

c) report on greenhouse gas monitoring and abatement measures in the AEMR, to the satisfaction of the Director-General.

Energy consumption (electricity and diesel) at Mangoola is monitored and reported in accordance with XCN requirements. These requirements are in accordance with the *National Greenhouse and Energy Reporting Act 2007* (NGER Act), which provides a national framework called the National Greenhouse and Energy Reporting System (NGERS) for the reporting and dissemination of information about greenhouse gas emissions, greenhouse gas projects, and energy use and production of corporations (DCCEE, 2010). The first annual reporting period for the NGERS began on 1 July 2008.

Details of the process designed to promote and support continuous change and sustainable improvement in energy management and energy efficiency at all XCN sites are included in the overarching XCN corporate Energy Savings Action Plan (ESAP).

Mangoola has developed an Energy Savings Action Plan (ESAP), which contains the outcomes of this process specifically for the Mangoola site. The ESAP has been produced to bring Mangoola in line with XCN's other sites in an attempt to go beyond compliance in response to the OEH ESAP Requirements and the federal *Energy Efficiency Opportunities Act 2006*, as well as to comply with Schedule 3 Condition 58 of the Project Approval.

The ESAP identifies opportunities at Mangoola to reduce greenhouse gas emissions and energy consumption, as well as specifying actions to realise these opportunities.

3.20.2 Environmental Performance

Energy Use and Greenhouse Gas Emissions

Mangoola operates 24 hours a day, seven days per week. The expected (average) baseline energy use over the life of the mine is approximately 2.8 TJ of energy, with all but 0.2 TJ of this energy being sourced from diesel. The greenhouse gas emissions associated with the predicted energy use on site is approximately 222,600 tonnes CO_2-e per year.

Data relating to electricity consumption and diesel usage during the reporting period, and the associated greenhouse gas emissions, is presented in **Table 54.**

Table 54 – Greenhouse Gas Data

	This reporting period (2011-2012)		Last reporting period (2010-2011)	
Emission source	**Consumption**	**CO_{2-e} (t)**	**Consumption**	**CO_{2-e} (t)**
Diesel usage	28.76 ML	73,313.20	18.9 ML	415,400.1
Electricity consumption	63,768.2MW	55,547	79.26 MWH	71.334
Explosives	10,197 t	unknown	5,522 t	unknown

The increase in energy consumption and diesel usage compared to the 2010-2011 reporting period is due to the increase in mining operations during the reporting period.

ESAP Actions Implemented in the Reporting Period

Energy saving actions implemented during the reporting period as part of the ESAP are detailed in **Table 55** below.

3.20.3 Reportable Incidents

No reportable incidents regarding greenhouse gas and energy occurred during the reporting period.

3.20.4 Further Improvements

Mangoola will continue to implement the actions identified in the ESAP in future reporting periods for energy use reduction and the subsequent decrease in greenhouse gas emissions as a result of operations at the site. These actions and the planned completion dates are summarised in **Table 55**. The status of these actions will be reported on in the next AEMR.

Table 55 – Energy Management Actions for the Future Reporting Period

Project Identifier	Energy Management Action	Status
MAN-01	Conduct fuel efficiency training with original equipment manufacturers, commencing Q3 2011	Completed. All equipment operators have been trained in the correct operation of equipment in order to operate it effectively and efficiently.
MAN-04	Conduct an energy efficiency audit two years after the commencement of mining and every three years subsequent to that.	Due for completion December 2012.
ESO-02	Investigate the use of biodiesel blend fuels in the mining fleet.	Due for completion December 2012. Mangoola plans to adopt the Xstrata Coal recommendations that are currently being developed.
ESO-03	Investigate the viability of installing a gas or electric boosted solar hot water system to heat water for the bathhouse.	Complete. As Mangoola is a new operation it has been constructed with energy efficient applications.
ESO-04	Investigate options for the establishment of small-scale plantings for the purpose of carbon sequestration as an offset for greenhouse gas emissions.	December 2012.
ESO-05	Review applicability of emission trading schemes, including opportunities and constraints from any future trading scheme that may be established.	Ongoing.

3.21 Environmental Reportable Incidents Summary

3.21.1 Environmental Management

Environmental Incidents are reported through the use of the Incident and Hazard Reporting Procedure (MAN SD PRO 0027). Incidents are managed in accordance with the incident management methodology outlined by the Xstrata Standard.

3.21.2 Environmental Performance

There were 15 environmental incidents reported at Mangoola during the 2011 – 2012 reporting period. A summary of the incidents is presented in **Table 56.**

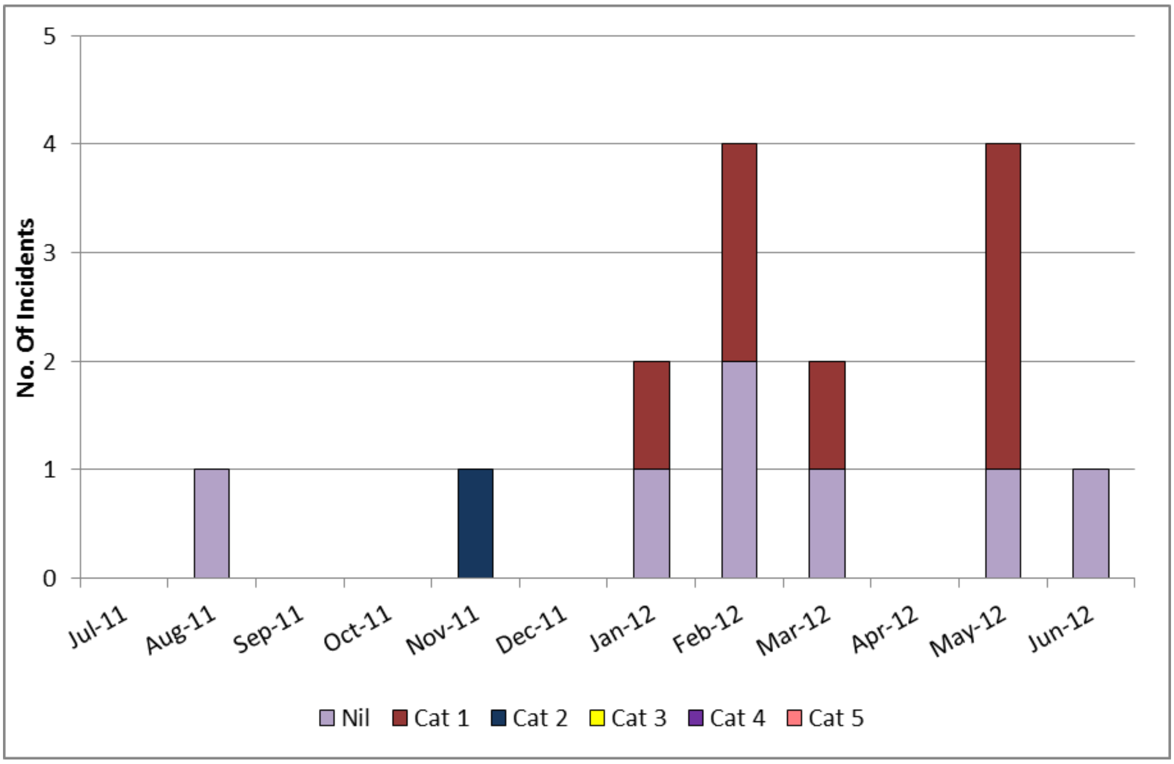
Table 56 - Category and No. of Incidents

Category	Cat. 0 Incidents	Cat. 1 Incidents	Cat. 2 Incidents	Total No. of Incidents
Hydrocarbons	1	3	0	4
Inappropriate Clearing	3	1	0	4
Blasting	1	0	1	2
Water	0	2	0	2
Noise	1	1	0	2
Sewage	1	0	0	1
Total	**7**	**7**	**1**	**15**

The number of incidents recorded during the reporting period lower than the number reported during the 2010-2011 reporting period (48 incidents in 2010-2011). All of the incidents during the reporting period were defined as either nil Category, Category 1 or Category 2. Category 1 incidents are those which cause negligible, reversible environmental impact, requiring very minor or no remediation. Category 2 incidents are those which cause minor, reversible environmental impact, requiring minor rehabilitation. Nil Category incidents are defined as incidents that rank lower than a Category 1. Four of the incidents recorded during the reporting period related to hydrocarbon spills, four related to inappropriate clearing, with the rest relating to noise, water and sewage.

Mangoola's Environmental Incidents Summary for the 2011 – 2012 reporting period is shown in **Figure 14** below.

Figure 14 – Environmental Category Incidents for Mangoola during the AEMR reporting period



3.21.3 Further Improvements

The minor nature of such incidents is considered a management tool in assisting to prevent more significant incidents occurring by identifying areas where additional management is required.

Mangoola will continue to implement the Environmental Incident Reporting System to determine how incidents can be avoided in the future.

3.22 Compliance

3.22.1 Environmental Management

The Mangoola Environmental Protection Licence 12894 is assessed through the Annual Return that is reviewed by OEH. The Annual Return Reporting period is from 7 July to 6 July the following year. The 2011 annual return was submitted on 5 September 2011.

3.22.2 Environmental Performance

Mangoola generally complied with all of the EPL conditions during the 2011 – 2012 reporting period, as discussed in detail in the relevant sections of this AEMR in **Section 3**.

The non-compliances identified during this period are as follows:

- EPL Condition M2.1 – EPL point 4 (dust) and point 6.7 (water) were not sampled for the full reporting period. Assorted dates throughout the reporting period were missed for a number of different reasons, including external power supply issues, a faulty filter, dry conditions (no flow/no sample), no access (too wet), and insufficient water for sampling; and

- EPL Condition U2 – On 9 March 2012 groundwater seepage downstream of the embankment of the Raw Water Dam was observed and identified that it was flowing offsite in the Sandy Creek catchment area.

3.22.3 Further Improvements

In response to the above non-compliances, Mangoola has implemented a number of actions. In relation to the power supply issues (M2.1), Mangoola notified the service provider to immediately investigate and commence rectification steps. Scheduled servicing and inspections will be maintained to minimise the risk of equipment failure in the future.

In response to the groundwater seepage incident (U2), all relevant agencies (EPA, DP&I, DTIRIS Mineral Resources, Muswellbrook Council, WorkCover NSW, and Ministry of Health) were immediately advised and a report was provided to the EPA dated 18 May 2012 outlining actions to be taken. Groundwater seepage flow was dammed and water management works to reduce seepage commenced in May 2012. A pump was installed on the catchment dam to pump the majority of the seepage water to the Mangoola Raw Water Dam and reduce the flow of seepage into the Sandy Creek catchment area. The seepage water will continue to be directed to the dam, and returned to the Raw Water Dam until it is determined that the residual groundwater has been flushed from the formations and is replaced with fresh water from the Hunter River source. Groundwater bores are planned to be drilled to monitor the rate of seepage before the end of 2012.

This incident is discussed in further detail in **Section 3.5.3** and detailed in the EPL Annual Return (**Appendix A**).

4.0 COMMUNITY RELATIONS

4.1 Introduction

Mangoola is committed to contributing to the environmental, social and economic development of both the local and broader communities by ensuring all stakeholders are factually informed of its activities and ensuring the environmental, social and economic impacts of its mining operations are responsibly managed. This commitment is reflected in the Mangoola Coal Sustainable Development Policy.

Mangoola has developed a comprehensive Social and Community Engagement Guideline (MAN SD GDL 0008) to identify and understand stakeholder views and concerns. During the reporting period, this strategy coordinated consultation with the local community, regulatory authorities, Non-Government Organisations (NGOs), the Aboriginal community and other interested parties as appropriate. The feedback obtained from the Stakeholder Engagement Strategy allows Mangoola to continually review and improve its engagement with stakeholders.

Mangoola is also actively involved in communicating its environmental and social performance internally to its employees and contractors via verbal communication sessions, toolbox talks, notice boards, intranet and e-mail as appropriate. Inductions and regular training and awareness sessions of all employees (commensurate with the job description of each) include detailed environmental and community components.

Mangoola recognises its ongoing partnership with the community by implementing sponsorships, keeping the community informed of its activities, and being available and open to communications from within the community.

4.2 Community Liaison

Mangoola continued its ongoing community liaison, consultation procedures, and scheduled meetings during the reporting period. This included 115 face to face meetings between Mangoola mine representatives and stakeholders in relation to a variety of matters. **Table 57** provides further detail on the methods of community liaison undertaken during the reporting period.

Table 57 - Community Liaison during the Reporting Period

Stakeholder Group	No. of Meetings Planned for AEMR period	No. of Meetings Held/attended AEMR period
Site Tours	8	8
Stakeholder Planned (F2F Program)	56	46
Stakeholder unplanned	32	32
Chamber of Commerce	12	12
Council	6	6
Local Government	3	3
CCC	4	4
Aboriginal Stakeholders	3	3
Total	**124**	**114**

As presented above, Mangoola held a number of stakeholder site tours during the reporting period which enabled community members to visit the site and have the opportunity to discuss with key Mangoola team members any issues relating to Mangoola that they wished.

The Mangoola Community Consultative Committee (CCC) continued to operate, with four CCC meetings held during the reporting period. **Table 58** provides a summary of the CCC meetings held including dates, and a list of all attendees who attended at least one CCC meeting during the reporting period.

Table 58 - Community Consultative Committee Meetings Summary

<table>
<tr><th>Attendees</th><th>Summary of Discussion</th></tr>
<tr><td rowspan="8">
Cr Ray Butchard (Muswellbrook Council)
Cr Stephen Ward (Muswellbrook Council)
Mr Craig Flemming (Muswellbrook Council)
Mr Ben Clibborn (Mangoola Coal)
Mr Ben de Somer (Mangoola Coal)
Mr Geoff Kelly (Mangoola Coal)
Mr Tony Israel (Mangoola Coal)
Ms Chloe Piggford (Mangoola Coal)
Ms Evelina Hendry (Mangoola Coal)
Mr Ben Harrison (Department of Planning and Infrastructure (DP&I))
Mr Craig Manwarring (Community Representative)
Mr Keith Campbell (Community Representative)
Mr Pat Keegan (Community Representative)
Mrs Fiona Hordern (Community Representative)
Ms Sharni Marjoribanks (Hansen Bailey, Minute taker)
Mr Nigel Charnock (XCN)
Listed attendees all attended at least one CCC meeting.</td>
<td>24 August 2011</td></tr>
<tr><td>
Mangoola Progress Report (Dust, Water, Blasting, Incidents, Noise, Visual Mitigation, Weed Management, Pest and Feral Animal Management, Approvals, AEMR, Land Acquisition, Complaints)
DA Modification
Construction Timeline
Community Support Program
DP&I role in the project
Air Quality
Vegetation Screening
Noise
Community Complaints Line
</td></tr>
<tr><td>23 November 2011</td></tr>
<tr><td>
Mangoola Progress Report (Dust, Blasting, Incidents, Noise, Visual Mitigation, Weed Management, Pest and Feral Animal Management, Approvals, AEMR, Land Acquisition, Complaints)
Muswellbrook Chamber of Commerce Breakfast
Mangoola Coal Mine Official Opening Day 22 November 2011
Property Management
Traffic
Ecological Monitoring
Road Conditions
Land Access
Mining supplies
</td></tr>
<tr><td>22 February 2012</td></tr>
<tr><td>
Mangoola Progress Report (Dust, Blasting, Incidents, Noise, Visual Mitigation, Weed Management, Pest and Feral Animal Management, Approvals, AEMR, Land Acquisition, Complaints)
Distribution of CCC Meeting Minutes
Heritage Buildings
Road Closures
</td></tr>
<tr><td>23 May 2012</td></tr>
<tr><td>
Site tour
Mangoola Progress Report (Mine Plan, Dust, Blasting, Incidents, Noise, Surface Water, Visual, Weed Management, Pest and Feral Animal Management, Rehabilitation, Approvals, Land Acquisition,
</td></tr>
</table>

Attendees	Summary of Discussion
	House Demolition, Clearing of Debris, Complaints, Community Support) • Traffic Management and Road Upgrades • Drilling near Wybong Road • CCC Consultation in relation to EPL • Dust Monitoring Camera

4.3 Newsletters and Flyers

Mangoola published and distributed three community newsletters during the reporting period (July, January and May), advising landowners and the local the community of the progress of the mine and outlining operational activities.

In addition, Mangoola also utilises flyers and fact sheets as a means of conveying pertinent information, usually to a specific audience. Flyers and public notices have been used to provide affected landowners with information in relation to road closures and services relocations which may affect them in the future. During the reporting period a Public Notice was issued in relation to the closure of Wybong Road

The use of newsletters, flyers and fact sheets provides an additional means for Mangoola to communicate with the community in a proactive manner to ensure important information is provided where it is needed, when it is needed, and effectively preventing conflicts arising as a result.

4.4 Environmental Complaints

Mangoola has a Complaints Management Procedure (MAN SD PRO 0045), which details the process for receiving and responding to complaints. The process involves the following:

- Recording the complaint in Xstrasafe;
- Seeking immediate identification and addressing the cause of the complaint, where possible;
- Telephone contact with the complainant; and
- Formal follow-up feedback provided to the complainant.

Complaints can be received via a dedicated Community Response Line, in person, facsimile, email, letter or general telephone. A total of 593 environmental complaints were received by Mangoola during the reporting period. Details of these complaints are provided in **Table 59** below, as well as a comparison with complaints received in the previous reporting period.

Table 59 – Summary of complaints 2011-2012

Category	This reporting period 2011-2012	Last reporting period 2010-2011
Noise	522	364
Spontaneous combustion/Odour	5	15
Dust	17	25
Lighting	22	15
Blasting (includes blast dust, vibration and overpressure)	17	12
Traffic	3	14
Water	0	1
Visual	2	4
Access	0	1
Fume	1	1
Other	4	5
Total	**593**	**457**

As can be seen in the table above, the vast majority of complaints received in the reporting period were in relation to noise from the site. Further details on management and mitigation measures regarding noise that were implemented during the reporting period are provided in **Section 3.11**. It is also noted that whilst the majority of complaints received were noise-related, Mangoola was compliant with all of the project approval noise criteria throughout the reporting period.

The number of complaints received represents an increase from the 457 environmental complaints that were received during the previous reporting period. The increase is predominately a result of increased noise complaints, which are in relation to the increase in mining operation activities during the reporting period.

The Community Response Line details remain unchanged from the previous reporting periods. The Community Response Line (1800 014 339) will continue to operate throughout the following reporting periods, enabling ongoing community input to be sought regarding mining operations and potential impacts.

4.5 Website

Mangoola operates a website (www.xstratacoalmangoola.com.au) where members of the community can access information about the site, including the latest reports, management plans and environmental monitoring data.

Conditions 9, 10 and 11, Schedule 5 of PA06_0014 outline the content that is to be published on this website.

4.6 Community Participation and Social/Economic Contributions

Mangoola is committed to supporting the local community in which it operates. To reflect this commitment, Mangoola was involved with, and supported a diverse range of innovative local community activities. **Table 60** outlines the community organisations and respective funding amounts provided to each organisation by Mangoola during the reporting period.

Table 60 - Community Support Program

Organisation	Amount
Westpac Rescue Helicopter	$17,000
Bursting with Energy Expo	$6,000
Upper Hunter Food and Wine Fair	$5,000
Muswellbrook and Upper Hunter Eisteddfod	$1,000
Clean up Australia Day	$1,000
Denman Children's Centre	$5,000
NAIDOC Week – Student of the Year	$500
Wildlife Aid	$2,000
National Tree Planting Day	$1,000
School of Big Air	$5,000
Camp Quality	$2,000
Denman Pony Club	$15,000
Total	**$60,500**

A key component of the Stakeholder Engagement Strategy is to ensure Mangoola supports the local community. Mangoola has implemented the Voluntary Planning Agreement (VPA) required under Schedule 2, Condition 12 of the Project Approval with Muswellbrook Shire Council (MSC). The VPA is designed to provide financial contributions commensurate with the terms set out in Appendix 4 of the Project Approval. Mangoola is committed to meeting it obligations under the VPA.

5.0 REHABILITATION

5.1 Buildings

During the reporting period no permanent buildings were demolished. Mangoola is currently in the process of gaining all the approvals and conducting the necessary inspections (including Phase One environmental and asbestos investigations), photography and recordings, as per Muswellbrook Council Approval requirements, and seeking suitable contractors before commencing the demolition of numerous empty/dilapidated residences and associated farm sheds/property buildings on Mangoola owned land.

Additional temporary demountable/portable offices that were installed during the construction phase to cope with the peak construction workforce numbers were progressively removed from site during the reporting period.

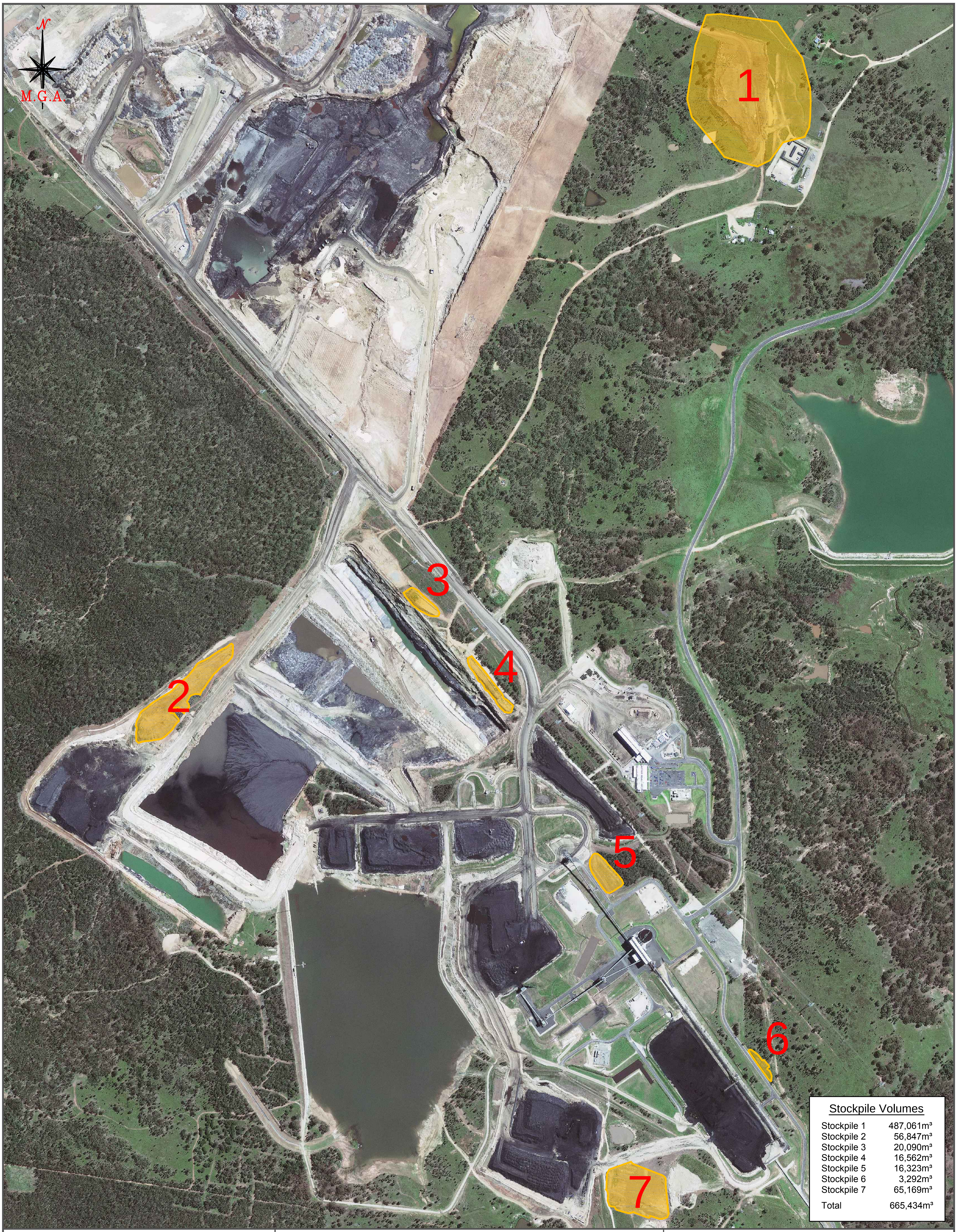
5.2 Rehabilitation of Disturbed Land

Disturbance activities associated with land preparation for mining operations took place across 138.21 ha during the reporting period, totalling 707.24 ha cleared by Mangoola to date. Given that mining operations at Mangoola only commenced during the previous reporting period there are currently few areas of land available for rehabilitation. 23.89 ha of land were topsoiled, seeded and planted during the reporting period. Topsoil volumes and locations are shown in **Figure 15**.

The 2011 AEMR inspection conducted by the DP&I noted parts of the rehabilitated rail loop dam area required resowing. The DP&I requested that Mangoola ensure that all rehabilitated areas are regularly inspected, and that appropriate actions are undertaken to ensure areas of seeding are effective. In response to this request Mangoola hydromulched 2.65 ha within the rail loop and 0.5 ha directly around the rail loop dam. Further mitigation will be undertaken as appropriate.

A summary of rehabilitation undertaken to date is provided in **Table 61.** The approved MOP Plan 5 (Proposed rehabilitation) and MOP Plan 6 (Final Rehabilitation for Lease Relinquishment) are included in **Appendix J**.

Plate 5 – Revegetation Activities at Mangoola



Stockpile Volumes

Stockpile 1	487,061m^3
Stockpile 2	56,847m^3
Stockpile 3	20,090m^3
Stockpile 4	16,562m^3
Stockpile 5	16,323m^3
Stockpile 6	3,292m^3
Stockpile 7	65,169m^3
Total	665,434m^3

SITE : MANGOOLA
DEPARTMENT : SURVEY
DATUM: A.H.D.
DRAWN : N.W.
DATE : 21/08/12
SIGN:
SCALE : NOT TO SCALE

xstrata coal
Mangoola Coal

Xstrata Mangoola Pty Ltd
ABN 54 127 535 755
Wybong Road Muswellbrook
NSW 2333 Australia
P.O. Box 495 Muswellbrook
NSW 2333 Australia
Telephone 61 2 6542 6600 - Facsimilie 61 2 6543 4318

TITLE: Topsoil Volumes & Location
DRAWING No. : 120910-NTH-EN-149-NW-R0
REV. 0
SHEET A3
File No. : **FIGURE 15**

Table 61 - Rehabilitation Summary for Mangoola

Mangoola Coal	Area Affected/Rehabilitated (ha)		
	To Date	Last Report	Next Report (estimated)
A. MINE LEASE AREA			
A1 Mine Lease Area	3561	3561	3561
B: DISTURBED			
B1: Infrastructure area (other disturbed areas to be rehabilitated at closure including facilities, roads)	376.1	376.1	376.1
B2: Active Mining Area (excluding items B3-B5 below)	156.73	184.1	220
B3: Waste Emplacements (active/unshaped/in or out of pit)	128.30	60.8	128
B4: Tailings Emplacements	20.82	43.3	43.3
B5: Shaped Waste Emplacement (awaits final vegetation)	2.95	7.8	25
ALL DISTURBED AREAS	707.24	672.1	792.4
C: REHABILITATION PROGRESS			
C1: Total Rehabilitated Area (except for maintenance)	145.8	122.6*	203.8
D: REHABILTATION ON SLOPES			
D1: 10 to 18 degrees	23.0	5.1	81
D2: Greater than 18 degrees	0.00	0	0
E: SURFACE OF REHABILTATED LAND			
E1: Pasture and Grasses (woodland)	122.8	117.5*	122.8
E2: Native Forest/Ecosystems	23	5.1*	81
E3: Plantations and Crops	0	0	0
E4: Other (include non-vegetative outcomes)	0	0	0

**Following the submission of the 2010-2011 AEMR these areas were recalculated with greater accuracy and are different to the figures previously reported.*

5.3 Other Infrastructure

Remediation work that was undertaken at Mangoola during the reporting period was the remediation of disturbed construction site areas, for example batters to stabilise disturbed land and allow the establishment of groundcover.

5.4 Rehabilitation Trials and Research

The University of Newcastle’s Centre for Sustainable Ecosystem Restoration (CSER) continued the Mangoola Ecological Restoration and Reconstruction Research Program (MERRRP) during the reporting period. This research will continue in future reporting periods, and the results are detailed in **Section 3.8**.

5.5 Further Development of the Final Rehabilitation Plan

The ROMP has been submitted and is currently awaiting approval. This document will be subject to regular reviews and continual improvement in future reporting periods.

6.0 ACTIVITIES PROPOSED IN THE NEXT AEMR PERIOD

6.1 Exploration

Exploration works planned for next reporting period include exploration drilling to further define the resource outline, better understand the stratigraphy and to use selected core samples for permeability testing and possible ground water monitoring purposes.

6.2 Construction

Project Approval PA 10_0002 500kV relocation project was approved in July 2012 relating to relocation of electricity power lines. Construction works relating to this modification will commence during the next reporting period.

6.3 Water Management and Dams

Mangoola will continue to utilise water from its water licences during the following reporting period. These licenses are from the Hunter Regulated River Water Source as this is the only river Mangoola extracts from for mining purposes.

The control of extraction through these licenses is also controlled by an Available Water Determination (AWD) expressed as a percentage to each license security level. The percentage varies according to the total water available in the river storage dams in dry periods. High security licenses have a higher AWD attached to them than General Security licenses.

6.4 Mining

Mining operations commenced at Mangoola during the reporting period. In the current reporting period Mangoola plans to continue mining, with the maximum extraction of 10.5 Mtpa of ROM coal planned.

6.5 Approvals and Implementation

Mangoola does not currently have any approvals pending.

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