

xstrata coal
mangoola coal

Xstrata Mangoola Pty Limited

Mangoola Coal

Annual Environmental Management Report

1 July 2010 to 30 June 2011










GSS ENVIRONMENTAL
Environmental, Land and Project Management Consultants

Prepared on behalf of:
Mangoola Coal

By: GSS Environmental
Date: October 2011

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TABLE OF CONTENTS

1.0 INTRODUCTION....1
1.1 Background....1
1.2 Location and Coal Resource....3
1.3 Consents, Leases and Licences....3
1.3.1 Project Approval/s....3
1.3.2 Leases....4
1.3.3 Licences....4
1.4 Mining Operations Plan Status....7
1.5 Performance Summary....7
1.6 Mine Contacts....8
1.7 Actions required from previous AEMR review....8
1.8 Compliance....10
1.9 Mining Lease Conditions....12
2.0 OPERATIONS DURING THE REPORTING PERIOD....13
2.1 Overview....13
2.2 Exploration....15
2.3 Land Preparation....15
2.4 Construction....15
2.5 Mining....19
2.6 Coal Processing....19
2.7 Waste Management....19
2.8 Ore and Product Stockpiles and Coal Transport....21
2.9 Water Management....21
2.10 Hazardous Substances Management....23
2.11 Land Acquisition....24
3.0 ENVIRONMENTAL MANAGEMENT AND PERFORMANCE....25
3.1 Environmental Management System....25
3.2 Meteorological Data....28
3.2.1 Overview....28
3.2.2 Rainfall....29
3.2.3 Temperature....29
3.2.4 Wind....30
3.2.5 Further Improvements....33
3.3 Air Quality....33
3.3.1 Environmental Management....33
3.3.2 Environmental Performance....34
3.3.3 Reportable Incidents....37
3.3.4 Further Improvements....38

3.4 Erosion and Sediment Control 38
3.4.1 Environmental Management 38
3.4.2 Environmental Performance 39
3.4.3 Reportable Incidents 40
3.4.4 Further Improvements 41
3.5 Surface Water Management 41
3.5.1 Environmental Management 41
3.5.2 Environmental Performance 41
3.5.3 Reportable Incidents 46
3.5.4 Further Improvements 46
3.6 Groundwater Management 46
3.6.1 Environmental Management 46
3.6.2 Environmental Performance 47
3.6.3 Reportable Incidents 49
3.6.4 Further Improvements 49
3.7 Contaminated Polluted Land 50
3.8 Threatened Flora and Fauna 50
3.8.1 Environmental Management 50
3.8.2 Environmental Performance 52
3.8.3 Reportable Incidents 57
3.8.4 Further Improvements 57
3.9 Weed and Pest Management 58
3.9.1 Environmental Management 58
3.9.2 Environmental Performance 58
3.9.3 Reportable Incidents 61
3.9.4 Further Improvements 61
3.10 Blasting and Vibration 62
3.10.1 Environmental Management 62
3.10.2 Environmental Performance 63
3.10.3 Reportable Incidents 67
3.10.4 Further Improvements 67
3.11 Operational Noise 67
3.11.1 Environmental Management 67
3.11.2 Environmental Performance 69
3.11.3 Reportable Incidents 71
3.11.4 Further Improvements 71
3.12 Visual Mitigation 71
3.12.1 Environmental Management 71
3.12.2 Environmental Performance 72
3.12.3 Reportable Incidents 73

3.12.4 Further Improvements 73
3.13 Aboriginal Heritage 73
3.13.1 Environmental Management 73
3.13.2 Environmental Performance 76
3.13.3 Reportable Incidents 81
3.13.4 Further Improvements 81
3.14 European Heritage 85
3.14.1 Environmental Management 85
3.14.2 Environmental Performance 85
3.14.3 Reportable Incidents 85
3.14.4 Further Improvements 85
3.15 Spontaneous Combustion 85
3.15.1 Environmental Management 85
3.15.2 Environmental Performance 86
3.15.3 Reportable Incidents 86
3.15.4 Further Improvements 86
3.16 Bushfire 86
3.16.1 Environmental Management 86
3.16.2 Environmental Performance 88
3.16.3 Reportable Incidents 88
3.16.4 Further Improvements 88
3.17 Mine Subsidence 88
3.18 Hydrocarbon Management 88
3.18.1 Environmental Management 88
3.18.2 Environmental Performance 88
3.18.3 Reportable Incidents 89
3.18.4 Further Improvements 89
3.19 Public Safety 89
3.19.1 Environmental Management 89
3.19.2 Environmental Performance 90
3.19.3 Reportable Incidents 90
3.19.4 Further Improvements 90
3.20 Greenhouse Gas and Energy 90
3.20.1 Environmental Management 90
3.20.2 Environmental Performance 91
3.20.3 Reportable Incidents 92
3.20.4 Further Improvements 92
3.21 Environmental Reportable Incidents Summary 93
3.21.1 Environmental Management 93
3.21.2 Environmental Performance 93

3.21.3 Further Improvements 94
3.22 Compliance 94
3.22.1 Environmental Management 94
3.22.2 Environmental Performance 94
3.22.3 Further Improvements 95
4.0 COMMUNITY RELATIONS 96
4.1 Introduction 96
4.2 Community Liaison 96
4.3 Newsletters and Flyers 98
4.4 Environmental Complaints 99
4.5 Website 100
4.6 Community Activities and Participation 100
4.7 Social / Economic Contributions and Achievements 101
5.0 REHABILITATION 102
5.1 Buildings 102
5.2 Rehabilitation of Disturbed Land 102
5.3 Other Infrastructure 104
5.4 Rehabilitation Trials and Research 104
5.5 Further Development of the Final Rehabilitation Plan 104
6.0 ACTIVITIES PROPOSED IN THE NEXT AEMR PERIOD 105
6.1 Exploration 105
6.2 Construction 105
6.3 Water Management and Dams 105
6.4 Mining 105
6.5 Management of Plan Approvals and Implementation 105
7.0 REFERENCES 106

TABLES

Table 1- Mangoola Project Approval and modifications 3
Table 2 - Mangoola Leases 4
Table 3 - Mangoola Groundwater Licences 4
Table 4 - Mangoola Surface Water Licences 6
Table 5 - Mine Contacts 8
Table 6 - Actions required from last AEMR 9
Table 7 - Relevant Project Approval Conditions 10
Table 8 - Mining Lease Reporting Requirements 12
Table 9 - Mine Features and Components 13
Table 10 - Summary of waste generation for major waste streams 20
Table 11 - Water Pumped from Hunter River 22
Table 12 - Volume of water held and source at Mangoola 23

Table 13 - Fuel Quantities Handled During the Reporting Period 23
Table 14 - Land Acquisitions during the Reporting Period 24
Table 15 - Management system guidelines and standards 25
Table 16 - Monthly Rainfall data for Wybong and Coolabah Meteorological Stations. 29
Table 17 - Temperature Data for Wybong and Coolabah Met Stations 29
Table 18 - Wind Data Wybong and Coolabah 30
Table 19 - Project Approval Air Quality Criteria 34
Table 20 - Depositional Dust Gauge Results July 2010 – June 2011 35
Table 21 - Mangoola Total suspended Particulates (TSP) (µg/m3) 36
Table 22 - Mangoola PM10 results - Wybong Post Office Road 37
Table 23 – Representative Borehole Analysis 47
Table 24 - Groundwater Monitoring Data 47
Table 25 - Mangoola Groundwater Drilling Program Summary 50
Table 26 - Mangoola Clearing Procedures 51
Table 27 - Clearing Results during Reporting Period 52
Table 28 - Number of Species 56
Table 29 - Weed Control during Reporting Period 59
Table 30 – Results of noxious weed control activities 59
Table 31 - Feral Animal Control during Reporting Period 60
Table 32 - Abundance Scoring 60
Table 33 - Blast Overpressure criteria 64
Table 34 - Blast Overpressure summary table 64
Table 35 - Blast Vibration Criteria 64
Table 36 - Blast Vibration Summary Table 66
Table 37 – Attended Noise Monitoring Locations 68
Table 38 – Unattended Noise Monitoring Locations 68
Table 39 – Attended Noise Monitoring Results 70
Table 40 - Registered Aboriginal Stakeholder Groups for Mangoola Coal 74
Table 41 - Aboriginal party attendance at 6 monthly meetings 75
Table 42 - Aboriginal party representatives participating in due diligence inspections 78
Table 43 - Aboriginal party representatives involved in surface collection of BFC74, BFC87 and BFC88 78
Table 44 - Results of surface collection of BFC74, BFC87 and BFC88 79
Table 45 - Aboriginal party representatives participating in rock shelter monitoring 80
Table 46 - Aboriginal party representatives participating in rock shelter monitoring 80
Table 47 - Aboriginal party representatives participating in inspection, demarcation and monitoring of sites in northern section of Big Flat Creek ACHOA 81
Table 48 - Timeframe and Actions for Implementation of the ACHMP 82
Table 49 - Summary of BMP Inspection and Monitoring Program 87
Table 50 - BMP Action Plan 87
Table 51 – Greenhouse Gas Data 91

Table 52 – Energy Management Actions 92
Table 53 – Energy Management Actions for the Future Reporting Period 93
Table 54 - Category and No. of incidents 93
Table 55 - Community Liaison during the Reporting Period 97
Table 56 - Community Consultative Committee Meetings Summary 97
Table 57 – Summary of complaints 2009-2011 99
Table 58 - Community Support Program 100
Table 59 - Rehabilitation Summary for Mangoola 103

FIGURES

Figure 1 – Location Plan 2
Figure 2 - Site Layout 14
Figure 3 – Operations During the Reporting Period 16
Figure 4 – Air Quality Monitoring Locations 31
Figure 5 – Annual wind roses for Mangoola (North) 32
Figure 6 – Annual wind roses for Mangoola (South) 32
Figure 7 – Surface and Groundwater Monitoring Locations 42
Figure 8 - Electrical Conductivity results at Mangoola Coal Surface Water Monitoring Stations during the reporting period 43
Figure 9 - pH results at Mangoola Coal Surface Water monitoring stations during the reporting period 43
Figure 10 - TSS results for Mangoola Coal Surface Water Monitoring Stations during the reporting period 44
Figure 11 - TDS results for Mangoola Coal Surface Water Monitoring Stations during the reporting period 44
Figure 12 – Noise and Blast Monitoring Locations 65
Figure 13 – Environmental Category Incidents for Mangoola during the AEMR reporting period 94

PLATES

Plate 1 – Mangoola Rail loop 17
Plate 2 – Mangoola CHPP under construction 18
Plate 3 – Mangoola CHPP under construction 18
Plate 4 – Initial mining operations in box cut at Mangoola 19
Plate 5 – Mangoola Site Water Balance 22
Plate 6 – Nest box installation at Mangoola 53

APPENDICES

APPENDIX A SUSTAINABLE DEVELOPMENT POLICY FOR XSTRATA MANGOOLA

APPENDIX B ANNUAL RETURN

APPENDIX C PROJECT APPROVAL CONDITIONS AND STATEMENT OF COMMITMENTS

APPENDIX D METEOROLOGICAL DATA

APPENDIX E AIR QUALITY MONITORING DATA

APPENDIX F SURFACE WATER QUALITY MONITORING SUMMARY

APPENDIX G GROUNDWATER MONITORING SUMMARY

APPENDIX H WEED CONTROL MAPS

APPENDIX I NOISE MONITORING

APPENDIX J BLAST VIBRATION MONITORING DATA

APPENDIX K AEMR PLANS

APPENDIX L SUMMARY OF RECOMMENDATIONS FROM THE URS INDEPENDENT AUDIT

1.0 INTRODUCTION

1.1 Background

Mangoola Coal (Mangoola) is owned 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 2010 to 30 June 2011** (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. Construction activities at Mangoola were completed during the reporting period, with mining activities commencing in September 2010. The Coal Handling and Preparation Plant (CHPP) and Train Loading Facility are also now fully operational with regular trains being despatched.

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 – Minerals 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 are planned for the 2011-2012 AEMR period (**Section 6.0**).



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Location Plan
FIGURE 1

V:\XCN17-002\Figures\Final\CAD\Fg1_XCN17-002_Loc Plan_110926.dwg

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. These approvals are detailed below**.**

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 150Mt. Project Approval 06_0014 allows for the extracting, processing and transportation of up to 10.5 Mtpa for a period of up to 21 years from the granting of a Mining Lease (ML). ML 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). Four modifications to the original Project Approval have been approved, as detailed below in **Table 1**. One modification, Modification 4 (MOD 4) was submitted to the DP&I during the reporting period, and is awaiting approval. This modification is to enable the relocation of the 500 kV power line and subsequent redesign of the mine plan.

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 5	Modification to Project Approval ("Night-time Works")	23 February 2010	20 November 2029

1.3.2 Leases

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

Table 2 - Mangoola Leases

Reference	Title	Date Granted	Expiry
ML 1626	**Mining Lease**	20 November 2008	20 November 2029
EL 5552	**Exploration Lease 5552**	8 May 2006	07 November 2014
AL 9	**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. 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 53ML	20BL 023739	Extraction Bore. Extraction limit 10ML
20BL 105208	Well. Extraction limit 219ML	20BL 144011	Well. Extraction limit 10ML
20BL 105207	Well. Extraction limit 218ML	20BL 166284	Extraction Bore
20BL 169276	Extraction Bore. Extraction limit 98ML	20BL 168696	Test Bore
20BL 120934	Extraction Bore. Extraction limit 596ML	20BL 168414	Test Bore
20BL 167327	Extraction Bore. Extraction limit 151ML	20BL 168135	Test Bore
20BL 114812	Bore. Extraction limit 120ML	20BL 171778	Monitoring Bore
20BL 105210	Well	20BL 172573	Monitoring Bore
20BL 105206	Well	20BL 172570	Monitoring Bore
20BL 031351	Well. Extraction limit 151ML	20BL 172569	Monitoring Bore
20BL 171859	Monitoring Bore	20BL 172568	Monitoring Bore
20BL 171860	Monitoring Bore	20BL 172567	Monitoring Bore
20BL 171864	Monitoring Bore	20BL 18663	Monitoring Bore
20BL 171866	Monitoring Bore	20BL 172788	Monitoring Bore
20BL 171863	Monitoring Bore	20BL 172790	Test Bore
20BL 171865	Monitoring Bore	20BL 172787	Test Bore
20BL 171867	Monitoring Bore	20BL 172789	Test Bore
20BL 171868	Monitoring Bore	20BL 172809	Test Bore
20BL 171861	Monitoring Bore	20BL 172808	Test Bore

Licence	Details	Licence	Details
20BL 171862	Monitoring Bore	20BL 172807	Test Bore
20BL 012875	Extraction Bore. Extraction limit 5ML	20BL 172811	Test Bore
20BL 141091	Extraction Bore	20BL 172806	Test Bore
20BL 011685	Extraction Bore	20BL 172827	Test Bore
20BL 011686	Extraction Bore. Extraction limit 5ML	20BL 172813	Test Bore
20BL 143405	Well	20BL 172812	Test Bore
20BL 169066	Extraction Bore	20BL 172814	Test Bore
20BL 167003	Monitoring Bore	20BL 167192	Extraction limit 10ML
20BL 168743	Test Bore	20BL 167425	20WA207718; Lot178, DP750924; not part of water sharing plan
20BL 128233	Extraction Bore	20BL 011687	WAL18232; Lot 1 DP571113; Bore 5ML Hunter River alluvial water source.
20BL 167212	Extraction Bore. Extraction limit 1ML	20BL 143666	Extraction limit 131ML
20BL 142497	Extraction Bore	20BL 167328	Extraction limit 8ML
20BL 166460	Extraction Bore	20BL 007696	Not subject to water sharing plan.
20BL 117574	Extraction Bore	20BL 025889	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
7291	20AL 202589	63	Wybong Creek Surface Water
644	20WA211008	3	Hunter Regulated River. Farming irrigation
691	20WA211008	50	Hunter Regulated River. Domestic, irrigation, stock
735	20WA211008	72	Hunter Regulated River. Irrigation
822	20WA211008	3	Hunter Regulated River. Irrigation
824	20CA 200916	175	Hunter Regulated River. Irrigation
830	20WA211008	306	Hunter Regulated River. Industrial
897	20WA211008	55	Hunter Regulated River. Domestic, irrigation, stock
933	20WA211008	43	Hunter Regulated River. Irrigation
1000	20CA 201326	3	Hunter Regulated River. Farming, 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
6316	20CA 202449	175	Wybong Creek Ground Water. 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	20CA 203185	5	Hunter Regulated River, Industrial
503	20 WA211008	159	Hunter Regulated River. Domestic, irrigation, stock
645	20 WA211008	432	Hunter Regulated River. Irrigation
898	20CA 201087	8	Hunter Regulated River. Domestic, irrigation, stock
6577	20AL201870	8	Hunter Regulated River. Domestic, irrigation, stock
831	20CA 200935	8	Hunter Regulated River. Industrial
6327	20CA 202482	30	Wybong Creek Ground Water. Industrial, Irrigation
6260	20CA 202523	36	Wybong Creek Surface Water. 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.
6298	20CA 202644	39	Wybong Creek Surface Water. Irrigation.
6306	20CA 202659	52	Wybong Creek Surface Water. Irrigation.
6308	20CA 202671	96	Wybong Creek Surface Water. Irrigation.
9343	20CA 203175	25	Wybong Creek Surface Water. Irrigation.
10199	20CA 203178	35	Wybong Creek Surface Water. Irrigation.
9987	20CA 203185	82	Hunter Regulated River. Domestic and Stock
9344	20CA 203207	164	Wybong Creek Surface Water. Irrigation.
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
1001	20CA 208171	334	Hunter Regulated River. Irrigation
1349	20 WA211008	8	Hunter Regulated River. Domestic, irrigation, stock
692	20AL200579	8	Hunter Regulated River. Domestic, irrigation, stock
9988	20CA 203185	8	Hunter Regulated River, Industrial
6275	20CA 202563	5	Wybong Creek. Domestic, Stock and Irrigation

Radiation Licence

Mangoola holds Radiation Licence RL42108 which expires 28/04/2013.

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

An amendment to the Mangoola Mining Operations Plan (MOP) was submitted to the Department of Primary Industries – Minerals and Petroleum (DPI) during the reporting period. This amendment was for the extension of the MOP term from June 2011 to June 2012 to allow for the continuation of mining in the North Pit. This MOP therefore allows Mangoola to commence coal mining and associated activities until a determination is made on MOD 4. At that time, the MOP will be revised and resubmitted for the approval of the DPI.

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 M3.1 - Two TEOM units operated for some time with faulty temperature control devices. These devices assist with controlling the air sample inlet stream to minimise the condensation and so impacting upon the air mass determination. The service provider has since advised that the dust concentration accuracies were maintained.

- EPL Condition M7 – Meteorological monitoring station WSS failed to record accurate data for the period of time between the 1st and the 6th of January 2011, and failed to record any data between the 6th and 18th of January 2011, due to a lightning strike.

- EPL Condition O7.1 – Rainfall exceeding the design capacity of several sediment dams caused them to overflow and leave the site at several locations.

- EPL Condition M2.1 - The number of samples collected and analysed for some monitoring points was less than required by the EPL for the reporting period. Samples were not collected at some dust and water sites due to either power failures, equipment servicing and resetting, software issues (faulty circuit board), a lost filter paper (lost at laboratory), access issues due to wet weather and dry sampling sites

- On 10th January 2011, two artefact sites, BFC87 and BFC74, were inadvertently displaced by a contract grader working on a secondary access road.

Mangoola aims at complying with all licence requirements, as well as implementing practices to monitor, mitigate and minimise any safety, health, 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 A**. Mangoola Coal's performance details for the reporting period are summarised in the Annual Return, provided in **Appendix B**.

As required by Mangoola's Project Approval 06_0014, Mangoola continued to acquire affected properties within the area of affectation during the reporting period.

Mangoola received 457 complaints during the reporting period, compared with 109 complaints in the last reporting period. The large increase in complaints relates to the increase of construction activities, and the commencement of mining operations and night time operations during the reporting period. 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 Steve Hubert Tel: 02 6570 2549 Email: shubert@xstratacoal.com.au	**Operations Manager** Geoff Kelly Tel: 02 6549 5501 Email: gkelly@xstratacoal.com.au
Senior Project Manager Scott Elliot Tel: (02) 6549 5571 Email: selliot@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	http://www.xstratamangoola.com.au

1.7 Actions required from previous AEMR review

A site inspection was conducted by the DP&I on 18 May 2010 as part of its review of the 2009-2010 AEMR. The Department found that the 2009-2010 AEMR generally satisfied the requirements of Mangoola's Project Approval 06_0014; however there were a number of comments made which are detailed in **Table 6.**

Mangoola received the Department's comments for the 2009-2010 AEMR on 23 May 2010, and therefore only had a short time to implement all of the recommendations before the end of the reporting period on 30 June 2010. Because of this short timeframe, some of these recommendations will be implemented in the 2011-2012 reporting period, and will therefore be reported on in the

following AEMR. Notwithstanding this, the status of all actions as listed in **Table 6** are discussed in this AEMR.

Table 6 - Actions required from last AEMR

Action Required	Where dealt with in this AEMR
Include a compliance audit table in the AEMR for the conditions in Project Approval 06_0014.	**1.8**
Ensure that the mine's website content is audited for compliance against Condition 10 and11, Schedule 5 of Project Approval 06_0014.	**4.5**
Explain any exceedences recorded from surface water monitoring points and the mines response to those exceedences.	**3.5.2**
Provide a brief summary of any water discharge incidents in the appropriate section.	**3.4.3**
Explain the reason for the total disturbance area reported in the 2009-2010 AEMR being greater than the mine lease area.	**5.2**
Provide an explanation of dust monitoring results which exceed the consent criteria, and bolding of these exceedences in the results table.	**3.3.3**
Undertake blast monitoring on the Anvil Hill rock structures and compare them from the results around the base of the structures to establish that the results are consistent. Also, investigate any structural measures necessary to stabilise the structures in consultation with OEH and relevant Aboriginal stakeholder groups and provide the outcome in the AEMR for the next reporting period. Develop site specific ground vibration criteria for the rock shelters and significant rock formations.	**3.10.2**
Inspect the vegetation screen plantings on Mangoola Road, replace any dead plants and provide a summary of the actions in the AEMR for the next reporting period.	**3.12.2**
Establish an inspection regime for all fuel bund drainage pits and report on this in the AEMR for the next period.	**3.18.2**
Ensure that all chemicals are placed within bunds in a manner that captures any potential spills, and establish an appropriate inspection regime.	**3.18.2**
Investigate raising a perimeter drain wall in the vicinity of the workshop area and report the outcome in the AEMR for the next reporting period.	**3.18.2**
Undertake an audit of all rehabilitated areas to ensure areas of seeding are effective	**5.2**
Give heating/spontaneously combusting areas of the ROM stockpile priority for processing and minimise ROM coal storage to decrease the risk of spontaneous combustion. Report spontaneous combustion management in the AEMR for the next reporting period.	**3.15**

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 C**). 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**	

Condition	AEMR Section
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**
(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 ML 1626 that address the 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

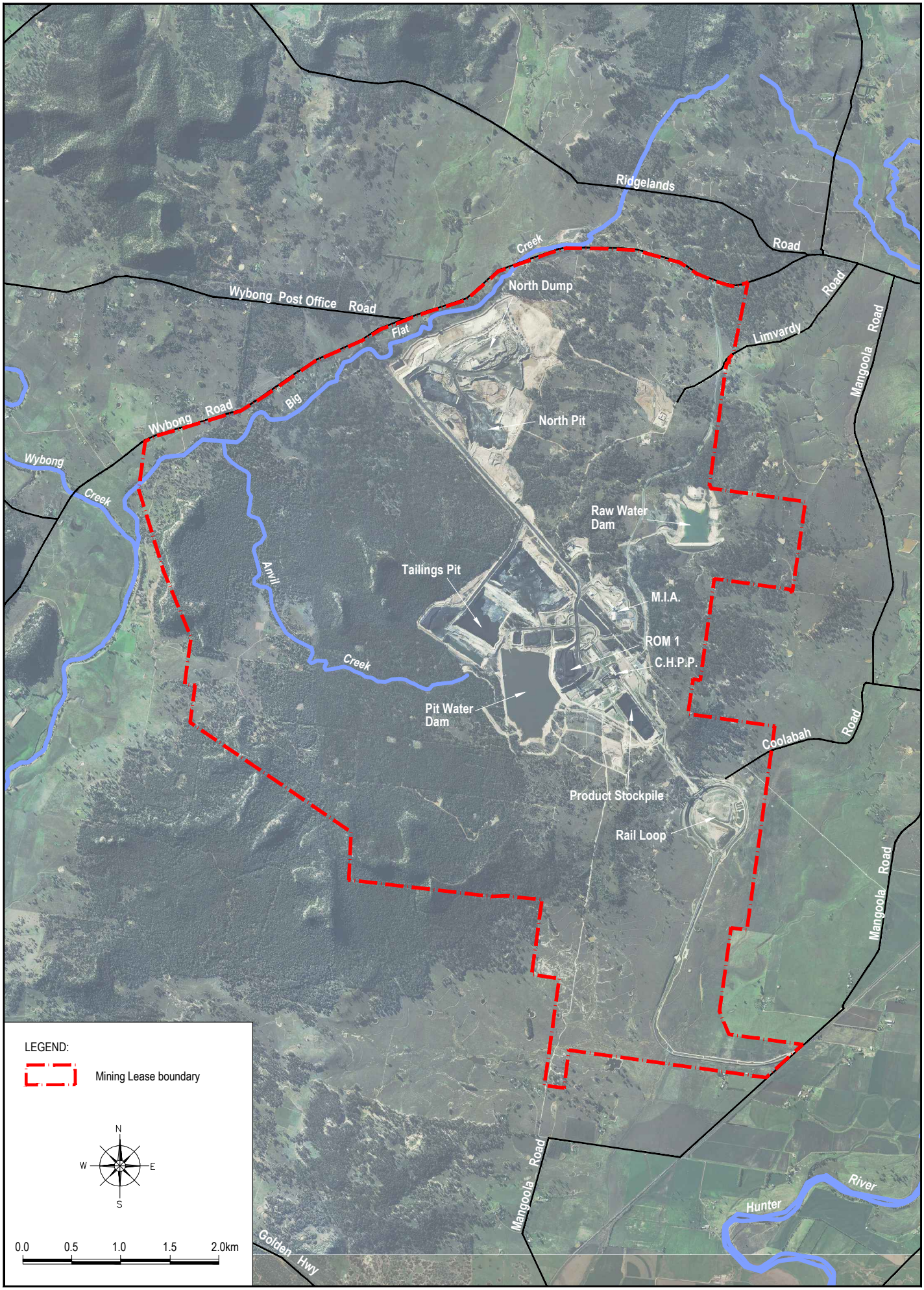
Open cut mining commenced at Mangoola during the reporting period. The site was largely constructed during the reporting period, with mining activities commencing in September 2010.

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 10.5Mtpa of ROM coal using truck, 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	Construction and operation of CHPP capable of handling up to 10.5Mtpa of ROM coal, at an average processing rate of 1,600 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	Construction workforce of up to 200 employees and operational workforce of up to 240 employees at peak production.
Construction	Construction of: • 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. • Expected construction period, 18 months.
Hours of Operation	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. Average four trains per day at peak production.
Mine access	Only road access is via Wybong Road. A new RTA design intersection has been constructed. Note there has been no change to site access since the last reporting period.

Activities undertaken during the reporting period included open cut mining, exploration drilling, construction 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 (including one redrill) large diameter holes (~150mm) were drilled to primarily investigate washability characteristics of the high ash coal in the southern part of the deposit. Seven of these holes were drilled in ML1626 and one was removed due to environmental constraints;
- Nine non-core holes were drilled for further investigation of a significant structural anomaly which appears to exist within the proposed open cut mine area;
- 91 non-core holes were drilled for further refinement of the limit of oxidation drilling; and
- Six non-core holes were drilled as part of resource definition in the northeast corner of the mining lease.

2.3 Land Preparation

During the reporting period 287.34 hectares (ha) of land were cleared for the purpose of undertaking construction and operation activities, totalling of 672.1 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

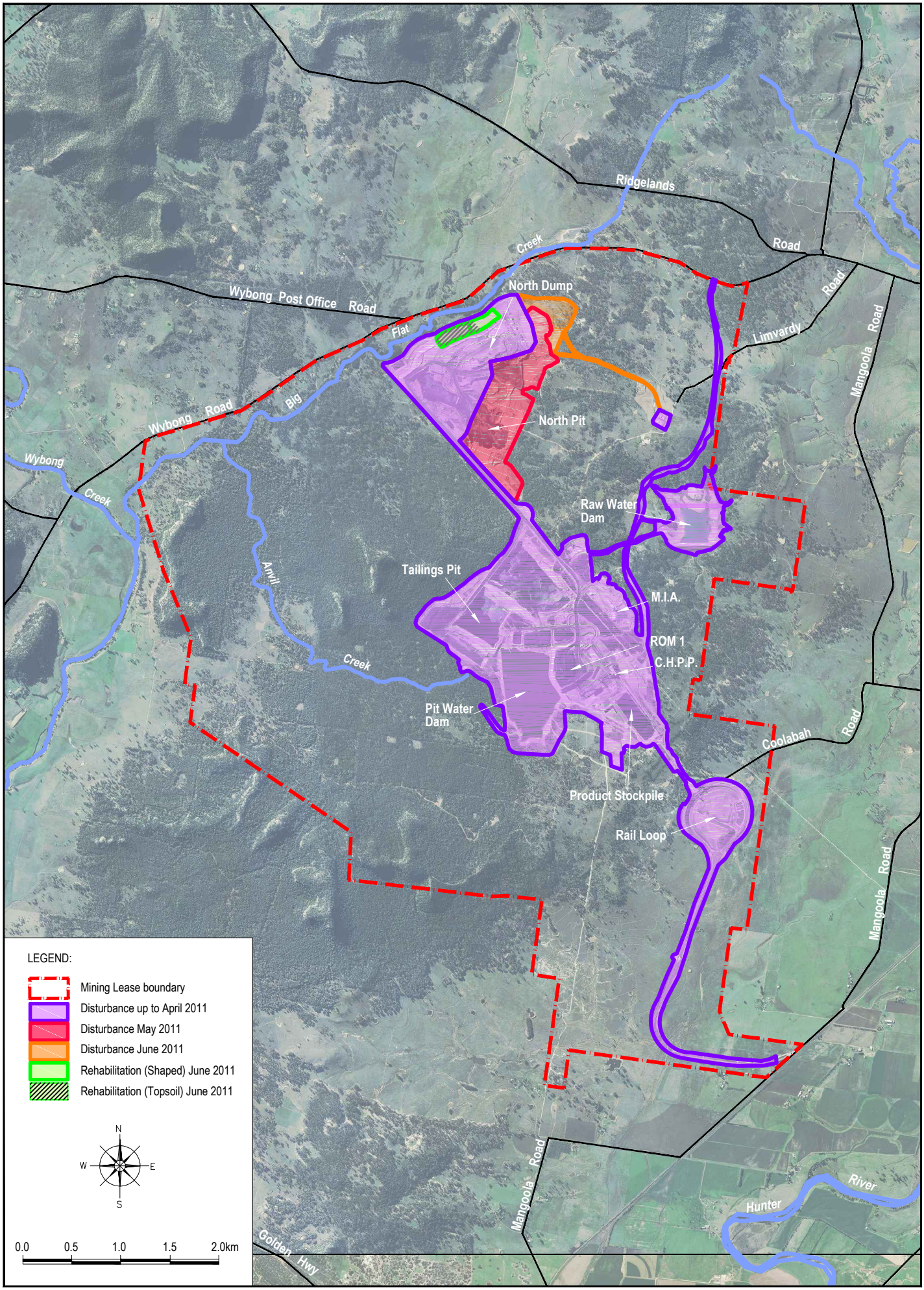
Mangoola followed the approved onsite activities for construction of the mine as specified in the MOP. The entire site was largely constructed and made operational in the reporting period, excluding the main access road and the initial temporary construction offices and car park. Additional temporary demountable offices were installed to cope with the peak construction workforce numbers; however these offices are progressively being removed from site. An upgrade to Wybong Road East was also completed during the reporting period.

The construction works program during the reporting period specifically included the aspects described further below, and shown in **Figure 3**.

Mine Infrastructure Area (MIA)

The MIA was commissioned during the reporting period, and includes the broad elements as listed below;

- Administration offices and bathhouse building complex;
- Six bay heavy vehicle workshop;
- Hydraulic infrastructure;
- Oils, coolant and fuel facility;
- Heavy vehicle and light vehicle wash stations;
- Water truck/cart refill;



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Operations During Reporting Period
June 2010 - June 2011

FIGURE 3

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- Warehouse and fenced storage area; and
- Electrical, fire fighting and communications infrastructure.

Coal Handling and Preparation Plant and Rail Loop

The CHPP, rail loop and train load out facility were also constructed and commissioned during the reporting period, and are all now operational, as are the raw coal receival and crushing station. Photos of the rail loop and the CHPP under construction are presented in Plates 1, 2 and 3 respectively.



Plate 1 – Mangoola Rail loop



Plate 2 – Mangoola CHPP under construction



Plate 3 – Mangoola CHPP under construction

Dams

The Raw Water Dam, Pit Water Dam and the Hunter River Pump Station were constructed and commissioned during the reporting period. A series of sediment control dams and pumps and pipelines were also installed together with the pit haul road. A mined out area has become Tailings Dam 1, and it is planned that over the life of the mine there will be 3 tailings dams.

2.5 Mining

Coal extraction commenced during the reporting period, with 4,194,350t of ROM coal being produced.

Mining throughout the reporting period began with a boxcut beside the Pit Water Dam, as illustrated on **Plate 4**. This cut was developed in advance of the wash plant commissioning and was converted to a tailings emplacement area thereafter.



Plate 4 – Initial mining operations in box cut at Mangoola

The remainder of the mining operations developed the North pit, beginning at the line of oxidation to the north east of the lease and working in a south east direction to Strip 6. Waste produced was run to out of pit dumps that reached a maximum height of 200RL during the reporting period.

2.6 Coal Processing

During the reporting period 3,002,690 t of ROM coal were processed through the CHPP.

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).

Towards the end of the reporting period, the waste contractor changed from Thiess to JR Richards. The collection and recording functions are the same with as much material as possible being recycled and detailed records maintained. A summary of the recorded waste collected at Mangoola during the reporting period is presented in **Table 10.**

Table 10 - Summary of waste generation for major waste streams

	Jul-2010	Aug-2010	Sep-2010	Oct-2010	Nov-2010	Dec-2010	Jan-2011	Feb-2011	Mar-2011	Apr-2011	May-2011	Jun-2011
	Weight (t)											
General Waste Total	32.7	38.3	82.3	65.9	56.6	89.9	33.6	53.4	87.3	15.9	25.2	16.1
Medical and Sanitary Waste Total	0	0	0.2	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0
Oily Rags Total	0	0	0	0	0	0	0	0	0	0	0	0.4
Recyclables												
20ltr Drum Total	0	0	0	0	0	0	0	0	0	0	0.0	0
205ltr Drum Total	0	0	0	0	1.4	1.1	0	0	0	0.7	0.2	0
Confidential Documents Total	0.1	0	0.3	0.1	0	0	0.1	0	0.1	0.1	0.1	0
Comingled Recycling Total	0.7	0.7	1.1	1.1	0.3	3.1	1.2	2.2	2.6	2.0	1.6	1.0
Effluent Total	214.0	257.4	321.0	382.0	304.5	566.0	367.5	241.0	252.0	139.0	61.0	48.0
Recycle Oil Filters Total	0	0	0	0.5	0.3	1.5	0.8	1.1	1.8	1.1	2.4	1.5
Recycle Oil from Oil Filters Total	0	0	0	0.1	0	0.3	0.1	0.2	0.3	0.2	0.4	0
Recycle Pallecon Total	0	0	0	0	0.6	0.9	0	0	0	0	0	0
Oily Water Total	0	0	0	5.5	0	0	0	0	12.0	0	0	0
Recycle Tyres Total	0	0	0	0.4	0	0	0	0	0	0	7.3	0
Recycle Timber Total	0	0	0	0	0	5.8	6.9	0	23.0	0	0	2.8
Rebates												
Batteries Total	0	0	0	0	0	0	0	0	0	0	0	0.9
Scrap Steel Total	14.9	1.4	0	10.9	19.3	5.9	12.1	11.4	7.4	43.6	10.1	1.6

	Jul-2010	Aug-2010	Sep-2010	Oct-2010	Nov-2010	Dec-2010	Jan-2011	Feb-2011	Mar-2011	Apr-2011	May-2011	Jun-2011
	Weight (t)											
Scrap Steel G.E.T. Total	0	0	0	0	0	0	0	7.3	4.9	3.9	4.9	0
Scrap Steel Light Total	0	0	0	2.3	0	0	0	0	0	0	0	0
Waste Oil Total	0	0	0	0	12.0	19.0	9.0	16.0	58.0	104.3	70.9	10.8
Miscellaneous												
Oily Rag Bin Total	0	0	0.0	0	0.1	0.1	0	0	0	0	0.2	0
Disposal Contaminated Soil Total	0	1.0	0	0	0	6.7	0	0	0	0	0	0
Disposal Thinners Total	0	0	0	0	0	0.8	0	0	0	0.2	0	0
Total	**262.5**	**298.8**	**404.9**	**468.8**	**395.1**	**701.2**	**431.2**	**332.7**	**449.5**	**311.0**	**184.4**	**83.0**

** Figures to one decimal place.*

During the previous reporting period 515.8 tonnes of waste were produced with 1.9 tonnes being recycled. In the current reporting period 4,323 tonnes of waste were produced, with 3715.9 tonnes of this being recycled. The large increase in waste recorded during the current reporting period is due to the significant increase in construction activities in the reporting period, as well as the commencement of mining operations and coal processing.

As detailed in **Table 10** the major waste stream generated during the reporting period by weight was effluent (73%), with the remainder of waste generated being spread across the various aspects of the construction and operation phase activities.

No regulated waste was produced at Mangoola during the reporting period.

2.8 Ore and Product Stockpiles and Coal Transport

At the end of the reporting period the volume of the ROM stockpile was 1,218,858 tonnes, and the volume of the product stockpile was 473,564 tonnes.

During the reporting period 2,055,180 tonnes of coal were transported by rail to the port of Newcastle. There were 240 train movements during the period, equating to an average of 0.67 train movements generated by Mangoola on a daily basis.

2.9 Water Management

As discussed above in **Section 2.4**, the water management infrastructure at Mangoola was largely constructed and commissioned during the reporting period, including the Raw Water Dam, Pit Water Dam and the Hunter River Pump Station. Sediment control dams and pumps and pipelines were also installed together with the pit haul road. In addition to construction works, routine inspections were undertaken by contractors on a weekly basis and after rain. Maintenance was undertaken when 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 2537ML. A further 262 ML is currently being processed for transferral to 20WA211008. The Xstrata Colinta Pastoral Company is allocated a further 846 ML of Hunter River Water, which may be transferred for use in the mine in times of drought. The monthly readings and totals of the water extracted during the reporting period are presented in **Table 11.**

Table 11 - Water Pumped from Hunter River

Pumps	Water Pumped (ML)
Initial Construction Period	
Pumps HR0001 and HR0002	87.642
New Pumping Station	
20WA211008	1830.587
Total	**1918.129**

Water extraction by pumping from the Hunter River during the current reporting period represents a significant increase over the 140.38ML extracted during the previous period. This is a direct result of the increase in construction and operation activities and the commencement of the CHPP operations. 20 separate water licences have been transferred across to the new pumping station with three more to be completed during 2011.

Specialist consultants have been engaged to develop a site water balance for Mangoola. The outcomes of this will be reported on in the next AEMR. Water held/captured onsite at Mangoola by the various dams during the reporting period is shown below in **Plate 5** and **Table 12.**

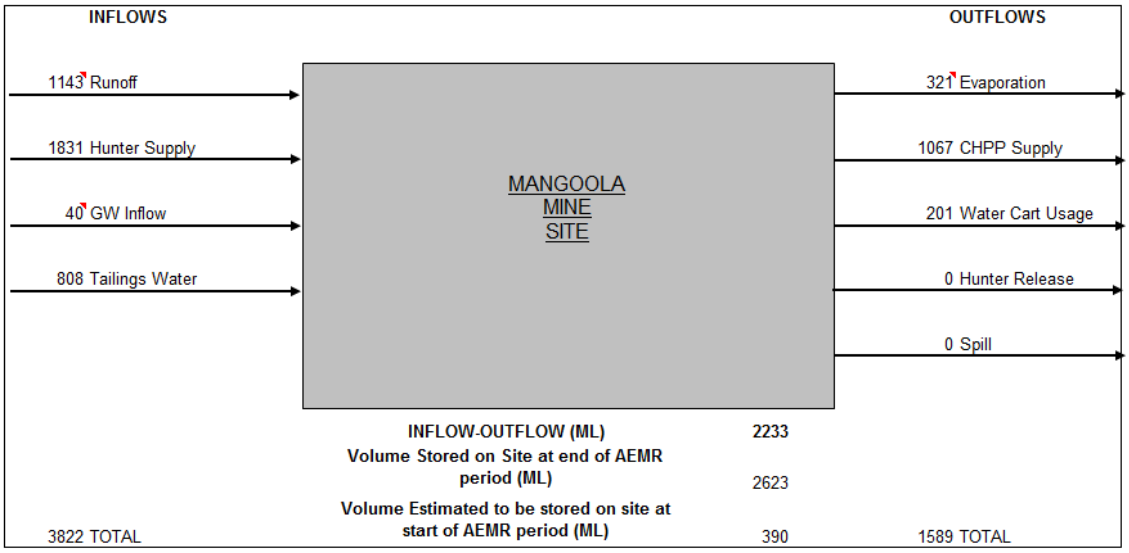


Plate 5 – Mangoola Site Water Balance (Gilbert & Associates)

Table 12 - Volume of water held and source at Mangoola

Volume held by dams (ML)			
	Start of Reporting Period	**End of Reporting Period**	**Storage Capacity**
Water held on site	390	2623	4150
Controlled discharge water (salinity trading schemes)	0	0	-
Contaminated water	0	0	0

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, Safety, Environment and Community (HSEC) 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. Emergency information regarding hazardous substances is readily available to emergency services at the Security Hut at the site entrance.

The quantities of diesel handled through the site during the reporting period are included in **Table 13.**

Table 13 - Fuel Quantities Handled During the Reporting Period

Storage Location	**Quantity (KL)**
Mangoola Coal Diesel Tank - Main Car Park, Temporary Construction Office	284.417
Daracon Diesel Tank - Daracon Area adjacent to NARE, Temporary Construction Office	785.666
Yore Contracting Diesel Tank - Yore Contracting Office, Coolabah Road	17.676
Temporary Diesel Tank (T1) Mangoola Operations, Temporary Workshop	747.093
Temporary Diesel Tank (T2) Mangoola Operations, Temporary Workshop	747.093
Fuel Farm HV Diesel Tanks (T1, T2, T3, T4) Mangoola Operations, Fuel Farm	12,813.942
Fuel Farm LV Diesel Tanks (TLV) Mangoola Operations, Fuel Farm	3,763.805

Quantities of dangerous goods onsite during the reporting period include the following:

1. 5,522,690 kg of explosives was used during the reporting period. Mangoola stores explosives onsite (emulsion and boosters); and

2. Approximately 18.9 ML of diesel was purchased during reporting period for the entire site.

All explosives are handled in accordance with MAN MIN PLN 0002 Mangoola Explosives Management Plan Version 2.0 dated 26/10/10

2.11 Land Acquisition

Table 14 details the land acquisitions that were made during the reporting period.

Table 14 - Land Acquisitions during the Reporting Period

Vendor	Address	Purchase Date	Reason for Purchase
Cooper	260 Hidden Valley Way ROW, Ridgelands Rd WYBONG	6 August 2010	Purchased at open market
Wicks	3079 Wybong Road, MUSWELLBROOK	30 June 2011	Private sale
Clern Pty Ltd and Bray	"Oakwood" 1689 Wybong Rd, WYBONG	15 November 2010	Mandatory Acquisition under Project Approval 06_0014
Baywalis Management Pty Ltd	"Mulgowrie" 2 Mulgowrie Access, MANGOOLA	2 November 2010	Mandatory Acquisition under Project Approval 06_0014
State of NSW	"Wallaby Rocks" Lot 229 DP 726283	27 May 2011	Part of offset areas for mine
State of NSW	Gravel pit reserve	27 May 2011	Part of mining disturbance area
State of NSW	Closed Crown roads	16 June 2011	Part of mining disturbance area

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 15.**

During the reporting period, Mangoola Coal's Water Management Plan, Blast Monitoring Plan, Noise Monitoring Plan, Air Quality Monitoring Program, Environmental Management Strategy, Energy Savings Action Plan and Environmental Monitoring Program were resubmitted to the appropriate government departments to reflect changes in the mine's transition from the construction phase to operational phase. 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 4** (Air Quality Monitoring), **Figure 7** (Surface and Groundwater Monitoring), and **Figure 12** (Noise and Blast Monitoring).

Table 15 - 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 Access Inspection

Document No	Document Type	Document Title
MAN SD PRO 0046	Procedure	Blasting Hotline Info Change Approval Procedure
MAN SD PRO 0073	Procedure	Noise Management Procedure
MANAGEMENT PLANS		
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 (BMP)
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
MAN SD FRM 0034	Form	Mangoola Coal Daily Weather Observation Form
MAN SD FRM 0046	Form	Ground Disturbance Permit

Document No	Document Type	Document Title
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 2 Pre-Qualification Assessment
MAN SD FRM 0056	Form	Level 3 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
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
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

Document No	Document Type	Document Title
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, Mangoola continued to operate two on-site meteorological stations throughout the reporting period. These are located at:

- Wybong Road WSN (in accordance with Condition 7.1 of the EPL): North of Mangoola, along Wybong Post Office Road; and
- Coolabah Road WSS: South of Mangoola, along Coolabah Road (refer to **Figure 4**). Note this monitor is not a mandatory requirement of the EPL.

Both stations log data every five minutes and send the data to a web database by Next G telemetry for near real time access. The web database is then updated every 10 minutes. The weather stations have 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 in 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.

Carbon Based Environmental Pty Ltd continues to operate the monitoring equipment and utilise site collections at their historical locations.

3.2.2 Rainfall

The monthly recorded rainfall for the Wybong and Coolabah weather stations and a comparison against the previous reporting period is shown in **Table 16.**

Table 16 - Monthly Rainfall data for Wybong and Coolabah Meteorological Stations.

RAIN (mm)						
Period	**2010/11**		**2009/10**		**Change since last reporting period**	
Site	**Coolabah**	**Wybong**	**Coolabah**	**Wybong**	**Coolabah**	**Wybong**
July	56.2	55.6	31.4	30.0	24.8	25.6
Aug	26.5	21.8	2.6	4.6	23.9	17.2
Sept	37.0	28.8	35.0	43.4	2.0	-14.6
Oct	59.4	64.3	51.2	62.6	8.2	1.7
Nov	88.1	87.0	50.8	50.8	37.3	36.2
Dec	127.4	123.3	24.0	25.9	103.4	97.4
Jan	0.2	54.4	107.6	18.7	-107.4	35.7
Feb	45.8	21.8	36.1	6.5	9.7	15.3
Mar	50.8	30.0	35.2	7.0	15.6	23.0
Apr	30.7	33.3	4.7	2.0	26.0	31.3
May	74.3	71.2	18.7	0.0	55.6	71.2
Jun	48.2	51.4	5.6	11.8	42.6	39.6
Totals	1287.5	1045.8	654.4	493.2	633.1	552.6

Cumulative rainfall during the reporting period showed a significantly higher rainfall than the previous reporting period with a difference of 552.6mm and 633.1mm for Wybong and Coolabah respectively. The highest monthly rainfalls fell in December 2011 at both Coolabah (127.4mm) and Wybong (123.3mm).

3.2.3 Temperature

The monthly maximum and minimum temperatures for the Wybong and Coolabah weather stations is presented in **Table 17.**

Table 17 - Temperature Data for Wybong and Coolabah Met Stations

Temperature (^{0}C)				
	Coolabah		**Wybong**	
	Minimum Temperature 2010/11	Maximum Temperature 2010/11	Minimum Temperature 2010/11	Maximum Temperature 2010/11
July 2010	0.4	19.6	-4.2	20.4

Temperature (^{0}C)				
August 2010	0.0	22.0	-4.0	22.4
September 2010	4.4	27.6	1.2	28.2
October 2010	6.4	29.6	2.2	30.0
November 2010	9.6	31.6	6.4	31.6
December 2010	10.4	36.0	7.8	36.0
January 2011	14.4	43.2	11.4	43.2
February 2011	14.0	41.2	10.4	40.2
March 2011	13.6	36.8	9.4	36.0
April 2011	7.4	28.4	3.8	29.0
May 2011	0.4	24.8	-4.1	25.2
June 2011	2.0	21.2	-1.4	21.6

The lowest temperature experienced during the reporting period was -4.2^{o}C at Wybong in July 2010 and the highest being 43.2^{o}C, which was experienced at both Wybong and Coolabah during January 2011.

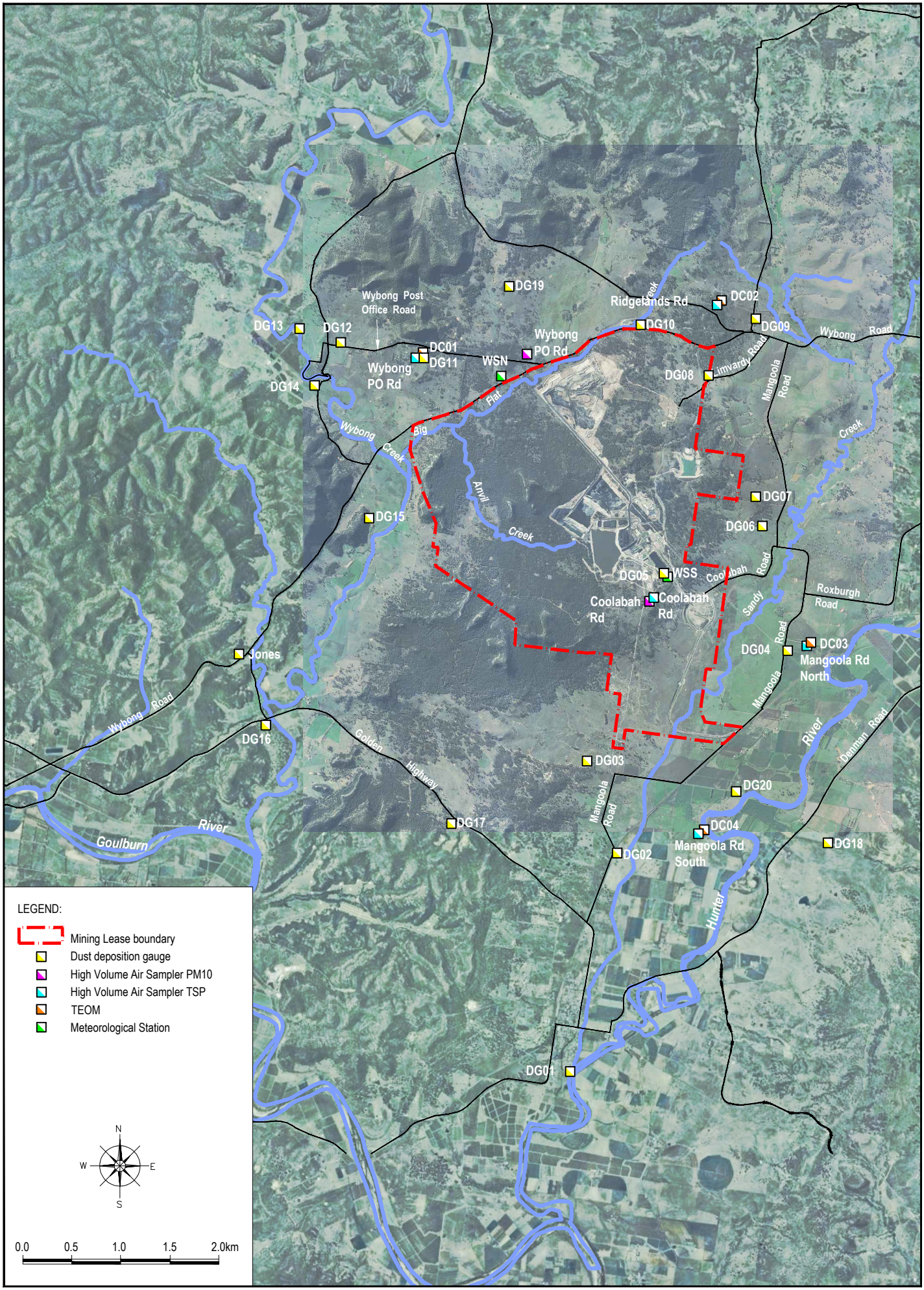
3.2.4 Wind

The monthly average wind speeds for the Wybong and Coolabah weather stations are shown in **Table 18.**

Table 18 - Wind Data Wybong and Coolabah

Monthly Mean Wind (km/hr)		
	Mean Wind Wybong 2010/11	**Mean Wind Coolabah 2010/11**
July 2010	5.8	7.2
August 2010	11.9	10.8
September 2010	9.0	10.1
October 2010	9.7	12.2
November 2010	7.6	9.7
December 2010	8.9	10.2
January 2011	9.4	10.8
February 2011	9.7	13.1
March 2011	8.7	10.2
April 2011	7.0	8.9
May 2011	6.3	8.0
June 2011	9.8	11.6
Annual Mean	**8.6**	**10.2**

The highest mean wind speeds were recorded during August 2010 at Wybong (11.9km/h) and during February 2011 at Coolabah (13.1km/h). The lowest mean wind speeds were recorded in July 2010, at both Coolabah (7.2 km/h) and Wybong (5.8 km/h).



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Air Quality Monitoring Locations

FIGURE 4

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Wind roses have been produced for the reporting period and are presented in **Figures 5** and **6**.

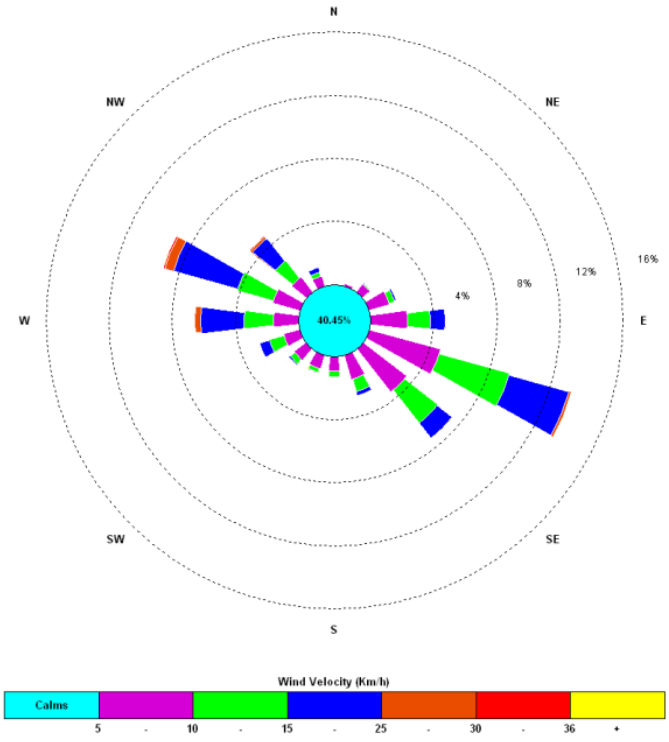


Figure 5 – Annual wind roses for Mangoola (North)

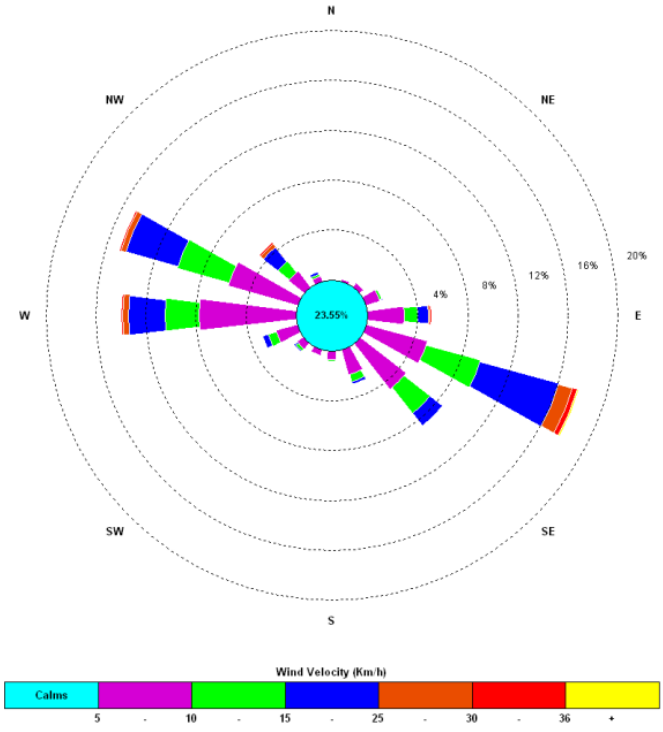


Figure 6 – Annual wind roses for Mangoola (South)

3.2.5 Further Improvements

Meteorological Monitoring station WSS (Coolabah Rd) failed to record data from 1-18th January 2011 due to a lightning strike. Data was logged for all parameters from the 1-6th January, but was deemed unreliable as most parameters remained static during this period. Data stopped logging from the 6-18th January and there was no data available for any parameters during this time.

New parts were ordered and installed at this monitoring station, which has recorded accurate data for the remainder of the reporting period. This information was provided to OEH in the Mangoola Coal Annual Return for 2010-2011. It is noted that operation of this station is not a mandatory requirement of the EPL. It will however continue to be used and serviced together with the Wybong Road (WSN) unit.

Carbon Based Environmental Pty Ltd continually monitors the weather stations both remotely and via site visits to ensure monitoring station 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's Air Quality Monitoring Program (AQMP) was revised and re-submitted during the reporting period, and describes monitoring requirements associated with the operational phase and construction phase of the mine.

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

- Twenty one depositional dust gauges known as DDG01 – DDG20 and 'Jones' (depositional dust gauges DDG09 and Jones are locations chosen in consultation with the Muswellbrook Shire Council);
- Two High Volume Air Sampler (HVAS) dust monitors measuring PM_{10} over one 24 hour period every six days. HVAS sampling has been undertaken at two locations since 2002. The two HVAS locations are known as Wybong Post Office Road and Coolabah Road. Note only the Wybong Road Post Office Road site is required by the EPL, and as such the results of this monitoring station are reported in this AEMR; and
- Five Total Suspended Particulates (TSP) dust monitors, known as Coolabah Rd, 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 19.**

Table 19 - Project Approval Air Quality Criteria

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

PM_{10} and TSP are monitored every six days by Carbon Based Environmental Pty Limited 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 μg/m^3.

Depositional dust is monitored monthly by Carbon Based Environmental Pty Limited 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 4**.

Mangoola commenced using RST (Reynolds Soil Technologies) RT9 product on the main haul road during the reporting period on 2 February 2011. 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.

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 20.** The data presented in **Table 20** is corrected for contamination of samples, and presents annual average deposition rate of insoluble solids as g/m^2/month.

Table 20 - Depositional Dust Gauge Results July 2010 – June 2011

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	0.5	3.6	1.9
DG02	Mangoola Rd	12	6	1.5	4.2	3.1
DG03	Mangoola Rd	12	12	0.3	2.8	1.0
DG04	Mangoola Rd	12	12	0.5	4.9	2.2
DG05	Adjacent to Coolabah Met. Station	12	12	0.8	5.9	2.0
DG06	Mangoola Rd	12	6	0.9	5.5	2.5
DG07	Mangoola Rd	12	12	0.5	2.9	1.3
DG08	Limvardy Rd	12	12	0.4	5.3	1.4
DG09	Castlerock Rd	12	10	0.6	3.5	1.6
DG10	Wybong Rd	12	10	0.5	2.6	1.4
DG11	Wybong Post Office Rd	12	11	0.3	1.6	1.2
DG12	Wybong Post Office Rd	12	8	0.7	4.4	2.3
DG13	Yarraman Rd	12	12	0.5	3.8	1.6
DG14	Yarraman Rd	12	8	1	5	2.7
DG15	Wybong Rd	12	10	0.8	3	1.7
DG16	Golden Highway	12	12	0.5	1.7	0.9
DG17	Golden Highway	12	5	0.4	3.7	2.0
DG18	Denman Rd	12	11	0.4	4.9	1.8
DG19	Ridgelands Rd	12	12	0.9	4.3	2.4
DG20	Near Hunter River, Mangoola Rd	12	10	1.1	6.9	2.7
Jones	3220 Wybong Rd	12	12	0.3	2.7	0.8

As shown in **Table 20,** the annual mean dust deposition did not exceed 4 g/m^2/month at any of the 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 **Table 21** and **Table 22** respectively.

Table 21 - Mangoola Total suspended Particulates (TSP) (µg/m3)

Site	Coolabah			Mangoola			Mangoola			Ridgelands			Wybong		
	Road TSP			North TSP			South TSP			Road TSP			Road TSP		
	Low	Mean	High	Low	Mean	High	Low	Mean	High	Low	Mean	High	Low	Mean	High
Jul-10	8.0	20.0	41.0	12.0	21.4	35.0	8.0	16.8	28.0	10.0	23.0	37.0	6.0	14.6	29.0
Aug-10	23.0	35.8	55.0	23.0	28.0	32.0	17.0	22.0	27.0	20.0	24.8	30.0	17.0	20.8	26.0
Sep-10	12.0	30.0	69.0	7.0	27.4	61.0	4.0	20.8	58.0	11.0	22.8	66.0	5.0	22.8	65.0
Oct-10	11.0	49.4	67.0	21.0	48.2	91.0	12.0	33.8	52.0	10.0	43.4	69.0	7.0	33.4	57.0
Nov-10	21.0	41.0	92.0	16.0	32.0	51.0	20.0	33.0	54.0	10.0	27.0	61.0	8.0	22.8	47.0
Dec-10	22.0	35.4	60.0	34.0	38.2	44.0	18.0	30.4	49.0	19.0	41.6	102	15.0	25.8	40.0
Jan-11	27.0	56.2	93.0	32.0	61.0	94.0	29.0	54.6	90.0	29.0	94.4	199	29.0	58.8	77.0
Feb-11	15.0	58.0	134	17.0	44.4	68.0	12.0	42.6	72.0	22.0	49.0	83.0	21.0	43.0	69.0
Mar-11	29.0	39.6	56.0	40.0	44.0	50.0	28.0	34.0	40.0	31.0	47.8	66.0	31.0	46.6	60.0
Apr-11	12.0	29.2	52.0	20.0	37.0	58.0	12.0	26.6	50.0	12.0	36.6	79.0	13.0	42.6	92.0
May-11	46.0	36.5	53.0	53.0	37.0	54.0	46.0	21.2	46.0	39.0	22.2	39.0	36.0	19.4	36.0
Jun-11	6.0	12.0	22.0	7.0	12.0	15.0	2.0	9.6	18.0	6.0	13.8	31.0	5.0	11.2	23.0
Annual Mean	36.9			35.9			28.8			37.2			30.2		
HIGH	6.0			7.0			2.0			6.0			5.0		
LOW	134.0			94.0			90.0			199.0			92.0		

Table 22 - Mangoola PM10 results - Wybong Post Office Road

Month	PM_{10} (µg/m^3)		
	Low	Mean	High
Jul-10	3.0	8.2	17.0
Aug-10	7.0	15.8	19.0
Sep-10	5.0	16.4	29.0
Oct-10	5.0	13.0	20.0
Nov-10	2.0	8.0	16.0
Dec-10	6.0	12.4	20.0
Jan-11	12.0	24.6	35.0
Feb-11	10.0	24.6	38.0
Mar-11	16.0	21.6	34.0
Apr-11	6.0	18.2	38.0
May-11	13.0	9.4	17.0
Jun-11	3.0	6.2	10.0
AVERAGE	**14.9**		
HIGHEST	**38.0**		
LOWEST	**2.0**		

As shown in **Table 21** and **Table 22**, 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 development consent and EPL criteria.

Mangoola Coal's HVAS TSP monitor at Coolabah Road did not work on two occasions (8 May 2011 and 1 June 2011) during the reporting period. On the first occasion the power was checked, found to be OK and the unit reset. In the second instance, there was no power, but the unit was faulty and was changed out. In response to this, Mangoola has advised monitoring contractors to take more care, and to check when programming for the next sample event.

During the reporting period, two of the Mangoola Coal TEOM units (SX86D1 - Ridgelands Road, and SX86D3 – Wybong PO Rd) operated for some time with faulty temperature control devices. These devices assist in controlling the air sample inlet stream to minimise condensation and so impaction upon the air mass determination. The instruments were operating slightly below the designed temperature for minimising the amount of moisture that might become entrained in the sample air, thus influencing the mass. The service provider has provided written advice to confirm that the dust concentration accuracies were maintained during this period. Replacement interface PCB's were purchased and installed on 14 June for SX86D3 and 21 June for SX86D1. This issue is now checked in the regular scheduled services.

The details of these events were reported to the OEH in Mangoola's 2010-11 EPL Annual Return.

There were 11 complaints received during the reporting period relating to dust, as well as an additional complaint specifically regarding dust as a result of blasting. Further detail on the Mangoola Coal complaints procedure is provided in **Section 4**.

3.3.4 Further Improvements

As described above Mangoola operates a dust monitoring network with the aim of monitoring dust deposition level at respective receivers to ensure that approval criteria are not exceeded. A number of measures are currently implemented that will continue to be used and expanded as applicable; and additional measures will be introduced. This includes RT8 dust suppression trials, which will be undertaken on the workshop unsealed hardstand area (an area of 22,500m^2).

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 to be 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 1 and Volume 2E Mines and Quarries (DECC, 2008). Recommendations from the *Draft Guidelines for Establishing Stable Drainage Lines on Rehabilitated Minesites* (DLWC 1999) will also be implemented.

Where possible, runoff from the undisturbed catchment has been diverted around the construction activities 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

as required, is undertaken 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. During the reporting period this monitoring was undertaken by Hunter Land Management. The outcomes are reported in the "*Annual Mangoola Channel Stability Report (Year 3)* (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 2 of the AMCSR. Channel cross-sections were also taken at representative points within each identified reach to analyse the shape of the channel bed.

3.4.2 Environmental Performance

In June 2011 Mangoola engaged GSS Environmental to undertake an Erosion and Sediment Control Audit to assess the existing controls across the Mangoola site against statutory and industry standard requirements. The audit included an assessment of key water storage and sediment dam capacities against the risk they pose for uncontrolled discharges into downstream waterways. A targeted visual assessment of the site was undertaken to identify risk areas, especially at the potential for polluting downstream waterways. The key actions that came out of the audit were:

- Undertake minor earthworks to re-instate failed drainage structures around the Northern Pit and implement new controls where required;
- Update / revise the site water balance to determine the required freeboard which must be maintained within the Pit Water Dam to provide storage for stormwater runoff;
- Implement an intensive revegetation program for all disturbed areas outside of the operational disturbance footprint around the Northern Pit to reduce the potential for offsite discharge of dirty water;
- Undertake the recommended reshaping and revegetation works detailed within the GSSE work plans for the Borrow Pit, MIA area and the 66KV service road in order to reduce the amount of dirty water runoff generated onsite;
- Undertake / implement the ESC rectification works detailed within the SCS site inspection reports; and
- Where the proposed works are not undertaken immediately, temporary sediment controls should be installed at sites with high potential for offsite discharge. These will require ongoing maintenance to ensure they remain effective.

Mangoola has commenced work on addressing these issues, and will report on the outcomes in the following AEMR.

The Ephemeral Stream Assessment Overview conducted during the reporting period (undertaken as part of the AMCSR) found that the majority of reaches assessed in all three stream systems were relatively stable and non-active. This can be seen when the scores remains above the 20 point mark from the Activity Rating table in Section 2 of the AMSCR.

There were some sections within some of the stream reaches that were Active or Very Active in terms of erosion. Active erosion as evident in 2009 and seen below in Anvil Creek is still a major issue. This erosion is a result of the combination of erodible channel wall materials and scouring of the outside bend of the channel.

The erosion evident in Reach 1 of Anvil Creek has been removed due to the creek being consumed by the Pit Water Dam and CHPP facilities construction.

Generally there were very little observed changes at any of the assessment points, which have only seen minor variations in the score for that location. This also indicates that there has been little change in channel stability over the last 12 months.

All sediment and erosion control works completed during the reporting period were undertaken in accordance with the Mangoola Coal Erosion and Sediment Control Plan.

3.4.3 Reportable Incidents

On 3rd December 2010, rainfall exceeding the design capacity of several sediment dams caused them to overflow and leave the site at several locations. The incident was self-reported.

In response to this, Mangoola installed additional dewatering pipes and pumps, installed all weather access to all dams which can discharge offsite, decommissioned sediment dams within the rail loop, and has continued weekly monitoring as per requirements. A full internal investigation of the incident was also conducted.

As a result of the investigation, a number of actions were recommended in relation to erosion and sediment control, as follows:

1. Development of a Trigger Action Response Plan (TARP);

2. Implementing a continuous monitoring system; and

3. Reviewing the GDP design to accommodate the design, construction and operation of sediment dams in time as part of overall mine development program.

As a result of the recommended action number 2 in the list above, Mangoola is currently obtaining quotes for automatic, continuous water level measuring units with the information to be connected via a SCADA system to a central monitor in a control room. A more robust inspection system is also in place with permanent pumps and pipelines now installed at all dams. Some pumps have permanent flow meters, while others have hour meters, which are read weekly. The dams are interconnected allowing transfer of water between dams to mitigate against overflowing. All weather access to pumps has also been installed to facilitate general access, maintenance, refuelling and flocculating of the water as required.

Additionally Mangoola plans to undertake revegetation outside mine activity boundary, conduct flocculation trials, investigate which ameliorants to add in the revegetation process to address the potentially dispersive soils, review dam sampling methodologies and monitoring points, and place freeboard markers and name/identify all dams and ensure there is an adequate dewatering system across the site. Mangoola will also conduct a Risk Assessment in relation to water management

aspects on site to identify all appropriate controls, and have them developed and implemented. The outcomes of these actions will be reported on in the next AEMR.

3.4.4 Further Improvements

In July 2011 Mangoola developed the 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. This procedure will be implemented and reported on in the next AEMR period.

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 Landcom's "Soils and Construction - Managing Urban Stormwater" (Blue Book Volume 1 and 2E) 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.

Mangoola will also continue to progress implementation of the actions arising from the discharge incident in December 2010, as discussed above in **Section 3.4.3**.

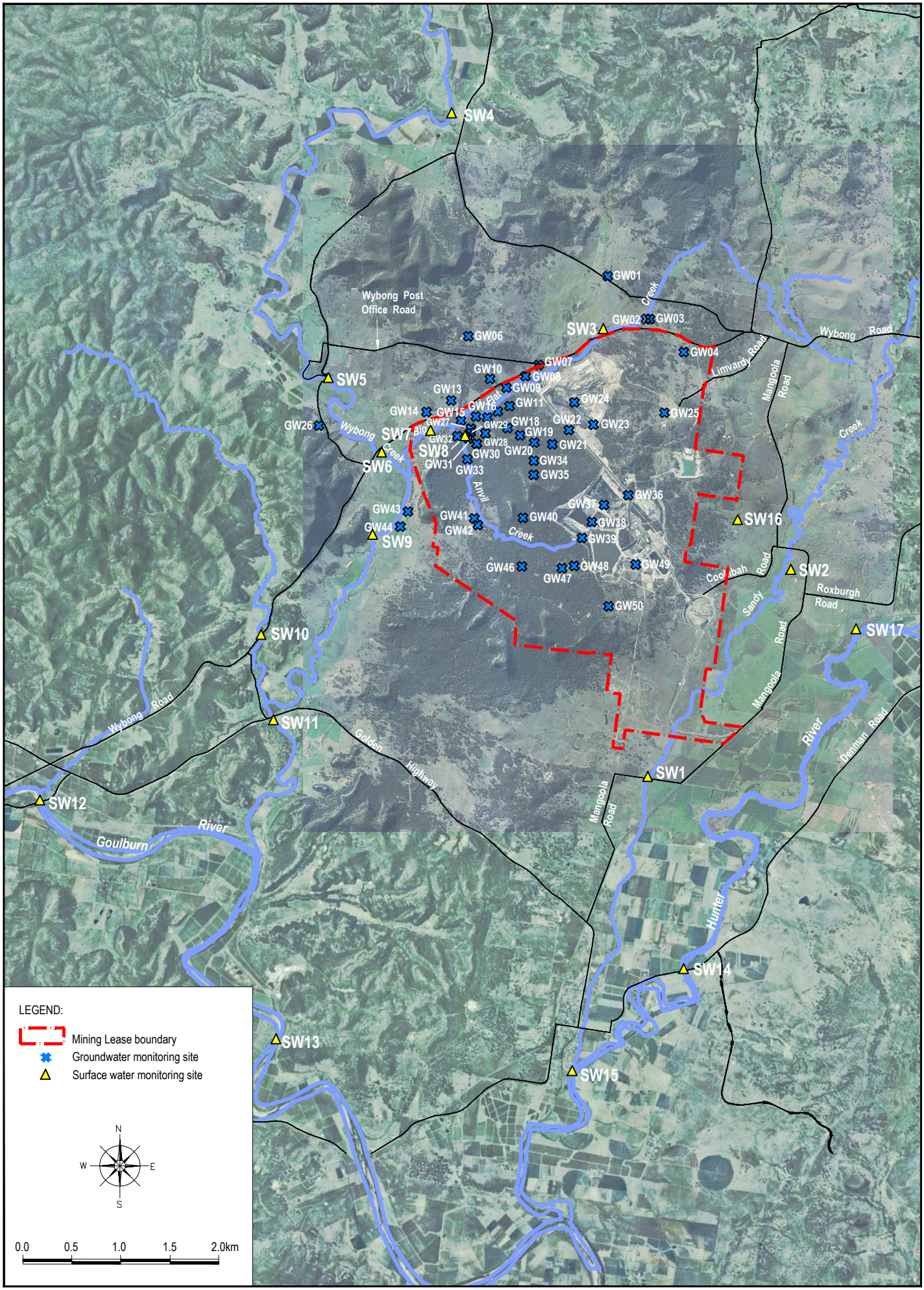
3.5 Surface Water Management

3.5.1 Environmental Management

Background surface water quality continued to be monitored 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 by Carbon Based Environmental Pty Ltd 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).

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 and Groundwater Monitoring Locations

FIGURE 7

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

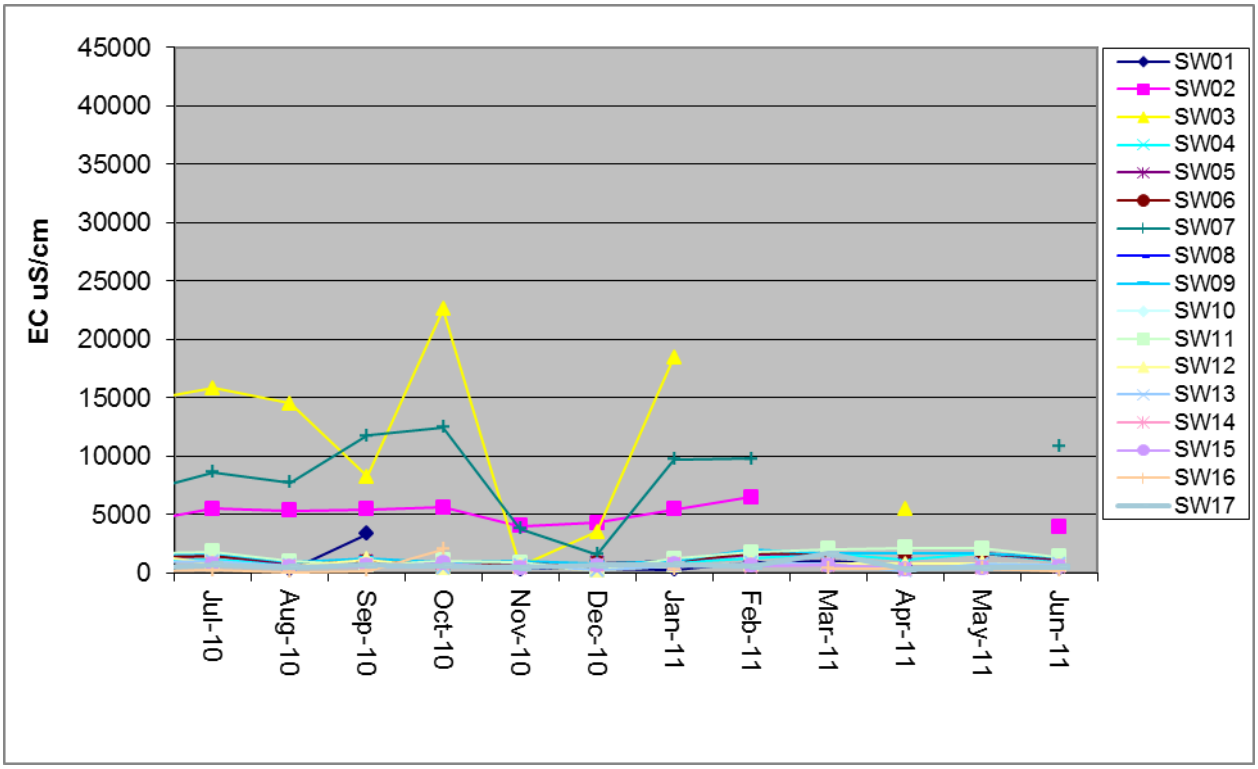


Figure 9 - pH results at Mangoola Coal Surface Water monitoring stations during the reporting period

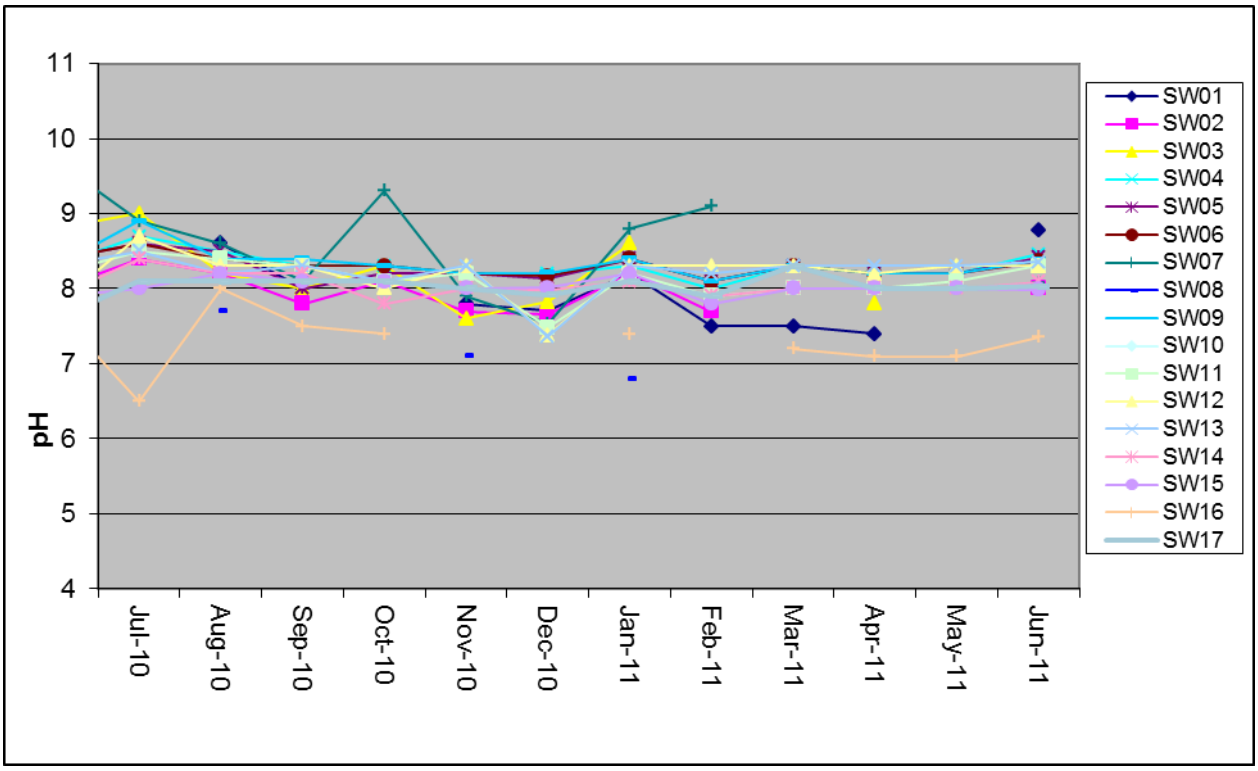


Figure 10 - TSS results for Mangoola Coal Surface Water Monitoring Stations during the reporting period

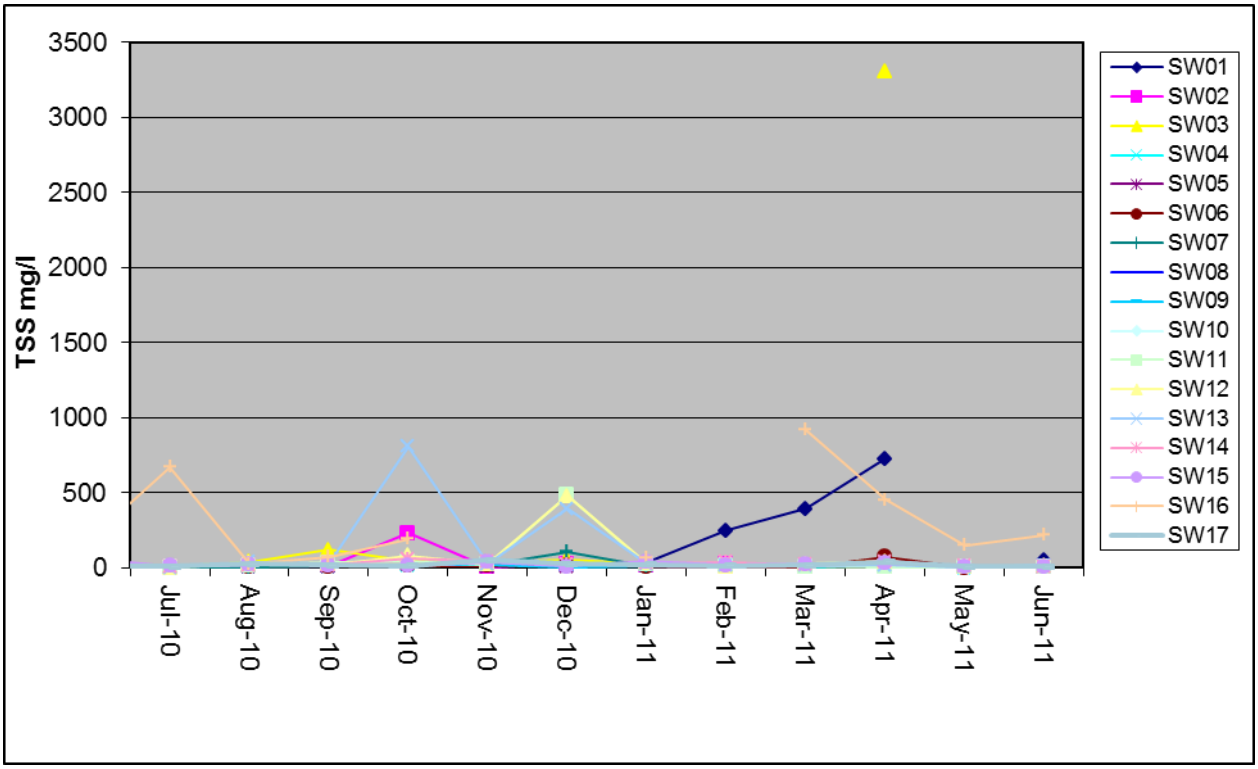
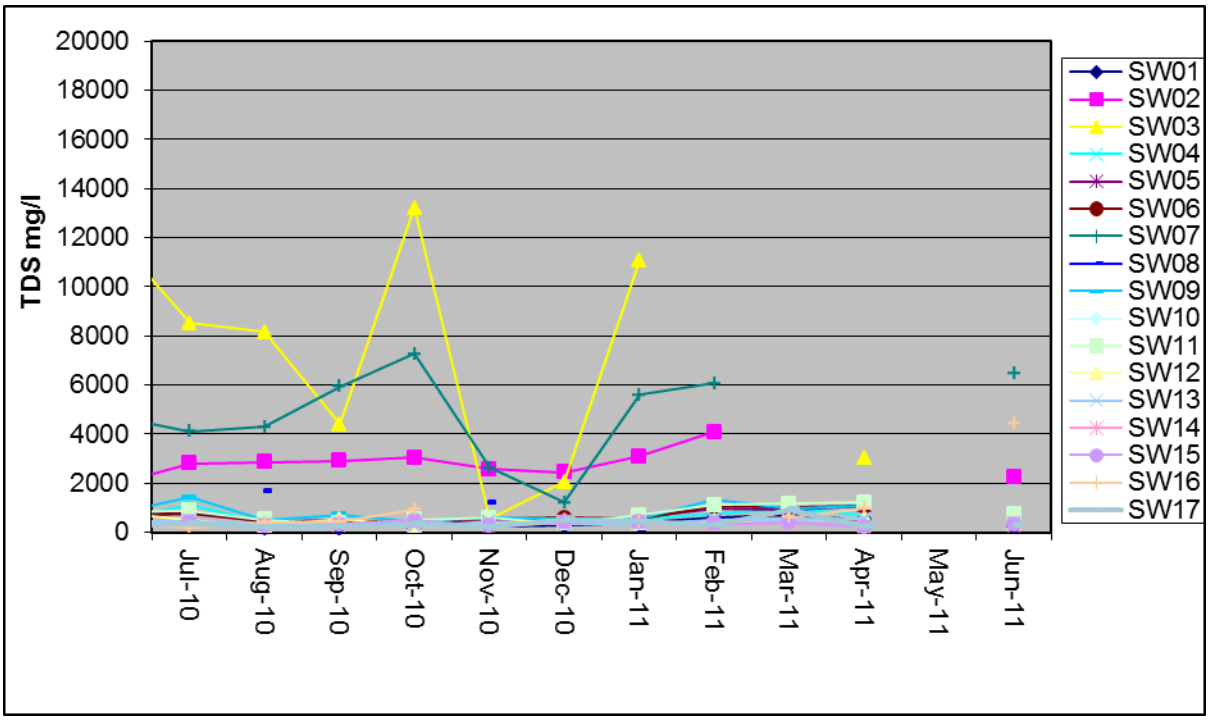


Figure 11 - TDS results for Mangoola Coal Surface Water Monitoring Stations during the reporting period



As can be seen from **Figure 8**, EC results at 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.

Monitoring site SW03 is located upstream of the Mangoola ML 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 ML boundary, is downstream of SW03.

Monitoring point SW03 had a maximum recorded EC of 22,600µS/cm during the reporting period. This is within the historical range at this point, which is between 96-50,500µS/cm. Similarly SW07 had a maximum recorded EC of 12,500µS/cm during the reporting period, within the historical range of 144-48,500µS/cm.

TSS was elevated at SW03 in April 2011 with a reading of 3,310mg/L of TSS. However the Mangoola Surface Water Monitoring Plan states that historically the TSS levels at SW03 ranged between 2-8,800mg/L, and as such the TSS level recorded during the monitoring period was within this range. TSS was also elevated periodically at SW16 with a maximum value of 920mg/L. The Mangoola Surface Water Monitoring Plan states that historically the TSS levels at this monitoring location ranged between 12-4,615mg/L. Therefore the TSS levels recorded during the monitoring period are also within this range.

Water pH levels were slightly alkaline across the site averaging a pH of 8, which is consistent with background pH levels.

With regard to TDS elevated levels were recorded at SW03, with a maximum recorded TDS level of 13,200mg/L, again within the historical range of between 260-31,700mg/L. Similarly, SW07 had a maximum recorded TDS of 7,260mg/L, within the historical range of 200-40,300mg/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 SW4 / SW5 / SW6 / SW9 / SW11 /SW12 / SW13 / SW14 / SW15 / SW17;
- SW1 had no flow for the entire reporting period, and was dry in July, October and May;
- SW2 was flowing for three months of the reporting period, had no flow for six months, and was dry between March and May;
- SW3 was dry for three months of the reporting period in February March and May, and flowing in August, September and April;
- SW7 was only flowing for September and November, and was dry for March, April and May;
- SW8 was dry for nine months of the reporting period and not flowing for the remaining three months;
- SW10 was always dry; and
- SW 16 is a dam which is part of Sandy Creek.

3.5.3 Reportable Incidents

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

One complaint was received during the reporting period relating to water. Further detail on the Mangoola Coal complaints procedure is provided in **Section 4**.

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.

In an effort to reduce the TSS levels recorded at surface water monitoring point SW16, stock have recently been excluded from near this monitoring point, with the areas of erosion managed as part of the overall land management plan for the site. The outcomes of this will be reported on in the following AEMR period.

3.6 Groundwater Management

3.6.1 Environmental Management

Mangoola continued to monitor background groundwater quality on site and in the surrounds during the reporting period. Groundwater monitoring locations are shown on **Figure 7** 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) by Carbon Based Environmental Pty Ltd. 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 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 Dr Colin Mackie, who has modelled the groundwater regime throughout the area. All holes will contain piezometers. In the period from late May 2011 to the end of June, three holes were drilled. The remaining holes will be drilled and reported on in the next AEMR period.

In September 2010 Mangoola undertook a comprehensive analysis of 8 representative boreholes, which were selected by Mangoola as being GW07-D, GW18, GW25, GW36, GW44, GW46, GW49 and GW50. The results of this analysis are included in **Table 23**. It is noted that GW25 and GW49 were blocked and GW50 had too little water to collect a sample at the time of the analysis. It is also noted that of these original eight holes, only three are now viable, these being GW07 (alluvials), GW18 (Fassifern) and GW46 (alluvials). In future monitoring periods these 'barren' holes will be replaced by the following holes: GW04 (coal measures), GW14 (Fassifern), GW33 (deep alluvium), GW34 (Fassifern) and GW02 (coal measures).

Table 23 – Representative Borehole Analysis

	GW07-D	GW18	GW36	GW44	GW46
pH	7.93	6.64	6.14	6.81	6.97
EC (µS/cm)	9630	48	8180	8000	8230
TDS (mg/L)	5180	24	4610	4640	4960
Alkalinity (mg/L)	614	10	170	659	918
Silicon (mg/L)	8.97	1.18	13.4	11.2	8.75
Sulfate (mg/L)	92	<1	534	252	90
Chloride (mg/L)	2950	6	2660	2360	2320
Calcium (mg/L)	39	4	264	174	107
Magnesium (mg/L)	171	<1	277	260	448
Sodium (mg/L)	1640	3	1020	1130	894
Potassium (mg/L)	33	1	43	26	48
Aluminium (mg/L)	<0.01	0.06	0.02	<0.01	<0.01
Arsenic (mg/L)	<0.001	<0.001	<0.001	0.004	<0.001
Barium (mg/L)	0.311	0.003	0.091	0.086	0.331
Lithium (mg/L)	0.006	<0.001	0.156	0.092	0.136
Manganese (mg/L)	0.004	0.02	2.67	0.126	0.796
Rubidium (mg/L)	0.007	0.001	0.044	0.062	0.058
Selenium (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium (mg/L)	2.78	0.025	2.48	4.62	2.98
Zinc (mg/L)	0.005	0.018	0.03	0.008	0.009
Boron (mg/L)	0.24	<0.05	0.41	0.1	0.07
Iron (mg/L)	<0.05	0.06	28.2	1.16	10.5
Total P (mg/L)	<0.01	0.13	0.52	0.09	0.18
Ionic Balance (%)	4.93	No Data	4.81	3.15	1.99

3.6.2 Environmental Performance

Appendix G presents the results of background groundwater monitoring undertaken during the reporting period. The pH and EC (µS/cm) levels for the bores in each aquifer are presented in **Table 24.**

Table 24 - Groundwater Monitoring Data

Bore ID	**EC (µS/cm)**			**pH**		
	Min	**Max**	**Annual Mean**	**Min**	**Max**	**Annual Mean**
GW01	No Data					
GW02	13430	14040	13655	6.9	8.9	8.0
GW03-S	Dry					

Bore ID	EC (µS/cm)			pH		
	Min	Max	Annual Mean	Min	Max	Annual Mean
GW03-D	27000	28300	27350	6.1	7.3	6.7
GW04	7340	7770	7590	6.2	7.1	6.8
GW06	156	176	162.825	7.1	8.3	7.5
GW07-S	15960	20010	18305	6.4	7.4	6.8
GW07-D	8330	19440	13720	6.3	8.1	7.1
GW08	No Data					
GW09	1223	8440	5343.25	6.8	7.8	7.4
GW10-A1	Blocked					
GW10-A2	617	804	722.5	6.4	8.0	7.2
GW10-P1	7560	10520	8590	6.8	7.7	7.2
GW10-P2	7090	7360	7272.5	6.5	7.8	7.2
GW11	12660	13160	12885	6.2	7.2	6.6
GW12	13190	13950	13665	6.6	7.2	6.9
GW13	187.3	321	258.075	7.5	9.1	8.2
GW14	2438	2740	2629.5	6.2	8.0	7.5
GW15	10370	11040	10792.5	6.2	7.1	6.7
GW16	19920	20770	20300	6.0	7.1	6.6
GW17	2780	18060	8902.5	6.5	7.6	6.9
GW18	109	109	109	5.8	8.2	7.0
GW19	6710	7430	7017.5	5.8	6.9	6.3
GW20	5120	5470	5277.5	5.8	7.1	6.4
GW22	1924	4490	3103.5	6.4	7.5	6.8
GW23	5660	5790	5720	5.4	7.4	6.5
GW25	Excavated by Mining					
GW26	2227	2284	2260	6.4	7.5	6.9
GW27	12890	17500	14387.5	6.0	7.3	6.8
GW28	10710	11190	11037.5	6.1	6.8	6.5
GW29	27700	30000	29275	4.5	7.1	6.3
GW30	10890	11830	11417.5	6.0	7.6	6.9
GW31	19970	21330	20807.5	4.7	7.0	6.0
GW32	22930	24700	24105	5.1	7.1	6.4
GW33	14010	15130	14492.5	5.4	7.0	6.4
GW34	2219	2284	2236.5	6.5	7.3	7.0
GW35	1535	2570	1991	6.9	7.6	7.2
GW36	6860	6860	6860	6.2	6.2	6.2

Bore ID	EC (µS/cm)			pH		
	Min	Max	Annual Mean	Min	Max	Annual Mean
GW37	Excavated by Mining					
GW38-S	Excavated by Mining					
GW38-D	Excavated by Mining					
GW39	Excavated by Mining					
GW40	3880	4060	3987.5	6.3	7.2	6.8
GW41	17890	22650	19240	6.2	7.4	6.7
GW43	303	415	359	6.6	7.0	6.8
GW44	7460	7570	7515	5.1	6.8	5.9
GW46	7070	7640	7412.5	6.1	7.2	6.8
GW47	5210	12510	7407.5	6.3	7.2	6.7
GW48	3440	12010	7902.5	6.1	7.2	6.7
GW49	Excavated by Mining					
GW50	Too low to sample					
McInerney - Piezo shallow	No Data					
McInerney - Piezo deep	No Data					
Ranch Spring	No Data					
Black Jack pond	No Data					
Jennarr well	1675	2062	1842.75	6.5	7.2	6.9

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 30,000µS/cm. This was an exceptional result however and is reflective of the stratum draining through this bore site.

Acidity levels are between 4.5 and 9.1 for all sites. These levels are consistent with the background variability of groundwater pH across the groundwater monitoring network.

3.6.3 Reportable Incidents

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

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.

A further nine holes have been drilled to complete this phase of the Mangoola Groundwater Drilling Program following the end of the 2010-11 reporting period. All holes have been geophysically logged and nine of the total twelve holes contain two or three piezometers each. One hole is to be fitted with vibrating wire piezometers, while 2 shallow holes were grouted (after being logged), after intersecting saline water which flowed from the holes into the drill sumps, and was pumped out for removal to the tailings dam. Data loggers are yet to be installed to any hole in this series.

The Groundwater Drilling Program is summarised in **Table 25**.

Table 25 - Mangoola Groundwater Drilling Program Summary

Drill Hole No.	Depth (m)	Piezometers Installed	Borehole Licence No.	Notes
MP2	70	2	20BL171862	Drilled in 2010-11 reporting period
MP10	70	1	20BL171860	Drilled in 2010-11 reporting period
MP1	70	1	20BL171861	Drilled in 2010-11 reporting period
MP3	70	1	20BL172568	Drilled after the 2010-11 reporting period
MP11	50	2	20BL172573	Drilled after the 2010-11 reporting period
MP6	80	2	20BL171865	Drilled after the 2010-11 reporting period
VW3	130	-	20BL171866	Drilled after the 2010-11 reporting period –fully cored
MP13	70	3	20BL171868	Drilled after the 2010-11 reporting period
MP14	70	3	20BL171864	Drilled after the 2010-11 reporting period
MP12	70	3	20BL171859	Drilled after the 2010-11 reporting period
MP17	50	fully grouted	20BL171789	Drilled after the 2010-11 reporting period
MP8	50	fully grouted	20BL171867	Drilled after the 2010-11 reporting period

In addition, a second suite of holes is planned to be drilled to delineate the Big Flat Creek alluvial limits. There will be three transects and each is planned to contain about nine shallow holes between 3-10m, totalling 27 holes. Licences have been obtained for all of these transect holes, and this will be reported on in the following AEMR period.

As well as the transect holes, five other piezometer holes are planned to be drilled along Big Flat Creek; all are inside Conservation Offset Areas and will require further archaeological and ecological assessment before permission can be obtained to drill them. These last six holes will all be between 50m and 70m deep.

3.7 Contaminated Polluted Land

Beyond the 14 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

Construction Pre Clearing

Construction 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 26** 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 construction activities. Pre clearing procedures used at Mangoola are summarised in **Table 26.**

Table 26 - 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 06-014 requires the development and implementation of a Rehabilitation and Offset Management Plan (ROMP). The ROMP was submitted during the reporting period in March 2011. 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. In addition, targeted monitoring was undertaken during summer 2010-2011 to

provide additional summer specific background ecological data for the reporting period. 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*" (Eastcoast Flora Survey, 2011). This requires detailed knowledge about the grasslands, and as such, a grassland classification and mapping project was instigated in 2009 at Mangoola over 250 ha. The project continued in this reporting period in Spring 2010 across a further 430 ha. This represented the first stage of the grassland study, which ultimately aims to describe and map the various grassland communities that occur across Mangoola, and to inform rehabilitation planning for the site. Results of this initial stage of survey are presented below in **Section 3.8.2**.

The University of Newcastle's Centre for Sustainable Ecosystem Restoration (CSER) undertook the Mangoola Ecological Restoration and Reconstruction Research Program (MERRRP) during the reporting period. The MERRRP is an integrated program for the adaptive management and reconstruction of ecosystem communities, and incorporates three main research studies: Reconstruction Soil Function, Reconstruction and Linking Ecological Communities and Enhancing Fauna Habitat. 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.

Orchids

Two threatened terrestrial orchids are present on lands at Mangoola, *Diuris tricolor* and *Prasophyllum* sp aff *petilum* (Wybong). Targeted surveys for these species began in 2009, and continued in this reporting period. 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.

In addition to monitoring, a strategy for the translocation of those individual orchids which will be lost due to land clearing was developed during the reporting period by Eastcoast Flora Survey (2010).

3.8.2 Environmental Performance

Construction Pre Clearing

Approximately 287.34 ha of vegetation were cleared during the reporting period to allow for construction works to proceed. Data directly related to the clearing conducted at Mangoola during the reporting period in relation to fauna is outlined in **Table 27.**

Table 27 - Clearing Results during Reporting Period

	Description	Number of hollows	% of total
Number of Hollows Cleared	Very Small – Small <50mm	403	31%
	Medium 51mm – 100mm	528	41%
	Large 101mm – 300mm	281	22%
	Very Large <301mm	79	6%
Total		**1,291**	**100%**
Number of hollows reinstated/nest boxes installed	95		

	Description	Number of hollows	% of total
Fauna			
Number of fauna deaths related to clearing	6		
Number of fauna that escaped during clearing	44		
Number of fauna that were relocated during clearing	99		

As can be seen from **Table 27,** 72% of the tree hollows removed were classed as being medium or small-to very small. Despite 1,291 hollows being removed as part of pre clearing works, only six fauna deaths were identified as a result of the tree removal.

Nest box installation

One of the key commitments in the EA for the site was that there would be no net loss of hollows within the EA study area as a result of construction and operation of the Mangoola mine. In order to address this issue, 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. The first round of nest box installation was undertaken during the reporting period, and will continue in future reporting periods.

A total of 95 nest boxes were installed during the first round of this program, which took place across eight months from October 2010 to July 2011, and as illustrated in **Plate 6**. The nest boxes were all installed by appropriately trained staff, and the condition and content of these boxes will be monitored biennially 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.



Plate 6 – Nest box installation at Mangoola

Grassland Survey and Classification

As discussed above, survey and classification of grasslands continued in the reporting period, totalling approximately 680 ha of the Mangoola property to date. The survey revealed 16 definable floristic groups (14 communities and two sub-communities), of varying condition. Seven of these can be considered primarily of exotic origin, while the remaining nine are predominantly native. All grasslands present have been impacted upon and shaped by past agricultural activities. The overall condition of the grasslands within the area investigated ranged from very poor to good. (Eastcoast Flora Survey, 2011).

It is noted that to date no research has been undertaken on the conservation significance of grasslands in the Hunter Valley. This study therefore represents the first attempt at a numerically-based grassland classification in the Hunter Valley.

Ten grassland communities are currently listed as threatened within the relevant state and federal legislation, however only two of these potentially include the grasslands at Mangoola (*Native Vegetation on Cracking Clay Soils of the Liverpool Plains* (TSC Act), and *White Box - Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (EPBC Act)). Confirmation of either of these threatened communities at Mangoola requires further investigation. The classification and mapping project will continue in 2011/2012 and results will be reported in the following AEMR.

Pilot Translocation of Threatened Terrestrial Orchids

In March 2010, Mangoola undertook a pilot translocation of *Diuris tricolor* and *Prasophyllum* sp aff *petilum* (Wybong). Six *Prasophyllum* and one *Diuris* were extracted and relocated a short distance away from their original location. The pilot translocation site was inspected on 24 September 2010, where it was found to be supporting nine *Prasophyllum*, however no *Diuris* was observed. The increase in the number of *Prasophyllum* was thought to be due to the presence of non-flowering tubers within the topsoil which, after translocation proceeded to flower. No explanation for the absence of *Diuris* could be provided. A number of recommendations were made as part of the translocation strategy to help ensure success of the translocation program.

Monitoring of orchids and implementation of the translocation strategy will continue in the next reporting period in an effort to maintain genetic diversity within populations of the two orchid species.

ROMP and Annual Ecological Monitoring

Flora Monitoring

As part of the ROMP, a total of 39 flora monitoring sites are located in a variety of landscape management units and are sampled seasonally across the site. In June/July 2010 Mangoola completed the Winter 2010 Ecological Monitoring Project, in which nine flora monitoring plots were sampled. Since the last monitoring of these sites in 2009, one flora monitoring site (RTW-WIN-03) no longer exists due to clearing of vegetation associated with mine infrastructure development, while monitoring site RTW-WIN-05 has been reduced in size and exists as a small remnant due to earthworks associated with construction of the rail loop.

A total of 138 plant species were recorded in the nine flora monitoring plots, 23 species fewer than sampling undertaken in Winter 2009. Such a reduction in species diversity may be expected in grassy woodlands and grasslands from season to season, but is also likely to be have been influenced by the loss of one monitoring site, and the disturbance suffered at another. The threatened grass *Bothriochloa biloba*, previously not recorded within the Winter monitoring plots, was located at two locations, in monitoring plots RTW-WIN-05 (Retained woodland) and RGG-WIN-06 (Regenerating grassland). *Acacia pendula* (part of Endangered Population, Endangered Ecological Community, and

Threatened Ecological Community) remains within flora monitoring plot RTW-WIN-05 and is vigorously suckering from underground root stock.

In addition to the scheduled seasonal survey as described above, additional summer surveys were undertaken to target species diversity specific to the summer months and provide increased background data on summer species. During the summer 2010-11 ecological monitoring project, seven flora monitoring surveys were sampled.

A total of 128 plant species were recorded in the seven flora monitoring plots. One threatened plant species (Bothriochloa biloba) was recorded within monitoring plot RGG-SUM-22, and the Hunter Valley Footslopes Slaty Gum Woodland Endangered Ecological Community was recorded at RTW-SUM-24.

Fauna Monitoring

As part of the winter 2010 Ecological Monitoring Project, Mangoola also undertook fauna monitoring across the site. Three fauna monitoring sites were sampled from a total of 11 fauna monitoring sites, which are located in a variety of landscape management units.

Bird species diversity was higher in winter 2010 at all three monitoring sites compared to the 2007 and 2008 monitoring years, with a total of 65 bird species recorded in the winter 2010 survey by census counts and opportunistic observations. A total of 11 native and one introduced mammal species were recorded in the winter 2010 survey. Only one small mammal species was captured; the Yellow-footed Antechinus. Three arboreal mammal species were recorded, including the threatened Squirrel Glider. No trapping for micro-bats was undertaken due to the risk of mortality associated with the very cold nocturnal temperatures experienced. However, Anabat recordings revealed very low bat activity due to the cold temperatures, with only 13 passes recorded for the equivalent of nine whole of night recording duration.

Reptile species diversity was very low for the winter 2010 survey, with only one species recorded. Reptile activity was also strongly influenced by the very cold temperatures experienced. No larger reptiles such as elapid snakes (Eastern Brown Snake, Red-bellied Black Snake) or Lace Monitor were observed to be active. Frog species diversity was also relatively low due to colder conditions experienced during fieldwork.

The un-named land snail mollusc *Meridolum* “Denman / Castle Rock” or *Meridolum* “Anvil Hill” was recorded at two fauna monitoring sites (FA1, FA2) in 2010, and was also recorded at these two sites in 2007. No evidence of the snail was found in 2009 at the three monitoring sites.

As described above additional summer surveys were also undertaken to target species diversity specific to the summer months and provide increased background data on summer species. Two fauna monitoring surveys were sampled during the summer 2010-11 ecological monitoring project.

A total of 35 birds, 17 native and two introduced mammals, four reptiles and one frog species were recorded during the summer 2010-11 monitoring survey.

Table 28 provides a comparison summary of fauna species recorded between monitoring years at the two locations sampled during the summer surveys.

Table 28 - Number of Species

Number of Species						
Fauna Group	**Site FA7**			**Site FA8**		
	2008-09	**2009-10**	**2010-2011**	**2008-09**	**2009-10**	**2010-2011**
Birds	13	26	22	15	26	23
Small Mammals	1*	1	1*	1 + 2*	0	1*
Large Mammals	2	2	2	3	4	4
Bats (Captures)	7	3	3	7	8	11
Bats (Echolocation)	8	67	289	6	8	280
Bats (Total Diversity)	10	9	10	9	11	10
Arboreal Mammals	2	0	0	1	2	1
Reptiles	3	4	2	2	4	4
Amphibians	4	4	1	0	0	0
Mollusc	0	0	2 Shells	0	2 Shells	2 Shells
Threatened Species						
Little Lorikeet	0	+	+	0	0	0
Glossy Black Cockatoo	0	0	0	0	0	0
Brown Treecreeper	+	+	+	+	0	+
Speckled Warbler	+	0	+	+	+	+
Squirrel Glider	0	0	0	0	+	0
Yellow Bellied Sheathtail bat	0	0	0			+
Eastern Bent-wing Bat	+	+	+	+	+	+
Greater Broad-nosed bat	0	0	0	0	+	+
Large-eared Pied bat	+	0	+	+	0	0
Eastern Cave Bat	+	0	0	+	0	0

*Note numbers with * indicate introduced species*

Bird species diversity recorded in the summer 2010-11 period was comparable to previous years. Several seasonal migratory species such as Sacred Kingfisher, Dollarbird and Common Koel were still resident within the Mangoola disturbance area during the 2010-11 survey.

The diversity of small mammals in this survey is lower than previous years, with no captures of native species. The combination of trapping and echolocation call recordings resulted in detection of 12 microchiropteran bat species.

Reptile species diversity was low in summer 2010-11, despite optimal weather conditions and presence of suitable habitat. For example, larger elapid snakes such as the Eastern Brown Snake and Red-bellied Black Snake were not observed during systematic searches. Frog species diversity was also low due to drier conditions experienced during fieldwork.

The un-named mollusc *Meridolum* "Denman / Castle Rock" or *Meridolum* "Anvil Hill" was recorded at both monitoring sites. Two discarded shell fragments were located beneath dead ironbark ground log and decorticated bark. The previous extensive activities of timber collection in this area has resulted in very high density of ground logs and felled timber, which appear to provide sheltering microhabitat for the land snail. No evidence of active individuals was observed, probably due to the dry conditions experienced during fieldwork. The use of felled timber in mined rehabilitation areas should assist in provision of habitat for this species.

Land Management Plan

Mangoola Coal engaged Hunter Land Management to conduct an assessment of newly acquired landholdings in February 2011. This involved site inspections and surveys of the identified 29 new properties, looking at a number of aspects including the condition of the following; fence lines, tracks, gates, dams, erosion, feral animal signs and sites, salinity, infrastructure, bushfire management and weed infestations.

3.8.3 Reportable Incidents

No reportable incidents regarding flora and fauna occurred during the reporting period.

3.8.4 Further Improvements

The ROMP was submitted (March 2011) and implemented during the reporting period. This plan will continue to be implemented during following reporting periods, providing a means of monitoring and managing the ongoing rehabilitation of disturbed areas as well as those areas set aside for offset purposes. The ROMP provides a holistic means of ensuring that the ecology of the site is maintained in accordance with the Mangoola approval and EMS requirements. The ROMP will continue to be strengthened by the inclusion of the data collected through this and following reporting periods which will provide a clearer indication of the ecology of the site, the impacts of mining/clearing activities and the works needed to maintain the diversity of the site over the long term.

The second round of Mangoola's nest box installation program commenced in July 2011, and will be reported on in the 2011-12 AEMR.

The grasslands survey and classification mapping project, as well as monitoring of orchids and implementation of the translocation strategy, will continue in 2011/2012, with results to be reported in the next AEMR.

A number of studies as part of the MERRRP have been recommended for implementation in 2011-2012, and these include understanding the life cycle components of orchids which are under threat as a result of the orchids being disturbed, seed viability and its ability to disperse, the presence of fungus needed for germination, soil remediation experiments, continuation of grid sampling, and investigating suitable trans-locational sites.

3.9 Weed and Pest Management

3.9.1 Environmental Management

Weed Management

Mangoola currently manages weeds through the implementation of the Mangoola Weed Action Plan and the ROMP, which respond to the assessed weed levels within the mine area and all Mangoola owned land which are recorded as part of the ongoing ecological monitoring program described in **Section 3.8**.

Commitments made in the Anvil Hill EA and relevant legislation requires the control of weeds at Mangoola. A Weed Action Plan for 2010 and 2011 was developed by Hunter Land Management (HLM). These Action Plans describe the results of weed management works undertaken in 2009 and 2010 respectively, and present the planned weed control works for the coming period. The primary targets in 2010 included the control of African Boxthorn, Blackberry and St Johns Wort infestations. Other weeds targeted included Green Cestrum and Mother of Millions. The focus of the 2011 Weed Action Plan remained on the species targeted in 2010, with a combination of follow up works, as well as new weed control areas. Xstrata Mangoola acquired more land during 2010, and these new areas were included in weed control works. In addition, the 2011 Weed Action Plan cover areas identified by the Upper Hunter Weeds Authority during inspections conducted in the reporting period.

There were no deviations from the planned weed control activities described in the current Weed Action Plan during the reporting period. The weed control activities undertaken at Mangoola during the reporting period are summarised in **Table 29.**

. **Feral Animal Management**

Feral animal management at Mangoola was undertaken during the reporting period in accordance with the Mangoola Vertebrate Pest Action Plan (HLM, 2010), 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 31.**

Monitoring was undertaken in the form of sand pad monitoring and determining abundance ratings, following the methods of Catling and Burt (1994). The abundance scoring data can be used to determine the effectiveness of existing feral animal control programs and assist in planning for future feral animal control works to be undertaken in accordance with the identified need. The result of the abundance scoring is provided in **Table 32.**

3.9.2 Environmental Performance

Weed Management

During the reporting period HLM were contracted 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 29**. Maps indicating weed control efforts during the reporting period are shown in **Appendix H**

Table 29 - Weed Control during Reporting Period

Date	Species Targeted	Weed Control Activities
Jul 2010	Green Cestrum (*Cestrum parqui*) Mother of Millions (*Bryophyllum delagoense*)	Cut and Paint Foliar Spray
Aug 2010	Green Cestrum (*Cestrum parqui*)	Cut and Paint
Sept 2010	African Boxthorn (*Lycium ferocissimum*) Environmental Weeds – Main Access Road Weed Control	Foliar Spray Foliar Spray
Oct 2010	African Boxthorn (*Lycium ferocissimum*) Tiger Pear (*Opuntia aurantiaca*)	Foliar Spray Foliar Spray
Nov 2010	Environmental Weeds – Main Access Road Weed Control	Foliar Spray
Dec 2010	*No species targeted*	Weed Surveys
Jan 2011	*No species targeted*	Weed Surveys
Feb 2011	*No species targeted*	Weed Surveys
Mar 2011	*No species targeted*	Weed Surveys
Apr 2011	Blackberry (*Rubus fruticosus*)	Foliar Spray
May 2011	Blackberry (*Rubus fruticosus*)	Foliar Spray
June 2011	Mother of Millions (*Bryophyllum delagoense*)	Foliar Spray (when flowering)

A weed inspection was conducted by HLM in January 2011 to assess the results of the weed control activities primarily targeting the five species described above in **Section 3.9.1** undertaken in 2010. The results of this survey is summarised below in **Table 30.**

Table 30 – Results of noxious weed control activities

Species targets	Classification	Results
African Boxthorn (*Lycium ferocissimum*)	Noxious Class 4	95% kill rate. Most plants which had been foliar sprayed illustrated signs of distress, death and overall severe damage to the whole plant.
Blackberry (*Rubus fruticosus*)	Noxious Class 4	90-95% of all Blackberry plants on site had been sprayed and killed. Some plants showed signs of regeneration, and follow up treatment program therefore identified in the 2011 Action Plan.
Mother of Millions (*Bryophyllum delagoense*)	Noxious Class 3	Infestation effectively controlled in areas that had been foliar sprayed, however new plants continue to establish from the huge seed bank in the soil.
Green Cestrum (*Cestrum parqui*)	Noxious Class 3	Infestation effectively controlled in areas that had been treated (using cut and paint techniques), however new plants continue to establish from the seed bank in the soil.

Species targets	Classification	Results
St Johns Wort *(Hypercium perforatum)*	Noxious Class 4	Not identified in survey conducted in last reporting period and hence was not planned for control. However, control works undertaken immediately once identified on site adjacent to the Northern Access Road. Effective control achieved by foliar spraying. 95% kill rate.

Feral and Pest Animal Management

Feral animal control activities were conducted across the site during the reporting period, in Winter 2010 and Autumn 2011. Activities involved the use of 1080 baits to target wild dogs and foxes, as described in **Table 31** in both control programs. Baiting methods conducted align with the Code of Practice and Safety Operations Procedures – Ground Baiting of Wild Dogs and Foxes with 1080 (NSW DPI).

Table 31 - Feral Animal Control during Reporting Period

Date	Feral Animal Control Activities	Conducted By
24/08/2010-07/09/2010	32 1080 Bait Stations set up, three with motion sensor cameras. Checked on four occasions over two weeks. One bait taken by a dog.	HLM
10/05/2011-12/05/2011	Sandpad monitoring. 20 sandpads laid to calculate species abundance, densities and movements.	HLM
19/05/2011-27/05/2011	32 1080 Bait Stations set up, one with a motion sensor camera. Checked on four occasions over two weeks. 32 baits taken, resulting in an overall uptake percentage of 22%. Conducted in conjunction with LHPA and HLM aerial baiting.	HLM
18/05/2011-27/05/2011	Nine soft jaw leg hold traps set up. One fox caught.	HLM

As evident in **Table 31**, there was a much improved uptake of baits by the intended targets in the Autumn 2011 program compared with Winter 2010. Fresh meat baits were used in Autumn 2011, instead of manufactured 1080 baits explaining the increase in uptake.

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. , In addition to baiting and soft jaw trapping, sand pad monitoring was also used to calculate species abundance, densities and movements of vertebrates to assist in planning feral animal control activities.

Abundance scoring of the sand plot records is presented in **Table 32.**

Table 32 - Abundance Scoring

Abundance Scoring – 20 locations across site		
Date of Monitoring: 10/05/2011-12/05/2011		
Target Species	**% Plot nights**	**Autumn 2011**
Wild Dog	8.33	Low
Fox	30	Medium
Kangaroo	68.33	High

Abundance Scoring – 20 locations across site		
Rabbit	1.66	Scarce
Cat	11.66	Medium
Wombat	5	Low

The abundance scoring results indicate that:

- Kangaroos are in high abundance across the site;
- Cats and foxes are in medium abundance across the site; and
- Wild dogs, rabbits and wombats are either scarce and/or of low 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

After a site inspection in 2011 of the areas controlled in 2010, and the investigation of other areas to identify new infestations, the following target species were found to warrant further control during the remainder of 2011:

- **African Boxthorn -** Foliar spray of African Boxthorn will continue to be a priority in 2011 in areas treated in previous years, particularly those areas treated in 2010. Control of weeds will continue from boundaries fence lines and roadsides for continued pressure and containment within the significant areas. This will decrease the spread of the noxious weed and make easier to control over several management programs.

- **Blackberry -** Follow up foliar spray will be conducted throughout the areas treated in 2010 to continue pressure on dense bushes still showing signs of growth. Control the now exposed centres of the bushes to stop growth and development. Vines and small developing Blackberry plants not controlled in 2010 program and as identified in the 2011 map will be spot sprayed.

- **Green Cestrum -** Control Green Cestrum, which is located on the Hunter River within the lands owned by Xstrata Mangoola. Start with follow up control of 2010 treated areas, working downstream. This will enable efficient and effective treatment bearing instant results. Control is to be a combination of foliar spraying and cut and paint, dependant on proximity to water.

- **Northern Access Roads (NAR) – Environmental Weeds -** Foliar spray annual weeds along the verge of the main access road will be undertaken. Controlling these weeds at the early stage of development will stop further spread into the native vegetation within the Mangoola area.

- **Mother of Millions -** Mother of Millions will be targeted in the same areas as previously sprayed in 2010. Foliar spray all re-establishing plants around the treated area to maintain control of species in the affected areas as identified in the 2008 survey and 2010 inspection. Spraying will take place just on flowering. A newly identified infestation at Bells Lane is also to be treated.

- **St Johns Wort -** St Johns Wort is found in a few locations. The area treated adjacent to the main entrance will require ongoing treatment in 2011. Another area has been identified along Hidden Valley Right of Way and is to be controlled as well.

Following the undertaking of these works, further review of the current state of weed infestations will be undertaken during the subsequent weeds survey planned for late 2011-early 2012. Following this, the 2012 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. Given the high abundance of kangaroos, culling will remain an ongoing feature of the animal control program. The addition of a cat trapping component to the program is also warranted given the abundance recorded in the Sandpad monitoring program. The soft jaw leg-hold trapping program will also continue, with traps to be placed in areas of high activity as well as in areas observed with bait disturbance to ensure higher chances of trap visits and possible capture and control. The use of motion cameras at baiting stations will also allow the observation of animal's interaction and behaviour towards the baits and attractants.

3.10 Blasting and Vibration

3.10.1 Environmental Management

Blasting at Mangoola is undertaken in accordance with the development consent conditions and the EPL, and monitored in accordance with the Blast Monitoring Program (BMP), which was re-submitted during the reporting period. 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 provided a 1800 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 stations 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 ten monitoring locations during the reporting period; with six locations being permanent and four being temporary. The six permanent monitoring locations are as follows:

- The Withers residence;
- The Phelps residence (also known as Wybong P.O);
- The Tailings Pit Rock Shelter;
- The North Pit Rock Shelter;
- 'The Book' Rock Formation, and
- Castle Hill Slab Hut.

The four temporary blast monitoring locations during the reporting period were:

- The nearest Transgrid Pylon (in proximity to the blast location);
- Dam wall (North abutment);
- Dam wall (top of wall), and
- Dam wall (bottom of wall).

The locations of these monitors are shown in **Figure 12** 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 (Phelps and Withers), the nearest Transgrid Tower (to the blast), as well as sensitive heritage items 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

Blasting monitoring commenced at seven new monitoring locations during the reporting period, as listed below:

- Blast monitoring at The Book commenced on 19 September 2010.
- Blast monitoring at the Tailings Pit Rock Shelter commenced on 23 November 2010
- Blast monitoring at the Phelps residence commenced on 2 March 2011.
- Blast monitoring at the North Pit Rock Shelter commenced on 4 March 2011.
- Blast monitoring at all three Dam locations commenced on 1 October 2010.

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 were implemented with regard to the management of minor blasting required for construction works during the construction 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 10 blast events per month with all blasts taking place between the hours of 9:02am and 2:55pm. 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 119 blast events occurred during the reporting period.

Schedule 3, Condition 12 of the Project Approval, as well as condition L7.1 of EPL 12894, provide the criteria for allowable blast overpressures as measured at any privately owned residence. These are detailed in **Table 33.**

Table 33 - 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

Blast overpressure results at all monitoring locations for the reporting period is included as **Appendix J**, with the results recorded at the nearest privately owned residence summarised in **Table 34** below.

Table 34 - Blast Overpressure summary table

Location	Minimum Overpressure (dBL)	Average Overpressure (dBL)	Maximum Overpressure (dBL)
Withers Residence	83.86	94.85	111.53
Phelps Residence	83.09	98.08	115.78

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 one occasion (115.78dBL) at the Phelps Residence on 26 May 2011, however this equated to 0.84% of the total number of blasts within the 12 month period, well within the 5% limit.

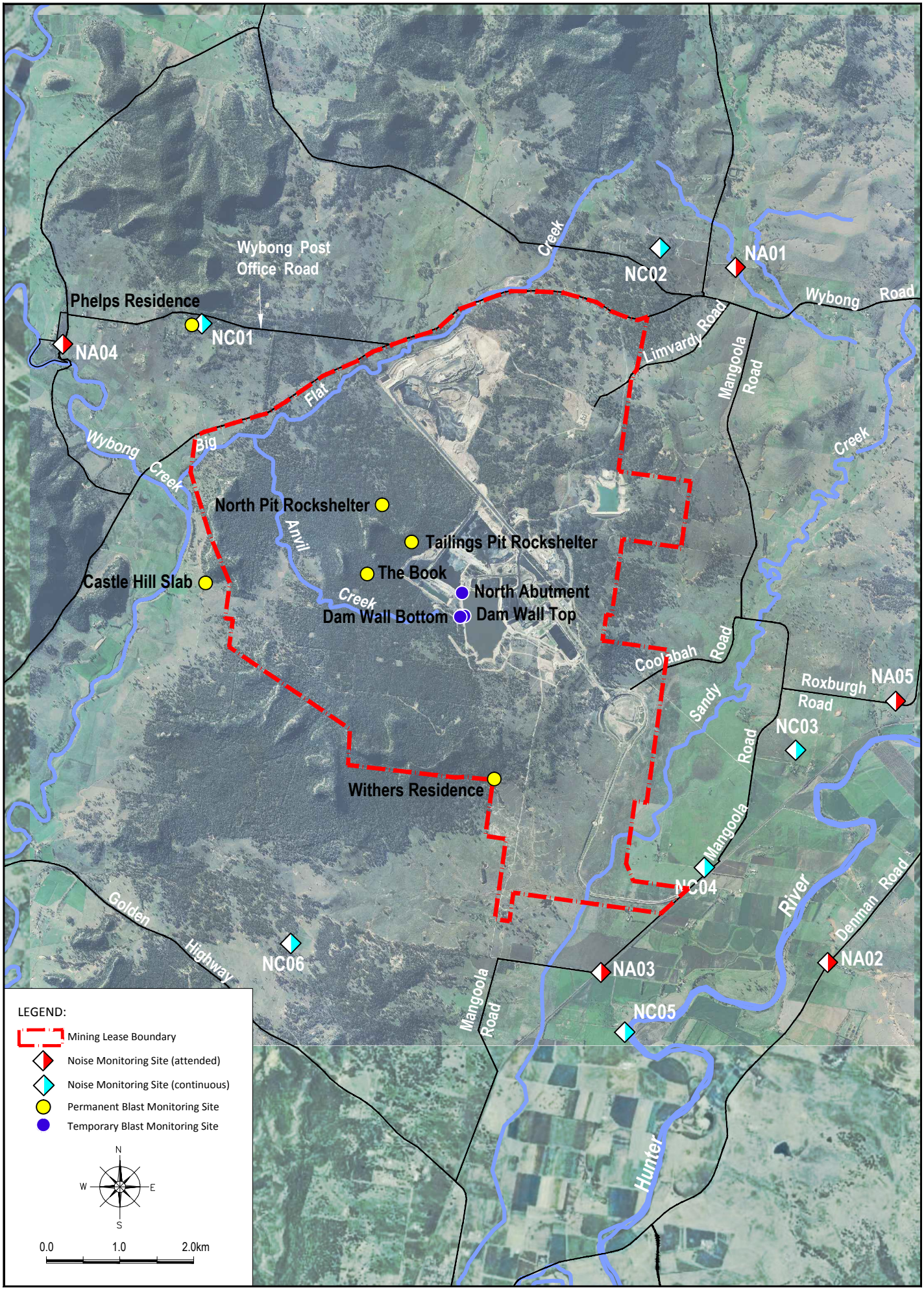
Blast Vibration

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 L7.2 of EPL 12894, and are presented in **Table 35.**

Table 35 - 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	0%
Aboriginal Rock Shelters	40 (Interim)	0%
Anvil Rock and “The Book” Rock Formation	40 (Interim)	0%

Ground vibration monitoring data for the reporting period is included as **Appendix J**, and is summarised in **Table 36** below.



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Noise and Blast Monitoring Locations

FIGURE 12

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Table 36 - Blast Vibration Summary Table

Location	Minimum vibration (mm/s)	Average vibration (mm/s)	Maximum vibration (mm/s)	Exceedences (Y/N)?
Withers Residence	0.01	0.13	0.58	N
Phelps Residence	0.01	0.06	0.20	N
Castle Hill	0.01	0.10	0.26	N
Nearest Transgrid Pylon Footing	0.11	18.42	108	Y
Tailings Pit Rock Shelter	0.14	1.11	5.97	N
North Pit Rock Shelter	0.01	0.65	1.83	N
The Book	0.01	0.44	2.35	N

There were no exceedences of blast vibration criteria at residences on privately owned land, Castle Hill, Aboriginal rock shelters, or The Book rock formation.

Rock shelter Monitoring and Anvil Hill Rock Structures

Baseline recording of the 16 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. The initial monitoring provided the baseline study for subsequent monitoring of the rock shelters. Mangoola has commissioned Terrock as its qualified, independent geotechnical consultant. Two Umwelt Archaeologists, Terrock's Principal Engineer, and a minimum of two Aboriginal stakeholder group representatives went to each rock shelter for baseline recording.

Terrock undertook all baseline recording works including:

- a detailed baseline monitoring program of the eighteen rock structures and formations;
- assessment of geotechnical issues, stability and possible failure mechanisms;
- establishment of permanent monitoring targets to enable future assessment of movement, stability and physical deterioration; and
- development of a risk assessment matrix to assist in development of a vibration management plan.

Further inspections of the rock shelters have been conducted as part of Terrock's installation of monitoring targets in each rock shelter during the reporting period during August 2010 and June 2011. These inspections involved updating field records with the condition of each shelter and structure. Terrock plan to utilise this information in conjunction with 12 months of operational blasting results (September 2011) to determine appropriate criteria. This will be reported on further during the next AEMR period.

3.10.3 Reportable Incidents

19 reportable incidents regarding blasting and vibration occurred during the reporting period, all involving ground vibration level of the 500kV powerlines

Mangoola 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. Mangoola has self-imposed a rule to model all blasts in this area not to exceed 60mm/sec.

On 19 occasions the blast criteria exceeded the 50mm/s limit for the Transmission Line Pylons. 14 occurred at Transgrid Pylon No.2 footing, three were at Transgrid Pylon No.3 footing, one at Transgrid Pylon No.1 footing, and one 'adjacent to TPL'. Two of the 19 results greater than 50mm/sec exceeded 100mm/sec (18 and 25 February 2011). A warning letter dated 9 March 2011 was received from DP&I for the two 100mm/sec exceedences, however no further action was taken.

Seven complaints relating to blasting, and one specifically relating to dust from blasting, were received during the reporting period. Details of these complaints, and the outcome of investigations of the blasts in question, are discussed in **Section 3.22**.

3.10.4 Further Improvements

The continued implementation of the BMP and the controls put in place by those documents will continue to ensure that blasting only occurs within the allowable criteria.

In response to the abovementioned letter from DP&I, Mangoola will adhere to the agreed procedures and recommendations in the findings of the incident report. Mangoola will also undertake a Non Destructive Testing (NDT) assessment of the Transgrid towers and footings after blasting has been completed in this area. Should a third exceedance occur Mangoola will undertake additional NDT, with blasting suspended until the condition of the footings can be confirmed.

Mangoola plans to investigate installing structural measures to stabilise the Anvil Hill rock structures. This issue is scheduled to be discussed with the registered Aboriginal Stakeholders in the second half of 2011 and reported on in the 2011-12 AEMR 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 12**, and are detailed in the table below.

Table 37 – Attended Noise Monitoring Locations

Monitoring Location ID	Description / Area	Easting (MGA)	Northing (MGA)	Nearest Residence	Monitoring Location Justification
NA01	Mangoola Rd	286575	6428570	162	Nearest private residence for construction and early works.
NA02	Denman Rd	287839	6419134	192	Nearest private residence on western side of the Hunter River.
NA03	Corner of Mangoola Rd and Bells Lane	284744	6418993	184	Nearest private residence to rail loop.
NA04	Yarraman Rd	277445	6427539	130 / 45B / 81	Nearest private residence outside acquisition zone.
NA05	Corner of Mangoola Road and Roxburgh Rd	288746	6422673	125C	Nearest private residence to the south-east.

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* (former Environment Protection Authority, 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 12**, and described in **Table 38.**

Table 38 – Unattended Noise Monitoring Locations

Monitoring Location ID	Description / Area	Easting (MGA)	Northing (MGA)	Nearest Residence	Monitoring Location Justification
NC01	275 Wybong Post Office Rd	279343	6427782	75A / 162 / 10	Nearest private residence.
NC02	96 Ridgelands Rd	285558	6428828	125	Nearest private residence to the north-east.
NC03	830 Mangoola Rd	287390	6422027	29	Reference site to monitor noise from the operation.
NC04	699 Mangoola Rd	286149	6420429	184 / 186	Nearest private residence to the rail loop.
NC05	22 Bells Lane	285067	6418186	177	Nearest private residence to the south.
NC06	Bells Lane West (Nipol Property)	280540	6419386	81	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.

Unattended monitoring took place at 11 residences during the reporting period, specifically, Feb-June 2011. Representative sampling of all the data for all the residences showed there were no exceedences of noise limits during valid meteorological 15 minute periods. In general, the noise levels attributable as 'mining' noises were at 30dB (L) or less, and commonly inaudible or a low continuum. Isolated levels ranged between 31-35dB (L).Specific periods of concern to residents were analysed in detail and all found to be compliant with operating noise limits.

Attended environmental noise monitoring was undertaken on a quarterly basis over the reporting period by Global Acoustics. Monitoring was undertaken in July and October 2010, and February and May 2011, 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 39.**

Table 39 – Attended Noise Monitoring Results

Location	Start Date And Time	LA_1 dB	LA_{10} dB	LA_{eq} dB	LA_{90} dB
MEASURED NOISE LEVELS - 27 JULY 2010 (Q3)					
A1 – Mangoola Rd	27/07/2010 9:24	52	37	53	27
A2 – Denman Rd	27/07/2010 7:52	83	74	71	37
A3 – Bells Lane	27/07/2010 8:25	45	38	37	35
A4 – Yarraman Rd	27/07/2010 9:57	50	39	41	29
A5 – Roxburgh Rd	27/07/2010 8:54	58	48	52	33
MEASURED NOISE LEVELS - 14 OCTOBER 2010 (Q4)					
A1 – Mangoola Rd	14/10/2010 7:52	45	39	37	28
A2 – Denman Rd	14/10/2010 9:17	79	59	63	33
A3 – Bells Lane	14/10/2010 8:46	42	39	37	34
A4 – Yarraman Rd	14/10/2010 7:21	45	39	37	30
A5 – Roxburgh Rd	14/10/2010 8:20	48	42	40	32
MEASURED NOISE LEVELS - 24-25 January 2011 (Q1)					
A1 – Mangoola Rd	25/01/2011 8:24	59	57	54	47
A2 – Denman Rd	25/01/2011 9:49	78	67	65	40
A3 – Bells Lane	25/01/2011 9:19	65	64	62	59
A4 – Yarraman Rd	25/01/2011 7:54	54	52	51	49
A5 – Roxburgh Rd	25/01/2011 8:50	46	39	38	35
A1 – Mangoola Rd	24/01/2011 20:26	59	49	46	34
A2 – Denman Rd	24/01/2011 21:47	70	54	56	38
A3 – Bells Lane	24/01/2011 21:16	65	64	62	58
A4 – Yarraman Rd	24/01/2011 19:56	53	51	49	40
A5 – Roxburgh Rd	24/01/2011 20:52	44	42	41	39
A1 – Mangoola Rd	25/01/2011 1:40	42	41	39	37
A2 – Denman Rd	25/01/2011 3:07	55	39	42	34
A3 – Bells Lane	25/01/2011 2:36	52	51	50	49
A4 – Yarraman Rd	25/01/2011 1:10	41	40	39	36
A5 – Roxburgh Rd	25/01/2011 2:07	48	46	44	40
MEASURED NOISE LEVELS - 19-21 April 2011 (Q2)					
A1 – Mangoola Rd	20/04/2011 8:04	46	38	36	32
A2 – Denman Rd	20/04/2011 9:57	79	67	66	35
A3 – Bells Lane	20/04/2011 9:14	42	35	33	29
A4 – Yarraman Rd	20/04/2011 7:00	50	43	40	31
A5 – Roxburgh Rd	20/04/2011 8:43	53	46	42	32
A1 – Mangoola Rd	19/04/2011 20:36	39	31	31	28
A2 – Denman Rd	21/04/2011 21:04	57	49	46	30
A3 – Bells Lane	19/04/2011 21:36	81	72	67	40

Location	Start Date And Time	LA_1 dB	LA_{10} dB	LA_{eq} dB	LA_{90} dB
A4 – Yarraman Rd	19/04/2011 20:03	33	31	29	28
A5 – Roxburgh Rd	19/04/2011 21:08	41	39	37	35
A1 – Mangoola Rd	20/04/2011 1:58	29	28	27	26
A2 – Denman Rd	19/04/2011 23:01	32	30	29	28
A3 – Bells Lane	19/04/2011 23:49	35	33	32	30
A4 – Yarraman Rd	20/04/2011 1:27	34	33	31	30
A5 – Roxburgh Rd	20/04/2011 2:31	37	36	34	33

Appendix I presents all noise monitoring results for the reporting period, including the yearly monitoring report completed by Global Acoustics.

In a letter dated 17 June 2011, Mangoola received notice from the DP&I regarding night time work on the maximum overburden elevation which occurred on 13 June 2011. The Department identified a potential non-compliance with Schedule 2, Condition 2, of the Mangoola Project Approval PA 06_0014, and Conditions 6.4.6 and 6.13.11 of the accompanying Statement of Commitments. These conditions relate to restricting work at night to lower levels on the overburden dumps to reduce potential truck noise impacts and potential direct lighting effects. The DP&I reviewed the available information and deemed no further action was necessary.

In response to this letter, Mangoola's planning processes have been improved to ensure appropriate night time dumps are available for use, even in wet weather, to prevent a reoccurrence.

3.11.3 Reportable Incidents

No reportable incidents regarding noise occurred during the reporting period.

A number of noise related complaints were received during the reporting period, and these 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 the 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. During the construction phase, which largely took place during the reporting period, a number of visual impact mitigation measures were incorporated as follows:

- Site infrastructures have been located in the less visually prominent sites within the proposed disturbance area. This includes locating the CHPP and site facilities within a naturally formed valley largely screened by surrounding property; and

- Appropriate colourings on all buildings and infrastructure have been used to reduce the prominence of these features in the landscape.

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. The 2010 AEMR inspection conducted by the DP&I noted that some plantings for this vegetation screen have died and require planting and maintenance, and subsequently requested that the dead trees be replaced. This vegetation screen has also been raised by members CCC during meetings in the reporting period. Maintenance activities including weed control and slashing have been carried out during the reporting period. In addition, replanting works are planned for 2011 as well as subsequent watering activities and further maintenance activities throughout the next reporting period. This project is ongoing, and under the control of HLM.

Also as per the Statement of Commitments (6.13.1), Mangoola planted a vegetation screen extending from Limb of Addy Hill. Maintenance activities including watering have been carried out in the reporting period and maintenance activities will continue where necessary.

A vegetation screen was also provided along the noise wall at the rail loop during the reporting period to screen the noise wall with vegetation. Maintenance activities including watering have been carried out in the reporting period and maintenance activities will continue where necessary.

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 37 stakeholders entitled to visual mitigation on 15 October 2008, 5 August 2010 and 4 July 2011 to advise them of their rights.

As discussed above in **Section 3.11.2**, in a letter dated 17 June 2011, Mangoola received notice from the DP&I regarding night time work on the maximum overburden elevation which occurred on 13 June 2011. The Department identified a potential non-compliance with Schedule 2, Condition2, of Mangoola Project Approval PA 06_0014, and Conditions 6.4.6 and 6.13.11 of the accompanying Statement of Commitments. These conditions relate to restricting work at night to lower levels on the overburden dumps to reduce potential truck noise impacts and potential direct lighting effects. The DP&I reviewed the available information and deemed no further action was necessary.

In response to this letter, Mangoola's planning processes have been improved to ensure night time dumps are available for use, even in wet weather, to prevent a reoccurrence.

3.12.3 Reportable Incidents

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

One complaint relating to visual amenity and nine relating to lighting at the site were received during the reporting period. These complaints, as well as the resulting outcome of investigations, are discussed further in **Section 4.1**.

3.12.4 Further Improvements

As discussed above in **Section 3.12.2**, works will continue in the next reporting period on the visual impact assessment and implementation of mitigation measures on identified properties, to meet the requirements of Schedule 3 Conditions 53-55 of the Project Approval. Outcomes of this process will be reported in the next AEMR.

In addition, 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 1 as extending from approval to Year 1 Mining, with Stage 2 continuing to Year 5 Mining. This AEMR relates to activities undertaken in both Stage 1 and Stage 2. Other activities relating to Aboriginal cultural heritage activities that may not be addressed in the ACHMP periodically arise and are undertaken in accordance with relevant legislation, guidelines and requirements.

Based on current information, there are 359 Aboriginal archaeological sites located within or adjacent to the Mangoola approval area. These sites are mainly artefact scatters or isolated finds but also include rock shelters (18 of which are associated with the Mangoola approval area), scarred trees (three of which are associated with the Mangoola approval area), sites with potential archaeological deposit (three of which are associated with the Mangoola approval area), a burial (located to the south of the Mangoola approval area) and a carved tree (located to the north of the Mangoola approval area). A relatively high proportion of these sites are located within identified Aboriginal Cultural Heritage Offset Areas (ACHOAs) within the Mangoola approval area which are set aside for long-term security, in accordance with Condition 40 of the project approval. All 18 rock shelter sites are located within ACHOAs. 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 GDP process, as described in **Table 18**.

Mangoola recognises the obligations of Aboriginal people to take an active role in the management of their 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 including a DVD presentation developed in partnership with Aboriginal party representatives.

Relevant Aboriginal Parties

The relevant Aboriginal parties consulted in relation to the management of Aboriginal cultural heritage at Mangoola are listed in **Table 40.**

Table 40 - 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
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

Reference	Name of Group	Date Registered for Mangoola Coal Project
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

Stakeholder Meetings

In accordance with the ACHMP, Mangoola organised two Aboriginal stakeholder meetings within the reporting period. These were held on 28 October 2010 and 3 March 2011 and were attended by representatives of the relevant Aboriginal parties (refer to **Table 41**). In accordance with the intent of the ACHMP, these meetings provided a forum to discuss a range of matters relating to management of Aboriginal cultural heritage and presented 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 minutes from these meetings were sent to those Aboriginal parties who did not have a representative attend on the meeting day. Copies of all presentations, minutes, and actions arising from the meetings are available upon request to all Aboriginal parties.

Table 41 - Aboriginal party attendance at 6 monthly meetings

Date	Meeting and Date	Attendance
28/10/10	Fifth six-monthly meeting	Hunter Valley Cultural Consultants
		Carrawonga Consultants
		Mingga Consultants
		Upper Hunter Heritage Consultants
		Hunter Valley Aboriginal Corporation
		Muswellbrook Cultural Consultants
		Hunter Valley Cultural Surveying
		Wanaruah Local Aboriginal Land Council
		Giwiirr Consultants
		Wonnarua Culture Heritage
		Valley Culture
		Cacatua Culture Consultants
		Bullen Bullen Heritage Consultants
		Ungooroo Cultural and Community Services
		Ungooroo Aboriginal Corporation
		Kayaway Eco Cultural and Heritage Services
		Hunter Traditional Owner Environmental Management Services

Date	Meeting and Date	Attendance
		Culturally Aware
		Wonnarua Nation
		Upper Hunter Wonnarua Council
		Yinnar Cultural Services
		Aboriginal Native Title Consultants
		Hunter Valley Aboriginal Corporation
		Yinnar Cultural Services
		Wanaruah Local Aboriginal Land Council
03/03/11	Sixth six-monthly meeting	Hunter Valley Aboriginal Corporation
		Yinnar Cultural Services
		Wanaruah Local Aboriginal Land Council
		Cacatua Culture Consultants
		Wonn1 Contracting
		Yarrawalk
		Hunter Traditional Owner Environmental Management Services
		Bullen Bullen Heritage Consultants
		Giwiirr Consultants
		Mingga Consultants
		Carrawonga Consultants
		Aboriginal Native Title Consultants
		Upper Hunter Heritage Consultants
		Hunter Valley Cultural Consultants
		Wonnarua Culture Heritage
		Kayaway Eco Cultural and Heritage Services
		Wattaka Wonnarua CC Services
		Valley Culture
		Muswellbrook Cultural Consultants
		Hunter Valley Cultural Surveying

3.13.2 Environmental Performance

During the reporting period, activities relating to Aboriginal cultural heritage consisted of:

- Due diligence inspection associated with the approved 66kV transmission line from Denman to Mangoola;
- Management of an incident involving harm to two recorded Aboriginal archaeological sites (BFC74 and BFC87);

- Due diligence inspection of a proposed tree screen, Western Rocks to Wallaby Rocks;
- Identification of an additional scarred tree (SC-ST-03) and a review of management of this tree and a previously salvaged scarred tree (SC-ST-01);
- Monitoring of the 18 identified rock shelters located within the ACHOAs;
- Due diligence inspections for alterations to electricity infrastructure associated with the rail loop and raw water dam; and
- Inspection and demarcation of proposed revegetation areas within the Big Flat Creek ACHOA and monitoring of condition of sites within this area.

Each is discussed further below.

Due diligence inspections associated with the 66kV transmission Line, Denman to Mangoola

Energy Australia in association with Mangoola was granted approval to construct a 66 kV transmission line between Denman and Mangoola. The 66kV transmission line was the subject of a Review of Environmental Factors (REF), which included an Aboriginal heritage component that recommended the salvage of some sites and the protection of others prior to the commencement of construction works.

Aboriginal Heritage Impact Permit (AHIP) #3220 was issued to Mangoola Coal for these works and they were completed in accordance with the conditions of the AHIP during the last reporting period.

Following the completion of the AHIP#3220 salvage program, contractors responsible for the construction of the 66kV transmission line identified additional vehicle access requirements within an area of archaeological sensitivity (Area 1) and associated with sites SC47, SC48 and SC49. A due diligence inspection was conducted with Aboriginal stakeholder representatives (refer to **Table 29**). During the inspection additional vehicle access areas were demarcated and it was ensured that they did not contain surface artefacts. Two additional loci of site SC49 (containing six and three artefacts respectively) were identified outside the area of the proposed access corridor. Recommendations were also made to ensure there was no sub-surface impacts associated with additional vehicle movements within Area 1, SC47, SC48 and SC49. In addition, the Aboriginal party representatives recommended that the opportunity should be granted for a representative to be present during tree felling within SC47. Aboriginal stakeholder (Allen Paget) was present during tree clearance.

It was also subsequently identified that an additional heavy vehicle access route outside the approved 66kV easement was required. The proposed additional heavy vehicle access route was subject to a due diligence inspection on 27 August 2010. This inspection was completed in consultation with the Aboriginal stakeholders listed in **Table 42**. During the inspection, one new site (SC71) was identified and a suitable heavy vehicle access route was demarcated to ensure that this route did not contain any surface artefacts. An area of moderate archaeological potential was identified and recommendations were also made to ensure there were no sub-surface impacts associated with vehicle movements within this area.

Table 42 - Aboriginal party representatives participating in due diligence inspections

Date	Task	Name	Organisation
23/07/10	Inspection and demarcation of additional vehicle access	Luke Hickey	Hunter Valley Cultural Surveying
		George Sampson	Cacatua Cultural Consultants
		Allan Paget	Ungooroo Aboriginal Corporation
24/07/10	Monitoring of tree felling and removal	Allan Paget	Ungooroo Aboriginal Corporation
27/08/10	Inspection of additional heavy vehicle access route	Georgina Berry	Upper Hunter Wonnarua Council
		Luke Hickey	Hunter Valley Cultural Surveying
		Katrina Cavanagh	Kayaway Eco-Cultural and Heritage Services
		Wayne French	Yarrawalk

Management of an incident involving harm to BFC87 and BFC74

During the reporting period, Mangoola became aware of an incident involving the regrading of an access track containing an identified artefact scatter (BFC87) and an isolated artefact (BFC74).

As required, Mangoola notified the DP&I of the incident. In a letter dated 1 April 2011, the DP&I identified that this incident was a non-compliance with condition 46, Schedule 3 of Mangoola's Project Approval PA 06_0014. The investigation determined that harm had occurred to the sites and a $3000 penalty notice was issued.

In response to this incident, relevant project disturbance limits have now been fenced to prevent access to cultural heritage sites. Mangoola's induction requirements have been upgraded to include an environmental presentation package on cultural awareness, and the ground disturbance process has been improved. The incident was also discussed with the relevant Aboriginal parties at the consultation meeting on 3 March 2011 and further consultation was undertaken regarding an appropriate salvage methodology for these sites and for an additional isolated artefact (BFC88) located on a nearby access track that had not been subject to impact.

Following from this consultation, it was determined that a surface collection of the above sites should be undertaken in accordance with the approved methodology provided in the ACHMP. This was completed on 28 April 2011 in consultation with the Aboriginal party representatives listed in

Table 43**.**

Table 43 - Aboriginal party representatives involved in surface collection of BFC74, BFC87 and BFC88

Date	Name	Organisation
28/04/11	Paulette Ryan	Hunter Traditional Owners
	George Sampson	Cacatua Cultural Consultants
	Delilah Williams	Hunter Valley Aboriginal Corporation

A total of eight artefacts were salvaged, as listed in **Table 44.**

Table 44 - Results of surface collection of BFC74, BFC87 and BFC88

Site	Location (MGA)	Description of artefact
BFC74	284204 6427087	Red mudstone flake
BFC87	284323 6427048	Red mudstone flake
	284331 6427044	Grey mudstone broken flake
	284401 6426965	Pink-grey silcrete flake
	284473 6426912	Mottled pink, grey, white mudstone broken flake
	284533 6426854	Pink and grey mudstone core
	284522 6426863	Pink and grey silcrete flake
BFC88	284014 6427856	Orange-pink mudstone broken flake

These artefacts will be subject to the same long-term storage mechanism as all other artefacts salvaged within the approval area, with this mechanism to be determined in consultation with the relevant Aboriginal parties.

Due diligence inspection of proposed tree screen, Western Rocks to Wallaby Rocks

Mangoola Coal is required to plant a tree screen between two elevated vegetated areas known as Western Rocks and Wallaby Rocks. In accordance with the ACHMP and relevant legislation and guidelines, this matter was the subject of consultation with the relevant Aboriginal parties and an inspection was conducted on 28 April 2011 by the Aboriginal party representatives listed in **Table 30**. No sites were identified during the course of the inspection and recommendations were provided to minimise the likelihood that the planting of the proposed tree screen would result in harm to Aboriginal cultural heritage.

Identification of new scarred tree (SC-ST-03) and review of management review of management of this tree and a previously salvaged scarred tree (SC-ST-01)

Based on information provided by an ecologist undertaking pre-clearance survey work, Mangoola Coal commissioned Urban Tree Management Australia Pty Limited (UTMA) to inspect a possible scarred tree within the approved mining area. UTMA inspected the tree on 1 July 2010 and identified that the scar on the tree is likely to be cultural in origin.

Mangoola subsequently informed the relevant Aboriginal parties of the presence of the newly identified scarred tree (SC-ST-03) within the approved mining area at the subsequent consultation meeting (October 2010). At the same meeting, consultation was undertaken regarding management options for both SC-ST-03 and a previously salvaged scarred tree (SC-ST-01). Agreement was reached by those in attendance at the meeting that SC-ST-01 should be transported to the SC10 Management Zone and allowed to decay naturally, whilst SC-ST-03 would be relocated to the mine office for display with an information board and cover. Mangoola commissioned International Conservation Services Pty Limited (ICS) to provide an updated condition report and methodology for the proposed management options for both scarred trees. This information was provided to the relevant Aboriginal parties on 30 June 2011 and will be subject to discussion at the upcoming consultation meeting.

Monitoring of rock shelters within ACHOAs

In accordance with the requirements of the ACHMP, monitoring of the condition of the 18 rock shelter sites located in the ACHOAs was undertaken between 30 August and 2 September 2010. Monitoring involved inspection of each rock shelter site to record any changes in its condition or the distribution of artefacts within the rock shelter but also incorporated detailed geotechnical monitoring in relation to potential blasting impacts. Aboriginal stakeholder representatives who participated in the rock shelter monitoring are listed in **Table 45** below.

Table 45 - Aboriginal party representatives participating in rock shelter monitoring

Date	Name	Organisation
30/08/11-02/0911	Paulette Ryan	Hunter Traditional Owners
	Luke Hickey	Hunter Valley Cultural Surveying
	Maree Waugh	Wonnarua Nation Aboriginal Corporation

Due diligence inspection of proposed removal and realignment of 11kV feeder associated with rail loop and raw water dam

Mangoola Coal was required to remove an existing 11kV power line extending over the approved rail loop and within the approved raw water dam and to construct a new section of 11kV power line to partially replace this line. In accordance with the requirements of the Mangoola Coal ACHMP and relevant legislation and guidelines, due diligence inspection of these locations was conducted on 25 January, 2 February and 10 March 2011.

Representatives of Aboriginal parties participating in the inspection of the raw water dam realignment are listed in **Table 46** below.

Table 46 - Aboriginal party representatives participating in rock shelter monitoring

Date	Name	Organisation
10 March 2011	David French	Yarrawalk
	Luke Hickey	Yinarr Cultural Services

No surface artefacts or areas of greater than low archaeological potential were identified in relation to the area proposed for impact as a result of removal of the 11kV feeder associated with the rail loop. Two isolated artefacts (SC73 and SC74) and one artefact scatter (SC75) were identified in association with the proposed realignment of the 11kV. As a result, it was recommended that one pole location be altered to avoid impact to SC73 and that all three sites should be fenced during construction works to avoid incidental impacts.

Inspection, demarcation and monitoring of sites in northern section of Big Flat Creek ACHOA

The ACHMP identifies the need for works to be undertaken within the Big Flat Creek ACHOA in order to revegetate the area in accordance with the Mangoola Coal Rehabilitation and Offset Management Plan. In accordance with the requirements of the ACHMP, the nature and extent of the proposed revegetation works was discussed at the consultation meeting in March 2011 and a methodology for inspection and demarcation of these sites was provided on 11 April 2011.
The inspection and demarcation of these sites was undertaken on 4-6 May 2011 with the participation of the Aboriginal party representatives listed in **Table 47**.

Table 47 - Aboriginal party representatives participating in inspection, demarcation and monitoring of sites in northern section of Big Flat Creek ACHOA

Date	Name	Organisation
04/05/11-06/05/11	Annie Hickey	Gidawaa Walang Cultural Heritage Consultancy
	Gordon Griffiths	Wonnarua Culture Heritage
	George Sampson	Cacatua Cultural Consultancy

In accordance with the requirements of the ACHMP, whilst undertaking the inspection and demarcation, detailed notes and photographs were completed for the identified sites as part of the ongoing monitoring of the condition of all artefact scatters and isolated finds with the ACHOAs.

3.13.3 Reportable Incidents

As discussed in **Section 3.13.2**, on 10th January 2011 two artefact sites, BFC87 and BFC74 were inadvertently displaced by a contract grader working on a secondary access road.

The incident was reported to DP&I as required and a $3000 penalty notice was issued. As a result of the incident, activities were ceased in the area. Agencies and stakeholders were informed of the incident and an Incident Cause Analysis Method (ICAM) Investigation was conducted. Mangoola's induction information has since been upgraded and to include an environmental presentation package on cultural awareness. Cultural awareness has also been reinforced in the process of issuing Ground Disturbance Permits (GDP's). Additionally, relevant project disturbance limits have now been fenced to prevent access to cultural heritage sites.

3.13.4 Further Improvements

A timeframe for implementation of the ACHMP actions has been constructed to monitor progress, and this includes actions to be undertaken in the next reporting period. The ACHMP actions and associated timeframes are presented in **Table 48.** There were no changes to the ACHMP during the reporting period.

Table 48 - Timeframe and Actions for Implementation of the ACHMP

Timeframe	Task	Score	Comment
Stage 1 – Approval to Year 1 Mining **Prior to the commencement of substantial infrastructure/ mine development**	Finalise the ACHMP in consultation with the DECC and relevant Aboriginal stakeholder groups and submit final ACHMP to the Director-General of DoP for approval prior to the disturbance of any Aboriginal object or site in compliance with Project Approval Condition 46 (refer to Section 5.0of ACHMP).		Final ACHMP submitted to DoP on 25th August 2008. Approval for ACHMP from DoP received 2nd January 2009.
	Inaugural Six Monthly Meeting which will include an open invitation to relevant Aboriginal stakeholder groups as discussed in Sections 6.2, 7.2 and detailed in Appendix 2 of ACHMP.		Inaugural meeting held 27th August 2008. Second six-monthly meeting held 13th February 2009.Third six-monthly meeting held 07/08/09.
	In compliance with Project Approval Condition 23, Mangoola Coal will prepare and implement a Blast Monitoring Program for the project to the satisfaction of the Director-General. This program will: (a) be prepared in consultation with the DECC; (b) be submitted to the Director-General for approval prior to carrying out any development on site; and (c) include a protocol for evaluating blasting impacts on, and demonstrating compliance with the blasting criteria in this approval for the sixteen Aboriginal rock shelters of Aboriginal cultural heritage significance. This program will include baseline monitoring of rock shelters, perched boulders and sites that will be managed *in situ* for their conservation and preparation of systematic monitoring procedure by an independent geotechnical consultant approved by DoP. The Blast Monitoring Program will be implemented as discussed in Section 7.3.14 of ACHMP.		Blasting Monitoring Program submitted to DoP 30th May 2008. Ap Monitoring Program received 2nd January 2009. Meeting held with community of proposed methodology for monitoring of potential blast effects on rock shelters on 14th November 2008. 15 of 24 groups' submitted comments – all agreed with proposed methodology. Consultation with DECC and DoP on the methodology. Installation conducted between 23rd February & 5th March 2009. Blasts occurred 20th & 27th March 2009. Post initial blast monitoring to commence end of August 2009.

Timeframe	Task	Score	Comment
	In consultation with the DECC undertake any structural measures necessary to stabilise the Anvil Hill rock shelters and perched boulders using methods approved by relevant Aboriginal stakeholder groups and the DECC as indicated in Section 7.3.14 of ACHMP.		This will not be known until post initial blast monitoring completed.
	Undertake survey of previously unsurveyed areas in the proposed revegetation areas including the Sustainable Agricultural Offset Area (SAOA), Habitat Enhancement Offset Areas and Corridors (HEOAC), Ecological Offset Areas (EOA) and Aboriginal Cultural Heritage Offset Areas (ACHOAs) as discussed in Section 7.3.8 (refer to Figure 1.8 in ACHMP) of ACHMP.		Not completed – proposed to begin October/November 2011.
	In consultation with the relevant Aboriginal stakeholders prepare a management strategy for sites identified in previously unsurveyed areas as discussed in Section 6.2.3 of ACHMP.		As outlined in Section 7.3.15 of the ACHMP.
	Following approval of the ACHMP undertake salvage of the project impact area using the methodology outlined in Sections 6.2.2 and 7.3.2 and Appendix 4 of the ACHMP.		Manual salvage, surface collection and grader scrapes have been completed (November 2008). Scarred tree salvage commenced in 23/03/09 with preservation works commencing 17/08/09. The artefact assemblages for the project disturbance area has been washed, cleaned and are being recorded & analysed. Site records are being finalised and written up for inclusion in the salvage report due in late 2010. A scar tree is still to be finalized for the records.
	Fence the Aboriginal Cultural Heritage Offsets (where not already fenced) and appropriately demarcate the site SC10 Management Zone to be managed for *in situ* conservation within the vicinity of areas where works are proposed in Years 1 to 5 using the procedures detailed in Section 7.3.5 of ACHMP.		Areas of ACHOAs are fenced. Fencing of SC10 completed 30th June 2009.
	Place appropriate signs on fences around the ACHOAs and on gates leading into ACHOAs. Place signage on demarcated sites using the procedures detailed in Section 7.3.5 of ACHMP.		Fencing of SC10 completed 30th June 2009. Signs have been received and to be put in place August 2009.Some signs in certain offset areas still to be installed.

Timeframe	Task	Score	Comment
	Remove stock from ACHOAs and the sites to be managed for *in situ* conservation within the project area as discussed in Section 7.3.6 of ACHMP.		All stock has been removed from ACHOAs.
	Initiate feral animal control in ACHOAs as discussed in Section 7.3.11 of ACHMP.		Animal control has been conducted each year as per the Vertebrate Pest Management Plan. Formalised plan currently being formulated to target feral animals and is to be included in the Mangoola Coal Land Management Plan.
	Undertake Cultural Heritage Awareness Training for all employees and contractors as discussed in Section 7.3.1 of ACHMP.		Training package is in development.
Stage 1 – Ongoing **At commencement of the infrastructure and mine development construction phase and ongoing**	In compliance with Project Approval Condition 14, within 2 years of starting mining operations, or as otherwise agreed by the Director-General (DoP), Mangoola Coal will develop site specific ground vibration impact assessment criteria for the 16 Aboriginal rock shelters that may be affected by blasting operations to the satisfaction of the Director-General. These criteria will be: (a) developed by a suitably qualified, independent geotechnical expert, whose appointment has been approved by the Director-General; (b) prepared in consultation with the DECC; and based on blast monitoring and site specific data collected from the sites (refer to DoP, Schedule 3). This will include systematic monitoring of the effects of vibration on relevant rock shelters and revisions of blast design as necessary. The Blast Monitoring Program will be implemented as discussed in Section 7.3.14 of ACHMP.		Baseline monitoring program conducted by Terrock Pty Ltd, in June 2011, including rock shelter monitoring and blast monitoring data review and modeling. Further baseline monitoring conducted in September 2011, with more monitoring to be conducted during the 2 year period post mining commencement.

3.14 European Heritage

3.14.1 Environmental Management

The following management and mitigation measures were followed during construction to ensure that no impact on European heritage occurs:

- Bundabulla was delineated and excluded from the site compound and adequate training provided to all employees working on site as to its location and management requirements;
- Ham House 1 and the Creamery have been delineated in the field by suitably qualified personnel to be avoided by works; and
- Prior to any disturbance of any Non-Aboriginal heritage item, a GDP will be completed which shall include consideration of all EA and Project Approval commitments.

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.

3.14.3 Reportable Incidents

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

3.14.4 Further Improvements

Items of historical significance have been salvaged from areas within the Project Disturbance Boundary. Discussions are continuing with the Denman Historical Village for future conservation of these items and European heritage items within the site more generally, with the outcomes of these discussions to be incorporated into the ongoing management of these items.

3.15 Spontaneous Combustion

3.15.1 Environmental Management

Management of spontaneous combustion is undertaken in accordance with the Mangoola Spontaneous Combustion Management Plan, which was developed during the reporting period. 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.

- 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

Spontaneous combustion was first detected at Mangoola on 23 March 2011. Three ROM coal stockpiles were found to show signs of heating, with 50,000 tonnes of coal estimated to be affected. These stockpiles were prioritised for processing through the CHPP.

Implementation of the measures outlined above **Section 3.15.1**, in conjunction with the Mangoola Spontaneous Combustion Management Plan, has resulted in no current Spontaneous Combustion on site.

3.15.3 Reportable Incidents

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

13 complaints were received during the reporting period regarding spontaneous combustion. These complaints, as well as the resulting outcome of any investigations, are discussed further in **Section 4.1**.

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 Bushfire Management Plan (BMP). The BMP was developed by Eco Logical Australia 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 and fauna within the Mangoola mine site from unplanned fire events; and

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

To fulfil these objectives, the Bushfire Management Plan contains an Inspection and Monitoring Program, as summarised in **Table 49**, and an Action Plan which is summarised in **Table 50**.

Table 49 - Summary of BMP Inspection and Monitoring Program

Task	Purpose	Frequency	Timing	Responsibility
Roads	Condition of roads, confirm access is suitable to key areas	Annually	Prior to fire season (1 October to 31 March). Also following periods of heavy rain	Mangoola HSEC personnel
Fuel loads	Assess the need for Hazard Reduction Activities	As per Management Zone	As per Management Zone	Mangoola HSEC personnel
Water supply	Adequate water supply for fire fighting use	Annually	Prior to fire season (1 October to 31 March)	Mangoola HSEC personnel
Audit fire fighting equipment	To ensure equipment is in proper working order and condition, and to identify any logistical changes that need to be made	Annually	Prior to fire season (1 October to 31 March)	Mangoola HSEC personnel
Patrol entire site	To ensure potential ignition sources are mitigated and to also locate fires quickly to allow for a quick response	Daily	During Very High to Extreme bushfire weather conditions	Mangoola HSEC personnel

Table 50 - BMP Action Plan

Action	Report Section	Year
Construct or upgrade trails in areas with inadequate access (within the guidelines for fire trail implementation by the then Department of Soil Conservation and considering the protection of biodiversity).	4.2.3	2008
Incorporate an annual maintenance schedule for all roads into the normal works program.	4.2.3	Annual
Assess the layout of mining infrastructure when a plan is available to ensure adequate sighting and APZs are implemented.	4.3.6	As needed
Minimise the risk of fire ignition.	5.1	Ongoing
Creation of a monitoring, inspection and maintenance program	5.1.1	2009
Confirm adequacy of water supply and onsite fire fighting resources	5.1.1	Annual
Undertake community consultation to foster fire prevention and cooperation between Xstrata and the local community.	5.1.2	Annual
Review fuel loads and any required fuel reduction	5.2	Annual

Action	Report Section	Year
Ensure that a current copy of the report and the BMP Poster be held by the local RFS	7.4	2008
Undertake an annual incident training program prior to the start of the fire danger season	7.8	Annual
Undertake an internal review after an emergency response incident has concluded to assess the effectiveness of the response	7.10	Post emergency
The fire management plan and poster is to be reviewed every 5 years or whenever there are significant changes to the landscape due to fire activity or significant development of the mine etc.	7.11	2013 or as needed

3.16.2 Environmental Performance

During the reporting period there were no recorded bushfires. There were no 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

During the reporting period 15 hydrocarbon spills occurred and were reported internally in the environmental incident record system. These spills were minor in nature, the majority of which being less than 20 litres, with the largest totalling approximately 150 litres. The majority of the spills occurred as a result of equipment failure, or during the performance of maintenance on equipment. All spills were contained on site, with no offsite pollution occurring as a result of these minor spills.

The 2010 AEMR inspection conducted by the DP&I identified a number of areas requiring attention with regards to hydrocarbon management. These have all been addressed as follows:

- An inspection regime for all fuel bund drainage pits has been established to ensure bunds requiring maintenance are identified and actioned. This is to ensure that any build-up of sediment and/or runoff is regularly cleaned out so that the full capacity of the bund is available to capture any spills should they occur.

- The fuel bund inspection regime includes monitoring the storage of pallets containing lubricants and chemicals within bunded areas, to ensure these pallets are stored in a manner (i.e. placed an appropriate distance from the edge of the bund) that ensures any spills are captured within these bunded areas. These monthly inspections occur as part of the site wide environmental inspections, and any matters that need attention are reported to the maintenance department for action.

- Investigations were commenced into the potential of raising the perimeter drain in the vicinity of the workshop area to ensure contaminated water leaving the mine water system is avoided. A contractor has been appointed and works scheduled to be carried out during the next reporting period.

3.18.3 Reportable Incidents

No reportable incidents regarding hydrocarbon management occurred during the reporting period. All spills that occurred were contained onsite, and 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

Fencing was replaced at some locations around the site during the reporting period. There were no road closures during the reporting period.

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 was reviewed in June 2011 and has been produced to bring Mangoola in line with XCN's other sites in an attempt to go beyond compliance in their response to the OEH (formerly Department of Energy, Utilities and Sustainability) ESAP 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, 7 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 51.**

Table 51 – Greenhouse Gas Data

	This reporting period (2010/2011)		Last reporting period (2009/2010)	
Emission source	**Consumption**	**$CO_{2\text{-}e}$ (t)**	**Consumption**	**$CO_{2\text{-}e}$ (t)**
Diesel usage	18.9 ML	415,400.1	3.9ML	85,717.48
Electricity consumption	79.26 MWH	71.334	8.7MWH	7.83
Explosives	5,522,690 kg	unknown	474,377kg	unknown

The increase in energy consumption and diesel usage compared to the 2009/2010 reporting period is due to the increase in construction activities as well as the commencement of mining operations during the reporting period.

ESAP actions implemented in the reporting period

At the start of the reporting period there were nine actions that were identified for the site following the ESAP review process which took place in May 2010. Three of these were completed during the 2010-2011 reporting period. The EASP was reviewed again in June 2011, and the status of the actions are summarised in the table below.

Table 52 – Energy Management Actions

Project Identifier	Energy Management Action	Status
MAN-01	Conduct fuel efficiency training with original equipment manufacturers commencing Q3 2011	Planned completion December 2011
MAN-02	Document the metering system on-site and develop systems for calibration	Planned completion October 2012
MAN-03	Include in the Application for Expenditure (AFE) and ATC process, a protocol for gaining input from stakeholders to ensure that energy efficiency is included as a consideration.	Completed December 2010 – this is now part of the AFE and ATC process.
MAN-04	Conduct an energy efficiency audit three years after the commencement of mining and every three years subsequent to that.	Planned for completion December 2013, then every three years after
ESO-01	Investigate the use of cogged V-belts rather than standard V-belts to improve the efficiency of power transmission from motors within the CHPP.	Planned for completion December 2011
ESO-02	Use of biodiesel to reduce GHG emissions	Completed October 2010
ESO-03	Investigate the viability of installing a gas or electric boosted solar hot water system to heat water for the bathhouse	Completed December 2010
ESO-04	Investigate options for Mangoola to establish small scale plantings for the purpose of carbon sequestration in order to offset GHG emissions from site operations	Planned completion December 2011
ESO-05	Investigate emissions trading schemes	Ongoing

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 53**. The status of these actions will be reported on in the next AEMR.

Table 53 – Energy Management Actions for the Future Reporting Period

Project Identifier	Energy Management Action	Planned Completion
MAN-01	Conduct fuel efficiency training with original equipment manufacturers, commencing Q3 2011	December 2011
MAN-04	Conduct an energy efficiency audit two years after the commencement of mining and every three years subsequent to that.	December 2012
ESO-02	Investigate the use of biodiesel blend fuels in the mining fleet.	December 2012
ESO-03	Investigate the viability of installing a gas or electric boosted solar hot water system to heat water for the bathhouse.	December 2011
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 2011
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 48 incidents reported at Mangoola during the 2010 – 2011 reporting period. A summary of the incidents is presented in **Table 54.**

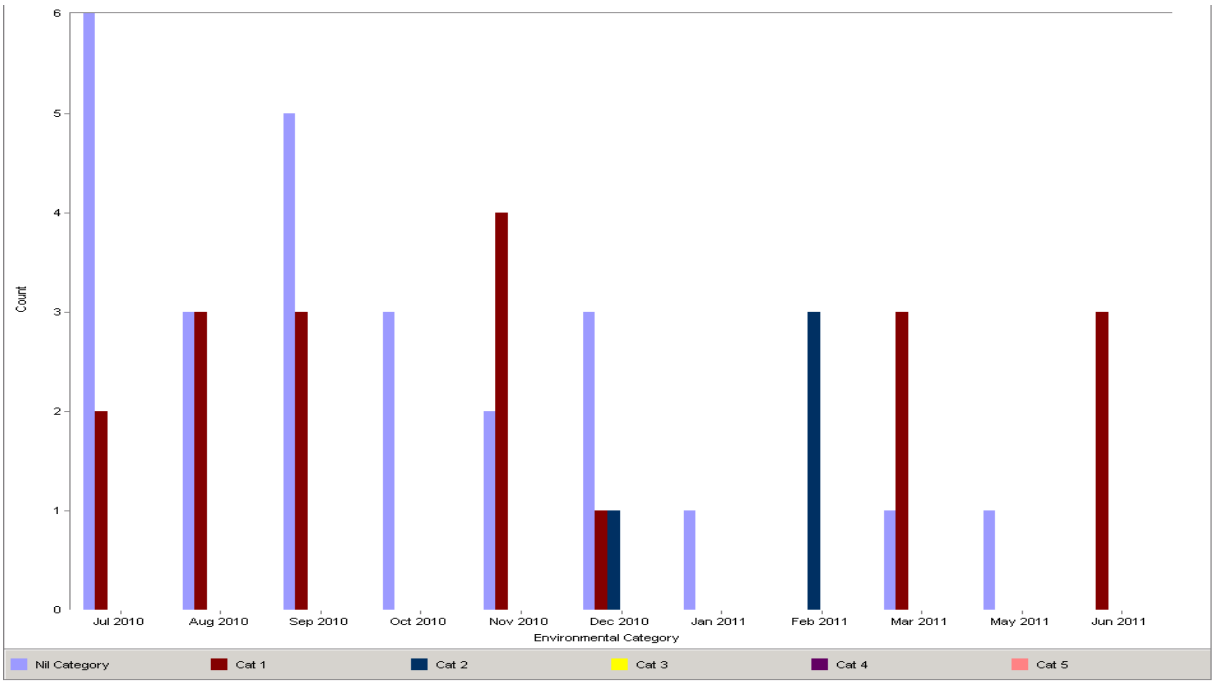
Table 54 - Category and No. of incidents

Category	No. of Incidents
Below Category 1	25
Category 1	19
Category 2	4
Category 3	0
Category 4	0
Category 5	0
Total	48

This is the same number of reported incidents which were observed during the 2009-2010 reporting period (48 incidents in 2009-2010). All of the incidents during the reporting period were defined as either Category 1 or 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.15 of the incidents recorded during the reporting period related to hydrocarbon spills, and 18 related to actions of transport trucks arriving or leaving site. Mangoola's Environmental Incidents Summary for the 2010-2011 reporting period is shown in **Figure 13** below.

Figure 13 – 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 much hydrocarbon spills can be avoided in the future.

3.22 Compliance

3.22.1 Environmental Management

The Mangoola Environmental Protection Licence 12894 (EPL) is assessed through the Annual Return that is reviewed by OEH. The 2010 annual return was submitted on 3 September 2010.

An independent audit is required by Schedule 5, Condition 5 of the Project Approval. This audit was conducted in October 2010 by URS. A summary of the status of the recommendations from this audit is included as **Appendix L**.

3.22.2 Environmental Performance

Mangoola generally complied with all of the EPL conditions during the 2010-2011 reporting period, as discussed in detail in the relevant sections of this AEMR in **Section 3**.

The non-compliances identified during this period (as detailed in the Annual Return), are as follows:

- EPL Condition M3.1 - Two TEOM units operated for some time with faulty temperature control devices. These devices assist with controlling the air sample inlet stream to minimise the condensation and so impacting upon the air mass determination.

- EPL Condition M7 – Meteorological monitoring station WSS failed to record accurate data for the period of time between the 1st and the 6th of January 2011, and failed to record any data between the 6th and 18th of January 2011.

- EPL Condition O7.1 – Rainfall exceeding the design capacity of several sediment dams caused them to overflow and leave the site at several locations.

- EPL Condition M2.1 - Number of samples collected and analysed for some monitoring points was less than required by licence for the reporting period.

- Two artefact sites, BFC87 and BFC74 were inadvertently displaced by a contract grader working on a secondary access road.

3.22.3 Further Improvements

In response to the above non-compliances, Mangoola has implemented a number of actions. Regarding the missing HVAS monitor reading, Mangoola has instructed monitoring contractors to take more care, and check when programming monitoring equipment for sampling events.

New parts were ordered and installed for Meteorological Station WSS, and this station has accurately recorded data since installation.

Replacement interface PCBs were installed for the two TEOM units operating with faulty CAP temperatures. The checking of these PCB's has been included in regular scheduled services.

A full investigation was conducted into the discharge incident in December 2010. The actions arising from this are discussed on detail in **Section 3.4.3.**

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 over 70 face to face meetings between Mangoola mine representatives and stakeholders in relation to a variety of matters from fence relocations to sponsorship opportunities. The majority of the face to face meetings were in relation to

- 500 kV modification application;
- Upgrade of Wybong Road;
- Driveway upgrades on Wybong Road;
- 66kV ETL installation;
- Commencement of Operations; and
- Project updates and activities on site.

Table 55 provides further detail on the methods of community liaison undertaken during the reporting period.

Table 55 - Community Liaison during the Reporting Period

Stakeholder Group	No. of Meetings Planned for AEMR period	No. of Meetings Held/attended AEMR period
Local Landowners	70 - 90	70
Community Meetings, BBQ's/Open Days/Site tours	20	30
State Government	0	2
Local Government	12	12
CCC's	4	4
Other Community Groups	20	30
Indigenous Groups	2	2
Total	**128-148**	**148**

As presented above, Mangoola held a number of stakeholder site tours in 2010 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 56** 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 56 - Community Consultative Committee Meetings Summary

Attendees	Meeting Date	Summary of Discussion
• Mr Keith Campbell (Community Representative) • Ms Penelope Young (Community Representative) • Mrs Fiona Hordern (Community Representative) • Cr Steven Ward (Council Representative) • Cr Ray Butchard (Council Representative) • Mr Chris Gidney (Council Office Representative) • Mr Craig Flemming (Council Office Representative) • Mr Scott Elliott (Mangoola) • Mr Geoff Kelly (Mangoola) • Mr Ben Clibborn (Mangoola) • Mrs Evelina Hendry (Mangoola)	**18 August 2010**	
		• Work commenced on 66kV line • Environmental management plans • Mangoola staff changes • Meeting with Aboriginal groups scheduled • Mangoola Coal's offset strategy. • Environmental Incidents • 500kV relocation modification • Mining Operations Plan submitted and approved by DII. • Feasibility of having rail refuelling facilities at rail loop. • Community Complaints • Community Participation • Project update: overview of the project timeline
	17 November 2010	
		• 66kV power line installation progressing. • New staff to the Environment and Community team. • Meeting with Aboriginal Stakeholder Groups held in October.

• Mr Steve Wylie (Mangoola) • Mr Ben de Somer (Mangoola) • Mr Martin Salm (Mangoola) • Mr Ross Reichel (Community Representative) • Ms Kimberley Wilkinson (Hansen Bailey) • Ms Nicola Proctor (AECOM) Listed attendees all attended at least 1 CCC meeting.	• Annual Environmental Monitoring Report. • MOU Employment and Training strategy moving forward with MSC. • Negotiation continuing regarding the WULMS Project. • Air quality monitoring locations. • Results of the Depositional Dust Gauges, PM10, TSP, and TEOM • Environmental Incidents • 500kV relocation modification • Project update and timeline
	23 February 2011
	• Air quality monitor locations • Dust monitoring information • Blasting and Vibration monitoring results • Noise monitoring results and location of monitors • Environment Incidents since last meeting • 500kV modification • Project update • Operational update • Land Acquisition • Upgrade of Wybong Road due to road failure • Outline of complaints management strategy and management of site specific issues by mining supervisors. • Community Participation update
	25 May 2011
	• Air quality monitor locations • Dust TSP and PM_{10} monitoring information • Noise monitoring locations and information • Blasting and Vibration monitoring information. • Incidents since the last meeting • 500kV modification • Construction timeline • Operational update • Spontaneous Combustion Management • Land Acquisition • Complaints monitoring information • Community mitigation measures • Corporate social involvement • Community CSI process • Community Support Program 2011: • 2011 Revised Stakeholder Engagement Action Plan

4.3 Newsletters and Flyers

Mangoola published and distributed one newsletter during the reporting period, advising landowners and the local the community of the progress of the project and outlining operational activities. Newsletters are generally well received by the community as they are a proactive means of distributing information on matters which may have impacts beyond the boundaries of the mine.

In addition, Mangoola also utilises flyers and fact sheets as a means of conveying pertinent information, usually to a specific audience. Flyers have been used to provide affected landowners with information in relation to road works, other construction works, and services relocations which may affect them in the future.

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 (GEN HSE PRO 0008), 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 within 24 hours where possible; 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. 457 environmental complaints were received by Mangoola during the reporting period. Details of these complaints are provided in the table below, as well as a comparison with complaints received in the previous reporting period.

Table 57 – Summary of complaints 2009-2011

	This reporting period 2010/2011	Last reporting period 2009/2010
Noise	364	96
Spontaneous combustion/Odour	15	-
Dust	25	-
Lighting	15	-
Blasting	9	2
Traffic	14	7
Water	1	1
Visual	4	-
Dust from blasting	3	1
Access	1	-
Fume	1	-
Other	5	2
Total	**457**	**109**

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 above 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 109 environmental complaints that were received during the previous reporting period. The increase is a result of the significant increase in construction activities during the reporting period, as well as the commencement of mining operations.

The Community Response Line details remain unchanged from the previous reporting periods in regards to its operation. 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.xstratamangoola.com.au) where members of the community can access information about the site, including the latest reports, management plans and environmental monitoring data.

Mangoola's website was audited during the reporting period for compliance against conditions 10 and 11, Schedule 5 of the Project Approval, as requested by the DP&I during the 2010 AEMR inspection. This audit was conducted on 29 November 2010 and identified two items requiring attention on the website; updating the CCC minutes as well as ensuring the latest environmental monitoring results are on the website. These were actioned, with the website now up-to-date.

4.6 Community Activities and Participation

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 58** outlines the community organisations and respective funding amounts provided to each organisation by Mangoola during the reporting period.

Table 58 - Community Support Program

Organisation	Amount
Westpac Rescue Helicopter	$2000
Relay for Life	$5000
Bursting with Energy Expo	$6000
Upper Hunter Food and Wine Fair	$5000
Solar Boat Challenge (Local Schools)	$2000
Muswellbrook and Upper Hunter Eisteddfod	$1000
Clean up Australia Day	$1000
Denman Children's Centre	$5000
NAIDOC Week – Student of the Year	$2000
Wildlife Aid	$2000
National Tree Planting Day	$1000
Total	**$32,000**

4.7 Social / Economic Contributions and Achievements

A key component of the Stakeholder Engagement Strategy is to ensure Mangoola supports the local community. Mangoola implemented the Voluntary Planning Agreement (VPA) required under Schedule 2, Condition 12 of the Project Approval with 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.

Additional temporary demountable/portable offices that were installed during the construction phase to cope with the peak construction workforce numbers are now in the process of being removed from site.

5.2 Rehabilitation of Disturbed Land

Disturbance activities took place across 287.34 ha during the reporting period, totalling 672.1 ha cleared by Mangoola to date. Disturbance areas are associated with land preparation for the construction activities as well as commencement of mining operations.

Given that mining operations at Mangoola only just commenced during the reporting period there are currently few areas of land available for rehabilitation. Rehabilitation activities that did take place during the reporting period include 5.1 ha of revegetation along the main access road, rail loop area, major dam walls, and batters around CHPP infrastructure.

During the reporting period Mangoola also undertook an audit of rehabilitated areas to monitor the effectiveness of rehabilitation works. Areas of poor rehabilitation success were added to the Mangoola rehabilitation contractor's action list, and these areas have since been re-sown. The success of this re-vegetation work will be reported on in the next AEMR.

A summary of rehabilitation undertaken to date is provided in **Table 59.** The approved MOP Plan 5 (Proposed rehabilitation) and MOP Plan 6 (Final Rehabilitation for Lease Relinquishment) are included in **Appendix K**.

Table 59 - Rehabilitation Summary for Mangoola

Mangoola Coal	Area Affected/Rehabilitated (hectares)		
	To Date	**Last Report**	**Next Report (estimated)**
A. MINE LEASE AREA			
A1 Mine Lease Area	3561	378	3561
B: DISTURBED			
B1: Infrastructure area (other disturbed areas to be rehabilitated at closure including facilities, roads)	376.1	329.14	392
B2: Active Mining Area (excluding items B3-B5 below)	184.1	55.62	234.1
B3: Waste Emplacements (active/unshaped/in or out of pit)	60.8	0	128
B4: Tailings Emplacements	43.3	0	66
B5: Shaped Waste Emplacement (awaits final vegetation)	7.8	0	24.8
ALL DISTURBED AREAS	672.1	384.76	635
C: REHABILITATION PROGRESS			
C1: Total Rehabilitated Area (except for maintenance)	5.1	0	15
D: REHABILTATION ON SLOPES			
D1: 10 to 18 degrees	5.1	0	15
D2: Greater than 18 degrees	0	0	0
E: SURFACE OF REHABILTATED LAND			
E1: Pasture and Grasses (woodland)	0	0	0
E2: Native Forest/Ecosystems	0	0	0
E3: Plantations and Crops	0	0	0
E4: Other (include non-vegetative outcomes)	0	0	0

In addition to the rehabilitated areas, significant areas along the main access road, rail loop area, major dam walls, and batters around CHPP infrastructure have been revegetated.

In the 2009-2010 AEMR the mining lease area for ML1626 was incorrectly recorded as 378 hectares. This was an administrative error, and should have read 3,561 hectares.

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) commenced the Mangoola Ecological Restoration and Reconstruction Research Program (MERRRP) during the reporting period. This research will continue in future reporting periods, and is detailed in **Section 3.8**.

5.5 Further Development of the Final Rehabilitation Plan

The ROMP was submitted during the reporting period, with implementation ongoing throughout the period. This document will be subject to regular reviews and continual improvement, and will continue to be strengthened by the inclusion of the data collected through this and following reporting periods.

6.0 ACTIVITIES PROPOSED IN THE NEXT AEMR PERIOD

6.1 Exploration

Exploration works during planned for next reporting period include a regional exploration drilling programme 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.

The Groundwater Drilling Program will continue in the reporting period, with a further six holes planned in this current programme. Most holes are 70m deep, with three being 130m; the latter holes will contain four piezometers each.

6.2 Construction

Construction works were largely completed during the current AEMR reporting period. If approval is given for relocation of electricity power lines as per Modification 4 of Project Approval PA 06_0014, construction works 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.

Mangoola also extracts a small amount from the Wybong Creek for domestic reasons.

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 Management of Plan Approvals and Implementation

Mangoola is currently seeking a modification (Modification 4) to the current Project Approval (06_0014) conditions to relocate the 500kV power lines, which will modify the mining schedule. Mangoola is currently awaiting determination from the DP&I on this modification.

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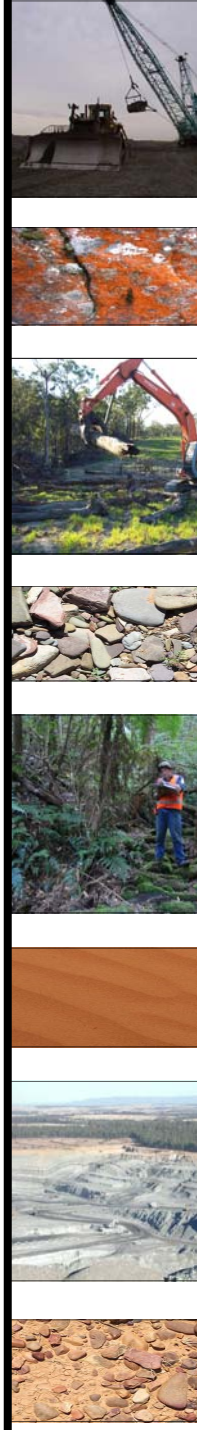
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Sustainable Development Policy for Xstrata Mangoola



APPENDIX A

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Sustainable Development Policy

We are committed to the goal of sustainable development. We balance social, environmental and economic considerations in how we manage our business. We believe that operating to leading standards of health, safety and environmental management, contributing to the development of sustainable communities, and engaging with our stakeholders in two-way, open dialogue, regardless of our location, enhances our corporate reputation and is a source of competitive advantage. This enables us to gain access to new resources, maintain a licence to operate, attract and retain the best people, access diverse and low-cost sources of capital, identify and act upon business opportunities, and optimise our management of risks.

We comply in full with the laws and regulations in each country where we operate. In addition, we operate in accordance with Xstrata's sustainable development framework, aspiring to achieve the highest international standards regardless of location and without exception. We conduct regular internal and external audits of our businesses and operations to assure compliance with our business principles, policies and standards.

Health and Safety

We aim to operate a safe workplace that is injury- and fatality-free, and to enhance the well-being of employees, contractors and communities. To achieve this:

- we provide visible safety leadership, and appropriate leadership development and training at every level;
- we foster and maintain a positive safety culture, behaviour, and awareness;
- we identify and eliminate or mitigate safety, occupational and community health and hygiene hazards;
- we maintain operational integrity;
- we apply safe work systems and occupational and community health and hygiene programmes;
- we actively engage with and monitor contractors, suppliers and business partners so that they understand and respect our occupational and community health and safety standards;
- we encourage and support our people and the communities associated with our operations to participate in programmes which enhance their health and well-being;
- we report, manage and learn from injuries, illnesses and high potential incidents; and
- we prepare for and effectively respond to emergencies and crises.





Environment

We aim to preserve the long-term health, function, and viability of the natural environments affected by our operations. To achieve this:

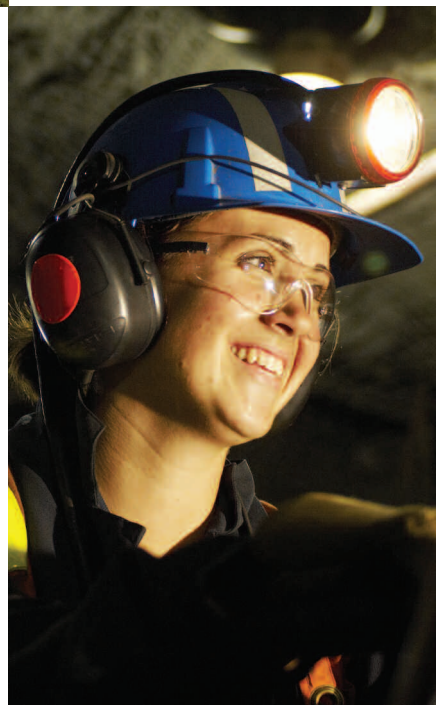
- we act as responsible stewards of our owners' assets and operate to leading practice environmental standards;
- we eliminate, mitigate or remediate the environmental impacts of our activities;
- we continually improve the efficiency with which we use raw materials, energy and natural resources;
- we reduce our direct and indirect greenhouse gas emissions and work with other organisations, governments and groups to address climate change;
- we reduce harmful emissions to air, water and land;
- we avoid net losses or degradation of natural habitats, biodiversity and landscape functions;
- we reduce wastes and the toxicity of our wastes;
- we prevent or mitigate the impacts of adverse environmental incidents; and
- we work with our stakeholders to mitigate the environmental impacts of our product life cycle and supply chain.

Sustainable Communities

We contribute to the social and economic development of sustainable communities associated with our operations. To achieve this:

- we identify the communities and other stakeholders associated with our operations and actively engage with them in a culturally appropriate and transparent manner as early as possible and throughout the life cycle of our operations to establish relationships based on mutual benefit and active participation;
- we respect the culture, customs, interests and rights of communities, including indigenous peoples and vulnerable or previously disadvantaged groups;
- we work with governments, local authorities, community representatives, inter-governmental and non-governmental organisations and other interested parties to develop and support projects that benefit the communities associated with our operations;
- we contribute a minimum of 1% of Group profit before tax each year to fund initiatives that benefit the communities associated with our operations, particularly those located in remote areas or in regions with a lower level of social and economic development and infrastructure;
- we manage our funding so that our community initiatives receive stable and continuing financial support; and
- we work to minimise the adverse impacts of our operations on the communities in which we operate and to avoid sole dependence on our operations.





Our People

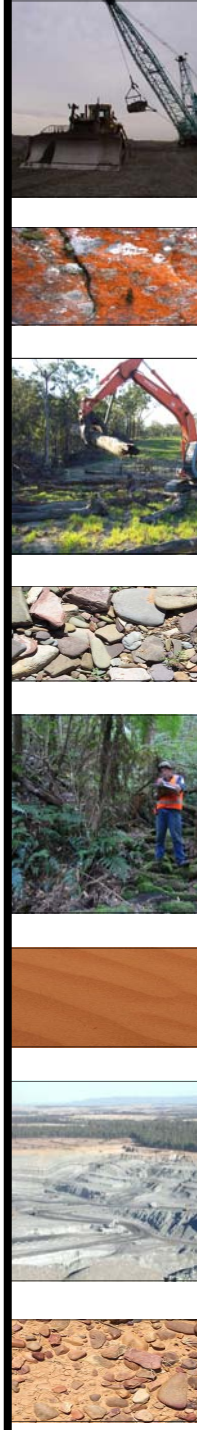
We maintain a safe workplace that is based on mutual respect, fairness and integrity. To achieve this:

- we do not tolerate any form of workplace discrimination, bullying, harassment or physical assault and we provide a fair and non-discriminatory employee grievance system;
- we value diversity and treat all employees and contractors fairly, providing equal opportunity at all levels of the organisation without bias;
- we employ and promote employees on the basis of merit while upholding legislation in regions that aim to benefit historically disadvantaged groups;
- we provide fair remuneration;
- we stipulate and enforce a drug- and alcohol-free workplace;
- we collect personal and private information about employees in a legal and ethical manner and take every precaution to protect the privacy of our employees and their personal information;
- we uphold the right of employees to freedom of association and collective bargaining;
- we provide appropriate training and development opportunities; and
- we consult, communicate and provide appropriate support to employees during significant organisational changes including closures, acquisitions, mergers and divestitures.

ML Davis, Chief Executive – December 2007

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Xstrata Mangoola Annual Return



APPENDIX B

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NSW GOVERNMENT | Environment, Climate Change & Water

ANNUAL RETURN

LICENCE NO.	12894
LICENCE HOLDER	XSTRATA MANGOOLA PTY LIMITED
REPORTING PERIOD	07-Jul-2010 to 06-Jul-2011

If your licence has been transferred, suspended, surrendered or revoked by the EPA during this reporting period, cross out the dates above and specify the new dates to which this Annual Return relates below:

REVISED REPORTING PERIOD _____/_____/_____ **to** _____/_____/_____

(**Note:** the revised reporting period also needs to be entered in Section E)

THIS ANNUAL RETURN MUST BE RECEIVED BY THE EPA BEFORE 05-Sep-2011

Your Annual Return must be completed, including certification in Section E, and submitted to the EPA no later than 60 Days after the end of the reporting period for your licence.

Failure to submit this Annual Return within 60 days after the reporting period ends may result in:

- **the issue of a Penalty Notice for $750 (individuals) or $1500 (corporations);**

OR

- **prosecution.**

Please send your completed Annual Return by **Registered Post** to:

Regulatory and Compliance Support Unit
Department of Environment, Climate Change and Water
PO Box A290
SYDNEY SOUTH NSW 1232

It is an offence to supply any information in this form to the EPA that is false or misleading in a material respect, or to certify a statement that is false or misleading in a material respect.

THERE IS A MAXIMUM PENALTY OF $250,000 FOR A CORPORATION OR $120,000 FOR AN INDIVIDUAL.

Details provided in this Annual Return will be available on the EPA's Public Register in accordance with section 308 of the Protection of the Environment Operations Act 1997.

Annual Return

XSTRATA MANGOOLA PTY LIMITED

NSW GOVERNMENT | Environment, Climate Change & Water

Use the checklist below to ensure that you have completed your Annual Return correctly.
(✓ the boxes)

CHECKLIST		
☑	Section A:	All licence details are correct
☑	Section B1:	You have entered the correct number in the complaints table
☑	Section B2 – B3:	If there are tables, you have provided the required details
☑	Section C:	You have answered question 1, and 2 if applicable
☐	Section D:	If applicable, you have completed all load calculation worksheets
☑	Section E:	The Annual Return has been signed by appropriate person(s) and, if applicable, the revised reporting period entered
☑	Make a copy of the completed Annual Return and keep it with your licence records	
☐	Attach a cheque (unless you have paid separately) for the payment of the administrative fee for the next licence fee period	

Please send your completed Annual Return by **Registered Post** to:

Regulatory and Compliance Support Unit
Department of Environment, Climate Change and Water
PO Box A290
SYDNEY SOUTH NSW 1232

Annual Return

XSTRATA MANGOOLA PTY LIMITED

NSW GOVERNMENT | Environment, Climate Change & Water

A Statement of Compliance – Licence Details

ALL licence holders must check that the licence details in Section A are correct.

If there are changes to any of these details **you must advise the EPA and apply as soon as possible for a variation to your licence or for a licence transfer.**

Licence variation and transfer application forms are available on the EPA website at: http://www.environment.nsw.gov.au/licensing, or from regional offices of the EPA, or by contacting us on telephone 02 9995 5700.

If you are applying to vary or transfer your licence you must still complete this Annual Return.

A1 Licence Holder

Licence Number	12894
Licence Holder	XSTRATA MANGOOLA PTY LIMITED
Trading Name *(if applicable)*	XSTRATA MANGOOLA PTY LIMITED
ABN	54 127 535 755

A2 Type of Licence

Scheduled Activity - Premises Based

A3 Premises to which Licence Applies

common name (*if any*)	Xstrata Mangoola
premises	Wybong Road, WYBONG, NSW

A4 Activities to which Licence Applies

Scheduled Activity

Mining for coal

Coal works

Concrete works

Crushing, grinding or separating

Extractive activities

Railway systems activities

A5 Other Activities (Not Applicable)

A6 Fee-Based Activity Classifications

Note that the fee based activity classification is used to calculate the **administrative fee.**

Fee-based activity	Activity scale	Unit of measure
Coal works	> 5000000	T loaded
Concrete works	> 25000 - 50000	m3 produced
Crushing, grinding or separating	> 500000 - 2000000	T processed
Land-based extractive activity	> 500000 - 2000000	T obtained
Mining for coal	> 5000000	T produced
Railway systems activities	> 0	All

A7 Assessable Pollutants (Not Applicable)

B Monitoring and Complaints Summary

B1 Number of Pollution Complaints

Number of complaints recorded by the licensee during the reporting period (as required by M4 of the licence) **If no complaints were received enter nil.**	457

B2 Concentration Monitoring Summary

For each monitoring point identified in your licence (see licence conditions M2 and R1), complete all the details for each pollutant listed in the tables provided below.

If concentration monitoring is not required by licence conditions M2 and R1, **no tables** will appear below.

Note this does not exclude the need to conduct appropriate concentration monitoring of accessible pollutants as required by load-based licensing (if applicable)

Monitoring Point 1

280000 East 6426000 North

Representative of property number 138

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of samples	Highest sample value
PM10	Micrograms per cubic metre	Continuous	347 days[1]	0.2	9.64	64.4[2]
Total suspended particles	Micrograms per cubic metre	60	60	5	29.8	92
Particulates – Deposited Matter	Grams per square metre per month	12	12	1.0	2.7	5.0

1. 7 results with '0.0'; recorded when an instrument is reset and the 24hr average calculation is resetting – part of scheduled service function. This equates to 95.06% data capture.
   4 results with insufficient data to calculate an average. Power related issues.
   2 results with no data available due to equipment being inoperable. This usually means equipment shut down for servicing or repairs.
   No data between 10 and 14 June inclusive (5 days) due to a failed interface board on the cap temperature circuit.
2. Wind 18-23kph from SW-W/WNW; not from Mangoola mine.

Monitoring Point 2

280000 East 6424000 North

South of the site (Bells Lane)

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of samples**	Highest sample value
Particulates – Deposited Matter	Grams per square metre per month	12	12	1.1	2.8	6.9
Total suspended particles	Micrograms per cubic metre	60	60	5	30.5	90
PM10	Micrograms per cubic metre	Continuous	358 Days[1]	0.4	8.89	21.8

1. 4 results with '0.0'; recorded when an instrument is reset and the 24hr average calculation is resetting – part of scheduled service function. This equates to 98.08% data capture.
   1 results with insufficient data to calculate an average. Power related issues.
   2 results with no data available due to equipment being inoperable. This usually means equipment shut down for servicing or repairs.

Monitoring Point 3

283500 East 6425000 North

North-east of the site

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of samples**	Highest sample value
PM10	Micrograms per cubic metre	Continuous	360 days[1,2]	0.4	10.59	31.4
Total suspended particles	Micrograms per cubic metre	60	59[3]	12	39.6	199
Particulates – Deposited Matter	Grams per square metre per month	12	12	0.6	1.71	3.5

1. 4 results with '0.0'; recorded when an instrument is reset and the 24hr average calculation is resetting – part of scheduled service function. This equates to 98.6% data capture.
2. Transferred to mains power on the 7th of July 2011
3. Filter paper lost at laboratory

Monitoring Point 4

282500 East 6422000 North

South-east of the site

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of samples*	Highest sample value
Particulates – Deposited Matter	Grams per square metre per month	12	12	0.5	2.1	4.9
Total suspended particles	Micrograms per cubic metre	60	60	17	32.5	94
PM10	Micrograms per cubic metre	Continuous	355 Days[1]	1.5	10.63	33.6

1. 5 results with '0.0'; recorded when an instrument is reset and the 24hr average calculation is resetting – part of scheduled service function. This equates to 97.26% data capture.
 3 results with insufficient data to calculate an average. Power related issues.
 2 results with no data available due to equipment being inoperable. This usually means equipment shut down for servicing or repairs.

Monitoring Point 6

282000 East 6426000 North

Anvil Creek (W8)

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of samples	Highest sample value
Conductivity	µS/cm	12	3[1]	122	159	191
pH	pH	12	3[1]	6.8	7.2	7.7
Total suspended solids	mg/L	12	3[1]	4	14	31

1. Sampling was not possible during 9 of the 12 months as the creek was dry.

Monitoring Point 7

285860 East 6424331 North

Sandy Creek (W16)

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of samples*	Highest sample value
Conductivity	µS/cm	12	9[1]	34	446	2060
pH	pH	12	9[1]	6.5	7.3	8.0
Total suspended solids	mg/L	12	9[1]	24	308	920

1. Sampling was not possible during 3 of the 12 months as the site was inaccessible due to wet weather

Monitoring Point 8

283089 East 6428124 North

Big Flat Creek Tributary (W3)

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of samples	Highest sample value
Conductivity	µS/cm	12	9[1]	575	11166	22600
pH	pH	12	9[1]	7.6	8.2	9.0
Total suspended solids	mg/L	12	9[1]	8	456	3310

1. Site dry on 3 occasions

Monitoring Point 9

280029 East 6432615 North

Wybong Creek (W4)

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of samples	Highest sample value
Total suspended solids	mg/L	12	12	2	11	18
pH	pH	12	12	8.0	8.3	8.7
Conductivity	µS/cm	12	12	664	1053	1684

Monitoring Point 10

284755 East 6427781 North

Big Flat Creek (GW023072)

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of samples	Highest sample value
Conductivity	µS/cm	4	4	7340	7590	7700
pH	pH	4	4	6.22	6.80	7.09

Note: This site is now renamed as GW04

Monitoring Point 11

277318 East 6426284 North

Wybong Creek (GW078396)

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of samples	Highest sample value
pH	pH	4	4	6.54	6.89	7.23
Conductivity	µS/cm	4	4	1675	1843	2060

Note: this site is now renamed 'Jennar well'.

B3 Volume or Mass Monitoring Summary

For each monitoring point identified in your licence (see licence conditions M6 and R1), complete the details of the volume or mass monitoring in the tables provided below.

If volume or mass monitoring is not required by licence conditions M6 and R1, **no tables** will appear below.

Note that this does not exclude the need to conduct appropriate concentration monitoring of assessable pollutants as required by load-based licensing (if applicable).

C Statement of Compliance – Licence Conditions

C1 Compliance with Licence Conditions

(✓ the boxes)

1 Were all conditions of the licence complied with (including monitoring and reporting requirements)? ☐ Yes ☑ No

(✓ a box)

2 If you answered 'No' to question 1, please supply the following details for each non-compliance in the format, or similar format, provided on the following page.

Please use a separate page for each licence condition that has not been complied with.

a) What was the specific licence condition that was not complied with?

b) What were the particulars of the non-compliance?

c) What were the date(s) when the non-compliance occurred, if applicable?

d) If relevant, what was the precise location where the non-compliance occurred?

Attach a map or diagram to the Statement to show the precise location.

e) What were the registration numbers of any vehicles or the chassis number of any mobile plant involved in the non-compliance?

f) What was the cause of the non-compliance?

g) What action has been, or will be, taken to mitigate any adverse effects of the non-compliance?

h) What action has been, or will be, taken to prevent a recurrence of the non-compliance?

3. How many pages have you attached?

Each attached page must be initialled by the person(s) who signs Section E of this Annual Return

11

C2 Details of Non-Compliance with Licence

Licence condition not complied with
Condition M2.1 Requirement to monitor at each monitoring point
Summary of particulars of the non-compliance (NO MORE THAN 50 WORDS)
Number of samples collected and analysed for monitoring points 1 to 4 less than required by licence for the reporting period.
If required, further details on particulars of non-compliance
Data was lost by the monitoring stations due to power interruptions, lost filter paper at laboratory and equipment break down.
Date(s) when the non-compliance occurred, if applicable
Monitoring point 1 – 12.7.10, 15.7.10, 18.7.10, 20.7.10, 21.7.10, 22.7.10, 4.8.10, 10.8.10, 11.8.10, 25.8.10, 26.8.10, 7.9.10, 8.10.10, 10 to 14. 6.10. Monitoring point 2 – 4.8.10, 10.8.10, 11.8.10, 21.8.10, 7.9.10, 6.10.10, 8.10.10 Monitoring point 3 – 4.8.10, 29.6.10, 7.9.10, 8.10.10, 2.5.11 Monitoring point 4 – 4.8.10, 10.8.10, 11.8.10, 25.8.10, 26.8.10, 7.9.10, 8.10.10, 10.10.10, 30.3.11, 20.4.11
If relevant, precise location where non-compliance occurred (attach a map or diagram)
n/a
If applicable registration numbers of any vehicles or the chassis number of any mobile plant involved in the non-compliance
n/a
Cause of non-compliance
Power interruptions to the units, regular servicing and equipment break down.
Action taken or that will be taken to mitigate any adverse effects of the non-compliance
As soon as a fault or loss of data became known, remedial work commenced by service supplier and/or resetting and repairing as soon as possible. Data excluded from analysis.
Action taken or that will be taken to prevent a recurrence of the non-compliance
Maintain scheduled servicing and inspections to minimise risk of equipment failure and monitor unavailability. Laboratory reviewed procedure for sample processing to minimise risk of losing filter paper in the future.

Licence condition not complied with
Condition M2.1 Requirement to monitor at each monitoring point
Summary of particulars of the non-compliance (NO MORE THAN 50 WORDS)
Number of samples collected and analysed for monitoring point 3 less than required by licence for the reporting period.
If required, further details on particulars of non-compliance
Monitoring location transferred to mains power from portable generator.
Date(s) when the non-compliance occurred, if applicable
7th of July 2010
If relevant, precise location where non-compliance occurred (attach a map or diagram)
n/a
If applicable registration numbers of any vehicles or the chassis number of any mobile plant involved in the non-compliance
n/a
Cause of non-compliance
A need to change over to mains power to improve data capture rate.
Action taken or that will be taken to mitigate any adverse effects of the non-compliance
Since been resolved with mains power now supplying the monitor, works completed on the 8th of July 2011.
Action taken or that will be taken to prevent a recurrence of the non-compliance
Maintain scheduled servicing and inspections to minimise risk of equipment failure and monitor unavailability.

C2 Details of Non-Compliance with Licence

Licence condition not complied with
Condition M2.1 Requirement to monitor at each monitoring point
Summary of particulars of the non-compliance (NO MORE THAN 50 WORDS)
Number of samples collected and analysed for monitoring points 6 and 8 less than required by the licence for the reporting period due to the sampling sites being dry.
If required, further details on particulars of non-compliance
NA
Date(s) when the non-compliance occurred, if applicable
Point 6 – 9.7.10, 16.9.10, 19.10.10, 2.12.10, 14.2.11, 10.3.11, 14.4.11, 11.5.11 and 9.6.11 Point 8 – 14.2.11, 10.3.11 and 11.5.11
If relevant, precise location where non-compliance occurred (attach a map or diagram)
n/a
If applicable registration numbers of any vehicles or the chassis number of any mobile plant involved in the non-compliance
n/a
Cause of non-compliance
Sampling points being dry as they are located in ephemeral water ways
Action taken or that will be taken to mitigate any adverse effects of the non-compliance
Samples excluded from data analysis.
Action taken or that will be taken to prevent a recurrence of the non-compliance
Nil

C2 Details of Non-Compliance with Licence

Licence condition not complied with
Condition M2.1 Requirement to monitor at each monitoring point
Summary of particulars of the non-compliance (NO MORE THAN 50 WORDS)
Number of samples collected and analysed for monitoring point 7 less than required by the licence for the reporting period as the monitoring point being inaccessible due to wet conditions.
If required, further details on particulars of non-compliance
NA
Date(s) when the non-compliance occurred, if applicable
10.11.10, 2.12.10 and 14.2.11
If relevant, precise location where non-compliance occurred (attach a map or diagram)
n/a
If applicable registration numbers of any vehicles or the chassis number of any mobile plant involved in the non-compliance
n/a
Cause of non-compliance
Sampling location situated in a location which is inaccessible during wet conditions.
Action taken or that will be taken to mitigate any adverse effects of the non-compliance
Sample excluded from data analysis.
Action taken or that will be taken to prevent a recurrence of the non-compliance
Seek licence variation to relocate monitoring point to allow better access during wet conditions.

C2 Details of Non-Compliance with Licence

Licence condition not complied with
Condition O7.1
Summary of particulars of the non-compliance (NO MORE THAN 50 WORDS)
Rainfall exceeding the design capacity of several sediment dams caused them to overflow and leave the site at several locations.
If required, further details on particulars of non-compliance
Rainfall data sourced from the site weather station has indicated that up to 92.1 mm fell during the 4 day period from Wednesday 1 December 2010 - Saturday 4 December. At Mangoola, the 5 day depth 95th percentile rainfall volume reference used for the site is taken from Scone at 51.3mm (Volume 1 Table 6.3a of the Blue Book). Consequently the site received almost double the rainfall provided for in the design of long term sediment dams as recommended in Table 6.1 Appendix 2E Mines and Quarries of the Blue Book. During the 4 day rainfall event mentioned above, between 2:45pm – 5:00pm on Friday 3 December 2010 approximately 50mm of rain fell on the site. Sedimentation dams adjacent to Sandy Creek within the rail loop discharged late afternoon Friday 3 December 2010 through until Sunday 7 December 2010. Water flowing through the site and from sediment dams along Sandy Creek flows into Sandy Creek along with diverted flow from catchments not associated with Mangoola Coal. Water from Sandy Creek was observed flowing into one of the site sedimentation dams in this area. Haul Road B and NOOP Sediment dams are designed for 5 day 95th percentile rainfall volume – for this region (as required by Blue Book– Scone 51.3mm rainfall event). The Haul Rd B Farm dam and NOOP dam were initially inspected on Friday evening and found to still have available freeboard, however as run-off inflows occurred overnight, this was reduced and overflow began. The Haul Road B Sediment Dam/Farm Dam was discharging from approximately the early hours of Saturday 4 December 2010 until Tuesday 7 December 2010 into Clarks Gully. Haul Road B Sediment Dam drained to the Farm Dam via a seepage route (that is at a height above the design criteria) under the Mangoola mine haul road. Once the Farm Dam reached its capacity, water discharged from the Farm Dam as a consequence of inflow from Haul Road B Sediment Dam. Northern Out Of Pit (NOOP) dam was discharging from approximately Saturday 4 December, towards Big Flat Creek, with overflow ceasing Sunday 12 December 2010. This flow decreased over the timeframe till only very small speed and volume was observed till ceasing. The event was reported via the DECCW Pollution Line as soon as practicable after determining water was discharging from the site. DECCW officer Bill George visited the site on the 6 December 2011 for an inspection of the incident. A written notification report was lodged on the 10 December 2010 to DECCW and DOP. An incident report was lodged on the 17 December 2010 to DECCW under R3 of EPL 12894 following a written request from DECCW. There was minimal environmental impact as a result of the incident.
Date(s) when the non-compliance occurred, if applicable
4/12/2010 to 12/12/2010
If relevant, precise location where non-compliance occurred (attach a map or diagram)

See following diagrams.

If applicable registration numbers of any vehicles or the chassis number of any mobile plant involved in the non-compliance

n/a

Cause of non-compliance

As above.

Action taken or that will be taken to mitigate any adverse effects of the non-compliance

After the storm on Friday 3 December 2010, the following actions were undertaken immediately:

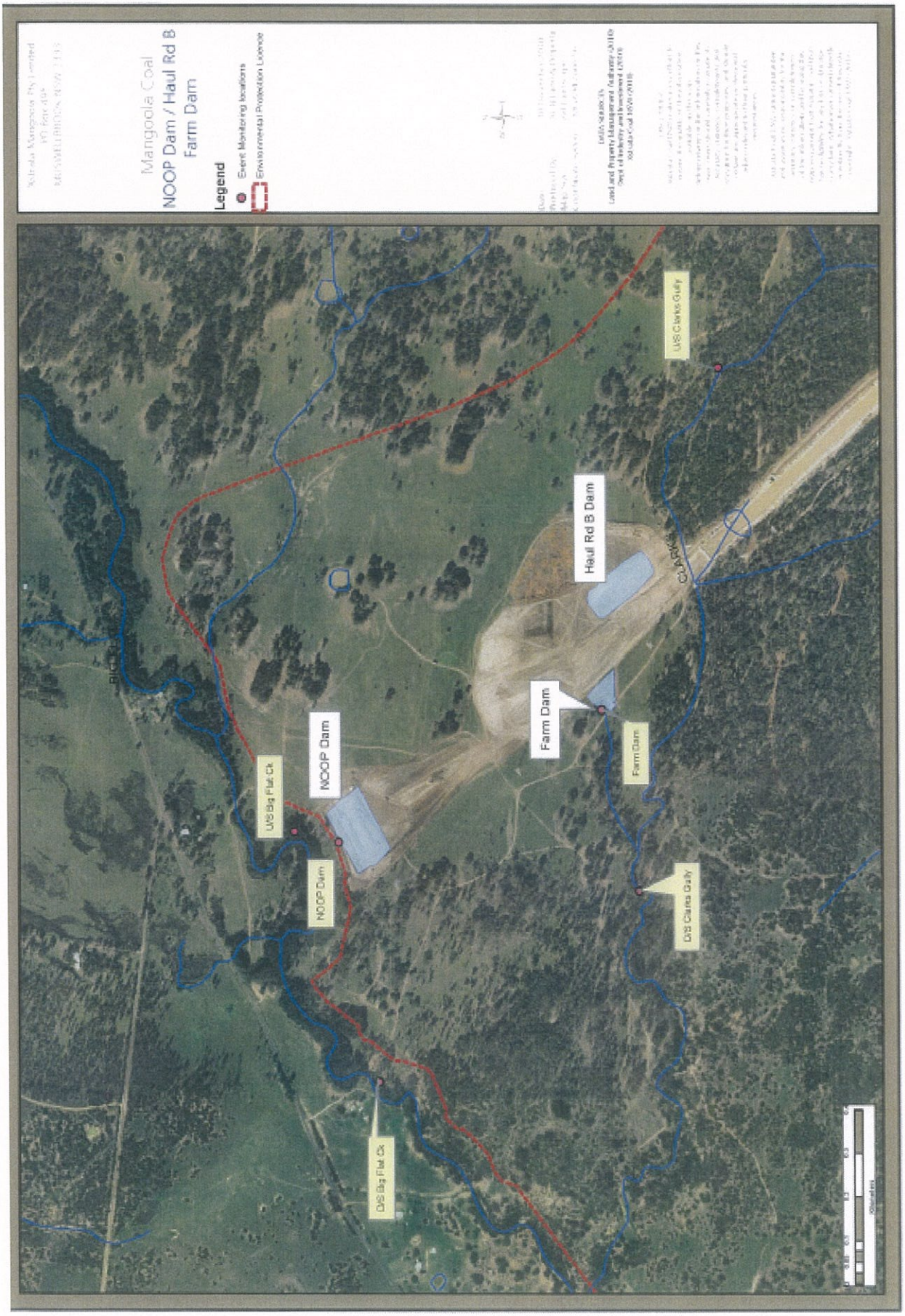
- A site inspection was conducted, including the NOOP Dam, Haul Road B/Farm Dam and the Rail Loop. Neither the NOOP nor the Haul Road B/Farm Dam was at capacity or overflowing immediately following the storm. Water was observed from Sandy Creek to be flooding a recently dewatered sediment dam near the rail loop adjacent to Sandy Creek and water samples upstream and downstream of the rail loop were taken. All water samples were analysed for pH, electrical conductivity, suspended solids and total dissolved solids.
- The event was reported via the DECCW Pollution Line as soon as practicable after determining water was discharging from the site.
- An environmental monitoring consultant was engaged on the evening of Friday, 3 December 2010 to undertake event sampling as per the site Water Management Plan immediately upon becoming aware of the water discharging from the site.
- Further inspections were undertaken on Saturday, 4 December 2010 during which the NOOP dam and the Haul Road B were observed to be discharging into the Farm Dam. Sample were taken of the Farm Dam discharge as well as from upstream and downstream of Big Flat Creek and Clarks Gully and analysed for pH, electrical conductivity, suspended solids and total dissolved solids.
- Two CAT 777 Water carts were used to dewater the Haul Road B sediment dam by transfer of water from the dam to the site Pit Water Dam. Due to the significant volume of rainfall received, there was limited access to both the NOOP dam and the Farm Dam.
- Access to the Farm Dam was restricted until Tuesday, 7 December 2010 due to the very wet ground conditions and the proximity to the 500kV Transgrid easement restricting safe access. It remained unsafe to access the Transgrid easement and the Farm Dam until a temporary access ramp was completed on Tuesday, 7 December 2010 following which pumping out of the Farm Dam commenced and the discharge ceased.
- Post event sediment flocculation was carried out at the NOOP dam and sediment dams along the Rail Loop in accordance with blue book requirements.

Action taken or that will be taken to prevent a recurrence of the non-compliance

- Additional dewatering pipelines and pumps have been installed on various dams including the dams which overflowed within the mining area to manage inflows. The pumps have capacity to dewater each dam within 5 days as required by the Blue Book
- All weather access installed to dams that can discharge offsite.
- A review of the ability to raise spillway level on NOOP Dam has been completed, all other dams were operating with a maximum spillway height. The review considered –
  i. whether any additional volume of runoff could be stored including the dam that overflowed in the incident given their engineered capacity; and
  ii. whether a raised spillway could be formed (i.e. keying in of earth and rock lining, etc) and how such a spillway would operate (i.e. would an overflow cause scour of either the spillway or downstream landform).
  The review concluded that a raise in spillway level would result in an overtopping of sections of the NOOP drain protecting Big Flat Ck, and therefore was deemed to be impractical.
- Maintain current management practices of weekly inspections (also undertaken after 20mm of rainfall over 24 hours), regular monitoring, sediment flocculation and dewatering program for all dams.
- The construction of the rail loop area adjacent to Sandy creek has completed and revegetated and therefore the sediment dams within the rail loop which overflowed during the incident are no longer required and have been decommissioned.

- A review was undertaken by the site Technical Services Dept on sealing of the base of Haul Rd B to restrict flow through to the Farm Dam, and therefore increasing the capacity of the Haul Road B Sediment Dam. Engineering advice was also sought on sealing options for base of Haul Road above design limit of Haul Road B Sediment Dam. The review concluded that the sealing of the road wall could increase the risk of dirty water overtopping directly to Clarks Gully adjacent to the dam and was therefore deemed unsuitable. Given this, an increase in dewatering capacity has been implemented to maintain water levels below the seepage route.
- At present, mining (Mangoola North Pit) has progressed through Clarks Gully and runoff is now collected in the mine void with Clarks Gully being blocked off.


U/S Sandy Ck
Rail Loop middle sed dam
U/S Sandy Ck culvert 1
Rail Loop middle sed dam
U/S Sandy Ck culvert 2
Sandy Ck Lower Catchment Inflow
Sandy Ck Sed dam 2
Sandy Ck Sed dam 1
D/S Sandy Ck
SANDY
Legend
Event Monitoring locations
Environmental Protection Licence
Mangoola Coal
Sandy Creek / Rail Loop


Mangoola Coal
NOOP Dam / Haul Rd B
Farm Dam
Legend
Event Monitoring locations
Environmental Protection Licence
US Clarks Gully
Haul Rd B Dam
CLARKS
Farm Dam
Farm Dam
NOOP Dam
US Big Flat Ck
NOOP Dam
DS Clarks Gully
DS Big Flat Ck

C2 Details of Non-Compliance with Licence

Licence condition not complied with
Condition M7
Summary of particulars of the non-compliance (NO MORE THAN 50 WORDS)
Met Station WSS failed to record accurate data for a period the period of time between the 1st and the 6th of January 2011 and failed to record any data between the 6th and 18th of January 2011
If required, further details on particulars of non-compliance
A lightning strike interfered with the functioning of weather station WSS, giving unreliable results between Jan 1-6 and no results for Jan 6-18, 2011.
Date(s) when the non-compliance occurred, if applicable
The 1st to the 18th of January 2011
If relevant, precise location where non-compliance occurred (attach a map or diagram)
n/a
If applicable registration numbers of any vehicles or the chassis number of any mobile plant involved in the non-compliance
n/a
Cause of non-compliance
Lightning Strike effecting recording of MET data
Action taken or that will be taken to mitigate any adverse effects of the non-compliance
The second site MET station was used during time of outage. Replacement parts ordered and installed and instrumentation reset on the 18th of January 2011
Action taken or that will be taken to prevent a recurrence of the non-compliance
Continue to operate second on site MET station as a backup.

C2 Details of Non-Compliance with Licence

Licence condition not complied with
Condition M3.1
Summary of particulars of the non-compliance (NO MORE THAN 50 WORDS)
Two TEOM units operated for some time with faulty temperature control devices. These devices assist in controlling the air sample inlet stream to minimize the condensation and so impacting upon the air mass determination.
If required, further details on particulars of non-compliance
The instruments were actually operating slightly below the designed temperature for minimizing the amount of moisture that might become entrained in the sample air, thus influencing the mass. The service provider has written to advise that the dust concentration accuracies were maintained.
Date(s) when the non-compliance occurred, if applicable
SX86-D3 was 16Nov 2010 to 14 June 2011; SX86-D1 was 10 Dec 2010 to 21 June 2011
If relevant, precise location where non-compliance occurred (attach a map or diagram)
The two units were SX86-D1 (Ridgelands Road) and SX86-D3 (Wybong Post Office Road).
If applicable registration numbers of any vehicles or the chassis number of any mobile plant involved in the non-compliance
n/a
Cause of non-compliance
Failure in the CAP temperature control mechanism, specifically the Interface Rear Connect PCB.
Action taken or that will be taken to mitigate any adverse effects of the non-compliance
Replacement interface PCB's were purchased and installed on 14 June for SX86-D3 and 21 June for SX86-D1.
Action taken or that will be taken to prevent a recurrence of the non-compliance
Include this check in regular scheduled services –this fault normally should not happen.

D Statement of Compliance - Load-Based Fee Calculation Worksheets

If you are **not** required to monitor assessable pollutants by your licence (see **A7** on this **Annual Return**), **no worksheets** will appear below. Please go to Section E.

If assessable pollutants have been identified on your licence (see licence condition L2), complete the following worksheets for each assessable pollutant to determine your load-based fee for the licence fee period to which this Annual Return relates.

A load-based licensing online fee calculator is available on the EPA's website at www.environment.nsw.gov.au

Loads of assessable pollutants must be calculated using any of the methods provided in the EPA's Load Calculation Protocol for the relevant activity. A Load Calculation Protocol would have been sent to you with your licence. If you require additional copies you can download the Protocol from the EPA's website or you can contact us on telephone 02 9995 5700.

You are required to keep all records used to calculate licence fees for four years after the licence fee was paid or became payable, whichever is the later date.

PENALTIES APPLY FOR SUPPLYING FALSE OR MISLEADING INFORMATION

D1 – D6 (Not Applicable)

E Signature and Certification

This Annual Return may only be signed by a person(s) with legal authority to sign it as set out in the categories below. **Please tick (✓) the box** next to the category that describes how this Annual Return is being signed.

If you are uncertain about who is entitled to sign or which category to tick, please contact us on telephone 02 9995 5700.

If the licence holder is:		the Annual Return must be signed and certified:
an individual	☐	by the individual licence holder, or
	☐	by a person approved in writing by the EPA to sign on the licence holder's behalf
a company	☐	by affixing the common seal in accordance with Corporations Act 2001, or
	☑	by 2 directors, or
	☐	by a director and a company secretary, or
	☐	if a proprietary company that has a sole director who is also the sole company secretary – by that director, or
	☐	by a person delegated to sign on the company's behalf in accordance with the Corporations Act 2001 **and** approved in writing by the EPA to sign on the company's behalf.
a public authority (other than a council)	☐	by the Chief Executive Officer of the public authority, or
	☐	by a person delegated to sign on the public authority's behalf in accordance with its legislation **and** approved in writing by the EPA to sign on the public authority's behalf.
a local council	☐	by the General Manager in accordance with s.377 of the Local Government Act 1993, or
	☐	by affixing the seal of the council in a manner authorised under that Act.

It is an offence to supply any information in this form that is false or misleading in a material respect, or to certify a statement that is false or misleading in a material respect. There is a maximum penalty of $250,000 for a corporation or $120,000 for an individual.

I/We

- *declare that the information in the Monitoring and Complaints Summary in section B of this Annual Return is correct and not false or misleading in a material respect, and*
- *certify that the information in the Statement of Compliance in sections A, C and D and any pages attached to Section C is correct and not false or misleading in a material respect.*

If your licence has been transferred, suspended, surrendered or revoked by the EPA during this reporting period, cross out the dates below and specify the new dates to which this Annual Return relates below:

For the reporting period 07-Jul-2010 to 06-Jul-2011 **or** ____/____/____ to ____/____/____

SIGNATURE: A Mason

NAME (printed): TONY MASON

POSITION: DIRECTOR

DATE: 1/9/2011.

SIGNATURE: L. Wilkes

NAME (printed): PATRICK WILKES.

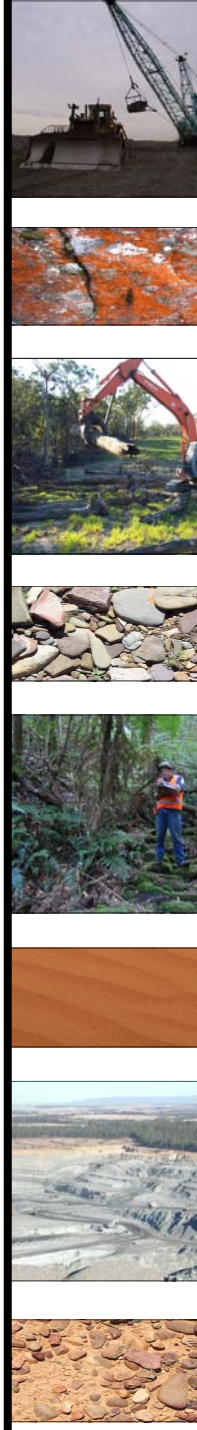
POSITION: DIRECTOR

DATE: 01/09/2011

SEAL(if signing under seal)

PLEASE ENSURE THAT ALL APPROPRIATE BOXES HAVE BEEN COMPLETED AND THAT THE CHECKLIST ON PAGE 2 OF THE ANNUAL RETURN HAS BEEN COMPLETED

Project Approval Conditions and Statement of Commitments



APPENDIX C

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Project Approval

Section 75J of the *Environmental Planning and Assessment Act 1979*

I approve the project referred to in schedule 1, subject to the conditions in schedules 2 to 5.

These conditions are required to:
- prevent, minimise, and/or offset adverse environmental impacts;
- set standards and performance measures for acceptable environmental performance;
- require regular monitoring and reporting; and
- provide for the ongoing environmental management of the project.

Frank Sartor MP
Minister for Planning

Sydney 2007

Blue type represents 22 July 2008 modification.
Red type represents 23 June 2009 modification.
Green type represents 4 November 2009 modification.
Purple type represents 23 February 2010 modification.

SCHEDULE 1

Application Number:	06_0014
Proponent:	Xstrata Mangoola Pty Limited
Approval Authority:	Minister for Planning
Land:	See Appendix 1
Project:	Mangoola Coal Project

TABLE OF CONTENTS

DEFINITIONS **3**

ADMINISTRATIVE CONDITIONS **4**

Obligation to Minimise Harm to the Environment 4
Terms of Approval 4
Limits on Approval 4
Management Plans/Monitoring Programs 4
Structural Adequacy 4
Demolition 4
Operation of Plant and Equipment 4
Planning Agreement 5

SPECIFIC ENVIRONMENTAL CONDITIONS **6**

Acquisition of Affected Properties 6
Noise 6
Blasting and Vibration 9
Air Quality 11
Meteorological Monitoring 13
Surface and Ground Water 13
Rehabilitation and Landscape Management 15
Aboriginal Cultural Heritage 17
Heritage 17
Traffic and Transport 18
Visual Impact 19
Greenhouse Gas 19
Waste Minimisation 20

ADDITIONAL PROCEDURES **21**

Notification of Landowners 21
Independent Review 21
Land Acquisition 22

ENVIRONMENTAL MANAGEMENT, MONITORING, AUDITING AND REPORTING **24**

Environmental Management Strategy 24
Environmental Monitoring Program 24
Incident Reporting 24
Annual Reporting 24
Independent Environmental Audit 24
Community Consultative Committee 25
Access to Information 26

APPENDIX 1: SCHEDULE OF LAND **27**

APPENDIX 2: PROJECT LAYOUT PLAN **29**

APPENDIX 3: STATEMENT OF COMMITMENTS **30**

APPENDIX 4: GENERAL TERMS FOR THE PLANNING AGREEMENT **35**

APPENDIX 5: LANDOWNERS WITH ACQUISITION RIGHTS **36**

APPENDIX 6: CONCEPTUAL REHABILITATION PLAN **37**

APPENDIX 7: ABORIGINAL SITES **38**

APPENDIX 8: INDEPENDENT DISPUTE RESOLUTION PROCESS **39**

DEFINITIONS

Acquisition Zone	The privately owned land listed in the table in Appendix 5 where there are no negotiated agreements in place between the Proponent and the applicable landowner
AEMR	Annual Environmental Management Report
BCA	Building Code of Australia
CCC	Community Consultative Committee
Construction Route 1	The access route described in the December 2008 Environmental Assessment
Council	Muswellbrook Shire Council
CHPP	Coal Handling and Preparation Plant
Day	The period from 7am to 6pm on Monday to Saturday, and 8am to 6pm on Sundays and Public Holidays
DECC	Department of Environment and Climate Change
Department	Department of Planning
Director-General	Director-General of Department of Planning, or delegate
Dirty water	Water from the project's dirty water management system as described in the EA
DPI	Department of Primary Industries
DWE	Department of Water and Energy
EA	Environmental assessment titled *Anvil Hill Project Environmental Assessment, Volumes 1-7*, dated August 2006, including the response to submissions
Early Works	The works identified in modification application MP 06_0014 MOD 1, as modified by the letter from Xstrata dated 4 July 2008, including construction and use of the: mine access road; temporary access roads; site office and associated amenities and compound; Coal Handling and Preparation Plant pad; borrow pit for the supply of material for civil works and disposal of unsuitable material; water pump and temporary pipeline from the Hunter River; and localised clearing associated with Aboriginal site salvage works and geotechnical investigations.
EEC	Endangered Ecological Community as defined under the NSW *Threatened Species Conservation Act 1995*
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
Evening	The period from 6pm to 10pm
Land	Land means the whole of a lot, or contiguous lots owned by the same landowner, in a current plan registered at the Land Titles Office at the date of this approval
Mining Operations	Includes all coal extraction, processing, and transportation activities carried out on site
Minister	Minister for Planning, or delegate
Night	The period from 10pm to 7am on Monday to Saturday, and 10pm to 8am on Sundays and Public Holidays
Offset Strategy	The conservation and enhancement program described in the EA and response to submissions
Panel	Independent Hearing and Assessment Panel for the project
Privately owned land	Land that is not owned by a public agency, or a mining company (or its subsidiary)
Project	The development as described in the EA
Proponent	Xstrata Mangoola Pty Limited, or its successors
Response to Submissions	The Proponent's response to issues raised in submissions, including Parts A, B and C
ROM	Run of Mine
RTA	Roads and Traffic Authority
Saline water	Water from the project's saline water management system as described in the EA
Site	The land referred to in schedule 1
Statement of Commitments	The Proponent's commitments in Appendix 3.

SCHEDULE 2
ADMINISTRATIVE CONDITIONS

Obligation to Minimise Harm to the Environment

1. The Proponent shall implement all practicable measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the project.

Terms of Approval

2. The Proponent shall carry out the project generally in accordance with the:
   (a) EA;
   (b) statement of commitments;
   (c) modification application MP 06_0014 MOD 1, and accompanying Environmental Assessment dated April 2008, including the letter from Xstrata to the Department dated 4 July 2008;
   (d) modification application MP 06_0014 MOD 2, and accompanying Environmental Assessment prepared by Umwelt Environmental Consultants and dated December 2008, including the Response to Submissions dated April 2009;
   (e) modification application MP 06_0014 MOD 3, and accompanying Environmental Assessment titled Environmental Assessment for Section 75W Modification to Approved Mining Operation, Mangoola Coal – Relocation of Mining Infrastructure Area, dated September 2009; and
   (f) modification application MP 06_0014 MOD 5, and accompanying Environmental Assessment titled Environmental Assessment for Night Time Rail Works, dated February 2010; and
   (g) conditions of this approval.

   Notes:
   - *The general layout of the project is shown in Appendix 2.*
   - *The statement of commitments is reproduced in Appendix 3 (excluding the commitments which are directly reflected in, or inconsistent with, the conditions of this approval).*

3. If there is any inconsistency between the above, the conditions of this approval shall prevail to the extent of the inconsistency.

4. The Proponent shall comply with any reasonable requirement/s of the Director-General arising from the Department's assessment of:
   (a) any reports, plans, programs, strategies or correspondence that are submitted in accordance with this approval; and
   (b) the implementation of any actions or measures contained in these reports, plans, programs, strategies or correspondence.

Limits on Approval

5. Mining operations may take place for 21 years from the grant of the mining lease for the project.

   Note: Under this Approval, the Proponent is required to rehabilitate the site to the satisfaction of the Director-General and DPI. Consequently this approval will continue to apply in all other respects other than the right to conduct mining operations until the site has been rehabilitated to a satisfactory standard.

6. The Proponent shall not extract more than 10.5 million tonnes of ROM coal a year from the site.

7. The Proponent shall only transport coal from the site by rail.

Management Plans/Monitoring Programs

8. With the approval of the Director-General, the Proponent may submit any management plan or monitoring program required by this approval on a progressive basis.

Structural Adequacy

9. The Proponent shall ensure that all new buildings and structures, and any alterations or additions to existing buildings and structures, are constructed in accordance with the relevant requirements of the BCA.

   Notes:
   - *Under Part 4A of the EP&A Act, the Proponent is required to obtain construction and occupation certificates for the proposed building works.*
   - *Part 8 of the EP&A Regulation sets out the requirements for the certification of the project.*

Demolition

10. The Proponent shall ensure that all demolition work is carried out in accordance with *Australian Standard AS 2601-2001: The Demolition of Structures*, or its latest version.

Operation of Plant and Equipment

11. The Proponent shall ensure that all plant and equipment used on site is:
    (a) maintained in a proper and efficient condition; and
    (b) operated in a proper and efficient manner.

Planning Agreement

12. Within 12 months of this approval, the Proponent shall enter into a planning agreement with Council in accordance with:
    (a) Division 6 of Part 4 of the EP&A Act; and
    (b) the terms of the Proponent's offer to the Council on 14 December 2006, which includes the matters set out in Appendix 4.

SCHEDULE 3
SPECIFIC ENVIRONMENTAL CONDITIONS

ACQUISITION OF AFFECTED PROPERTIES

Acquisition Upon Request

1. Upon receiving a written request for acquisition from the owner of the land listed in the table in Appendix 5, the Proponent shall acquire the land in accordance with the procedures in conditions 10-12 of schedule 4.

Best Endeavours To Acquire

2. Prior to starting mining operations on site, the Proponent shall demonstrate to the satisfaction of the Director-General that it has used its best endeavours to acquire all of the land listed in the table in Appendix 5, or to enter into a negotiated agreement with the applicable landowners.

   At least 3 months prior to the proposed start of mining operations on site, the Proponent shall submit a report to the Director-General that:
   (a) identifies the land in the acquisition zone; and
   (b) demonstrates that it has used its best endeavours to acquire this land, or enter into a negotiated agreement with the applicable landowner.

   Note: In this condition, negotiated agreement means a written agreement between the Proponent and the landowner in which the landowner agrees, for the purpose of this approval, not to be counted as a number in the acquisition zone.

NOISE

Noise Impact Assessment Criteria

3. The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 1.

   Table 1: Noise impact assessment criteria dB(A)

Day	***Evening***	***Night***		***Land Number***
$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{A1(1minute)}$	
40	40	40	45	66
40	40	39	45	138
40	40	38	45	45B
40	40	37	45	180
39	39	37	45	130, 148
39	38	37	45	59B
38	39	38	45	139
38	38	40	45	186A, 186B
38	38	36	45	110
37	37	39	45	184
37	37	38	45	199
37	37	37	45	171
37	37	36	45	128, 144, 205
36	37	39	45	164
36	36	40	45	193, 125D, 125E, 125F
36	36	39	45	192, 189
36	36	38	45	74, 104, 183C
36	36	37	45	191
36	36	36	45	200, 134A
36	36	35	45	116A, 116B, 116C, 116D, 116E, 116F, 116G, 134B

Day	Evening	Night		Land Number
$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{A1(1minute)}$	
36	35	38	45	125A
35	36	38	45	185
35	35	38	45	183A, 183B
35	35	37	45	187, 190, 251
35	35	36	45	294
35	34	39	45	111, 162
35	34	38	45	125C
35	34	37	45	241B
35	34	36	45	174A, 174B, 175, 241C
34	34	38	45	96B, 168
34	34	37	45	198, 241A
34	34	36	45	178, 201A, 201B, 201C, 227
34	33	38	45	96A
34	32	38	45	75A
33	33	36	45	182, 269B
33	32	37	45	125B
32	32	36	45	240
38	38	38	-	Anglican Church, Castlerock Road
37	37	37	-	Catholic Church, Wybong Road

However, if the Proponent has a written negotiated noise agreement with any landowner of the land listed in Table 1, and a copy of this agreement has been forwarded to the Department and DECC, then the Proponent may exceed the noise limits in Table 1 in accordance with the negotiated noise agreement.

Notes:

- *To determine compliance with the $L_{Aeq(15\ minute)}$ noise limits, noise from the project is to be measured at the most affected point or within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.*
- *To determine compliance with the $L_{A1(1\ minute)}$ noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).*
- *The noise emission limits identified in the above table apply under meteorological conditions of:*
  - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
  - *temperature inversion conditions of up to 3ºC/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.*

Land Acquisition Criteria

4. If the noise generated by the project exceeds the criteria in Table 2, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 10-12 of schedule 4.

Table 2: Land acquisition criteria dB(A)

Day/Evening/Night $L_{Aeq(15\ minute)}$	Land
40	All privately owned land, excluding the land listed in the table to Appendix 5.

Note: Noise generated by the project is to be measured in accordance with the notes presented below Table 1.

Cumulative Noise Criteria

5. The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other mines does not exceed the following amenity criteria on any privately owned land, excluding the land listed in the table to Appendix 5, to the satisfaction of the Director-General:
   - $L_{Aeq(11\ hour)}$ *50 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *45 dB(A) – Evening; and*
   - $L_{Aeq(9\ hour)}$ *40 dB(A) – Night.*

6. If the cumulative noise generated by the project combined with the noise generated by other mines exceeds the following amenity criteria on any privately owned land, excluding the land listed in the table to Appendix 5, then upon receiving a written request from the landowner, the Proponent shall take all reasonable and feasible measures to acquire the land on as equitable basis as possible with the relevant mines, in accordance with the procedures in conditions 10-12 of schedule 4, to the satisfaction of the Director-General:
   - $L_{Aeq(11\ hour)}$ *53 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *48 dB(A) – Evening; and*
   - $L_{Aeq(9\ hour)}$ *43 dB(A) – Night.*

   Notes:
   - *For the purpose of this condition, the expression "Proponent" in conditions 10-12 of schedule 4 should be interpreted as the Proponent and any other relevant mine owners.*
   - *The cumulative noise generated by the project combined with the noise generated by other mines is to be measured in accordance with the relevant procedures in the NSW Industrial Noise Policy.*

Traffic Noise Impact Assessment Criteria

7. The Proponent shall take all reasonable and feasible measures to ensure that the traffic noise generated by the project (after commencement of mining operations) combined with the traffic noise generated by other mines does not exceed the traffic noise impact assessment criteria in Table 3:

   Table 3: Traffic noise criteria dB(A)

Road	***Day/Evening***	***Night***
	$L_{Aeq(5\ hour)}$	$L_{Aeq(1\ hour)}$
Denman Road	60	55
Wybong Road, Bengalla Link Road	55	50

   Note: Traffic noise generated by the project is to be measured in accordance with the relevant procedures in the DECC's Environmental Criteria for Road Traffic Noise.

Additional Noise Mitigation Measures

8. Upon receiving a written request from:
   - a landowner of the land listed in the table to Appendix 5 (unless the landowner has requested acquisition); or
   - a landowner of the land listed in Table 1 (except where a negotiated noise agreement is in place); or
   - the owner of any residence where subsequent operational noise monitoring shows the noise generated by the project is greater than, or equal to, $L_{Aeq(15\ minute)}$ 35 dB(A) (except where a negotiated noise agreement is in place); or
   - an owner of the 4 residences on Wybong Road where traffic noise levels are predicted in the EA to exceed the traffic noise criteria in Table 3 (ie. Residence numbers 168, 246, 249 and 96B); or
   - an owner of the 2 residences adjacent the Ulan to Muswellbrook rail line where rail noise levels are predicted in the EA to cause additional exceedances of the applicable rail noise criteria,

   the Proponent shall implement additional noise mitigation measures such as double glazing, insulation, and/or air conditioning at any residence on the land in consultation with the landowner.

   These additional mitigation measures must be reasonable and feasible.

   If within 3 months of receiving this request from the landowner, the Proponent and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

   Within 3 months of this approval, the Proponent shall notify all applicable landowners that they are entitled to receive additional noise mitigation measures, to the satisfaction of the Director-General.

9. Prior to starting mining operations, the Proponent shall ensure that all development on site is carried out during the day, with the exception of:
   (a) development that is inaudible at residences on privately owned land;
   (b) the delivery of materials to the site as requested by Police or other authorities for safety reasons;
   (c) emergency work to avoid the loss of lives, property and/or to prevent environmental harm; or
   (d) development specifically approved in writing by the Director-General.

Continuous Improvement

10. 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.

Monitoring

11. The Proponent shall prepare and implement a detailed Noise Monitoring Program for the project to the satisfaction of the Director-General. This program must:
   (a) be prepared in consultation with DECC;
   (b) be submitted to the Director-General for approval prior to carrying out any development on site; and
   (c) include:
      - a combination of real-time and supplementary attended monitoring measures; and
      - noise monitoring protocol for evaluating compliance with the noise impact assessment and land acquisition criteria in this approval.

BLASTING AND VIBRATION

Airblast Overpressure Impact Assessment Criteria

12. The Proponent shall ensure that the airblast overpressure level from blasting at the project does not exceed the criteria in Table 3 at any residence on privately owned land.

Table 3: Airblast overpressure impact assessment criteria

Airblast overpressure level (dB(Lin Peak))	***Allowable exceedance***
115	5% of the total number of blasts over a period of 12 months
120	0%

Ground Vibration Impact Assessment Criteria

13. The Proponent shall ensure that the ground vibration level from blasting at the project does not exceed the criteria in Table 4.

Table 4: Ground vibration impact assessment criteria

Receiver	***Peak particle velocity (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 line pylons	50	0%
Aboriginal rock shelters	40 (interim)	0%

Receiver	*Peak particle velocity (mm/s)*	*Allowable exceedance*
Anvil Rock and 'The Book' rock formations	40 (interim)	0%

Note: The impact assessment criteria for Castle Hill applies until further monitoring is undertaken to identify either blast control measures or undertake detailed archival recording of the heritage slab hut where measures cannot achieve the criteria. The impact assessment criteria for the Aboriginal rock shelters, Anvil Rock and 'The Book' apply until site specific impact assessment criteria are developed, as required by condition 14.

14. Within 2 years of starting mining operations on site, or as otherwise agreed by the Director-General, the Proponent shall develop site specific ground vibration impact assessment criteria for the 16 Aboriginal rock shelters and 2 culturally significant rock formations (Anvil Rock and 'The Book') that may be affected by blasting operations to the satisfaction of the Director-General. These criteria must be:
    (a) developed by a suitably qualified, independent geotechnical expert, whose appointment has been approved by the Director-General;
    (b) prepared in consultation with the DECC; and
    (c) based on blast monitoring and site specific data collected from the sites.

Blasting Hours

15. The Proponent shall only carry out blasting on site between 9am and 3pm Monday to Saturday inclusive. No blasting is allowed on Sundays, public holidays, or at any other time without the written approval of DECC.

Blasting Frequency

16. The Proponent may carry out:
    (a) a maximum of 2 blasts a day;
    (b) 5 blasts a week, averaged over a 12 month period;
    (c) only 1 blast a week, averaged over a 12 month period, with a maximum instantaneous charge of greater than 1,500 kilograms; and
    (d) only 1 blast a day when it carries out a blast with a maximum instantaneous charge of greater than 1,500 kilograms,

    on site without the written approval of the Director-General.

Operating Conditions

17. During mining operations on site, the Proponent shall implement best blasting practice to:
    (a) protect the safety of people, property, public infrastructure, and livestock;
    (b) protect significant rock shelters and formations of Aboriginal and non-indigenous cultural heritage significance; and
    (c) minimise the dust and fume emissions from blasting at the project,

    to the satisfaction of the Director-General.

18. The Proponent shall not undertake blasting within 500 metres of any privately owned land or any land not owned by the Proponent, unless suitable arrangements have been made with the landowner and any tenants to minimise the risk of flyrock-related impact to the property to the satisfaction of the Director-General.

Road Closure

19. Prior to blasting within 500 metres of Wybong Road, the Proponent shall prepare a Road Closure Management Plan for the project to the satisfaction of Council and DPI; and following approval, implement this plan to the satisfaction of Council and DPI.

Public Notice

20. During mining operations on site, the Proponent shall:
    (a) notify the landowner/occupier of any residence within 2 km of the project (as depicted in the project layout plan in Figure 2, but excluding the rail and pipeline infrastructure) who registers an interest in being notified about the blasting schedule at the mine;
    (b) operate a Blasting Hotline, or alternate system agreed to by the Director-General, to enable the public to get up-to-date information on the blasting schedule at the project; and
    (c) advertise the blasting hotline number in a local newspaper at least 4 times each year,

    to the satisfaction of the Director-General.

Property Inspections

21. At least 6 months prior to starting mining operations on site, the Proponent shall advise all landowners of privately owned land within 2 km of the project (as depicted in the project layout plan in Figure 2, but excluding the rail and pipeline infrastructure) that they are entitled to a structural property inspection.

    If the Proponent receives a written request for a structural property inspection from the landowner, the Proponent shall within 3 months of receiving this request and prior to blasting within 2km of the property:
    (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Director-General, to inspect the condition of any building or structure on the land, and recommend measures to mitigate any potential blasting impacts; and
    (b) give the landowner a copy of the property inspection report.

Property Investigations

22. If any landowner of privately owned land within 2 km of the project (as depicted in the project layout plan in Figure 2, but excluding the rail and pipeline infrastructure) claims that buildings and/or structures on his/her land have been damaged as a result of blasting at the project, the Proponent shall within 3 months of receiving this request:
    (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Director-General, to investigate the claim; and
    (b) give the landowner a copy of the property investigation report.

    If this independent property investigation confirms the landowner's claim, and both parties agree with these findings, then the Proponent shall repair the damages to the satisfaction of the Director-General.

    If the Proponent or landowner disagrees with the findings of the independent property investigation, then either party may refer the matter to the Director-General for resolution.

    If the matter cannot be resolved within 21 days, the Director-General shall refer the matter to an Independent Dispute Resolution Process (see Appendix 8).

Blast Monitoring Program

23. The Proponent shall prepare and implement a Blast Monitoring Program for the project to the satisfaction of the Director-General. This program must:
    (a) be prepared in consultation with the DECC;
    (b) be submitted to the Director General for approval prior to carrying out any development on site; and
    (c) include a protocol for evaluating blasting impacts on, and demonstrating compliance with the blasting criteria in this approval for:
        - privately owned residences and structures;
        - heritage structures (including Castle Hill);
        - the 500kV transmission line;
        - rock formations (including Anvil Rock and 'The Book'); and
        - rock shelters of Aboriginal cultural heritage significance.

AIR QUALITY

Impact Assessment Criteria

24. The Proponent shall ensure that the dust emissions generated by the project do not cause additional exceedances of the air quality impact assessment criteria listed in Tables 5, 6, and 7 at any residence on privately owned land, or on more than 25 percent of any privately owned land (excluding the dust affected properties listed in the table to Appendix 5).

Table 5: Long term impact assessment criteria for particulate matter

Pollutant	***Averaging period***	***Criterion***
Total suspended particulate (TSP) matter	Annual	90 µg/m^3

Particulate matter < 10 µm (PM_{10})	Annual	30 µg/m^3

Table 6: Short term impact assessment criterion for particulate matter

Pollutant	***Averaging period***	***Criterion***
Particulate matter < 10 µm (PM_{10})	24 hour	50 µg/m^3

Table 7: Long term impact assessment criteria for deposited dust

Pollutant	***Averaging period***	***Maximum increase in deposited dust level***	***Maximum total deposited dust level***
Deposited dust	Annual	2 g/m^2/month	4 g/m^2/month

Note: Deposited dust is assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method.

Land Acquisition Criteria

25. If the dust emissions generated by the project exceed the criteria in Tables 8, 9, and 10 at any residence on privately owned land, or on more than 25 percent of any privately owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 10-12 of schedule 4.

Table 8: Long term land acquisition criteria for particulate matter

Pollutant	***Averaging period***	***Criterion***
Total suspended particulate (TSP) matter	Annual	90 µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	30 µg/m^3

Table 9: Short term land acquisition criteria for particulate matter

Pollutant	***Averaging period***	***Criterion***	***Percentile[1]***	***Basis***
Particulate matter < 10 µm (PM_{10})	24 hour	150 µg/m^3	99[2]	Total[3]
Particulate matter < 10 µm (PM_{10})	24 hour	50 µg/m^3	98.6	Increment[4]

[1]Based on the number of block 24 hour averages in an annual period.
[2]Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, illegal activities or any other activity agreed by the Director-General in consultation with DECC.
[3]Background PM_{10} concentrations due to all other sources plus the incremental increase in PM_{10} concentrations due to the mine alone.
[4]Incremental increase in PM_{10} concentrations due to the mine alone.

Table 10: Long term land acquisition criteria for deposited dust

Pollutant	***Averaging period***	***Maximum increase in deposited dust level***	***Maximum total deposited dust level***

Deposited dust	Annual	2 g/m^2/month	4 g/m^2/month

Note: Deposited dust is assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method.

Operating Conditions

26. The Proponent shall:
    (a) ensure any visible air pollution generated by the project is assessed regularly, and that mining operations are relocated, modified, and/or stopped as required to minimise air quality impacts on privately owned land;
    (b) ensure that the real-time air quality monitoring and meteorological monitoring data are assessed regularly, and that mining operations are relocated, modified and/or stopped as required to ensure compliance with the relevant air quality criteria; and
    (c) implement all practicable measures to minimise the off-site odour and fume emissions generated by any spontaneous combustion on site,

    to the satisfaction of the Director-General.

Monitoring

27. The Proponent shall prepare and implement a detailed Air Quality Monitoring Program for the project to the satisfaction of the Director-General. This program must:
    (a) be prepared in consultation with DECC;
    (b) be submitted to the Director-General for approval prior to carrying out any development on site; and
    (c) include:
        - a combination of real-time monitors, high volume samplers and dust deposition gauges to monitor the dust emissions of the project; and
        - an air quality monitoring protocol for evaluating compliance with the air quality impact assessment and land acquisition criteria in this approval.

METEOROLOGICAL MONITORING

28. During the life of the project, the Proponent shall ensure that there is a suitable meteorological station in the vicinity of the site that complies with the requirements in the *Approved Methods for Sampling of Air Pollutants in New South Wales* guideline.

SURFACE AND GROUND WATER

Water Supplies

29. The Proponent shall not use any licensable water from the Wybong Creek Water Source for mining purposes.

    Note: This restriction does not apply to water used outside the project disturbance area for revegetation purposes associated with implementation of the Offset Strategy.

Discharge Limits

30. The Proponent shall:
    (a) not discharge any dirty water from the site, except as may be expressly provided by a DECC Environment Protection Licence; and
    (b) not discharge any saline water from the site.

Site Water Management Plan

31. The Proponent shall prepare and implement a Site Water Management Plan for the project to the satisfaction of the Director-General. This plan must:
    (a) be prepared in consultation with DECC and DWE by suitably qualified expert/s whose appointment/s have been approved by the Director-General;
    (b) be submitted to the Director-General for approval prior to carrying out any development on site; and
    (c) include:
        - a Site Water Balance;
        - an Erosion and Sediment Control Plan;
        - a Surface Water Monitoring Plan;

- a Ground Water Monitoring Program; and
- a Surface and Ground Water Response Plan.

Site Water Balance

32. The Site Water Balance must:
    (a) include details of:
        - sources and security of water supply;
        - water use on site;
        - water management on site;
        - off-site water transfers;
        - reporting procedures; and
    (b) investigate and describe measures to minimise water use by the project.

32A. By the end of September 2009, the Proponent shall update the Site Water Balance to take into account the necessary changes required as a result of the June 2009 modification (MOD 2), to the satisfaction of the Director-General.

Erosion and Sediment Control

33. The Erosion and Sediment Control Plan must:
    (a) be consistent with the requirements of the Department of Housing's Managing Urban Stormwater: Soils and Construction manual;
    (b) identify activities that could cause soil erosion and generate sediment;
    (c) describe measures to minimise soil erosion and the potential for the transport of sediment to downstream waters;
    (d) describe the location, function, and capacity of erosion and sediment control structures; and
    (e) describe what measures would be implemented to maintain the structures over time.

Surface Water Monitoring

34. The Surface Water Management and Monitoring Plan must include:
    (a) detailed baseline data on surface water flows and quality in creeks and other waterbodies that could potentially be affected by the project;
    (b) surface water and stream health impact assessment criteria;
    (c) a program to monitor surface water flows, quality and impacts on water users (upstream and downstream of the project in Anvil Creek, Sandy Creek, Big Flat Creek and Wybong Creek);
    (d) a program to assess stream health conditions in Anvil Creek, Sandy Creek, Big Flat Creek and Wybong Creek;
    (e) a program to monitor channel stability in Anvil Creek, Sandy Creek and Big Flat Creek; and
    (f) reporting procedures for the results of the monitoring program.

Groundwater Monitoring

35. The Groundwater Monitoring Program must include:
    (a) detailed baseline data, based on sound statistical analysis, to benchmark the pre-mining natural variation in groundwater levels, yield and quality (including privately owned groundwater bores within the predicted drawdown impact zone identified in the EA);
    (b) groundwater impact assessment criteria (including for monitoring bores and privately owned bores);
    (c) a program for accurately delineating the boundary of the Big Flat Creek alluvial aquifer in any areas intersected by mining;
    (d) a program to monitor:
        - impacts on the groundwater supply of potentially affected landowners;
        - impacts on the Big Flat Creek and Wybong Creek alluvial aquifers;
        - impacts on groundwater dependent ecosystems and riparian vegetation;
        - the volume of ground water seeping into the open cut mine workings;
        - regional ground water levels and quality in the alluvial, coal seam, and overburden/interburden aquifers; and
        - the groundwater pressure response in the surrounding coal measures;
    (e) procedures for the verification of the groundwater model; and
    (f) reporting procedures for the results of the monitoring program and model verification.

Surface and Ground Water Response Plan

36. The Surface and Ground Water Response Plan must include:
    (a) a protocol for the investigation, notification and mitigation of any exceedances of the surface water, stream health and groundwater impact assessment criteria;

(b) measures to mitigate and/or compensate potentially affected landowners with privately owned groundwater bores within the predicted drawdown impact zone identified in the EA, including provision of alternative supply of water to the affected landowner that is equivalent to the loss attributed to the project;
(c) measures to mitigate and/or compensate potentially affected landowners for the loss of surface water flows in Sandy Creek, Big Flat Creek and Wybong Creek downstream of the project;
(d) measures to minimise, prevent or offset groundwater leakage from the Big Flat Creek alluvial aquifer;
(e) measures to mitigate any direct hydraulic connection between the backfilled open cuts and the Big Flat Creek alluvium if the potential for adverse impacts is detected;
(f) a contingency plan for isolating the Big Flat Creek alluvium from Anvil Creek alluvium and mining areas in the event that it is required; and
(g) the procedures that would be followed if any unforeseen impacts are detected during the project.

REHABILITATION AND LANDSCAPE MANAGEMENT

Rehabilitation

37. The Proponent shall progressively rehabilitate the site to the satisfaction of the Director-General and the DPI, in a manner that is generally consistent with the final landform in the EA (shown conceptually in Appendix 6). However, the Proponent must endeavour to incorporate at least 700 hectares of native grassland in the final rehabilitated landscape.

Offset Strategy

38. Prior to starting mining operations on site, the Proponent shall revise the Offset Strategy, including the proposed Conceptual Corridor Strategy, (as described in the EA and Response to Submissions) to the satisfaction of the Director-General. The revised strategy must be prepared in consultation with the DECC, and accommodate the minimum offset areas referred to in Table 11.

Table 11: Offset Strategy

Area	***Minimum Size***
Existing vegetated (treed) areas	1,560 ha
Treed areas to be established	1,040 ha
Grassland areas	200 ha
Total	**2,800 ha**

Notes:
(a) The offset areas shall be in addition to, and outside, the rehabilitated areas of the project disturbance area.
(b) The quantum of existing and revegetated treed areas may be varied within reason, subject to meeting the total minimum offset area.

39. The Offset Strategy must contain adequate provisions to offset the project's net impact on:
(a) significant and/or threatened plant communities, including:
- Ironbark Woodland Complex;
- Bulloak Woodland;
- Paperbark Woodland;
- Slaty Box Woodland;
- Forest Red Gum Riparian Woodland;
- Rough Barked Apple Woodland;
- Swamp Oak Riparian Forest; and
- Weeping Myall Woodland;

(b) significant and/or threatened plant species, including:
- *Goodenia macbarronii*;
- *Diuris tricolor*;
- *Prasophyllum sp. aff. Petilum*; and
- *Oligochaetochilus sp. aff. Praetermissus*; and

(c) significant and/or threatened animal species,includin molluscan fauna.

Long Term Security of Offset

40. Within 3 years of this approval, the Proponent shall make suitable arrangements to provide appropriate long term security for the offset areas to the satisfaction of the Director-General.

Landscape Management Plan

41. The Proponent shall prepare and implement a detailed Landscape Management Plan for the project to the satisfaction of the DPI and Director-General. This plan must:
    (a) be prepared in consultation with DECC and DWE by suitably qualified expert/s whose appointment/s have been approved by the Director-General;
    (b) submitted to the Director-General for approval prior to starting mining operations on site; and
    (c) include a:
        - Rehabilitation and Offset Management Plan;
        - Final Void Management Plan; and
        - Mine Closure Plan.

    Note: The Department accepts that the initial Landscape Management Plan may not include the detailed Final Void Management Plan and Mine Closure Plan. However, if this occurs, the Proponent will be required to seek approval from the Director-General for an alternative timetable for the completion and approval of the Final Void Management Plan and Mine Closure Plan.

Rehabilitation and Offset Management Plan

42. The Rehabilitation and Offset Management Plan must include:
    (a) the rehabilitation objectives for the site and offset areas;
    (b) a description of the short, medium, and long term measures that would be implemented to:
        - rehabilitate the site;
        - implement the Offset Strategy; and
        - manage the remnant vegetation and habitat on the site and in the offset areas;
    (c) detailed performance and completion criteria for the rehabilitation of the site and implementation of the Offsets Strategy;
    (d) a detailed description of how the performance of the rehabilitation of the mine and the offset areas would be monitored over time to achieve the stated objectives;
    (e) a detailed description of what measures would be implemented over the next 3 years to rehabilitate and manage the landscape of the site and offset areas including the procedures to be implemented for:
        - progressively rehabilitating areas disturbed by mining;
        - implementing revegetation and regeneration within the disturbance areas and offset areas, including establishment of canopy, sub-canopy (if relevant), understorey and ground strata;
        - reducing the visual impacts of the project;
        - protecting areas outside the disturbance areas;
        - rehabilitating creeks and drainage lines on the site (including Anvil Creek and Clarks Gully), to ensure no net loss of stream length and aquatic habitat;
        - undertaking pre-clearance surveys;
        - managing impacts on fauna;
        - landscaping the site to minimise visual impacts;
        - conserving and reusing topsoil;
        - minimising the risk of *Phythophora cinnamomi* spread, based on detailed soil investigations;
        - collecting and propagating seed for rehabilitation works;
        - salvaging and reusing material from the site for habitat enhancement;
        - salvaging, transplanting and/or propagating threatened flora and native grassland, based on additional survey and research;
        - controlling weeds and feral pests;
        - controlling access;
        - bushfire management; and
        - managing any potential conflicts between the rehabilitation of the mine and Aboriginal cultural heritage;
    (f) a description of the potential risks to successful rehabilitation and/or revegetation, and a description of the contingency measures that would be implemented to mitigate these risks; and
    (g) details of who is responsible for monitoring, reviewing, and implementing the plan.

    Notes:
    - *The plan shall be prepared generally in accordance with the recommendations of the Panel's ecological assessment (available from the Department), unless otherwise authorised by the Director-General.*
    - *Reference to "rehabilitation" in this approval includes all works associated with the rehabilitation and restoration of the site as described in the EA, and applies to all areas within the Mining Lease and Offset Strategy.*

Final Void Management

43. The Final Void Management Plan must:
    (a) justify the planned final location and future use of the final voids;
    (b) incorporate design criteria and specifications for the final voids based on verified groundwater modelling predictions and a re-assessment of post-mining groundwater equilibration;
    (c) assess the potential interactions between creeks on the site and the final voids; and
    (d) describe what actions and measures would be implemented to:
        - minimise any potential adverse impacts associated with the final voids; and
        - manage and monitor the potential impacts of the final voids.

Mine Closure Plan

44. The Mine Closure Plan must:
    (a) define the objectives and criteria for mine closure;
    (b) investigate options for the future use of the site, including the final voids;
    (c) investigate ways to minimise the adverse socio-economic effects associated with mine closure, including reduction in local employment levels;
    (d) describe the measures that would be implemented to minimise or manage the ongoing environmental effects of the project; and
    (e) describe how the performance of these measures would be monitored over time.

Conservation and Biodiversity Bond

45. Within 3 months of the approval of the Landscape Management Plan, the Proponent shall lodge a conservation and biodiversity bond with the Department to ensure that the Offset Strategy is implemented in accordance with the performance and completion criteria of the Landscape Management Plan. The sum of the bond shall be determined by:
    (a) calculating the full cost of implementing the Offset Strategy and Conceptual Corridor Strategy; and
    (b) employing a suitably qualified quantity surveyor to verify the calculated costs,
    to the satisfaction of the Director-General.

    Notes:
    - *If the Offset Strategy is completed to the satisfaction of the Director-General, the Director-General will release the conservation bond.*
    - *If the Offset Strategy is not completed to the satisfaction of the Director-General, the Director-General will call in all or part of the conservation bond, and arrange for the satisfactory completion of the relevant works.*
    - *If amendments to the Mining Act 1992 allow the Minister for Mineral Resources to require rehabilitation securities under a Mining Lease which apply to the implementation of rehabilitation works outside the boundary of a Mining Lease, the Proponent may transfer the conservation bond required under this approval to the Minister of Mineral Resources provided the Director-General and the DPI agree to the transfer.*

ABORIGINAL CULTURAL HERITAGE

Aboriginal Cultural Heritage Management Plan

46. The Proponent shall prepare and implement an Aboriginal Cultural Heritage Management Plan to the satisfaction of the Director-General. This plan must:
    (a) be prepared in consultation with DECC and the Aboriginal communities;
    (b) be submitted to the Director-General for approval prior to the disturbance of any Aboriginal object or site; and
    (c) include a:
        - detailed salvage program and management plan for all Aboriginal sites within the project disturbance area;
        - detailed description of the measures that would be implemented to protect Aboriginal sites outside the project disturbance area, including the 16 Aboriginal rock shelter sites identified in the EA;
        - detailed monitoring program for the 16 Aboriginal rock shelter sites identified in the EA;
        - description of the measures that would be implemented if any new Aboriginal objects or skeletal remains are discovered during the project; and
        - protocol for the ongoing consultation and involvement of the Aboriginal communities in the conservation and management of Aboriginal cultural heritage on the site.

    Note: The 16 Aboriginal rock shelter sites include sites AC38, AC42, BFC12, CG01, CG08, CG09, CG10, WC05, WC25, WC26, WC27, WC33, WC43, WC45, WC46 and WC47, as shown on the figure in Appendix 7.

HERITAGE

Wybong Community Heritage

47. Prior to starting mining operations on site, the Proponent shall prepare a report documenting the history of the Wybong community to the satisfaction of the Director-General. This report must:
    (a) be prepared in consultation with the Wybong community and NSW Heritage Office; and
    (b) include:
        - detailed historical research and oral history for all the land within the 40dBA noise contour (see the EA); and
        - archival recording, in accordance with the requirements and guidelines of the NSW Heritage Office, for all items of heritage value within the project disturbance area and blast affectation area (including 'Castle Hill').

48. The Proponent shall prepare and implement a detailed Conservation Management Strategy for all heritage items within the blast affectation area to the satisfaction of the Director-General. This strategy must:
    (a) be prepared in consultation with the relevant landowners and the NSW Heritage Office;
    (b) be submitted to the Director-General for approval prior to starting mining operations on site; and
    (c) include a:
        - program for baseline dilapidation surveys of the heritage items;
        - program to monitor the effects of blasting on the heritage items; and
        - description of the measures that would be implemented to protect relevant heritage items (particularly Castle Hill) from the effects of blasting; and
        - description of the measures that would be implemented to protect Anvil Rock and 'The Book' rock formations from the effects of blasting.

    Note: For the purposes of these conditions the blast affectation area includes all properties predicted to exceed the 5mm/sec ground vibration criteria.

TRAFFIC AND TRANSPORT

Monitoring of Coal Transport

49. 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.

Traffic Management

50. The Proponent shall upgrade:
    (a) the Bengalla Link Road intersections with Wybong Road and Denman Road, to the satisfaction of the RTA and Council, in conjunction with the construction of the Bengalla Link Road extension and prior to carrying out any development on site apart from the defined early works;
    (b) Wybong Road and its intersection with the mine access road to the satisfaction of Council, prior to carrying out any development on site apart from the defined early works;
    (c) the Golden Highway/Wybong Road intersection to the satisfaction of the RTA, prior to carrying out any development on site apart from the defined early works, unless otherwise agreed by the Director-General;
    (d) lighting and signposting of the relevant intersections to the satisfaction of the RTA/Council, in conjunction with the relevant intersection upgrades; and
    (e) all bus stops affected by the proposal to the satisfaction of Council, prior to carrying out any development on site apart from the defined early works.

50A. The Proponent shall undertake the following in relation to the section of Wybong Road between the Golden Highway and the mine access road:
    (a) undertake a road condition survey, in consultation with Council and to the satisfaction of the Director-General, prior to carrying out any development on site;
    (b) maintain the road to the satisfaction of Council, from the commencement of project-related works until the Bengalla Link Road extension is commissioned;
    (c) undertake a second road condition survey, in consultation with Council and to the satisfaction of the Director-General, following the completion and commissioning of the Bengalla Link Road extension; and
    (d) following approval of the second road condition survey, repair the road to at least the condition determined by the initial survey, to the satisfaction of Council.

The road condition surveys shall be undertaken by a suitably qualified expert/s whose appointment/s have been approved by the Director-General.

51. Prior to carrying out any development on site, the Proponent shall prepare (and subsequently implement) a construction traffic management plan for the project to the satisfaction of the RTA and Council; and following approval, implement the plan to the satisfaction of the RTA and Council. The plan shall include specific measures in relation to:
- speed limits, warning signage, barriers and repairs on Wybong Road, based on a detailed road safety audit;
- restriction of project-related traffic to the nominated access routes, including an effective driver education and self-policing penalty system;
- restriction of heavy vehicle access during school bus hours; and
- consultation with the local community and relevant agencies regarding the project and traffic management measures.

51A. Prior to commencing any works requiring the use of the section of Mangoola Road included within Construction Route 1, the Proponent shall update the Construction Traffic Management Plan to the satisfaction of Council, to include specific measures for this section of road in relation to:
- warning signage, speed limits, barriers, and maintenance of the road surface condition; and
- additional controls to manage pipeline construction underneath the road.

52. No project related traffic shall use Reedy Creek Road, Mangoola Road (apart from that section forming part of Construction Route 1 during construction of the project pipeline), Roxburgh Road or Castlerock Road to get to or from the site, except in an emergency to avoid the loss of lives, property and/or to prevent environmental harm.

Note: This condition does not apply to any employees that may reside on Reedy Creek Road, Mangoola Road, Roxburgh Road or Castlerock Road, or the infrequent use of the roads for consultation, environmental monitoring, and inspection and maintenance of nearby infrastructure.

VISUAL IMPACT

Additional Visual Impact Mitigation

53. Within 12 months of this approval, the Proponent shall prepare a report that:
(a) identifies the residences that are likely to experience significant visual impacts during the construction and operation of the project; and
(b) describes (in general terms) the additional mitigation measures that could be implemented to reduce the visibility of the mine from these residences,
to the satisfaction of the Director-General.

54. Within 3 months of the Director-General approving this report, the Proponent shall advise all owners of residences identified in the report that they are entitled to additional mitigation measures to reduce the visibility of the mine from their properties.

55. Upon receiving a written request from an owner of a residence identified in this report, the Proponent shall implement additional visual impact mitigation measures (such as landscaping treatments or vegetation screens) in consultation with the landowner, and to the satisfaction of the Director-General.

These mitigation measures must be reasonable and feasible.

If within 3 months of receiving this request from the owner, the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

Note: The additional visual impact mitigation measures must be aimed at reducing the visibility of the mine from significantly affected residences and do not necessarily require measures to reduce visibility of the mine from other locations on the affected properties. The additional visual impact mitigation measures do not necessarily have to include measures on the affected property itself (i.e. the additional measures may consist of measures outside the affected property boundary that provide an effective reduction in visual impacts).

55A. By July 2010 the Proponent shall plant a vegetation screen from the north of view point 3 to view point 4, as identified in Appendix 9. The Proponent shall maintain the vegetation screen for the life of the project.

Visual Amenity

56. The Proponent shall minimise the visual impacts of the project to the satisfaction of the Director-General.

Lighting Emissions

57. The Proponent shall:
    (a) take all practicable measures to mitigate off-site lighting impacts from the project; and
    (b) ensure that all external lighting associated with the project complies with *Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting*,

    to the satisfaction of the Director-General.

GREENHOUSE GAS

Energy Savings Action Plan

58. The Proponent shall prepare and implement an Energy Savings Action Plan for the project to the satisfaction of the Director-General. This plan must be prepared in accordance with the requirements and guidelines of DWE, and submitted to the Director-General for approval prior to starting mining operations on site.

Monitoring and Reporting

59. 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.

WASTE MINIMISATION

60. 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.

SCHEDULE 4
ADDITIONAL PROCEDURES

NOTIFICATION OF LANDOWNERS

1. Within 1 month of this approval, the Proponent shall notify the landowners of the land listed in the table in Appendix 5 in writing that they have the right to require the Proponent to acquire their land at any stage during the project.

2. If the results of monitoring required in schedule 3 identify that impacts generated by the project are greater than the impact assessment criteria in schedule 3, except where this is predicted in the EA, and except where a negotiated agreement has been entered into in relation to that impact, then the Proponent shall notify the Director-General and the affected landowners and/or existing or future tenants (including tenants of mine owned properties) accordingly, and provide quarterly monitoring results to each of these parties until the results show that the project is complying with the criteria in schedule 3.

3. The Proponent shall develop a brochure to advise landowners and/or existing or future tenants (including tenants of mine owned properties) of the possible health and amenity impacts associated with exposure to particulate matter, to the satisfaction of the Director-General. The brochure shall be prepared in consultation with NSW Health, and be submitted to the Director-General within 6 months of the date of this approval.

   The Proponent shall review relevant human health studies and update this brochure every 3 years, to the satisfaction of the Director-General.

   The Proponent shall provide this brochure (and associated updates) to all landowners and/or existing or future tenants (including tenants of mine owned properties) of properties where:
   (a) the predictions in the EA identify that the dust emissions generated by the project are likely to be greater than the air quality land acquisition criteria in condition 25 of schedule 3; and
   (b) monitoring results identify that the mine is exceeding the air quality land acquisition criteria in condition 25 of schedule 3.

INDEPENDENT REVIEW

4. If a landowner considers the project to be exceeding the impact assessment criteria in schedule 3, except where this is predicted in the EA, then he/she may ask the Director-General in writing for an independent review of the impacts of the project on his/her land.

   If the Director-General is satisfied that an independent review is warranted, the Proponent shall within 3 months of the Director-General advising that an independent review is warranted:
   (a) consult with the landowner to determine his/her concerns;
   (b) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Director-General, to conduct monitoring on the land, to determine whether the project is complying with the relevant impact assessment criteria in schedule 3, and identify the source(s) and scale of any impact on the land, and the project's contribution to this impact; and
   (c) give the Director-General and landowner a copy of the independent review.

5. If the independent review determines that the project is complying with the relevant impact assessment criteria in schedule 3, then the Proponent may discontinue the independent review with the approval of the Director-General.

6. If the independent review determines that the project is not complying with the relevant impact assessment criteria in schedule 3, and that the project is primarily responsible for this non-compliance, then the Proponent shall:
   (a) take all reasonable and feasible measures, in consultation with the landowner, to ensure that the project complies with the relevant criteria; and
   (b) conduct further monitoring to determine whether these measures ensure compliance; or
   (c) secure a written agreement with the landowner to allow exceedances of the criteria in schedule 3,

   to the satisfaction of the Director-General.

   If the additional monitoring referred to above subsequently determines that the project is complying with the relevant criteria in schedule 3, then the Proponent may discontinue the independent review with the approval of the Director-General.

   If the Proponent is unable to finalise an agreement with the landowner, then the Proponent or landowner may refer the matter to the Director-General for resolution.

If the matter cannot be resolved within 21 days, the Director-General shall refer the matter to an Independent Dispute Resolution Process (see Appendix 8).

If the measures referred to in (a) do not achieve compliance with the air quality and/or noise land acquisition criteria in schedule 3, and the Proponent cannot secure a written agreement with the landowner to allow these exceedances within 3 months, then the Proponent shall, upon receiving a written request from the landowner, acquire all or part of the landowner's land in accordance with the procedures in conditions 10-12 below.

7. If the independent review determines that the relevant criteria in schedule 3 are being exceeded, but that more than one mine is responsible for this non-compliance, then the Proponent shall, together with the relevant mine/s:
   (a) take all reasonable and feasible measures, in consultation with the landowner, to ensure that the relevant criteria are complied with; and
   (b) conduct further monitoring to determine whether these measures ensure compliance; or
   (c) secure a written agreement with the landowner and other relevant mines to allow exceedances of the criteria in schedule 3,

   to the satisfaction of the Director-General.

   If the additional monitoring referred to above subsequently determines that the projects are complying with the relevant criteria in schedule 3, then the Proponent may discontinue the independent review with the approval of the Director-General.

   If the Proponent is unable to finalise an agreement with the landowner and/or other mine/s, then the Proponent or landowner may refer the matter to the Director-General for resolution.

   If the matter cannot be resolved within 21 days, the Director-General shall refer the matter to an Independent Dispute Resolution Process (see Appendix 8).

   If the measures referred to in (a) do not achieve compliance with the air quality and/or noise land acquisition criteria in schedule 3, and the Proponent together with the relevant mine/s cannot secure a written agreement with the landowner to allow these exceedances within 3 months, then upon receiving a written request from the landowner, the Proponent shall acquire all or part of the landowner's land on as equitable a basis as possible with the relevant mine/s, in accordance with the procedures in conditions 10-12 below.

8. If the landowner disputes the results of the independent review, either the Proponent or the landowner may refer the matter to the Director-General for resolution.

   If the matter cannot be resolved within 21 days, the Director-General shall refer the matter to an Independent Dispute Resolution Process.

9. If, following the Independent Dispute Resolution Process, the Director-General decides that the Proponent shall acquire all or part of the landowner's land, then the Proponent shall acquire this land in accordance with the procedures in conditions 10-12 below.

LAND ACQUISITION

10. Within 3 months of receiving a written request from a landowner with acquisition rights, the Proponent shall make a binding written offer to the landowner based on:
   (a) the current market value of the landowner's interest in the property at the date of this written request, as if the property was unaffected by the project the subject of the project application, having regard to the:
      - existing and permissible use of the land, in accordance with the applicable planning instruments at the date of the written request; and
      - presence of improvements on the property and/or any approved building or structure which has been physically commenced at the date of the landowner's written request, and is due to be completed subsequent to that date, but excluding any improvements that have resulted from the implementation of the 'additional noise mitigation measures' in condition 8 of schedule 3;
   (b) the reasonable costs associated with:
      - relocating within the Muswellbrook local government area, or to any other local government area determined by the Director-General;
      - obtaining legal advice and expert advice for determining the acquisition price of the land, and the terms upon which it is required; and
   (c) reasonable compensation for any disturbance caused by the land acquisition process.

However, if at the end of this period, the Proponent and landowner cannot agree on the acquisition price of the land, and/or the terms upon which the land is to be acquired, then either party may refer the matter to the Director-General for resolution.

Upon receiving such a request, the Director-General shall request the President of the NSW Division of the Australian Property Institute (API) to appoint a qualified independent valuer to:

(a) consider submissions from both parties;
(b) determine a fair and reasonable acquisition price for the land and/or the terms upon which the land is to be acquired, having regard to the matters referred to in paragraphs (a)-(c) above;
(c) prepare a detailed report setting out the reasons for any determination; and
(d) provide a copy of the report to both parties.

Within 14 days of receiving the independent valuer's report, the Proponent shall make a binding written offer to the landowner to purchase the land at a price not less than the independent valuer's determination.

However, if either party disputes the independent valuer's determination, then within 14 days of receiving the independent valuer's report, they may refer the matter to the Director-General for review. Any request for a review must be accompanied by a detailed report setting out the reasons why the party disputes the independent valuer's determination. Following consultation with the independent valuer and both parties, the Director-General shall determine a fair and reasonable acquisition price for the land, having regard to the matters referred to in paragraphs (a)-(c) above, the independent valuer's report and the detailed report of the party that disputes the independent valuer's determination.

Within 14 days of the Director-General's determination, the Proponent shall make a binding written offer to the landowner to purchase the land at a price not less than the Director-General's determination.

If the landowner refuses to accept the Proponent's binding written offer under this condition within 6 months of the offer being made, then the Proponent's obligations to acquire the land shall cease, unless the Director-General determines otherwise.

11. The Proponent shall pay all reasonable costs associated with the land acquisition process described in condition 10 above.

12. If the Proponent and landowner agree that only part of the land shall be acquired, then the Proponent shall pay all reasonable costs associated with obtaining Council approval for any plan of subdivision (where permissible), and registration of the plan at the Office of the Registrar-General.

SCHEDULE 5
ENVIRONMENTAL MANAGEMENT, MONITORING, AUDITING AND REPORTING

ENVIRONMENTAL MANAGEMENT STRATEGY

1. The Proponent shall prepare and implement an Environmental Management Strategy for the project to the satisfaction of the Director-General. This strategy must be submitted to the Director-General prior to carrying out any development on site, and:
   (a) provide the strategic context for environmental management of the project;
   (b) identify the statutory requirements that apply to the project;
   (c) describe in general how the environmental performance of the project would be monitored and manage;
   (d) describe the procedures that would be implemented to:
      - keep the local community and relevant agencies informed about the operation and environmental performance of the project;
      - receive, handle, respond to, and record complaints;
      - resolve any disputes that may arise during the course of the project;
      - respond to any non-compliance;
      - manage cumulative impacts; and
      - respond to emergencies; and
   (e) describe the role, responsibility, authority, and accountability of all the key personnel involved in environmental management of the project.

ENVIRONMENTAL MONITORING PROGRAM

2. The Proponent shall prepare and implement an Environmental Monitoring Program for the project to the satisfaction of the Director-General. This program must consolidate the various monitoring requirements in schedule 3 of this approval into a single document, and be submitted to the Director-General concurrently with the submission of the relevant monitoring programs/plans.

INCIDENT REPORTING

3. Within 7 days of detecting an exceedance of the limits/performance criteria in this approval or an incident causing (or threatening to cause) material harm to the environment, the Proponent shall report the exceedance/incident to the Department, and any other relevant agency. This report must:
   (a) describe the date, time, and nature of the exceedance/incident;
   (b) identify the cause (or likely cause) of the exceedance/incident;
   (c) describe what action has been taken to date; and
   (d) describe the proposed measures to address the exceedance/incident.

ANNUAL REPORTING

4. 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:
   (a) identify the standards and performance measures that apply to the project;
   (b) describe the works carried out in the last 12 months;
   (c) describe the works that will be carried out in the next 12 months;
   (d) include a summary of the complaints received during the past year, and compare this to the complaints received in previous years;
   (e) include a summary of the monitoring results for the project during the past year;
   (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;
   (g) identify any trends in the monitoring results over the life of the project;
   (h) identify any non-compliance during the previous year; and
   (i) describe what actions were, or are being, taken to ensure compliance.

INDEPENDENT ENVIRONMENTAL AUDIT

5. Within 2 years of this approval, and every 3 years thereafter, unless the Director-General directs otherwise, the Proponent shall commission and pay the full cost of an Independent Environmental Audit of the project. This audit must:
   (a) be conducted by a suitably qualified, experienced, and independent team of experts whose appointment has been endorsed by the Director-General;
   (b) assess the environmental performance of the project, and its effects on the surrounding environment;

(c) assess whether the project is complying with the relevant standards, performance measures, and statutory requirements;
(d) review the adequacy of any strategy/plan/program required under this approval; and, if necessary,
(e) recommend measures or actions to improve the environmental performance of the project, and/or any strategy/plan/program required under this approval.

Note: This audit team must include experts in the field of mine rehabilitation; and noise, blasting, air quality, and flora and fauna impact assessment.

6. Within 6 weeks of completing this audit, or as otherwise agreed by the Director-General, the Proponent shall submit a copy of the audit report to the Director-General with a response to any recommendations contained in the audit report.

7. Within 3 months of submitting the audit report to the Director-General, the Proponent shall review and if necessary revise the:
(a) strategies/plans/programs required under this approval; and
(b) Conservation and Biodiversity Conservation Bond,
to the satisfaction of the Director-General.

COMMUNITY CONSULTATIVE COMMITTEE

8. Within 3 months of this approval, the Proponent shall establish a Community Consultative Committee for the project. The CCC shall:
(a) be comprised of:
- 2 representatives from the Proponent, including the person responsible for environmental management on site;
- at least 1 representative from Council (if available); and
- at least 4 representatives from the local community,

whose appointment has been approved by the Director-General in consultation with the Council;
(b) be chaired by an independent chairperson, whose appointment has been approved by the Director-General;
(c) meet at least twice a year;
(d) review the Proponent's performance with respect to environmental management and community relations;
(e) undertake regular inspections of the mine's operations;
(f) review community concerns or complaints about the mine's operations, and the Proponent's complaint handling procedures; and
(g) provide advice to:
- the Proponent on improved environmental management and community relations, including the provision of information to the community and the identification of community initiatives to which the Proponent could contribute;
- the Department regarding the conditions of this approval; and
- the general community on the performance of the mine with respect to environmental management and community relations; and

(h) be operated generally in accordance with any guidelines the Department may publish on the operation of Community Consultative Committees for mining projects.

Note: The CCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Proponent complies with this approval.

9. The Proponent shall:
(a) ensure that at least 2 of its representatives attend CCC meetings;
(b) provide the CCC with regular information on the environmental performance and management of the project;
(c) provide meeting facilities for the CCC;
(d) arrange site inspections for the CCC, if necessary;
(e) respond to any advice or recommendations the CCC may have in relation to the environmental management or community relations;
(f) take minutes of the CCC meetings, and put a copy of these minutes on its website within 1 month of the CCC meeting; and
(g) forward a copy of the minutes of each CCC meeting, including a response to any recommendations from the CCC, to the Director-General within 1 month of the CCC meeting.

ACCESS TO INFORMATION

10. 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;
    (b) put a copy of the relevant document/s on the Proponent's website.

11. During the project, the Proponent shall:
    (a) make a summary of monitoring results required under this approval publicly available on its website; and
    (b) update these results on a regular basis (at least every 3 months).

APPENDIX 1
SCHEDULE OF LAND

Property ID*	Lot	DP	Owner
CH0052	12	842072	Xstrata Mangoola Pty Limited
CH0217	32	735121	Bell PI & CJ
CH0012	160	750968	Xstrata Mangoola Pty Limited
CH0055	12	230283	Xstrata Mangoola Pty Limited
CH0058	112	531273	Xstrata Mangoola Pty Limited
CH0061	11	842072	Xstrata Mangoola Pty Limited
CH0147	633	748470	Xstrata Mangoola Pty Limited
CH0244	227	750968	Xstrata Mangoola Pty Limited
CH0291	199	750968	Xstrata Mangoola Pty Limited
CH0298	193	750968	Xstrata Mangoola Pty Limited
CH0309	185	750924	Xstrata Mangoola Pty Limited
CH0322	177	750968	Xstrata Mangoola Pty Limited
CH0219	31	735121	Xstrata Mangoola Pty Limited
CH0117	7004	93189	Crown
CH0267	21	622786	Xstrata Mangoola Pty Limited
CH0256	2170	706389	Eddy BM & TA
CH0306	188	750,924	Xstrata Mangoola Pty Limited
CH0088	912	588390	Xstrata Mangoola Pty Limited
CH0089	911	588390	Hayes CA
CH0254	218	750968	Hogan LP & LR
CH0275	201	706571	Hogan PD
CH0009	163	750968	Hogan PJ
CH0010	162	750968	Hogan PJ
CH0087	93	750968	Hogan PJ
CH0104	1	1014899	Hogan PJ
CH0146	634	748470	Hogan PJ
CH0152	62	750968	Hogan PJ
CH0183	46	750968	Hogan PJ
CH0184	45	750968	Hogan PJ
CH0188	42	750968	Hogan PJ
CH0191	1	950763	Hogan PJ
CH0193	41	750968	Hogan PJ
CH0196	40	750968	Hogan PJ
CH0203	4	729944	Hogan PJ
CH0211	39	750968	Hogan PJ
CH0216	32	750968	Hogan PJ
CH0257	216	750968	Hogan PJ
CH0259	215	750968	Hogan PJ
CH0261	212	750968	Hogan PJ
CH0262	211	750968	Hogan PJ
CH0263	210	750968	Hogan PJ
CH0272	209	750968	Hogan PJ
CH0273	205	750968	Hogan PJ
CH0274	204	750968	Hogan PJ
CH0295	196	750968	Hogan PJ
CH0299	192	750968	Hogan PJ
CH0300	191	750968	Hogan PJ
CH0301	190	750968	Hogan PJ
CH0305	189	750968	Hogan PJ

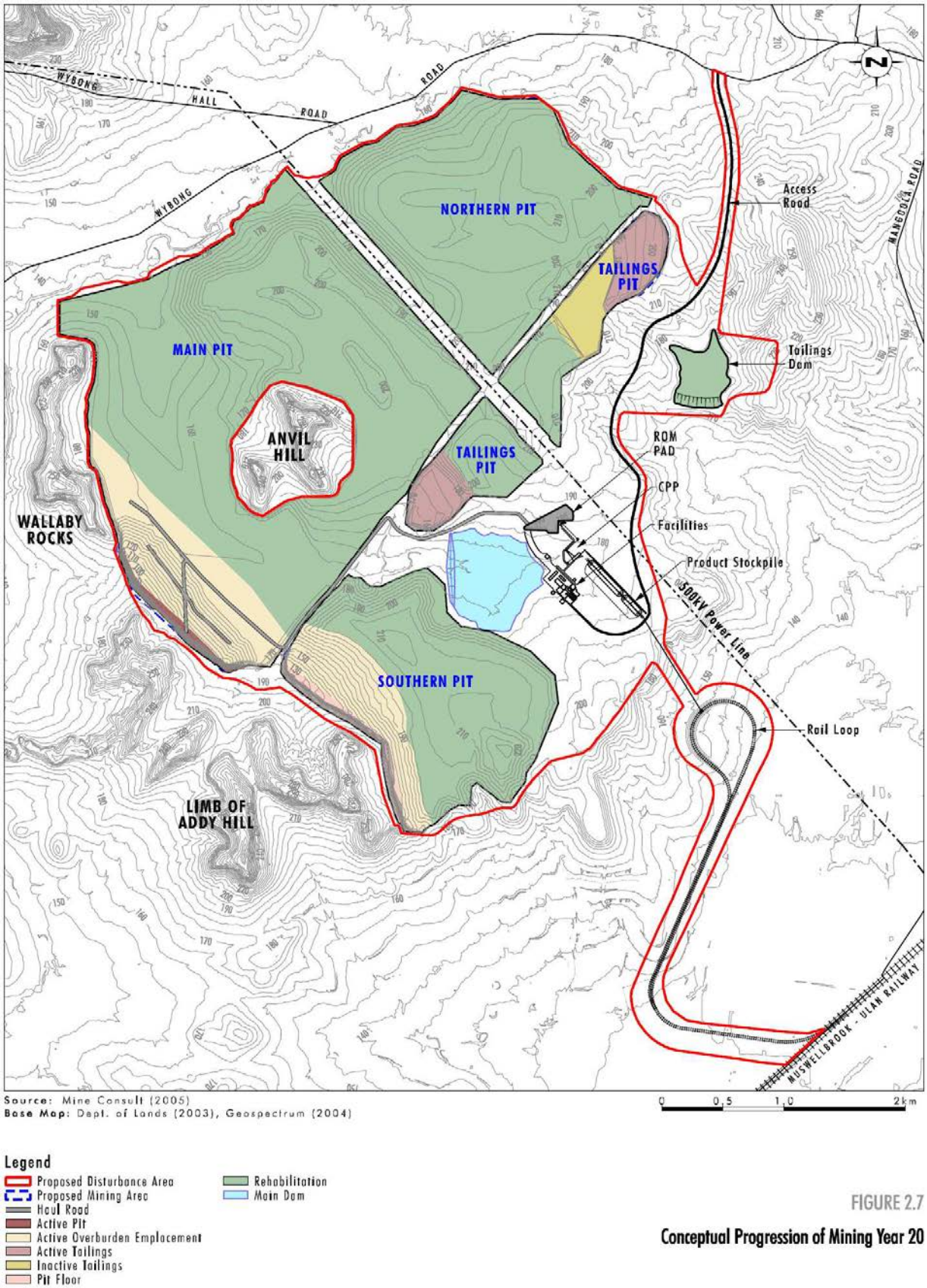
Property ID*	Lot	DP	Owner
CH0097	88	750968	Hogan PJ & JT
CH0239	230	869334	Xstrata Mangoola Pty Limited
CH0233	257	706955	Xstrata Mangoola Pty Limited
CH0241	23	622786	Xstrata Mangoola Pty Limited
CH0019	156	750968	Xstrata Mangoola Pty Limited
CH0020	155	750968	Xstrata Mangoola Pty Limited
CH0251	22	622786	Xstrata Mangoola Pty Limited
CH0296	195	750968	Xstrata Mangoola Pty Limited
CH0297	194	750968	Xstrata Mangoola Pty Limited
CH0255	2171	706389	McLane G
CH0066	11	112946	Xstrata Mangoola Pty Limited
CH0240	23	8090	Xstrata Mangoola Pty Limited
CH0249	22	8090	Xstrata Mangoola Pty Limited
CH0264	21	8090	Xstrata Mangoola Pty Limited
CH0060	111	531273	Xstrata Mangoola Pty Limited
CH0092	101	805458	Xstrata Mangoola Pty Limited
CH0192	41	805505	Xstrata Mangoola Pty Limited
CH0187	42	805505	Ray HJG
CH0103	100	805458	Xstrata Mangoola Pty Limited
CH0036	13	842072	Sormaz N & M
CH0243	229	726283	The State of New South Wales (Licence to Hogan P D)
CH0324	173	750968	Xstrata Mangoola Pty Limited
CH0320	179	750924	Wood ND
CH0053	12	594674	Xstrata Mangoola Pty Limited
CH0321	178	750924	Xstrata Mangoola Pty Limited
CH0307	187	750924	Xstrata Mangoola Pty Limited
CH0159	1	995693	Xstrata Mangoola Pty Limited
	11	112946	Xstrata Mangoola Pty Limited
	21	8090	Xstrata Mangoola Pty Limited
	22	8090	Xstrata Mangoola Pty Limited
	23	8090	Xstrata Mangoola Pty Limited
	1	1003300	Xstrata Mangoola Pty Limited
	18	996754	Xstrata Mangoola Pty Limited
	1	995693	Xstrata Mangoola Pty Limited
	12	594674	Xstrata Mangoola Pty Limited
	11	842072	Xstrata Mangoola Pty Limited
	257	706955	Xstrata Mangoola Pty Limited
	178	750924	Xstrata Mangoola Pty Limited
	PT 11	750919	Muswellbrook Shire Council
		Part Coolabah Road	Muswellbrook Shire Council
		Part Mangoola Road	Muswellbrook Shire Council
		Part Muswellbrook – Ulan Rail Line	Rail Corporation New South Wales (RailCorp).

* As identified in the Environmental Assessment

Other Lands

Crown Roads, Council Roads, the bed and banks of the Hunter River and the Muswellbrook – Ulan railway, identified in the area shown on Figure 1 – Project Application Boundary

APPENDIX 2
PROJECT LAYOUT PLAN



Source: Mine Consult (2005)
Base Map: Dept. of Lands (2003), Geospectrum (2004)

Legend

- Proposed Disturbance Area
- Proposed Mining Area
- Haul Road
- Active Pit
- Active Overburden Emplacement
- Active Tailings
- Inactive Tailings
- Pit Floor
- Rehabilitation
- Main Dam

FIGURE 2.7

Conceptual Progression of Mining Year 20

APPENDIX 3
STATEMENT OF COMMITMENTS

[Note: References to sections, figures and appendices are references to the EA]

6.2 Community Enhancement Program

6.2.2 Xstrata will work with the local Council to facilitate local employment opportunities within the Muswellbrook Shire.

6.4 Noise

Noise Mitigation Measures

The following noise control measures will be employed throughout the life of the Project unless otherwise agreed by the Department:

6.4.3 The CPP, coal stockpiles and associated infrastructure will be located near the eastern boundary of the Proposed Disturbance Area to take advantage of natural topographic shielding which will reduce noise impacts on surrounding areas.

6.4.4 The CPP and crushers will have noise enclosures, and shielding will be installed for conveyors.

6.4.5 The rail loop will be located to use natural topography for shielding as much as possible. In addition, a 4 metre high noise barrier will be constructed on parts of the track to meet the noise modelling in the EA.

6.4.6 At night, trucks will be restricted to operate below the maximum elevation of the overburden emplacement areas.

6.4.9 If there are more than 20 privately-owned properties in the acquisition zone that have not entered into a negotiated agreement, Xstrata will either:

(a) carry out no night time mining operations; or

(b) prepare and implement a noise management plan, in consultation with the DECC, and to the satisfaction of the Director-General to reduce the noise impact of mining operations on the properties in the acquisition zone.

Notes:

1. *This plan may include measures to reduce the intensity of mining operations, or restrict night time mining operations.*
2. *In this commitment, negotiated agreement means a written agreement between Xstrata and the landowner in which the landowner agrees not to be counted as a number in the acquisition zone.*

6.5 Blasting and Vibration

Blast Controls

6.5.6 Xstrata will design and undertake blasts to ensure the relevant vibration and blast overpressure criteria are met at the 500 kV transmission line.

6.5.7 Xstrata will refine and manage its blasting practices or undertake ameliorative measures so as not to significantly increase the risk of instability or affect the structural integrity of the rock shelter sites that are considered to be of significant Aboriginal cultural value in the Wallaby Rocks, Western Rocks and Limb of Addy Hill plateaus. This will include an ongoing monitoring program and review of blast design parameters.

6.5.8 Techniques to minimise blast impacts will be employed as necessary to ensure compliance with relevant criteria. This may include blast initiation using electronic detonation techniques, limiting blast MIC, consideration of wind speed and direction prior to blasting, use of adequate stemming, implementing a delay detonation system, and careful drilling and hole loading to ensure that the required blast design is implemented.

6.5.9 The Mine Manager or delegate will undertake a pre-blasting review of weather conditions to identify any conditions which may significantly increase blasting impact or dust impacts. When weather conditions are suitable or if safety requirements dictate at other times, the Mine Manager or delegate will issue a blast clearance prior to each blast proceeding.

6.5.10 Wybong Road will be temporarily closed during blast events within 500 metres of the road.

6.5.12 All relevant personnel will be trained on environmental obligations in relation to blasting controls.

6.5.13 The date, location of blast holes and quantity of explosive detonated each day will be documented.

6.5.14 Monitoring will be undertaken at locations representative of surrounding nearest private residences and other sensitive locations to verify compliance with relevant vibration and blast overpressure criteria, and identify appropriate further blast refinement or management.

6.5.15 Blast management procedures will be periodically reviewed to evaluate performance and identify corrective action, if required.

6.5.16 Blast monitoring results will be reported in the AEMR.

6.6 Air Quality

Air Quality Controls

6.6.2 Water sprays will be used at coal handling transfer points and on stockpile areas that are capable of generating dust.

6.6.3 All active roads will be clearly defined and the development of minor roads will be limited. Minor roads used regularly for access will be constructed so as to minimise dust generation (for example, by using well-compacted select material) and will be watered as required.

6.6.4 Speed limits will apply and be enforced on all roads on the mine site.

6.6.5 Water carts will be used on active haul roads and unsealed working areas. Surface moisture levels on all haul roads will be maintained at suitably elevated levels and/or chemical treatments will be applied to achieve 90% dust suppression.

6.6.6 Only the minimum area necessary for mining operations will be disturbed at any time.

6.6.7 Reshaping and rehabilitation of mining and overburden emplacement areas, and obsolete roads, will be undertaken as soon as practicable.

6.6.8 Drills will be fitted with dust suppressant measures.

6.6.9 Blasting design and operation will be managed to achieve optimum material breakage and movement to facilitate efficient mining while minimising the explosives used to achieve this outcome. This includes consideration of material and explosives characteristics, excavating equipment specifications, hole spacing and stemming material specification, accurate placement and drilling of holes, accurate explosives loading and well-managed stemming of blast holes. These measures will assist with minimising dust generation in the blasting process.

6.6.10 Cover crops will be established on any topsoil and subsoil stockpiles that are not planned to be used in less than six months.

6.6.11 Meteorological conditions will be monitored and weather data will be considered in the timing of blasts to assist with minimising the impacts of blast generated dust.

6.6.12 Dust control measures to be employed during construction will include use of water carts, defining of trafficked areas, imposition of vehicle speed limits and constraints on work under extreme unfavourable weather conditions.

6.6.13 A spontaneous combustion management strategy will be developed for the Project and will include coal stockpile and reject emplacement management measures, monitoring potential causes of spontaneous combustion events, and actions that can be implemented in the event of spontaneous combustion occurring.

6.6.14 Mine personnel will be provided with training in dust controls during induction for mine operations.

6.6.15 Xstrata will install first flush systems on residential rain water tanks, at the request of landowners located within 4 kilometres of the Project Disturbance boundary.

6.7 Water Management

6.7.1 Conceptual surface water controls have been designed to ensure that clean runoff is separated from runoff within disturbed mining and infrastructure areas. Conceptual sediment and erosion controls have been designed to ensure any runoff from disturbed areas is appropriately treated.

6.7.2 The drainage lines to be constructed as part of the final landform generally along the alignment of Anvil Creek as it existed prior to approval will be designed and constructed to provide a stable vegetated channel with a natural appearance that blends in with any adjoining riparian areas. Native trees and shrubs will be planted along the drainage alignment to enhance the long term stability of the drainage system and to provide suitable habitat for native fauna.

6.7.3 A comprehensive water quality monitoring program will continue throughout the life of the Project to monitor the surrounding surface water quality.

Groundwater

6.7.4 The existing groundwater monitoring bore locations will be maintained and a number of additional bores will be constructed at new locations beyond the mine pit areas, and in spoils following reshaping. Locations for these piezometers will be subject to consultation with DWE. These bores will be monitored every two months for a range of parameters including water table level, pH, and EC and further analyses every six months for total dissolved solids (TDS), major ions, and heavy metals. Daily monitoring of water levels by automatic data loggers at existing piezometers and in selected new piezometers will continue. Analyses of this 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.

6.7.5 As discussed in **Section 5.3.2.3**, it is possible (but unlikely) that two existing groundwater wells not owned by Xstrata may be affected by the Project. If the data obtained from the groundwater monitoring program indicates that the Project is having an adverse affect on these groundwater bores (that is, reduced groundwater yield from existing wells), then an alternative water supply will be provided by Xstrata.

6.7.6 If monitoring indicates it is required, a barrier cut off wall within the alluvium associated with Big Flat Creek will be constructed to limit groundwater seepage into the mine.

6.7.7 Final voids have been designed to intercept leachate from overburden emplacement areas and minimise discharge of saline groundwater. Final void design will be reviewed at least three years prior to anticipated mine closure.

6.7.8 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.

6.8 Ecological Management and Site Rehabilitation

6.8.2 Xstrata is committed to long term protection of the Proposed Offset Areas and will finalise the appropriate tenure / conservation mechanism to achieve this, in consultation with the Department, DECC and DPI.

6.8.3 Xstrata will seek to acquire all proposed components of the Proposed Offset Areas within one year of the date of project approval. If one or more proposed components of the Proposed Offset Areas have not been acquired within this time frame, Xstrata will consult with DECC and the Department to identify alternatives.

6.8.4 The land to be included in the conceptual corridors will include one external corridor to the north and one external corridor to the west, with the final location to be determined in consultation with DECC and the Department.

6.8.5 Xstrata will take all reasonable steps to acquire all proposed component(s) of the conceptual corridors within one year of the date of granting of project approval. If proposed component(s) of the conceptual corridors have not been acquired within this time frame, Xstrata will consult with DECC and the Department to identify alternatives.

6.9 Aboriginal Cultural Management

Site Management in Proposed Disturbance Area

6.9.1 Surface collection and grader scrapes will be undertaken for sites identified in the EA, prior to works commencing in these areas. Manual excavation will be undertaken in areas where the grader scrapes reveal features such as hearths, heat treatment pits, knapping floors or significant artefact concentrations.

6.9.2 Site AC13 will be subject to a detailed geomorphic investigation, a sub-surface test pitting program, large area manual excavation and grader scrapes.

6.9.3 Site SC10 will be managed for use by the Aboriginal and wider communities for teaching and educational purposes.

Conservation Management

6.9.4 The Proposed Offset Areas shown on **Figure 5.8** provide for conservation of archaeological terrain units evaluated as having equal or greater overall significance than in the Proposed Disturbance Area. Xstrata is committed to conserving all 98 identified sites and the landscapes in which they occur, within the Proposed Offset Areas. The Proposed Offset Areas will conserve all the rockshelter sites within Wallaby Rocks, Limb of Addy Hill, Western Rocks and Anvil Hill. Anvil Hill rockshelter sites (four sites), however, may be affected by the indirect impacts of blasting. This impact will be mitigated and management strategies for the rockshelters on Anvil Hill are discussed in **Appendix 13**.

6.10 Heritage

6.10.2 Archival recording will be undertaken for all heritage items identified within the Proposed Disturbance Area, prior to disturbance of such sites, to the standards of local heritage significance as specified by the guidelines of the NSW Heritage Office.

6.10.3 The surface collection and salvage of Ham House 1 and Ham House 2 and associated dairies, creamery and structures will be undertaken.

6.10.4 Xstrata will complete a detailed archival recording of the Castle Hill homestead to the standard of local heritage significance.

6.10.5 Potential further sites of local heritage value located within the area at which the relevant vibration criteria are predicted to be exceeded will be inspected, subject to landowner permission for access, and appropriately recorded prior to blasting. This will include assessing the structural status and identifying appropriate ameliorative measures, where relevant.

6.11 Traffic and Transport

6.11.2 Wybong Road will be upgraded in association with Council, from the intersection with Bengalla Link Road to the proposed mine access road. This includes an upgrade to a sealed carriageway minimum 6.5 metres wide, road marked centreline to relevant standards, enhancement of safety and advisory signage, and upgrade of sections to ensure safe operation of school bus zones and stops. All works will be undertaken in consultation with Council and to the standards recommended in the detailed traffic assessment in **Appendix 16**.

6.11.3 The intersection of Wybong Road and the mine access road will be a Type B rural layout with a left turn auxiliary lane from Wybong Road into the proposed access road.

6.12 Greenhouse Gas

6.12.1 Xstrata will implement the following approaches to improving energy efficiency and reducing greenhouse emissions from the Project:

- use of minimum 5% bio-diesel or similar in the mining fleet, where environmental benefit is demonstrated;
- implementation of an energy management system within 2 years of the commencement of mining;
- conduct of an energy efficiency audit each three years after the commencement of mining; and
- installation of gas boosted solar hot water system.

Xstrata will continue to assess and implement energy and greenhouse management initiatives during the Project design, operation and decommissioning.

6.12.2 In addition to these initiatives, Xstrata will review various emission trading schemes and abatement initiatives available and assess the suitability of these for the Project (for example, the NSW Greenhouse Gas Abatement Scheme). The objective of these measures is to seek further opportunities to reduce or offset GHG emissions from the Project.

6.13 Visual Controls

Vegetative Screenings

6.13.1 Where access allows, vegetative screens will be planted along the lower sections of Mangoola Road from Roxburgh Road to the new rail loop intersection and along the ridge extending west from Limb of Addy Hill.

6.13.2 Final revegetation of disturbed areas will consider the reduction of visual impacts.

Infrastructure

6.13.4 The link road from the CPP to the Tailings Dam will be relocated to avoid the knoll 500 metres east of the product stockpile. This will ensure existing vegetation on the knoll shields views of the CPP and stockpile from VP 2.

6.13.5 The colour of building roofs and walls will be selected to differentiate elements and reduce visual mass.

6.13.6 The spur on the north-east edge of Anvil Hill at RL 220 will be recreated as part of the overburden emplacement areas to assist screening of the CPP from Years 10 to 20 when viewed from the north around VP 10.

6.13.7 The north, east and south sides of the workshop and CPP will be clad to meet the noise modelling in the EA.

6.13.8 All floodlights in the open cut area will be shielded to the maximum extent practicable.

6.13.9 Workshop doors will be orientated south or south-west, where possible, to reduce light spill.

6.13.10 Where safe to do so, trucks on access roads will make use of portable visual edge markers to increase drivers' visibility of road edges when driving with dipped headlamps.

Operational Measures

6.13.11 At night, work will be restricted to lower levels on the overburden emplacement areas to reduce noise impacts which will also reduce potential direct lighting effects from random elements such as truck headlights and flashing beacons.

APPENDIX 4
GENERAL TERMS FOR THE PLANNING AGREEMENT

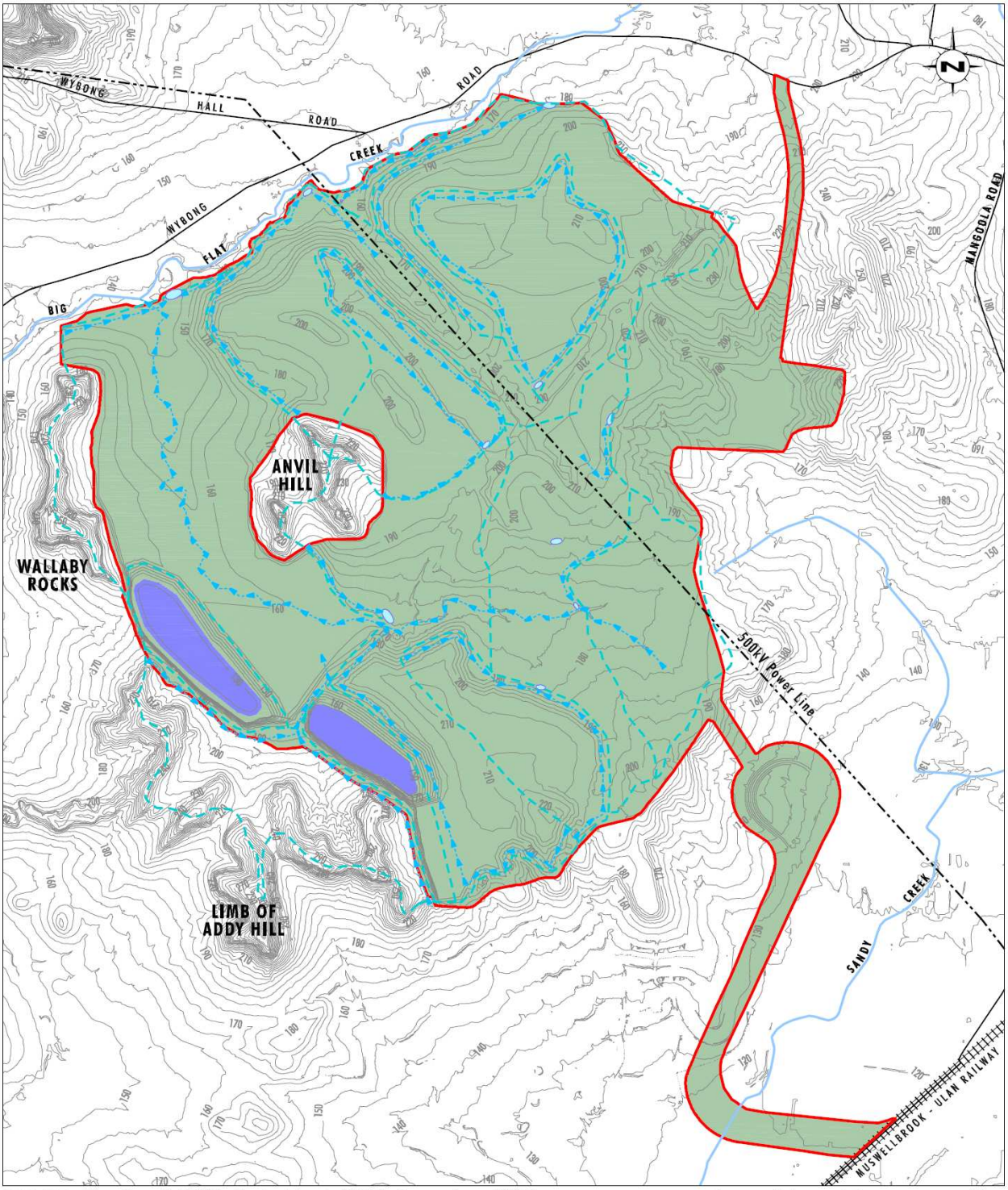
Funding Area	Project	Minimum Proponent Contribution	Funding Time Frame
Local Environmental Management	Wybong Uplands Land Management Strategy	$500,000	$100.000 x 5 years, from commencement of construction.
Local Employment	Educations and Training Strategy	$600,000	3 – 6 annual contributions to be paid from commencement of construction.
Community Projects	Recreation Assets Renewal Fund	$1,200,000	Contributions to start on commencement of production, with flexible instalments. and interest on the capital outstanding to be contributed annually.
Community Infrastructure	Denman recreation area enhancements	$2,200,000	3-4 annual contributions to be paid from commencement of production, with a weighting towards the latter contributions in accordance with Council's schedule of works.

APPENDIX 5
LANDOWNERS WITH ACQUISITION RIGHTS

Residence ID*	Owner	Lot	DP	Significant Noise Impact	Significant Air Impact	Significant Blast Impact - Vibration	Significant Blast Impact - Overpressure
Residences							
28	Attkins BK & Barnett VJ	18	750969	Yes	-	Yes	-
30	Baywalis Management Pty Ltd	11	805364	Yes	-	-	-
31	Bell PI & CJ	32	735121	Yes	Yes	Yes	Yes
56	Buddin KW & Bezzina S	23	240086	Yes	Yes	Yes	Yes
140	Cleal AP & Molloy LM	121	811176	Yes	-	-	-
34	Cole G R	186	750924	Yes	-	-	-
115	Cope AW & LK	181	750924	Yes	-	-	-
37	Danks JL, CA, PW	10	805364	Yes	-	-	-
39	Duggan KM & EA	651	263080	Yes	-	-	-
43	Eddy BM & TA	2170	706389	Yes	Yes	Yes	Yes
45A	Elliott MJ	71	631197	Yes	-	-	-
121	Fairweather JA	2	593485	Yes	-	-	-
269A	Fernandes MAR	90	818690	Yes	-	-	-
269C	Fernandes MAR	13	1043996	Yes	-	-	-
59B	Hopkins CM	6	750969	-	Yes	-	-
132	Horden RJ & AM	180	750924	Yes	-	-	-
10	Hurney PJ & AM	1593	809469	Yes	-	-	-
137	Jannsen HM & PH	178	750924	Yes	-	-	-
71	Morgan JM	2	555166	Yes	-	-	-
78	Peel PM & RH	184	750924	Yes	-	-	-
81	Phelps JR & CM	12	240086	Yes	-	-	-
82	Pittman LA & BA	19	240086	Yes	Yes	Yes	Yes
84	Ray HJG	42	805505	Yes	Yes	Yes	Yes
83	Ray MD & JT	9	750968	-	Yes	Yes	Yes
89	Santa Beef Breeders Pty Ltd	4	555166	Yes	-	-	-
91	Shorter GM & O'Hara PJ	10	240086	Yes	-	-	-
118	Ward JW & SL	3	845723	Yes	-	-	-
101	Weir RW	654	263080	Yes	-	-	-
25	Withers KL, LA, RIC & PJ RAY	168	750968	Yes	-	Yes	Yes
169	Wood ND	179	750924	Yes	-	-	-
Vacant Land							
-	Englebrecht JA & Telfer S	123	869335	Yes	-	-	-
-	LeBreton MJ & CA	22	2827772	Yes	Yes	Yes	Yes
-	James Visser Pty Limited	11	1154052	Yes	-	-	-
-	Googe FN & WL	1	1957072	Yes	-	-	-
-	Fairweather CR, ALJ, JMA & WS	71	9011088	Yes	-	-	-
-	The Trustees of the Roman Catholic Church for the Diocese of Maitland	19	650541		Yes	-	-

* As identified in the Environmental Assessment

APPENDIX 6
CONCEPTUAL REHABILITATION PLAN



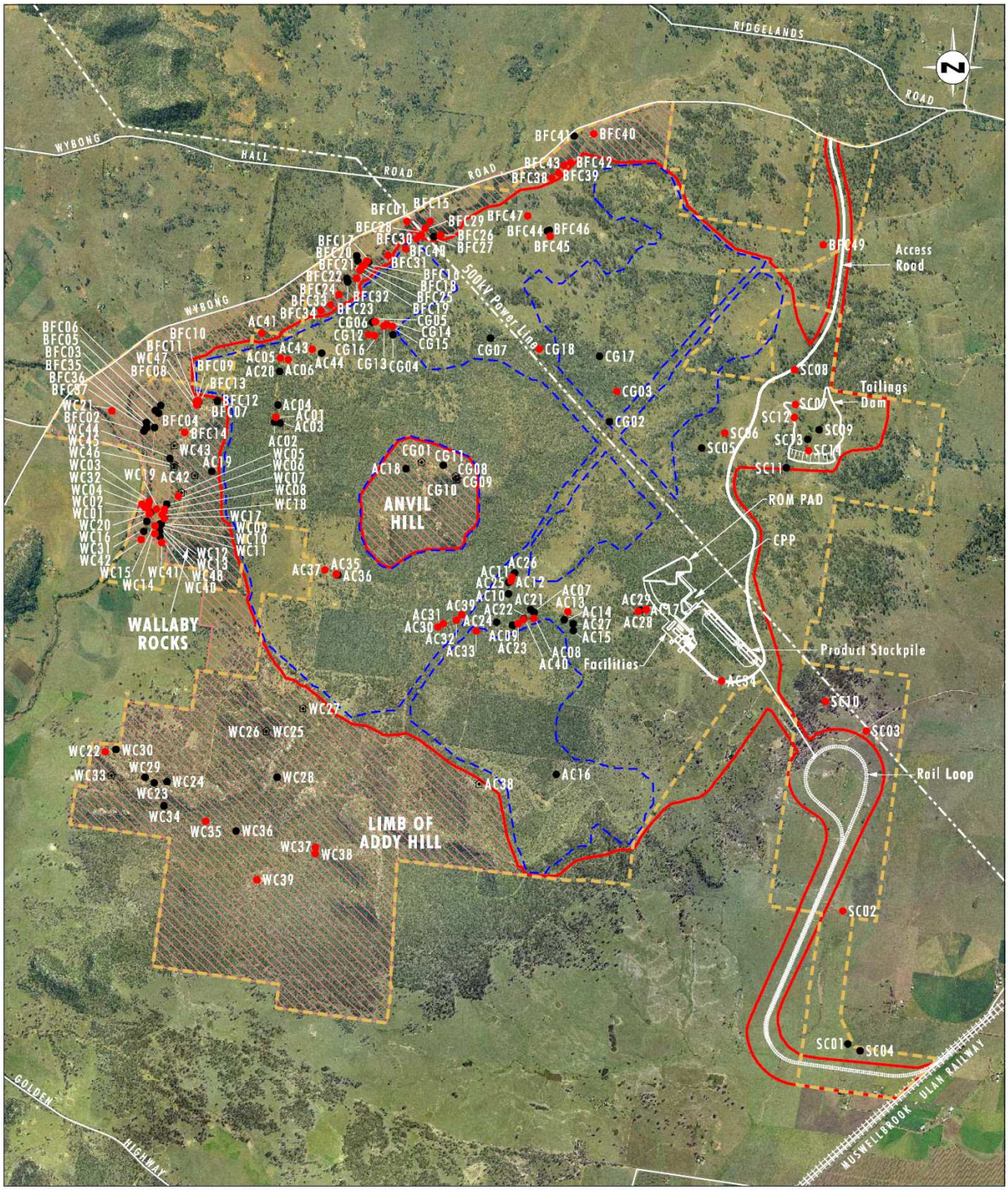
Base Map: Mine Consult (2005), Dept. of Lands (2003), Geospectrum (2004)
Note: Contour Interval 5m

Legend
- Proposed Disturbance Area
- Rehabilitation
- Final Voids
- Sediment Dam
- Catchment Boundary
- Major Catch/Diversion Drain

FIGURE 5.5

Conceptual Final Landform and Drainage

APPENDIX 7
ABORIGINAL SITES



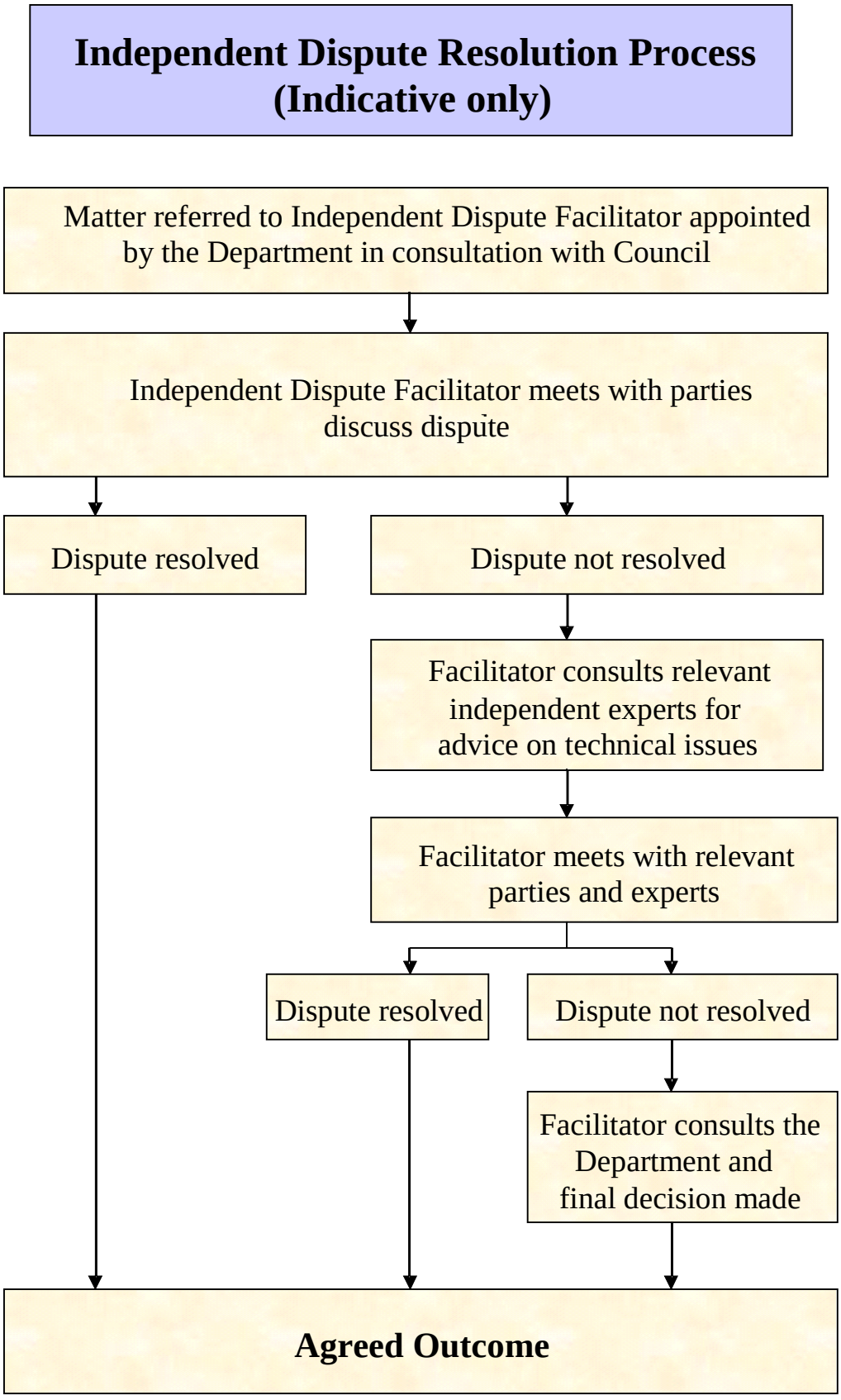
Source: Umwelt (2006)
Base Map: Dept. of Lands (2003), ortho-rectified by Plateau Images 2005

Legend
- Proposed Disturbance Area
- Archaeological Survey Area
- Proposed Mining Area
- Proposed Offset Area
- Artefact Scatter (Open Camp Site)
- Isolated Find
- Shelter with PAD

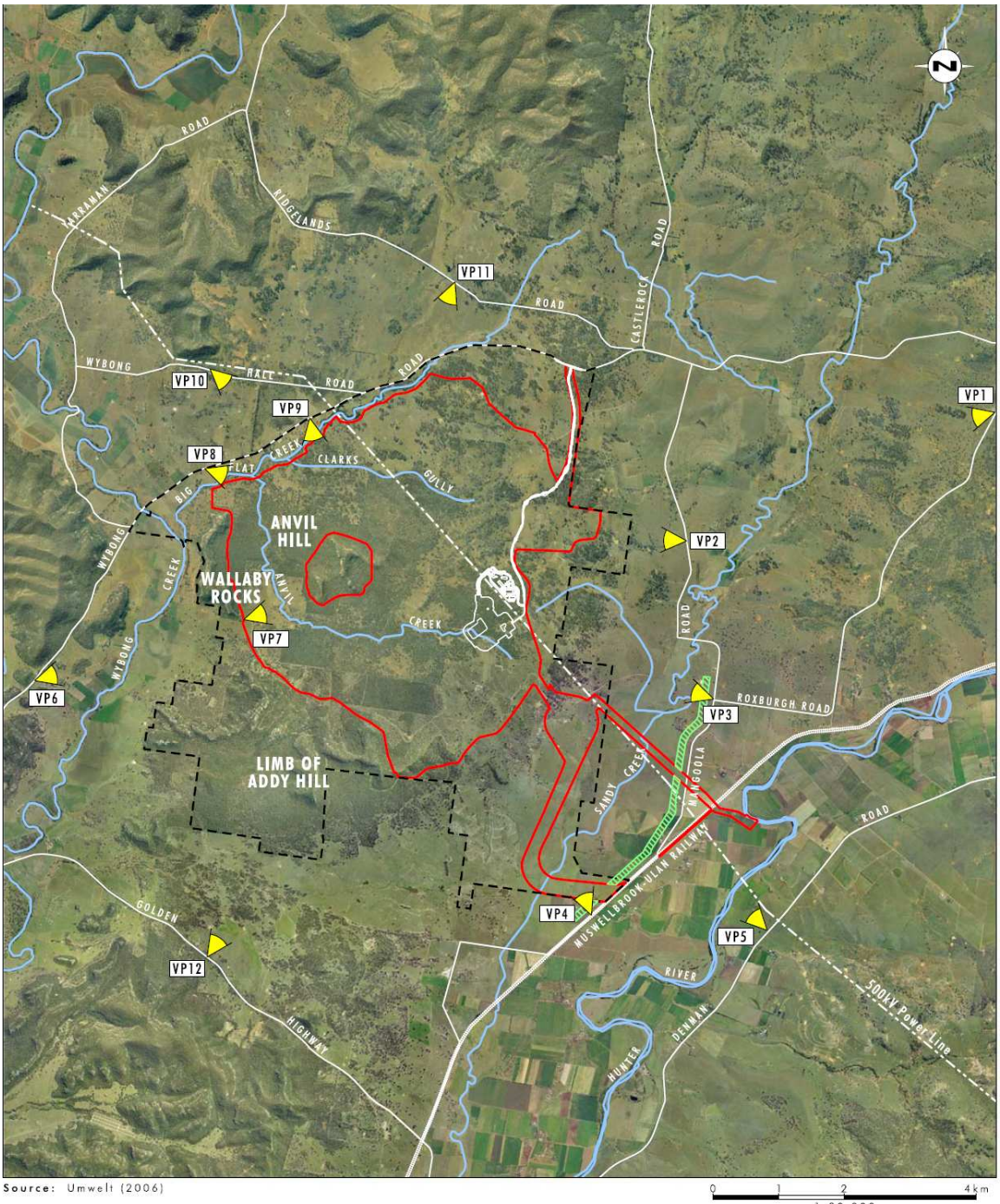
FIGURE 5.26

Aboriginal Sites and Cultural Heritage Offsets

APPENDIX 8
INDEPENDENT DISPUTE RESOLUTION PROCESS



APPENDIX 9
VISUAL VEGETATION SCREEN



Source: Umwelt (2006)

Legend

- Proposed Disturbance Area
- Project Area
- Viewpoint
- VP6 Viewpoint Number
- Proposed Vegetation Screening

FIGURE 4.1

Visual Assessment Locations

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Meteorological Data










APPENDIX D

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Mangoola Coal AEMR 2010-2011
Meterological Monitoring Data
Monitor: WSS

Date	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (m/s)	Wind Speed Ave (m/s)	Wind Speed Max (m/s)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/07/2010	0.4	7.2	14.4	0.7	7.3	13.7	44	69	92	1021.8	1023.5	1025.4	0.3	1.5	3.3	0.0	4.7	91.9	491.8	-1.40	0.14	1.90	0.70	6.34	68.70
2/07/2010	5.2	8.3	11.6	5.5	8.3	11.0	64	80	90	1022.9	1024.4	1026.6	0.1	1.2	3.2	0.1	4.7	42.9	213.0	-1.00	-0.05	0.90	0.90	4.75	18.00
3/07/2010	3.2	9.7	15.6	4.3	9.6	14.4	40	64	84	1023.0	1025.4	1028.3	1.4	3.2	5.9	0.0	3.9	124.3	547.7	-1.60	-0.10	2.10	0.60	3.28	19.70
4/07/2010	0.8	7.1	14.4	0.8	7.2	13.4	53	75	94	1025.2	1027.1	1029.3	0.2	1.4	3.5	0.0	4.7	97.6	472.7	-1.40	0.14	2.10	0.70	6.69	61.10
5/07/2010	2.8	9.2	15.2	3.3	9.1	14.1	70	86	96	1018.9	1023.3	1026.2	0.1	1.7	4.1	0.0	3.5	75.2	504.6	-1.40	-0.17	1.00	0.50	8.31	94.60
6/07/2010	8	11.9	17.6	8.1	11.8	16.7	45	77	96	1013.4	1016.5	1019.5	0.1	2.1	5.3	1.3	3.9	81.4	536.8	-1.60	-0.11	1.20	0.50	6.74	74.90
7/07/2010	6.8	10.8	14.4	7.0	10.5	13.7	64	76	87	1019.0	1021.6	1023.5	0.3	2.0	5.8	0.0	4.7	64.1	364.3	-1.30	-0.29	0.60	0.60	5.13	37.20
8/07/2010	8.8	11.6	14.4	9.4	11.4	13.7	69	77	89	1023.0	1024.2	1025.8	0.3	2.0	4.6	0.0	5.3	63.2	557.7	-1.40	-0.16	1.40	1.00	6.57	76.80
9/07/2010	4.4	10.3	14.4	6.5	10.4	13.6	78	91	97	1025.2	1026.3	1027.7	0.2	2.0	5.7	0.0	5.3	58.6	460.9	-1.60	0.14	3.60	0.70	6.75	81.80
10/07/2010	8.4	12.2	17.6	9.2	12.2	16.4	62	85	96	1022.1	1024.9	1027.5	0.1	1.4	3.4	0.0	3.9	92.5	560.8	-1.50	-0.03	1.80	0.80	6.55	43.50
11/07/2010	8.4	12.7	17.6	8.6	12.6	16.9	63	84	95	1019.6	1021.1	1022.6	0.2	2.1	7.8	0.4	4.7	53.3	282.2	-1.30	-0.08	1.20	0.60	5.15	45.00
12/07/2010	12	12.9	15.2	12.2	12.7	14.5	91	95	96	1019.7	1020.8	1022.3	0.1	1.2	4.3	3.5	3.9	30.2	212.3	-0.90	-0.25	0.40	0.50	6.65	70.50
13/07/2010	12.2	13.3	15.6	12.0	13.1	14.8	87	93	96	1009.9	1016.4	1020.4	0.2	1.1	2.6	0.0	3.9	46.6	283.6	-1.10	-0.24	0.50	1.10	6.93	63.90
14/07/2010	10.8	13.6	17.6	11.1	13.4	17.5	45	69	94	1006.2	1011.4	1014.6	0.6	4.8	9.7	24.7	5.3	118.8	599.3	-1.90	-0.18	0.50	0.60	2.75	19.40
15/07/2010	6	11.4	15.2	6.6	11.2	14.1	45	59	73	1012.8	1017.4	1022.4	2	4.7	9.7	0.1	5.3	122.9	550.7	-1.60	-0.21	0.90	0.40	2.75	12.20
16/07/2010	1.2	7.8	14.8	1.8	7.9	14.3	46	70	94	1022.4	1023.9	1025.7	0.3	1.4	3.3	0.0	4.7	134.6	500.0	-1.50	0.11	1.90	0.60	8.25	62.50
17/07/2010	0.4	7.9	16.4	0.8	8.0	15.4	54	79	96	1023.0	1024.8	1027.4	0.2	1.4	2.9	0.0	5.3	135.0	503.1	-1.30	0.15	1.70	0.30	5.44	50.90
18/07/2010	0.8	9.8	19.6	1.2	9.8	18.9	41	74	97	1017.0	1019.9	1023.1	0.2	1.8	5	0.0	4.7	135.8	506.6	-2.00	0.07	2.00	0.50	6.68	38.30
19/07/2010	3.2	8.5	15.2	3.5	8.7	14.7	56	82	94	1014.7	1016.3	1017.8	0.1	1.3	3	0.0	3.9	63.9	592.8	-1.40	0.28	1.50	0.80	8.19	107.70
20/07/2010	5.6	9.9	15.2	6.1	9.8	13.9	48	72	94	1017.8	1020.4	1022.9	0.1	1.2	2.8	0.0	5.3	97.3	563.6	-1.40	0.00	1.40	0.70	7.41	45.10
21/07/2010	4.4	8.6	14	4.3	8.5	12.9	55	76	93	1022.9	1024.1	1025.8	0.3	1.9	5.1	0.0	5.8	97.9	552.0	-1.70	-0.10	2.00	0.50	4.37	33.90
22/07/2010	0.8	7.7	15.6	1.3	7.8	15.1	47	79	97	1025.4	1027.3	1029.9	0.2	1.5	4.6	1.0	4.7	135.5	519.9	-1.50	0.13	2.20	0.80	8.06	83.70
23/07/2010	4.4	9.6	16.6	4.3	9.4	15.5	53	78	95	1028.2	1029.6	1031.7	0.1	1.7	4.7	0.0	4.7	125.4	576.3	-1.70	-0.13	1.40	0.70	7.19	64.50
24/07/2010	6	11.4	17.2	6.1	11.2	16.3	56	78	92	1025.1	1027.4	1029.6	0.2	1.5	3.5	0.0	2.6	122.3	615.5	-1.40	-0.16	0.80	0.70	8.84	84.70
25/07/2010	9.2	12.3	17.6	9.5	12.1	16.0	58	81	93	1024.9	1026.9	1028.6	0.1	2.0	5.5	0.0	5.3	104.4	597.0	-2.30	-0.24	0.80	1.00	7.56	97.10
26/07/2010	8.8	11.8	16.8	9.2	11.7	15.7	52	77	89	1028.5	1030.7	1032.4	0.4	2.4	5.7	0.0	5.3	111.8	631.4	-1.70	-0.16	0.80	0.80	5.89	61.00
27/07/2010	5.2	11.0	17.2	6.7	11.1	16.1	64	85	96	1029.0	1031.1	1033.3	0.1	2.7	7.7	0.0	5.3	98.1	507.1	-1.40	0.08	1.90	0.60	5.65	56.80
28/07/2010	9.4	11.8	12.8	9.8	11.7	12.6	86	93	96	1020.0	1024.2	1029.5	0.3	2.3	5.5	18.3	5.3	18.0	68.4	-0.50	-0.08	0.90	0.80	3.89	67.70
29/07/2010	10.4	13.5	16	10.7	13.4	15.8	82	91	96	1014.7	1017.4	1020.0	0.2	1.2	2.9	0.2	3.9	53.7	246.2	-0.90	-0.08	0.90	0.70	11.05	88.20
30/07/2010	10	15.1	19.6	10.9	15.1	19.1	67	85	95	1012.5	1015.5	1017.5	0	1.7	5.9	3.0	4.7	80.8	485.7	-1.30	0.05	2.40	0.50	6.74	54.20
31/07/2010	10.4	15.0	19.6	10.5	14.8	18.0	56	77	95	1010.1	1014.5	1020.0	0.3	3.5	8.6	3.6	4.7	108.4	587.0	-1.50	-0.22	0.60	0.60	4.59	77.10

	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (m/s)	Wind Speed Ave (m/s)	Wind Speed Max (m/s)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/08/2010	8	12.2	18.4	8.0	11.9	17.4	39	66	82	1015.5	1019.3	1022.2	0.8	4.0	8.3	1.3	5.3	145.3	577.8	-1.40	-0.29	0.50	0.70	2.65	10.20
2/08/2010	7.2	9.1	11.8	7.2	8.8	11.2	57	69	80	1013.5	1016.5	1019.0	3.4	5.8	10.2	0.5	4.7	95.7	600.9	-1.70	-0.24	0.40	0.70	2.25	7.60
3/08/2010	8.4	12.7	18.4	9.0	12.5	16.8	46	64	81	1012.8	1015.8	1018.5	0.4	3.3	7.9	0.1	4.5	118.7	755.5	-1.70	-0.20	2.10	0.60	3.97	63.60
4/08/2010	3.6	10.4	18.8	4.2	10.5	17.4	37	69	96	1014.6	1016.9	1019.0	0.4	2.2	5.7	0.0	6.6	155.1	595.9	-1.50	0.10	2.40	0.40	4.27	64.10
5/08/2010	3.6	10.0	17.2	4.0	9.8	15.6	32	62	91	1015.0	1017.0	1018.9	0.6	2.7	5.9	0.0	4.7	155.2	606.1	-1.70	-0.14	1.10	0.50	4.35	52.40
6/08/2010	5.4	9.6	16	5.6	9.4	15.1	36	61	80	1017.9	1019.5	1022.4	1.2	2.9	5.3	0.0	4.7	158.1	609.2	-1.40	-0.16	0.90	0.50	3.51	24.80
7/08/2010	1.2	8.0	15.2	1.6	8.0	14.6	35	63	90	1020.0	1022.2	1024.6	0.2	1.5	3.3	0.0	3.9	156.8	573.4	-1.40	0.04	2.10	0.60	8.65	62.60
8/08/2010	0.4	8.2	16.8	0.7	8.4	15.8	36	66	92	1017.3	1019.6	1021.7	0.2	1.3	2.8	0.1	5.3	160.1	575.0	-1.50	0.16	2.30	0.80	7.15	44.80
9/08/2010	0	9.8	19.2	0.9	9.7	18.1	39	68	94	1017.6	1019.7	1022.6	0.4	2.1	5.7	0.0	5.3	155.1	567.1	-1.50	-0.01	1.70	0.60	5.40	54.90
10/08/2010	10	12.3	14	9.9	12.1	13.7	68	89	96	1011.5	1014.7	1018.2	0.2	1.1	2.7	5.9	4.7	35.5	190.0	-1.00	-0.14	0.80	0.90	9.68	65.70
11/08/2010	9.6	12.7	15.2	9.5	12.4	14.8	49	63	95	1004.6	1008.5	1012.1	1.5	4.7	8.5	1.7	5.3	103.7	658.2	-1.60	-0.15	1.20	0.60	2.54	8.20
12/08/2010	8.8	11.1	13.6	9.0	10.8	12.5	59	71	86	1002.3	1005.7	1010.0	2.8	6.4	11.9	0.1	5.3	83.5	656.0	-1.80	-0.26	0.30	0.70	2.57	8.10
13/08/2010	8	11.9	17.6	8.2	11.6	16.8	42	65	81	1009.7	1012.2	1015.1	0.8	3.1	5.3	0.0	5.3	163.6	678.9	-1.70	-0.24	0.70	0.50	4.10	66.80
14/08/2010	3.6	11.2	18.8	3.7	11.2	17.8	39	67	95	1009.1	1012.8	1016.0	0.5	2.3	6.9	0.0	4.7	166.9	589.5	-1.60	-0.01	1.80	0.50	4.84	57.20
15/08/2010	8	13.8	19.6	8.4	14.0	18.4	32	54	81	1005.9	1008.3	1012.6	0.2	4.4	12.5	0.1	3.9	139.2	740.8	-1.70	0.15	2.70	0.60	9.31	85.20
16/08/2010	10.4	12.8	16	10.6	12.4	15.2	43	60	83	1012.0	1014.3	1018.1	2.2	5.4	9.8	0.0	5.3	162.2	722.2	-1.70	-0.36	0.50	0.60	2.53	8.80
17/08/2010	5.2	10.4	16.8	5.7	10.4	15.9	27	57	79	1018.2	1019.8	1022.3	0.2	1.9	4.7	0.0	4.5	157.1	642.7	-1.70	0.05	1.80	0.60	10.39	81.30
18/08/2010	1.2	12.2	21.6	1.9	12.2	21.2	38	64	90	1009.9	1015.3	1020.1	0.2	2.1	8.1	1.0	3.9	162.2	588.2	-1.90	0.06	2.40	0.50	7.97	68.90
19/08/2010	13.4	16.8	20.8	13.6	16.6	19.4	60	71	92	1008.4	1010.2	1011.9	0.7	4.6	9.9	8.9	4.5	96.9	528.6	-1.40	-0.18	0.50	0.60	2.83	19.10
20/08/2010	8.4	12.8	17.6	8.4	12.6	16.3	34	56	85	1010.7	1013.5	1017.3	1	4.1	8.5	1.0	3.5	176.5	623.8	-1.60	-0.26	0.60	0.80	3.19	10.10
21/08/2010	5.6	10.4	15.6	6.3	10.2	14.6	37	51	66	1016.6	1018.1	1020.7	0.5	3.0	6.5	0.0	3.9	129.9	593.6	-1.60	-0.14	0.80	0.50	3.16	45.90
22/08/2010	3.6	9.9	15.2	3.9	9.8	14.4	42	62	85	1018.4	1020.7	1023.3	0.3	1.4	3.9	0.0	5.3	144.3	622.4	-1.40	-0.15	1.00	0.40	5.92	49.60
23/08/2010	7.6	9.4	11.2	7.4	9.1	10.7	63	89	95	1009.7	1014.0	1018.2	0.3	2.1	7.1	2.9	3.9	26.9	111.8	-0.80	-0.22	0.50	0.60	5.56	72.50
24/08/2010	8.8	12.5	16.4	8.9	12.1	16.0	45	66	82	1009.9	1011.9	1014.4	1.9	5.0	8	0.0	4.7	148.2	717.8	-1.50	-0.33	0.30	0.60	2.46	8.00
25/08/2010	10.6	12.7	16.8	10.6	12.5	15.5	37	56	74	1006.5	1008.2	1010.1	2.4	5.5	10.8	0.0	4.7	149.8	678.8	-1.40	-0.24	0.50	0.80	2.33	7.00
26/08/2010	9	11.6	16	9.3	11.4	14.8	44	58	81	1003.5	1005.9	1007.4	2.7	6.0	11.1	2.9	3.9	120.1	716.4	-1.60	-0.21	0.90	0.60	2.28	8.60
27/08/2010	9.6	11.4	13.6	9.4	11.2	13.3	55	68	79	1007.1	1011.6	1017.0	2.7	5.5	11.3	0.0	5.3	77.3	411.3	-1.00	-0.21	0.40	0.90	2.15	7.80
28/08/2010	6	11.3	16.8	6.4	11.1	16.1	39	62	86	1017.1	1020.7	1025.3	0.2	2.1	4.1	0.0	4.7	188.2	763.5	-1.60	-0.14	1.20	0.40	10.20	87.80
29/08/2010	2.8	10.7	18.4	3.0	10.7	17.3	30	66	92	1023.7	1025.7	1028.0	0.1	1.3	2.8	0.0	5.3	184.0	646.1	-1.60	0.03	1.70	0.70	9.25	59.40
30/08/2010	3.6	11.3	18.8	4.0	11.3	18.0	45	73	94	1021.8	1024.3	1026.6	0.2	1.6	3.3	0.0	5.3	180.3	657.9	-1.70	0.02	1.40	0.60	10.21	88.60
31/08/2010	4.6	12.8	22	4.9	12.8	20.8	38	69	96	1018.3	1021.9	1024.9	0.3	2.4	7.4	0.0	5.3	161.1	685.0	-1.90	0.03	2.00	0.40	6.43	44.60

Mangoola Coal AEMR 2010-2011
Meterological Monitoring Data
Monitor: WSS

Date	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (m/s)	Wind Speed Ave (m/s)	Wind Speed Max (m/s)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/09/2010	8.6	17.6	23.6	9.8	17.5	22.8	37	52	74	1014.3	1016.7	1019.6	0.4	4.1	11.4	0.0	5.3	165.9	629.8	-1.40	-0.08	1.90	0.60	2.59	26.50
2/09/2010	14.4	19.4	27.6	14.5	19.1	26.5	37	65	89	1011.2	1014.4	1018.4	0.1	2.6	7.4	0.0	5.3	130.9	678.0	-1.70	-0.29	1.70	0.90	9.86	62.40
3/09/2010	13.6	14.6	16	13.2	14.2	15.4	79	86	95	1018.4	1020.9	1023.4	1.1	4.5	8.4	1.9	5.3	45.6	291.0	-1.10	-0.36	0.30	0.80	2.56	8.30
4/09/2010	13.8	16.8	22	13.9	16.6	21.4	53	84	96	1005.9	1011.9	1018.9	0.1	3.0	9.6	5.3	3.9	40.9	218.7	-3.20	-0.21	0.50	0.90	7.54	73.60
5/09/2010	11.2	15.8	18.8	11.5	15.5	18.0	48	58	82	1010.7	1014.1	1018.1	0.9	5.9	10.5	2.1	2.6	186.0	667.1	-1.80	-0.27	0.60	0.80	2.71	6.70
6/09/2010	8	12.8	18	8.5	12.7	17.0	36	59	84	1017.5	1019.1	1021.1	1	2.8	5.1	0.0	3.9	144.3	698.4	-1.60	-0.09	1.30	0.60	2.76	10.90
7/09/2010	4.8	11.8	18.8	5.5	11.6	17.8	31	64	88	1020.4	1022.2	1025.6	0.4	2.6	5.3	0.1	4.7	162.1	729.5	-1.80	-0.14	1.50	0.50	4.76	29.30
8/09/2010	5.6	11.9	18	6.7	11.8	17.0	40	67	92	1020.5	1023.4	1026.5	0.2	1.7	3.7	0.0	5.3	189.7	751.9	-1.70	-0.02	1.30	0.80	8.56	57.50
9/09/2010	6.4	11.2	15.2	6.3	11.0	14.6	68	87	94	1008.1	1014.5	1020.5	0.1	1.3	4.3	5.8	4.7	75.1	484.2	-1.00	-0.18	1.50	0.90	8.93	76.10
10/09/2010	11.4	15.9	22.8	11.8	15.7	21.7	39	68	94	1002.3	1007.1	1013.2	0.3	4.2	11.1	0.4	1.2	155.7	839.0	-1.70	-0.17	0.90	0.50	4.29	82.60
11/09/2010	9.8	14.8	20.8	10.1	14.6	20.1	32	51	65	1013.2	1016.7	1019.7	0.5	2.5	4.3	0.0	5.8	200.7	703.9	-1.50	-0.17	0.80	0.60	7.46	77.00
12/09/2010	5	14.3	21.4	5.7	14.2	20.8	38	61	90	1016.1	1018.9	1022.0	0.1	1.5	3.4	0.0	2.6	187.4	719.2	-1.50	-0.13	1.00	0.80	9.06	64.20
13/09/2010	13.2	17.6	23.2	13.3	17.4	22.1	35	52	69	1012.9	1015.1	1016.8	0.2	2.3	6	0.0	5.3	142.7	752.3	-2.10	-0.23	0.90	0.50	3.87	31.00
14/09/2010	13.2	15.7	21.6	13.0	15.4	20.0	52	76	94	1007.8	1011.9	1015.4	0.1	1.8	4.1	19.1	5.3	127.2	711.8	-1.80	-0.29	1.10	0.80	6.73	65.90
15/09/2010	9.6	15.2	21.2	10.0	14.9	20.1	28	60	95	1007.4	1011.5	1016.5	1.6	3.9	7.4	0.7	3.9	184.4	785.7	-1.70	-0.32	0.60	0.90	3.35	15.40
16/09/2010	8.2	12.3	18.4	8.3	12.0	16.9	42	57	69	1013.9	1016.4	1019.8	2.6	4.9	9	0.0	0.0	166.2	857.7	-1.70	-0.30	0.50	0.70	2.51	10.60
17/09/2010	7	11.8	17.2	7.4	11.5	16.7	34	52	66	1018.0	1019.7	1021.8	1.8	3.7	5.8	0.0	4.5	177.8	749.4	-1.50	-0.26	0.50	0.70	2.59	9.60
18/09/2010	7.8	13.2	19.6	8.1	12.9	18.6	44	59	70	1014.2	1017.2	1019.2	1.7	4.5	9	0.0	5.8	203.3	749.3	-1.50	-0.31	0.60	0.50	2.20	7.90
19/09/2010	8.4	13.3	17.2	8.4	13.1	16.9	49	66	86	1018.0	1019.6	1021.6	0.2	1.4	4.3	0.0	3.5	117.4	489.8	-1.20	-0.16	0.80	0.90	9.40	69.10
20/09/2010	10.4	15.3	21.2	10.4	15.0	20.0	44	68	87	1019.8	1021.5	1022.8	0.1	2.8	7.8	0.0	4.7	182.7	781.7	-2.20	-0.30	0.90	0.50	5.03	73.80
21/09/2010	9.6	16.4	24.4	10.3	16.1	23.4	35	70	95	1019.2	1022.2	1025.9	0.3	3.1	11.1	0.0	3.9	185.4	719.7	-1.60	-0.28	1.30	0.60	10.24	72.90
22/09/2010	11.6	17.1	24.4	11.8	16.8	23.4	40	64	87	1018.6	1022.3	1025.7	0.4	2.1	5.6	0.0	3.9	205.1	716.0	-1.70	-0.30	1.00	0.50	7.04	73.10
23/09/2010	11.2	15.7	20.8	11.8	15.4	19.8	56	77	91	1019.5	1021.3	1022.8	0.1	2.0	4.5	0.0	3.9	119.5	799.6	-2.00	-0.28	0.80	0.50	6.08	50.20
24/09/2010	11.2	17.1	26	11.5	16.9	25.0	34	66	94	1017.2	1019.8	1023.0	0.2	1.8	4.5	0.0	3.9	168.5	860.9	-1.80	-0.11	1.50	0.60	8.23	82.40
25/09/2010	8.4	17.3	25.6	8.6	17.2	24.5	22	50	85	1014.1	1016.7	1018.4	0.4	3.2	8.8	0.0	5.3	207.2	789.3	-1.70	-0.03	2.10	0.60	3.31	29.80
26/09/2010	7.2	16.8	25.2	7.9	16.9	24.3	24	51	85	1015.9	1017.6	1019.9	0.2	1.4	3	0.0	5.8	211.3	738.2	-1.60	0.06	2.10	0.60	10.64	80.70
27/09/2010	8	17.2	26.8	8.0	17.0	25.0	42	66	90	1009.9	1013.1	1016.6	0.2	2.4	8.3	1.6	3.9	157.5	857.0	-1.80	-0.09	1.20	0.60	4.94	40.80
28/09/2010	11.2	18.5	26.4	11.5	18.4	24.7	25	48	90	1010.0	1012.4	1014.4	0.4	2.7	7.4	0.0	5.3	220.6	763.5	-1.90	-0.14	2.00	0.90	8.07	75.30
29/09/2010	8	13.4	20.8	8.4	13.1	19.9	26	57	87	1012.8	1016.4	1021.0	0.2	3.0	9.4	0.0	3.9	204.3	764.1	-1.40	-0.32	1.40	0.50	8.91	76.50
30/09/2010	4.4	11.9	18.8	4.9	11.8	17.8	25	56	90	1020.8	1022.6	1024.5	0.1	1.7	3.9	0.0	3.9	216.9	775.0	-1.70	-0.14	1.20	0.70	10.05	76.90

	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (m/s)	Wind Speed Ave (m/s)	Wind Speed Max (m/s)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/10/2010	6.4	14.3	20.8	7.0	14.1	19.8	42	59	80	1022.5	1024.5	1026.5	0.2	2.0	5.8	0.0	3.9	164.4	872.7	-1.60	-0.21	1.60	0.80	7.66	57.70
2/10/2010	13	15.6	21.2	13.2	15.2	18.8	49	71	91	1024.4	1025.9	1027.4	0.4	2.7	6.7	1.8	4.7	133.2	957.6	-2.40	-0.36	0.70	1.10	3.98	29.40
3/10/2010	13.2	15.3	18.8	13.3	15.1	18.2	72	87	94	1023.3	1024.9	1026.5	0.8	4.2	7.8	10.3	4.7	82.2	352.9	-1.00	-0.23	0.60	0.70	2.30	10.50
4/10/2010	14.2	17.1	20.8	14.3	16.7	19.9	68	85	94	1018.7	1021.1	1023.4	1.5	4.7	7.4	0.5	3.5	113.0	644.4	-1.40	-0.38	0.20	0.70	2.51	8.90
5/10/2010	15.6	18.6	24.4	15.6	18.2	23.4	53	80	94	1017.8	1019.8	1021.2	0.9	3.4	7.3	0.0	3.5	138.2	878.4	-1.70	-0.38	0.40	0.80	2.93	11.10
6/10/2010	15.6	19.3	25.2	15.7	18.8	24.0	54	78	94	1014.8	1018.1	1020.8	0.3	3.0	6.4	0.0	3.9	197.8	812.4	-2.20	-0.44	0.80	0.70	4.24	62.00
7/10/2010	14.8	18.8	25.2	14.7	18.4	23.6	44	74	94	1013.4	1016.3	1020.4	0.4	3.0	6.4	0.0	3.5	142.8	636.7	-1.60	-0.39	0.80	0.90	3.63	17.40
8/10/2010	14	16.0	20	14.0	15.6	18.9	65	77	88	1019.2	1020.9	1023.0	1.2	3.9	8.3	0.0	3.9	85.4	443.6	-1.30	-0.34	0.30	0.90	2.75	8.00
9/10/2010	12.8	16.6	21.6	13.5	16.2	19.9	58	71	82	1021.5	1023.3	1025.7	1.8	4.6	9.4	0.0	4.7	172.2	918.3	-1.90	-0.40	0.60	0.80	2.79	10.60
10/10/2010	10.8	16.0	20.4	11.8	15.7	19.3	43	66	85	1025.0	1027.6	1029.8	1	6.2	13.3	0.1	3.9	162.4	941.6	-1.70	-0.27	1.10	0.60	2.86	21.50
11/10/2010	13.6	17.5	22.8	13.9	17.0	21.2	44	68	88	1027.0	1028.7	1030.0	1.1	6.0	9.8	0.1	3.9	183.4	961.5	-2.20	-0.44	0.60	0.60	2.46	9.90
12/10/2010	10.8	18.5	26.4	11.7	18.3	24.6	39	67	90	1021.5	1025.1	1029.2	0.1	1.9	4.9	0.0	3.9	229.8	804.6	-2.30	-0.20	1.10	0.50	8.43	74.00
13/10/2010	13	19.3	24.8	13.4	19.1	24.0	44	65	92	1013.7	1017.5	1021.5	0.2	2.2	6.2	0.1	3.9	143.6	743.1	-1.90	-0.21	0.90	0.00	6.62	85.30
14/10/2010	16.4	20.3	25.2	16.5	20.0	24.2	54	68	81	1007.6	1011.0	1013.8	0.1	2.7	7.4	0.1	5.3	149.6	882.4	-1.50	-0.25	0.70	1.20	5.63	64.90
15/10/2010	13.6	18.5	22.8	13.5	18.5	22.2	61	78	90	989.9	997.5	1007.5	0.2	5.1	12.7	8.7	5.3	78.6	485.7	-0.80	-0.02	0.90	0.90	7.13	72.30
16/10/2010	7.2	10.6	13.8	7.1	10.2	13.6	39	57	83	995.7	1005.7	1013.2	3.1	6.7	13.1	2.5	6.6	187.1	919.6	-2.30	-0.38	1.10	0.60	2.96	10.70
17/10/2010	7.2	13.9	20.8	7.3	13.4	19.9	39	54	69	1012.3	1014.2	1017.1	2	4.1	6.6	0.0	5.3	256.1	827.3	-2.00	-0.47	0.50	0.60	2.74	8.90
18/10/2010	8.4	16.6	24.4	8.9	16.2	23.3	29	52	77	1015.1	1017.5	1020.3	1.3	3.2	6.7	0.0	2.6	258.8	830.3	-1.90	-0.34	0.90	0.60	3.43	21.80
19/10/2010	8.2	14.7	20.4	8.7	14.4	19.1	47	66	83	1019.9	1023.5	1027.1	0.3	3.7	8.3	0.0	5.3	235.8	876.3	-2.60	-0.29	1.40	0.60	4.62	46.50
20/10/2010	9.6	17.0	24.8	10.4	16.7	23.3	34	65	92	1022.2	1025.0	1027.6	0.3	2.1	5.1	0.0	5.3	249.2	953.5	-2.40	-0.28	1.20	0.70	8.04	96.70
21/10/2010	10	18.6	26.8	10.4	18.2	25.2	26	60	91	1018.7	1022.1	1025.3	0.1	1.8	4.6	0.0	5.3	260.9	822.9	-2.20	-0.39	1.30	1.00	8.54	50.70
22/10/2010	12.8	18.1	26.8	13.3	17.8	25.8	35	70	91	1017.0	1019.3	1021.6	0.2	1.8	7.3	0.4	5.8	168.9	943.9	-1.70	-0.26	0.70	0.60	6.94	70.80
23/10/2010	10.8	19.2	29.2	10.8	18.8	27.7	32	69	94	1013.2	1016.6	1018.5	0.3	2.7	7.4	10.6	5.3	228.6	986.5	-2.20	-0.45	0.60	0.60	5.99	66.10
24/10/2010	12.6	14.3	16.8	12.6	14.0	16.3	84	90	94	1016.3	1018.5	1020.5	0.4	2.6	5.8	24.2	3.9	36.6	142.1	-0.70	-0.20	0.30	0.80	3.22	28.00
25/10/2010	12.6	15.9	21.2	12.6	15.6	19.3	58	77	91	1016.4	1018.3	1020.1	0.2	2.2	6.4	0.0	4.7	134.7	996.2	-1.70	-0.28	0.80	0.70	5.12	32.20
26/10/2010	12.4	19.0	26.8	12.4	18.9	26.0	31	61	93	1013.9	1016.2	1018.1	0.2	1.8	5.2	0.0	3.9	235.4	945.9	-1.80	-0.19	2.40	0.40	8.06	79.80
27/10/2010	11.6	19.9	29.2	11.9	19.6	27.8	24	59	90	1012.0	1014.9	1017.9	0.2	2.8	8.9	0.0	5.3	234.4	899.5	-1.60	-0.29	1.10	0.60	6.02	63.90
28/10/2010	15.2	17.6	22	15.3	17.2	20.7	57	70	82	1016.5	1018.0	1019.5	2.1	5.5	10	0.0	5.8	175.5	903.5	-2.10	-0.44	0.40	0.40	2.34	7.80
29/10/2010	13.4	19.0	25.2	14.1	18.5	23.3	51	69	84	1014.0	1016.5	1018.8	0.8	3.1	6.5	0.0	3.9	261.2	999.3	-2.30	-0.52	0.80	1.00	3.61	13.90
30/10/2010	13.8	22.4	29.6	13.7	22.1	28.8	37	61	94	1011.3	1013.2	1015.3	0.1	2.4	6.7	0.0	4.5	227.2	798.7	-2.40	-0.29	0.80	0.60	11.77	70.60
31/10/2010	11.6	22.8	29.2	12.2	22.5	27.9	41	60	83	1009.8	1012.0	1019.5	0.2	2.9	9.2	0.0	3.9	182.4	971.3	-1.90	-0.28	1.00	0.90	7.19	65.60

Mangoola Coal AEMR 2010-2011
Meterological Monitoring Data
Monitor: WSS

Date	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (m/s)	Wind Speed Ave (m/s)	Wind Speed Max (m/s)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/11/2010	12.4	16.6	20	12.5	16.5	19.4	70	85	94	1009.9	1012.1	1014.5	0.2	2.2	6.8	28.3	4.7	70.5	668.6	-1.20	-0.15	0.60	0.70	9.25	98.40
2/11/2010	10.4	15.4	20.4	10.6	15.1	19.5	37	58	81	1011.3	1013.7	1016.8	1.3	3.7	6.9	0.0	4.7	205.7	1049.5	-1.70	-0.29	0.90	0.40	3.10	14.50
3/11/2010	9.6	17.7	25	9.8	17.3	23.9	31	54	81	1014.4	1016.8	1018.7	0.2	2.1	4.3	0.0	5.3	269.6	934.0	-1.70	-0.32	0.60	0.60	7.16	63.10
4/11/2010	14	16.6	21.2	14.1	16.2	19.7	50	72	85	1015.7	1018.1	1020.0	0	4.0	9.8	0.0	3.9	175.2	1002.1	-2.30	-0.40	0.70	0.60	4.02	66.80
5/11/2010	11.2	12.9	14	11.4	12.6	13.7	81	88	93	1018.6	1020.2	1021.5	0.6	3.3	7.5	17.1	5.3	51.2	214.1	-0.70	-0.21	0.30	0.80	2.44	10.40
6/11/2010	12.4	14.8	19.6	12.4	14.5	18.1	63	81	92	1017.8	1019.7	1021.2	1.4	3.9	8.7	1.4	5.3	159.0	693.4	-1.70	-0.29	0.80	0.80	2.75	8.60
7/11/2010	10.4	17.9	25.2	10.6	17.5	24.1	43	72	94	1014.7	1017.5	1020.2	0.2	1.8	5	0.0	3.9	260.6	853.9	-1.80	-0.35	0.60	0.90	8.36	70.10
8/11/2010	14.6	23.0	30	14.8	22.7	28.8	35	60	94	1014.1	1016.8	1021.1	0.2	3.0	9	0.1	5.3	281.2	924.0	-1.70	-0.30	1.10	0.40	8.73	73.90
9/11/2010	16.8	21.1	28	16.7	20.7	26.8	50	75	93	1021.3	1023.0	1024.3	0.2	1.8	5.2	11.5	3.5	196.6	1033.7	-1.60	-0.37	0.70	1.10	8.97	96.20
10/11/2010	16.4	21.1	28	16.6	20.8	26.9	53	77	93	1016.3	1019.5	1022.4	0.3	1.8	6.3	2.1	3.0	181.8	934.2	-1.80	-0.34	1.20	0.80	7.55	81.50
11/11/2010	18	21.8	28	18.1	21.5	26.8	47	73	93	1011.4	1014.6	1017.1	0.1	2.4	6.4	1.5	5.3	206.9	974.8	-1.60	-0.29	1.00	0.80	5.70	73.20
12/11/2010	15.4	23.9	31.6	16.0	23.7	30.7	27	58	90	1010.4	1012.6	1014.7	0.2	1.7	4.3	0.0	3.9	292.2	871.2	-1.60	-0.14	2.20	0.60	9.17	62.50
13/11/2010	17.4	25.2	31.2	17.7	24.8	30.1	42	60	83	1012.9	1014.8	1016.4	0.2	2.6	7.2	0.0	3.9	244.3	943.1	-1.80	-0.34	1.10	1.00	9.59	56.40
14/11/2010	21	26.4	31.6	21.1	25.9	30.2	39	56	83	1012.2	1014.9	1017.3	0.7	3.0	7.1	0.0	4.5	259.7	863.3	-1.70	-0.43	0.70	0.90	3.99	42.50
15/11/2010	18.6	21.5	25.6	18.5	21.2	24.8	62	82	93	1011.1	1012.1	1013.0	0.2	2.3	7.4	17.0	3.9	82.9	635.7	-1.20	-0.30	0.30	0.50	10.35	83.20
16/11/2010	16.6	20.3	25.2	16.6	19.8	24.1	55	78	94	1009.0	1011.6	1014.2	0.2	3.3	10.7	3.2	3.9	239.7	1017.7	-1.60	-0.42	0.50	0.90	9.58	86.30
17/11/2010	15.2	17.7	21.2	15.5	17.4	19.8	67	80	90	1012.6	1014.4	1015.7	1	3.7	7.3	0.3	4.7	90.3	419.2	-1.20	-0.29	0.60	0.70	2.48	10.30
18/11/2010	14.4	18.7	22.8	14.5	18.5	22.1	62	79	91	1011.2	1013.3	1014.9	0.3	1.5	4.3	0.0	4.7	155.9	867.4	-1.70	-0.26	0.60	0.80	6.96	63.00
19/11/2010	13.8	16.9	19.2	14.0	16.7	18.4	68	78	95	1013.6	1020.1	1025.1	0.2	3.8	7.4	0.0	3.9	69.0	388.0	-1.30	-0.24	0.90	0.60	3.60	35.80
20/11/2010	13.4	18.4	24	13.7	17.7	22.7	46	67	84	1021.3	1023.6	1025.8	1	3.8	7.1	0.0	5.3	293.3	1025.2	-2.20	-0.62	0.70	0.90	3.21	9.80
21/11/2010	12.4	19.1	26.4	12.7	18.7	25.1	35	68	93	1018.8	1021.4	1023.4	0.1	3.0	7.2	0.0	3.9	289.3	928.1	-2.20	-0.43	0.90	0.80	8.12	83.40
22/11/2010	12.8	19.5	26	13.0	19.1	24.4	43	64	89	1020.4	1022.1	1024.1	0.5	2.8	6.9	0.0	3.9	253.2	1004.7	-2.20	-0.37	1.10	0.80	5.51	35.90
23/11/2010	14.4	20.7	26.8	14.9	20.3	25.7	37	60	83	1021.0	1023.3	1025.6	0.3	2.0	4.2	0.0	5.3	275.0	953.1	-2.00	-0.42	0.80	0.90	6.70	43.50
24/11/2010	14.8	22.0	28.8	15.2	21.6	27.7	35	61	89	1018.7	1021.7	1024.4	0.1	2.1	5.4	0.0	5.3	289.9	886.5	-2.00	-0.38	0.90	0.80	7.90	56.60
25/11/2010	15.6	23.8	30.4	16.0	23.5	29.7	28	54	89	1015.6	1018.4	1020.8	0.2	1.4	3.7	0.0	5.3	296.8	957.2	-1.70	-0.34	0.80	1.00	15.37	84.40
26/11/2010	14.8	23.6	30	15.5	23.3	29.1	28	52	81	1013.3	1015.6	1017.9	0.1	1.9	5	0.0	5.3	243.3	904.5	-1.60	-0.33	0.90	0.80	8.87	74.20
27/11/2010	17.6	24.8	30.8	17.8	24.5	29.7	26	48	79	1009.2	1012.5	1015.6	0.2	1.8	6.3	0.0	2.6	245.9	1002.2	-1.80	-0.36	0.80	0.80	13.33	78.60
28/11/2010	17.8	21.1	25.6	17.8	20.8	24.6	45	66	91	1009.5	1010.7	1011.9	0.2	2.2	6.2	1.0	4.7	123.1	886.5	-1.40	-0.28	0.80	1.00	9.21	76.80
29/11/2010	17.4	19.9	25.2	17.3	19.5	23.4	63	82	94	1009.1	1011.2	1013.5	0.2	2.9	6.5	4.0	3.9	105.6	768.3	-1.90	-0.39	0.50	0.90	4.53	60.60
30/11/2010	17.2	20.3	25.6	17.1	19.8	23.3	65	82	92	1010.2	1012.2	1014.1	1.3	4.1	7.6	0.6	2.6	121.5	981.9	-2.50	-0.39	0.30	1.00	3.04	10.60

	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (km/h)	Wind Speed Ave (km/h)	Wind Speed Max (km/h)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/12/2010	17.8	19.0	21.2	17.9	18.8	20.8	82	90	94	1011.7	1013.7	1015.9	1.5	11.6	26.8	17.4	4.7	61.4	271.2	-0.90	-0.22	0.30	0.70	2.92	21.70
2/12/2010	17.2	21.3	27.6	17.3	20.9	26.5	56	79	94	1012.8	1015.0	1017.1	1.2	7.8	20.7	5.0	1.3	225.2	1012.5	-1.90	-0.46	0.50	0.90	5.72	81.30
3/12/2010	18	21.2	26.8	18.3	21.0	26.2	60	83	93	1011.4	1013.9	1016.5	0.5	5.7	28.1	51.4	3.9	147.8	863.7	-1.40	-0.25	1.10	1.00	9.93	72.80
4/12/2010	18.4	21.3	26.4	18.5	20.8	25.4	59	82	94	1007.5	1010.6	1012.8	0.8	6.3	17.9	18.1	3.9	173.6	1075.8	-1.60	-0.42	0.30	0.70	6.17	68.20
5/12/2010	18.6	21.2	26.8	18.6	20.8	25.0	61	84	95	1008.5	1010.0	1011.6	0.3	6.3	18.9	2.5	3.9	141.4	1010.1	-1.80	-0.38	0.50	1.00	8.30	92.70
6/12/2010	18.8	22.1	28	18.7	21.6	26.7	49	74	88	1009.7	1011.6	1013.5	1.7	11.1	27.4	0.0	4.5	195.4	1104.4	-2.20	-0.46	0.40	0.70	4.54	43.40
7/12/2010	17.6	22.9	29.2	17.7	22.4	27.8	46	70	92	1011.0	1013.3	1015.5	2.2	12.1	29.4	0.0	3.5	273.4	987.7	-1.90	-0.51	0.60	0.80	4.36	24.90
8/12/2010	17.6	25.2	33	18.0	24.7	31.7	40	63	86	1010.1	1013.1	1016.3	1.4	7.8	20.1	0.0	2.6	278.9	983.2	-1.80	-0.48	0.80	1.30	10.48	81.10
9/12/2010	21.6	27.5	32	21.6	27.1	30.7	49	59	87	1007.3	1010.5	1013.0	1.9	15.6	33	5.1	4.7	227.7	941.4	-2.00	-0.38	0.80	0.70	4.86	65.80
10/12/2010	20.8	24.0	28.4	20.5	23.6	27.4	50	71	92	1006.3	1008.1	1011.0	1.4	9.1	21.5	6.3	3.9	156.4	805.8	-1.40	-0.33	0.60	0.50	4.83	65.60
11/12/2010	18	23.6	28	18.4	23.4	27.5	34	56	87	1002.8	1005.6	1008.1	1.8	9.1	22.1	0.0	3.5	256.7	951.6	-1.40	-0.21	0.80	0.60	3.62	16.60
12/12/2010	16	24.0	30.4	16.4	23.8	29.5	28	46	75	1003.9	1005.2	1008.2	0.4	10.2	28.5	0.0	4.5	288.8	1012.2	-1.70	-0.24	1.40	0.60	5.45	53.10
13/12/2010	15.2	22.4	29.2	15.6	22.0	28.4	29	53	78	1008.1	1011.2	1014.2	0.8	9.1	29.3	0.0	3.5	312.9	886.8	-2.20	-0.40	1.20	0.70	7.73	64.50
14/12/2010	16.6	21.7	27.6	16.8	21.2	26.2	51	69	89	1010.0	1012.7	1015.3	3.3	13.5	28.7	0.0	3.9	203.9	957.4	-2.10	-0.41	1.00	0.70	3.07	10.40
15/12/2010	18.4	24.9	32.4	18.5	24.4	31.8	27	62	91	1004.5	1008.2	1011.5	0.6	6.3	23.4	0.0	3.9	293.5	912.3	-1.80	-0.45	0.60	1.10	18.61	94.90
16/12/2010	19.2	23.0	28	19.4	22.8	26.9	44	67	88	1002.2	1004.0	1006.1	1.5	8.3	28.8	2.8	3.9	124.7	903.2	-1.50	-0.20	0.70	0.90	7.31	62.40
17/12/2010	17.8	21.1	26.4	17.9	20.8	25.5	34	67	92	1003.6	1004.8	1005.9	0.7	10.7	29	0.0	3.9	116.9	586.7	-1.20	-0.27	0.40	0.80	4.29	53.30
18/12/2010	17.2	20.0	22.8	17.3	19.7	22.3	46	58	72	1002.1	1004.9	1006.4	3.1	15.9	36	0.0	3.5	136.9	644.1	-1.10	-0.30	0.40	0.70	2.44	5.70
19/12/2010	15.2	19.2	22.8	15.3	19.0	22.1	47	67	88	995.9	1001.1	1005.8	1.3	13.4	30.5	10.4	5.8	127.7	615.3	-1.20	-0.23	1.10	1.00	3.66	31.10
20/12/2010	10.4	15.9	21.2	10.5	15.4	20.2	36	51	84	998.4	1003.3	1008.1	4.6	21.2	39.5	0.0	4.7	297.9	1013.6	-1.90	-0.46	0.80	0.80	3.04	9.70
21/12/2010	11.6	20.1	26.8	12.6	19.8	25.8	28	40	60	1007.7	1009.9	1013.5	0.7	9.5	25.8	0.0	3.5	322.4	910.5	-2.00	-0.29	1.30	0.90	6.03	50.40
22/12/2010	11.6	21.0	29.2	12.3	20.6	28.0	28	55	80	1013.6	1015.4	1017.5	0.7	9.1	29.4	0.0	5.3	295.2	953.3	-2.30	-0.46	1.70	1.00	6.96	45.50
23/12/2010	17.2	23.0	30.4	17.4	22.7	28.7	29	58	82	1015.4	1016.9	1020.9	0.2	6.3	28.3	0.0	3.5	211.6	886.7	-1.90	-0.30	0.70	0.60	10.19	54.80
24/12/2010	17.2	20.3	24.8	16.7	19.8	23.2	53	68	83	1019.6	1021.4	1024.1	5.2	20.1	34.4	0.0	5.3	140.2	866.6	-2.30	-0.48	0.30	0.70	2.35	8.40
25/12/2010	16.8	23.7	32	16.9	23.1	31.0	37	66	85	1008.4	1013.7	1019.8	0.8	6.5	26.2	0.0	3.9	267.0	867.4	-2.10	-0.54	0.80	0.90	13.62	77.70
26/12/2010	19.6	21.6	25.6	19.5	21.4	24.9	65	81	92	1002.2	1006.1	1009.7	1.1	6.2	16.5	8.0	3.9	81.4	298.0	-1.00	-0.24	0.80	0.90	8.52	59.30
27/12/2010	16.4	21.2	28	16.1	20.7	27.2	50	78	93	1000.8	1004.5	1013.0	1.1	12.1	33.4	0.3	3.9	200.6	968.7	-2.10	-0.51	0.30	0.70	9.29	73.70
28/12/2010	14.4	17.9	22.4	14.5	17.3	20.9	53	67	82	1013.0	1016.1	1018.0	6.4	19.7	34.6	0.0	3.9	197.8	944.2	-2.30	-0.55	0.80	0.80	2.40	7.70
29/12/2010	14	20.3	30.4	14.3	19.9	28.8	41	70	92	1013.4	1016.2	1018.3	1.3	5.6	12.1	0.0	5.3	318.0	864.5	-2.10	-0.37	0.90	0.70	14.94	81.90
30/12/2010	18.8	23.8	32.4	19.0	24.0	32.0	34	60	84	1012.1	1014.4	1015.3	0.5	7.5	32.2	0.1	2.6	14.7	100.3	-0.70	0.13	0.70	0.80	7.22	49.90
31/12/2010	18.4	29.5	36	18.8	19.8	19.8	82	82	85	1014.4	1014.7	1014.7	0.6	1.0	5	0.0	17.1	122.4	126.3	-16.20	-9.74	0.60	0.00	0.30	10.50

Mangoola Coal AEMR 2010-2011
Meterological Monitoring Data
Monitor: WSS

	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (km/h)	Wind Speed Ave (km/h)	Wind Speed Max (km/h)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/01/2011																									
2/01/2011																									
3/01/2011																									
4/01/2011																									
5/01/2011																									
6/01/2011																									
7/01/2011																									
8/01/2011																									
9/01/2011																									
10/01/2011																									
11/01/2011																									
12/01/2011																									
13/01/2011																									
14/01/2011																									
15/01/2011																									
16/01/2011																									
17/01/2011																									
18/01/2011	20.8	25.1	29.2	20.8	24.5	28.0	44	62	79	1004.3	1005.8	1007.6				0.1				0.00	4.08	34.80	4.30	60.66	94.00
19/01/2011	20.4	24.1	30.6	20.2	23.5	28.5	51	71	84	1005.8	1007.6	1009.8				0.0				0.70	3.38	17.10	15.20	49.89	105.10
20/01/2011	20.4	24.2	30.6	20.4	23.6	28.6	44	69	88	1009.2	1010.8	1013.0				0.0				0.80	3.11	9.00	17.50	65.35	118.00
21/01/2011	18	24.6	32.4	18.3	24.0	30.7	27	61	90	1010.1	1012.6	1014.9	1.1	8.4	24.6	0.0				-2.30	-0.59	0.50	0.80	7.86	53.00
22/01/2011	18	24.3	31.2	18.0	23.7	29.8	25	57	86	1011.7	1013.6	1015.6	1.3	13.1	27.8	0.0				-2.50	-0.66	0.70	0.70	5.21	51.60
23/01/2011	18	24.6	32.4	18.2	24.1	31.2	20	55	84	1006.6	1010.1	1013.6	1.1	6.1	18.7	0.0				-2.50	-0.48	0.70	0.70	12.88	84.00
24/01/2011	19.2	27.0	34.2	19.1	26.6	32.4	33	53	82	1002.4	1005.1	1007.3	0.6	9.8	26	0.1				-2.10	-0.46	0.90	1.00	5.87	49.80
25/01/2011	20.8	29.6	39.6	21.1	29.0	38.0	23	53	84	1004.4	1006.8	1009.4	2	8.3	18.1	0.0				-2.30	-0.67	1.40	0.80	7.70	67.00
26/01/2011	22.8	32.5	42.4	22.7	32.0	41.4	19	50	87	1008.2	1010.3	1012.4	1	5.0	11.3	0.0				-2.40	-0.53	1.50	0.80	12.23	95.20
27/01/2011	23.6	31.6	43.2	23.7	30.9	42.0	14	54	83	1007.4	1011.1	1014.4	1.1	11.8	30.2	0.0				-2.40	-0.69	1.20	0.90	10.98	85.30
28/01/2011	19.6	24.7	29.2	19.7	23.9	27.2	43	64	83	1014.1	1016.3	1019.6	11.8	25.1	37	0.0				-2.60	-0.74	0.20	0.90	2.23	6.30
29/01/2011	16.8	22.6	29.2	17.2	21.9	27.5	34	58	82	1017.0	1019.3	1020.8	5.1	18.0	30.4	0.0				-2.80	-0.77	0.70	0.60	3.01	8.20
30/01/2011	14.4	25.3	36	14.6	24.9	34.6	13	46	89	1014.5	1018.0	1020.9	0.9	5.7	12.1	0.0				-2.20	-0.37	1.40	0.70	12.02	71.80
31/01/2011	17.6	29.6	39.6	18.1	29.0	38.2	18	32	55	1009.8	1013.6	1016.7	1.6	7.0	14.9	0.0				-2.30	-0.52	1.30	0.60	9.13	67.20

Date	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (m/s)	Wind Speed Ave (m/s)	Wind Speed Max (m/s)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/02/2011	21.6	31.5	39.2	21.7	30.9	37.5	22	36	59	1008.6	1011.2	1013.7	0.6	11.4	27.6	0.0				-2.60	-0.55	1.10	0.80	5.40	52.40
2/02/2011	25.2	31.8	40	25.9	31.3	38.3	27	42	53	1010.5	1012.7	1015.3	3.3	10.3	23.1	0.0				-2.50	-0.54	1.20	0.60	5.35	59.20
3/02/2011	26.4	32.3	38.8	26.2	31.7	37.2	33	47	65	1010.1	1012.2	1014.5	0.2	14.8	36	0.0				-2.40	-0.61	0.70	0.90	5.08	78.20
4/02/2011	23.6	31.4	41.2	23.7	30.7	38.8	25	53	83	1009.0	1012.6	1015.7	1.4	8.8	21	0.0				-2.50	-0.70	0.40	0.60	12.27	92.50
5/02/2011	27.6	33.5	39.2	27.7	32.8	37.4	24	38	68	1007.6	1010.6	1013.0	1.7	17.9	36.2	0.0				-2.80	-0.70	0.50	1.00	3.34	20.40
6/02/2011	18	28.3	37.2	17.7	27.8	34.3	34	60	87	1010.5	1014.7	1022.6	1.6	17.7	37.1	5.3				-2.90	-0.49	1.50	0.80	3.23	13.60
7/02/2011	15.6	19.1	22.8	15.5	18.6	21.5	59	73	90	1016.9	1020.3	1022.8	9	19.6	30.2	0.0				-1.70	-0.57	0.10	0.80	2.64	7.20
8/02/2011	16.4	21.6	28.8	16.9	20.9	26.2	41	61	80	1015.2	1017.5	1019.8	3.9	16.9	35.9	0.0				-2.90	-0.73	0.60	0.70	3.09	11.90
9/02/2011	15	21.5	29.6	15.6	20.9	27.1	34	63	87	1019.6	1021.1	1023.3	0.6	15.2	35	0.0				-3.00	-0.65	0.90	0.80	4.09	52.70
10/02/2011	16.8	23.4	32	17.0	22.8	30.1	28	63	91	1016.8	1020.1	1023.1	0.9	8.1	25.9	0.0				-2.80	-0.58	0.80	0.70	9.17	46.60
11/02/2011	17.2	27.5	36.8	17.6	26.9	35.7	25	52	87	1010.2	1014.5	1018.2	0.8	7.7	19.9	0.0				-2.60	-0.64	1.10	0.60	7.76	73.90
12/02/2011	19.4	25.5	32	19.4	25.1	29.9	39	58	91	1011.0	1013.7	1017.7	1.1	10.9	34.8	3.0				-2.30	-0.38	0.90	0.80	4.92	63.80
13/02/2011	19	21.0	24.8	19.1	20.6	24.1	70	86	93	1013.4	1016.5	1020.4	2	11.4	29.2	22.7				-1.40	-0.38	0.40	0.80	3.61	30.10
14/02/2011	17.6	18.7	21	17.3	18.5	20.1	74	87	93	1018.3	1021.0	1022.6	6.4	13.6	29.7	0.2				-0.90	-0.27	0.20	0.50	2.31	6.50
15/02/2011	18	20.1	24.4	17.9	19.7	22.8	66	77	86	1019.3	1020.8	1022.4	4.2	13.9	27.8	0.3				-3.10	-0.39	0.50	0.70	2.42	7.60
16/02/2011	17.8	23.1	30.8	18.0	22.4	31.6	42	71	86	1013.3	1016.6	1019.9	2.3	22.6	79.5	0.1	0.0	38.8	604.1	-2.80	-0.68	2.10	1.10	4.97	41.00
17/02/2011	20.8	24.8	32.8	20.6	24.3	30.8	45	75	93	1010.0	1012.4	1014.3	1.8	19.3	62.2	4.6	1.9	128.2	703.0	-2.50	-0.50	0.90	1.10	9.93	73.40
18/02/2011	19.6	24.1	31.6	19.6	23.6	29.5	52	79	94	1011.0	1012.9	1014.9	2.5	22.1	70.6	0.0	2.6	85.8	571.7	-2.30	-0.48	0.60	0.20	4.35	19.00
19/02/2011	22.4	29.5	37.6	22.2	28.8	36.3	30	58	89	1006.6	1009.9	1013.4	0.6	8.6	26.4	0.0	2.8	168.8	623.3	-2.50	-0.64	0.90	0.60	6.73	60.00
20/02/2011	24	31.5	38	24.0	30.8	36.4	35	48	81	1004.3	1007.2	1009.9	1.9	13.1	32.9	0.1	2.6	144.1	694.7	-2.40	-0.63	0.80	0.40	3.96	14.10
21/02/2011	18.8	23.9	30	18.5	23.3	28.0	47	68	88	1008.6	1011.1	1016.7	0.8	14.2	40.4	0.0	2.4	141.4	618.2	-2.50	-0.67	0.90	0.80	6.03	69.10
22/02/2011	16.8	19.7	24.4	16.7	19.0	22.7	41	62	77	1016.8	1019.6	1022.6	9.4	21.3	35.9	0.0	2.5	109.9	511.4	-2.30	-0.68	0.10	0.80	2.42	9.60
23/02/2011	15.4	20.0	26	15.8	19.3	24.4	39	62	78	1018.3	1020.5	1022.3	3.8	14.0	27.3	0.0	3.0	127.5	564.0	-2.60	-0.65	0.60	0.70	2.77	10.80
24/02/2011	14.4	21.6	30	14.8	21.0	28.7	28	59	85	1013.1	1016.9	1019.9	1	7.0	17.4	0.0	2.5	190.9	610.9	-2.70	-0.56	0.90	0.40	8.77	68.50
25/02/2011	14	23.0	33.2	14.5	22.5	31.2	21	58	91	1009.6	1012.7	1014.9	0.7	6.7	26.6	0.0	2.2	161.3	695.3	-3.50	-0.44	0.80	0.70	10.77	91.90
26/02/2011	18.8	25.5	33.8	19.1	25.1	32.2	24	51	78	1007.5	1010.3	1012.8	1	7.2	19.3	0.0	2.8	136.5	649.5	-2.20	-0.49	1.20	0.50	11.27	82.10
27/02/2011	17.2	25.0	32.4	17.7	24.7	31.0	34	55	76	1007.8	1009.0	1010.9	0.7	4.8	17.2	1.4	2.5	76.3	603.7	-1.80	-0.27	0.80	0.80	8.12	86.00
28/02/2011	20.2	25.9	37.2	20.1	25.4	36.1	25	69	92	1004.2	1008.1	1010.9	1.3	7.2	26.6	8.1	2.4	138.8	629.8	-2.10	-0.50	1.30	0.90	11.30	83.40

Mangoola Coal AEMR 2010-2011
Meterological Monitoring Data
Monitor: WSS

	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (km/h)	Wind Speed Ave (km/h)	Wind Speed Max (km/h)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/03/2011	21.2	26.9	36.8	21.2	26.6	34.7	30	62	87	1003.9	1006.0	1012.7	0.9	12.6	39.8	8.5	2.1	127.9	661.4	-2.20	-0.26	2.00	1.00	6.71	89.80
2/03/2011	18.4	19.9	22	18.3	19.6	21.1	67	76	90	1011.3	1013.5	1015.8	2.1	17.4	28.9	0.2	2.4	48.7	442.9	-1.90	-0.36	0.40	0.80	3.07	32.70
3/03/2011	18	22.9	30.8	18.0	22.6	29.5	22	64	93	1007.0	1009.3	1012.1	1.5	7.9	25	3.9	2.3	110.7	464.8	-1.80	-0.34	1.80	0.60	4.76	41.70
4/03/2011	19.6	24.1	32	19.5	23.6	30.9	21	59	78	1007.7	1010.4	1013.9	1.6	8.0	24.2	0.0	2.5	147.5	612.3	-1.90	-0.53	0.30	1.00	6.99	39.90
5/03/2011	16.4	20.0	24.8	16.6	19.5	21.9	48	63	76	1014.0	1019.5	1025.2	12.1	24.3	40.1	0.0	1.9	97.8	610.6	-2.80	-0.47	0.40	0.70	2.22	6.50
6/03/2011	14	18.8	24.8	14.2	18.3	23.0	42	59	73	1021.7	1023.9	1025.2	7	19.1	38.4	0.0	3.2	113.5	551.7	-2.70	-0.46	0.60	0.60	2.16	7.40
7/03/2011	15.2	20.3	26.8	15.3	19.7	25.2	39	62	80	1018.4	1021.5	1024.2	1.3	12.6	26.2	0.0	2.5	129.6	692.0	-2.50	-0.55	0.90	1.00	4.28	55.40
8/03/2011	13.6	22.2	30.8	14.0	21.9	29.4	28	58	91	1013.3	1016.8	1020.1	0.4	5.2	11.4	0.0	2.8	174.1	607.7	-2.00	-0.35	1.00	1.20	11.41	77.70
9/03/2011	17.2	23.5	28.8	17.4	23.1	27.6	41	59	83	1013.1	1014.5	1016.4	1.2	5.1	13.3	0.0	2.5	90.2	458.5	-1.70	-0.35	0.70	0.60	7.03	44.50
10/03/2011	18.4	22.1	28	18.8	21.9	26.9	44	67	88	1012.1	1013.3	1014.8	0.4	5.5	20.1	1.3	2.1	80.1	377.8	-1.80	-0.20	0.80	0.60	8.35	59.50
11/03/2011	17.8	21.4	27.6	17.9	21.0	26.5	55	81	93	1012.6	1015.3	1017.8	0.8	4.7	11.9	2.1	2.4	87.0	587.1	-1.80	-0.36	0.50	0.80	8.05	71.10
12/03/2011	19.2	23.6	31.2	19.1	23.1	29.5	43	71	92	1016.8	1018.7	1020.9	0.6	5.8	24.4	0.0	2.6	130.7	666.6	-2.40	-0.46	0.70	0.90	12.94	76.50
13/03/2011	17.8	24.4	33.6	18.3	24.1	32.3	32	66	90	1016.0	1019.1	1021.7	0.5	5.9	24.3	0.1	2.5	152.8	584.3	-2.30	-0.39	1.10	1.00	14.14	103.70
14/03/2011	18	23.7	34.4	18.3	23.0	31.8	37	73	91	1016.4	1018.9	1021.9	1.4	12.3	34.8	0.0	2.4	147.1	605.1	-2.90	-0.68	0.70	0.60	4.89	44.40
15/03/2011	18.8	22.2	28.8	18.4	21.5	26.5	52	69	83	1015.3	1018.7	1021.6	1.6	8.3	18.1	0.1	2.5	118.9	661.3	-3.10	-0.70	0.40	1.20	6.96	69.50
16/03/2011	17.2	23.0	33.6	17.6	22.5	31.7	37	73	92	1013.3	1016.2	1018.5	0.6	8.4	30.9	5.4	2.4	135.7	607.5	-2.40	-0.52	0.60	0.70	9.68	77.30
17/03/2011	19.8	21.8	24.8	20.2	21.5	23.8	71	84	91	1014.4	1016.5	1018.4	1	7.5	15.4	4.8	2.5	55.3	351.8	-1.60	-0.36	0.60	1.10	3.75	17.30
18/03/2011	18.8	21.0	24	18.9	20.6	23.3	64	84	93	1011.8	1013.6	1015.1	1.5	8.2	21.2	0.0	2.2	41.8	254.9	-1.40	-0.33	0.40	0.90	4.28	52.10
19/03/2011	17.6	20.6	25.6	17.6	20.4	24.7	60	78	88	1008.7	1011.8	1014.1	1	7.2	23.3	0.0	3.0	70.9	500.6	-1.90	-0.28	0.70	0.70	5.45	38.20
20/03/2011	18.8	22.9	29.2	18.7	22.3	27.4	43	73	91	1005.5	1008.6	1010.8	2.2	11.0	28	0.0	2.4	100.2	624.8	-2.30	-0.61	0.20	0.90	5.02	44.60
21/03/2011	20	23.3	29.2	19.8	22.8	27.9	52	78	94	1000.7	1004.2	1007.4	0.8	7.1	17	24.2	2.4	103.8	600.5	-2.60	-0.56	1.80	1.00	8.98	86.80
22/03/2011	20.4	25.4	31.6	20.3	24.8	30.4	32	65	94	999.5	1001.4	1003.3	0.8	9.3	21	0.0	2.5	132.9	641.3	-2.00	-0.53	0.50	0.60	3.80	19.70
23/03/2011	20	24.5	30.4	20.2	24.0	29.0	33	53	77	1001.6	1003.8	1006.5	4.1	13.1	30.5	0.0	2.4	145.0	615.6	-2.20	-0.53	0.70	0.50	3.25	14.50
24/03/2011	14.8	20.7	25.6	15.1	20.2	24.2	36	50	70	1005.7	1006.9	1009.0	2.3	13.4	32.5	0.0	1.9	132.7	615.5	-2.30	-0.46	0.60	0.90	3.12	9.70
25/03/2011	16.4	20.0	24.8	16.4	19.5	23.6	38	56	74	1007.1	1010.2	1015.1	8.3	16.2	28.3	0.0	2.9	136.8	650.5	-2.80	-0.54	0.40	0.70	2.99	14.00
26/03/2011	15.2	18.9	23.6	15.5	18.3	21.7	51	63	77	1015.2	1018.1	1021.8	1.2	11.3	26.5	0.0	2.5	81.3	484.0	-2.90	-0.56	0.50	0.70	5.80	88.90
27/03/2011	14	18.0	23.2	14.4	17.5	21.4	49	69	82	1021.1	1022.8	1024.9	0.8	11.6	28.5	0.0	3.2	126.3	568.8	-2.60	-0.44	1.00	0.70	4.90	72.70
28/03/2011	14.8	19.1	26	15.0	18.7	24.3	47	72	87	1021.9	1024.1	1025.9	0.7	12.8	35.1	0.0	2.7	124.1	620.4	-3.00	-0.50	0.90	0.60	4.84	67.60
29/03/2011	14.8	21.0	28.4	15.3	20.6	26.5	39	69	93	1019.5	1022.4	1025.2	0.6	7.3	18.3	0.0	2.7	134.3	570.7	-2.80	-0.47	0.70	1.20	6.53	84.20
30/03/2011	16.4	22.2	30.8	16.8	21.8	29.6	28	63	88	1014.7	1018.5	1021.0	0.9	5.9	24.3	0.2	2.8	135.5	545.3	-2.10	-0.35	1.30	0.80	7.35	56.10
31/03/2011	14	18.9	25.2	14.3	18.6	23.0	60	77	92	1017.7	1020.8	1024.0	1.1	12.6	31.2	0.0	2.4	79.2	523.6	-2.50	-0.27	0.80	0.70	4.44	46.80

	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (km/h)	Wind Speed Ave (km/h)	Wind Speed Max (km/h)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/04/2011	14.4	20.3	27.2	14.9	19.9	25.7	43	67	89	1017.6	1021.2	1024.1	1.6	6.7	15.5	0.0	2.6	133.4	575.7	-2.50	-0.43	0.80	0.80	6.93	67.60
2/04/2011	14.4	20.0	28.4	14.5	19.6	26.4	42	67	91	1016.9	1019.0	1023.2	0.7	12.7	38	0.0	2.5	132.6	569.5	-2.00	-0.40	0.80	0.50	5.73	40.80
3/04/2011	13.6	19.6	26.4	14.1	19.2	25.0	35	59	79	1019.8	1022.0	1023.9	0.4	7.1	14.6	0.0	2.7	142.2	533.0	-2.50	-0.39	1.10	0.70	7.98	83.80
4/04/2011	13.2	18.4	25.2	13.3	18.1	23.9	41	66	88	1022.8	1024.7	1027.4	0.6	10.6	29.7	0.0	2.8	116.6	570.9	-2.40	-0.29	1.00	0.60	5.04	85.00
5/04/2011	15.2	17.9	22.4	15.2	17.3	20.9	49	70	89	1026.1	1027.4	1028.8	4	13.1	30.7	0.0	2.9	74.0	434.7	-2.30	-0.51	0.30	0.90	2.79	8.90
6/04/2011	13.2	17.5	23.2	13.6	17.1	21.3	51	72	89	1025.4	1027.3	1028.7	0.3	9.9	27	0.0	2.8	80.7	450.0	-2.20	-0.35	0.80	1.00	5.76	86.70
7/04/2011	14	16.8	21.4	14.3	16.6	20.1	58	78	92	1026.7	1028.0	1029.4	0.6	10.2	30	0.1	2.9	63.8	456.7	-2.30	-0.18	1.20	0.60	3.97	39.90
8/04/2011	13.6	17.8	23.6	14.3	17.4	21.9	54	72	85	1025.3	1027.4	1029.7	0.7	9.5	22.1	0.0	2.7	114.8	565.4	-2.80	-0.38	0.90	1.00	4.64	30.90
9/04/2011	13.6	19.1	26.4	13.7	18.8	25.1	31	62	92	1017.2	1021.9	1025.9	0.7	4.8	13.2	0.0	2.1	129.5	492.7	-1.70	-0.22	0.80	1.00	10.77	83.60
10/04/2011	10.4	17.7	28.4	10.3	17.4	27.0	32	69	92	1007.5	1012.3	1017.1	1.1	10.5	35	24.8	2.8	90.9	526.9	-2.00	-0.23	1.10	0.30	6.33	76.00
11/04/2011	11.6	15.5	20.8	11.6	15.3	19.4	37	63	92	1008.6	1010.5	1012.8	1.3	9.0	17.8	0.0	3.0	93.8	498.9	-1.80	-0.23	0.90	0.70	4.58	33.00
12/04/2011	7.4	14.9	21.6	8.3	14.8	20.1	36	54	81	1011.7	1013.6	1016.0	2.2	11.1	28.9	0.0	2.5	113.0	574.9	-2.00	-0.08	1.80	0.60	3.69	38.70
13/04/2011	8	16.7	24	8.4	16.5	22.9	29	49	81	1011.6	1014.3	1016.6	2.9	10.3	28.9	0.0	2.2	136.0	479.4	-1.80	-0.17	1.40	0.50	2.71	8.30
14/04/2011	11.6	17.2	24.4	11.8	17.1	23.0	31	48	73	1010.1	1012.8	1015.0	1.2	8.5	19.8	0.0	3.0	125.0	475.0	-2.20	-0.08	1.40	0.60	3.58	15.50
15/04/2011	8.6	16.3	23.2	9.2	16.0	21.7	38	59	83	1012.8	1014.9	1016.9	1.3	7.8	20.6	0.0	3.0	120.7	511.5	-2.10	-0.27	1.30	0.70	6.23	75.00
16/04/2011	14	15.3	17.6	14.2	15.1	17.1	71	87	94	1015.2	1017.4	1020.2	0.4	7.8	21.2	4.5	2.8	25.9	295.8	-0.80	-0.13	0.70	0.80	3.85	34.30
17/04/2011	13.2	16.7	21.6	13.7	16.4	20.7	45	69	91	1019.9	1021.6	1023.4	2.6	14.1	33.7	0.3	2.9	102.9	533.1	-1.70	-0.21	0.90	0.80	2.49	7.50
18/04/2011	10.8	16.6	23.2	11.0	16.4	22.0	48	72	92	1017.3	1020.3	1023.0	0.9	5.8	16.6	0.0	3.0	131.7	524.3	-1.80	-0.13	1.10	0.60	7.57	65.60
19/04/2011	10	17.5	25.6	10.1	17.4	24.8	38	72	94	1017.0	1018.9	1020.6	0.5	5.4	12.6	0.0	2.7	108.0	498.2	-2.20	-0.05	1.20	0.70	11.18	81.10
20/04/2011	12	17.3	22.8	12.5	17.2	22.2	48	74	93	1015.3	1017.6	1019.7	0.5	4.7	10.4	0.1	2.7	60.3	450.2	-1.40	-0.08	1.30	0.60	8.19	88.00
21/04/2011	13.2	19.9	27.2	14.2	19.7	25.8	26	54	83	1011.0	1013.4	1016.4	1.5	9.1	24.5	0.1	2.8	126.3	456.5	-1.80	-0.18	1.80	0.50	4.58	43.90
22/04/2011	9.8	17.9	26.4	10.1	17.8	25.5	30	53	83	1009.6	1012.6	1016.1	1.7	9.0	30.3	0.0	2.6	125.8	440.2	-1.90	-0.14	1.50	0.80	6.27	80.70
23/04/2011	8.4	16.0	23.2	8.5	15.7	21.6	43	64	85	1016.1	1018.7	1021.2	1.2	7.7	19.1	0.0	2.9	123.9	432.1	-2.10	-0.29	1.40	0.60	5.21	41.30
24/04/2011	14.8	18.3	23.6	14.5	17.9	22.3	52	74	89	1020.2	1021.5	1023.0	0.4	6.8	16.7	0.0	2.7	110.6	465.3	-2.00	-0.37	0.90	0.80	6.92	61.00
25/04/2011	15.2	17.8	22.4	15.3	17.4	21.3	56	80	93	1021.9	1024.1	1026.5	1	8.7	22.3	0.0	2.8	79.5	511.6	-1.80	-0.35	0.80	0.70	7.05	110.10
26/04/2011	12.4	16.3	20.8	13.1	16.1	19.5	59	80	93	1025.5	1026.8	1028.3	1.5	14.1	35.1	0.3	3.0	53.0	566.4	-1.80	-0.16	0.90	0.80	2.67	11.10
27/04/2011	12	15.3	21.2	12.4	15.0	19.4	52	76	93	1025.1	1026.7	1028.2	3.3	14.4	31.8	0.0	2.1	92.0	476.0	-1.90	-0.32	0.80	0.90	3.21	22.80
28/04/2011	12.8	15.5	20	12.7	15.3	19.3	63	83	93	1022.1	1024.0	1025.8	1.1	6.8	21.6	0.5	2.7	61.6	509.7	-1.70	-0.22	0.80	0.80	4.96	53.70
29/04/2011	12.4	16.0	21.2	13.2	15.9	19.8	61	84	93	1020.8	1022.4	1024.2	1.2	5.5	14.9	0.0	2.7	49.3	364.6	-1.80	-0.06	1.00	1.00	6.15	80.20
30/04/2011	14	17.4	22.4	14.7	17.2	21.4	59	80	92	1017.5	1019.7	1021.7	0.5	5.9	23.8	0.0	3.2	73.8	557.9	-1.90	-0.26	0.70	1.10	8.69	75.60

Mangoola Coal AEMR 2010-2011
Meterological Monitoring Data
Monitor: WSS

	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (km/h)	Wind Speed Ave (km/h)	Wind Speed Max (km/h)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/05/2011	10.4	16.2	23.4	10.8	16.2	21.8	43	75	95	1014.1	1016.4	1019.2	1.3	6.5	18.7	0.0	2.7	99.8	486.2	-2.20	-0.05	1.50	0.50	5.44	79.00
2/05/2011	9.6	13.9	18.4	9.7	13.9	17.6	62	81	94	1013.8	1014.8	1016.7	0.3	3.8	9.1	0.0	2.3	48.6	204.8	-0.80	0.03	1.00	0.70	12.14	88.10
3/05/2011	11.2	14.7	20.8	11.4	14.5	19.7	55	81	91	1012.2	1013.7	1015.2	0.9	5.1	21.5	0.4	2.5	63.7	444.1	-1.80	-0.12	0.90	0.50	10.33	87.20
4/05/2011	10	14.5	21.6	10.0	14.3	20.1	48	77	95	1014.3	1015.8	1017.6	1.2	6.6	18.1	0.1	3.2	97.1	413.4	-1.70	-0.14	1.00	0.80	6.02	35.00
5/05/2011	7.6	13.4	20.8	7.9	13.3	19.1	40	70	95	1017.5	1019.7	1022.5	0.8	7.2	22.6	0.1	2.5	108.2	435.1	-2.00	-0.09	1.20	0.30	6.08	45.40
6/05/2011	5.2	12.3	19.2	5.8	12.3	18.4	39	65	90	1018.5	1020.9	1023.5	1.3	5.8	12.3	0.0	2.8	103.5	428.2	-1.70	0.08	1.80	0.70	7.67	64.40
7/05/2011	4.8	12.5	20	5.0	12.4	19.5	34	66	92	1014.1	1016.7	1019.3	0.4	4.3	8.7	0.0	2.5	110.3	410.4	-1.70	-0.05	1.50	0.60	9.93	74.90
8/05/2011	4.8	13.9	22.4	5.6	13.9	21.3	28	55	90	1010.2	1012.5	1014.3	1	7.2	19.2	0.0	2.7	100.8	434.5	-2.00	0.03	1.80	0.40	5.14	58.60
9/05/2011	5.6	12.3	17.8	6.1	12.2	16.2	51	62	82	1011.6	1012.9	1014.3	0.9	8.4	18.5	0.0	3.0	83.1	423.1	-2.10	-0.13	1.30	0.80	7.18	73.30
10/05/2011	6.8	12.8	18.8	7.4	12.7	17.4	38	58	74	1011.8	1013.4	1015.1	0.6	5.9	19.6	0.1	3.2	100.3	441.1	-1.80	-0.12	1.40	0.90	8.73	58.80
11/05/2011	6.4	11.0	16	6.6	10.9	14.6	41	52	77	1008.6	1010.9	1013.2	0.9	16.9	36.2	0.0	2.8	86.7	466.6	-1.60	-0.11	1.00	0.80	3.71	72.60
12/05/2011	7.2	10.8	15.2	7.4	10.4	13.9	39	60	86	1009.3	1011.7	1014.3	5.6	14.0	27.6	1.3	2.7	108.3	459.2	-1.80	-0.34	0.70	0.90	3.41	12.00
13/05/2011	9.6	13.6	19.2	9.9	13.4	17.9	48	64	80	1010.1	1012.4	1014.3	6.8	15.4	29.3	0.0	2.8	64.9	392.1	-1.70	-0.24	0.50	1.00	2.88	9.10
14/05/2011	6	13.0	18	7.3	12.6	16.5	24	46	70	1012.7	1017.3	1023.9	3.9	13.2	25	0.0	3.0	109.9	406.3	-1.90	-0.29	1.40	0.80	3.27	9.60
15/05/2011	1	9.1	18	1.4	9.1	17.2	25	50	81	1023.9	1027.1	1029.1	2	6.8	11.1	0.1	3.0	108.7	396.1	-1.60	0.09	1.90	0.60	5.66	78.30
16/05/2011	0.4	11.1	22	1.1	11.3	21.3	16	44	79	1025.0	1027.5	1029.7	1.4	8.3	15.8	0.0	3.0	108.7	397.5	-1.80	0.23	1.90	0.50	3.77	32.80
17/05/2011	1.4	10.9	19.6	2.0	11.0	18.1	36	56	86	1025.6	1027.5	1029.2	0.9	6.6	16.8	0.0	3.1	104.9	386.8	-1.80	0.14	2.00	0.70	5.50	62.80
18/05/2011	5.6	13.3	20.8	6.0	13.2	19.4	44	73	92	1027.4	1029.2	1031.4	1	6.2	15.1	0.0	2.7	99.9	379.9	-1.80	-0.10	1.10	0.60	5.22	54.30
19/05/2011	9.6	14.0	20.8	9.5	13.8	20.0	48	78	95	1026.6	1028.2	1030.3	0.6	4.0	10.3	0.0	2.5	83.3	405.3	-2.00	-0.09	1.30	0.90	12.33	100.30
20/05/2011	6.4	13.3	22.4	6.6	13.4	21.6	33	70	95	1023.2	1025.5	1028.0	0.9	4.7	9.7	0.0	3.2	75.2	407.0	-1.90	0.11	1.90	0.50	9.80	75.80
21/05/2011	5.6	13.8	24	5.8	13.9	22.7	33	63	90	1021.0	1023.0	1025.5	0.7	5.3	12.3	0.0	3.0	83.8	478.8	-2.20	0.18	1.90	0.70	8.20	69.30
22/05/2011	6.4	14.9	24.8	6.9	14.9	23.8	33	63	90	1010.9	1017.1	1021.7	0.9	5.4	10.9	0.0	2.6	84.3	388.4	-1.80	0.04	1.10	0.70	6.27	49.90
23/05/2011	12.4	16.3	21.6	12.8	16.0	20.4	43	68	93	1004.0	1006.9	1010.8	1.4	14.6	31.6	18.9	3.0	74.5	396.2	-1.40	-0.20	0.70	0.80	4.95	58.20
24/05/2011	10.8	13.4	18	10.5	13.1	16.9	53	73	92	1003.9	1005.9	1008.6	1.5	9.6	18.8	3.0	2.8	69.4	479.9	-1.80	-0.28	0.40	0.80	3.42	19.70
25/05/2011	9.2	12.5	17.2	9.9	12.4	15.9	48	66	91	1007.6	1010.4	1013.7	0.8	9.0	24.8	0.2	3.1	48.5	358.2	-1.50	-0.03	1.50	0.50	4.96	35.60
26/05/2011	6.4	11.4	18	6.8	11.6	16.5	51	68	90	1013.4	1015.5	1017.2	1.3	6.5	11.7	0.0	2.7	70.6	433.9	-1.50	0.19	3.30	0.60	6.72	46.10
27/05/2011	4.8	10.5	17.2	5.8	10.5	16.1	43	66	91	1016.7	1018.1	1020.6	1.5	7.4	17.5	0.0	3.1	99.5	373.9	-1.80	0.12	1.80	0.50	3.90	36.70
28/05/2011	2	10.2	18	2.0	10.0	16.7	49	74	93	1020.4	1022.0	1023.8	1.7	7.8	19	0.0	2.4	87.9	392.6	-1.70	-0.18	1.00	0.70	4.32	64.60
29/05/2011	10.4	12.9	16.8	10.4	12.7	16.0	67	84	94	1020.6	1022.3	1024.3	0.4	4.4	12.3	0.0	2.8	52.9	306.3	-1.20	-0.15	1.00	0.90	8.65	62.20
30/05/2011	9.4	11.4	13.2	9.3	11.3	13.2	86	92	94	1014.7	1017.8	1021.1	1	6.1	19.2	21.7	2.9	16.2	67.4	-0.60	-0.10	0.90	0.70	7.66	85.80
31/05/2011	12	14.0	16.4	12.3	13.9	16.1	69	89	94	1013.1	1016.0	1019.7	6	14.4	31.4	28.4	2.5	31.9	184.3	-0.80	-0.12	0.50	0.60	2.61	18.90

	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (km/h)	Wind Speed Ave (km/h)	Wind Speed Max (km/h)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/06/2011	13.2	15.5	19.6	13.4	15.4	18.6	59	76	93	1019.5	1021.2	1023.7	5.7	16.9	37.8	0.7	2.6	57.6	416.4	-1.20	-0.08	0.70	0.80	2.25	5.90
2/06/2011	11.2	13.8	17.2	11.6	13.9	16.7	71	83	93	1020.3	1021.8	1023.5	0.7	7.2	23.7	0.3	2.8	41.2	353.2	-1.10	0.14	1.10	0.80	4.95	35.30
3/06/2011	7.6	12.9	18.8	7.9	12.9	18.1	48	75	95	1015.0	1017.6	1020.5	0.5	6.9	15.8	0.0	2.8	88.5	413.0	-1.60	0.00	1.30	0.50	5.66	81.90
4/06/2011	6.8	14.3	21.2	7.3	14.2	20.3	44	65	89	1013.5	1015.7	1017.2	0.3	8.3	21.5	0.1	2.8	86.7	377.3	-1.60	-0.11	1.20	0.90	3.26	21.80
5/06/2011	8	13.4	18.4	8.5	13.3	17.7	42	67	92	1012.8	1015.5	1017.8	0.6	7.4	21.7	0.1	3.0	74.7	387.8	-1.70	-0.17	0.90	0.70	6.10	39.20
6/06/2011	8	12.1	17.6	7.9	12.0	16.6	45	61	81	1014.8	1016.5	1019.0	4.5	11.9	22.2	0.0	3.2	84.0	380.7	-1.50	-0.09	1.20	0.60	2.81	15.20
7/06/2011	4	9.9	15.6	4.5	9.8	14.5	44	63	89	1014.4	1017.0	1019.1	1.4	12.0	36.1	0.0	2.5	61.6	418.8	-1.20	-0.03	1.00	0.50	4.36	45.40
8/06/2011	6.4	10.0	13.6	6.4	9.7	12.7	31	51	72	1014.4	1015.7	1017.3	4.6	14.8	27.8	0.0	2.9	93.3	362.4	-1.50	-0.23	0.90	0.80	3.18	11.90
9/06/2011	4.8	8.4	13.6	5.0	8.1	12.6	48	61	70	1013.2	1015.4	1016.5	10.3	17.6	32.5	0.0	3.3	92.0	353.7	-1.70	-0.26	0.50	0.50	2.53	8.30
10/06/2011	6.4	10.7	16.8	6.7	10.5	15.9	46	67	84	1015.0	1017.1	1020.5	0.7	10.5	21	0.1	2.5	88.2	344.9	-1.70	-0.16	1.30	0.60	5.41	59.10
11/06/2011	5.2	10.6	16	5.9	10.4	14.9	59	79	92	1019.6	1022.1	1024.1	1.8	8.8	19.5	0.1	3.2	38.9	205.2	-1.30	-0.15	1.10	0.80	4.25	60.40
12/06/2011	10.4	11.7	14.4	10.5	11.5	13.5	76	87	94	1019.9	1021.4	1023.0	1.5	12.5	53.2	2.1	3.0	32.0	214.1	-0.90	-0.12	0.40	0.90	3.65	39.70
13/06/2011	10.6	12.8	15.2	10.8	12.6	14.3	70	80	94	1017.5	1018.9	1020.8	5.7	12.6	24	0.4	3.2	32.7	132.1	-0.90	-0.14	0.70	1.20	2.84	9.10
14/06/2011	11.6	13.2	16	11.3	13.1	15.6	69	83	93	1014.4	1016.2	1017.5	4.2	16.2	36.4	9.2	2.8	33.6	289.4	-1.00	-0.14	0.90	0.70	2.32	7.80
15/06/2011	12	13.1	15.2	11.8	13.0	15.0	71	86	94	1016.0	1017.8	1020.1	4.2	18.5	46.1	30.8	2.7	33.9	294.2	-0.80	-0.10	0.60	0.60	2.51	16.00
16/06/2011	8.8	13.3	17.6	9.1	13.1	16.7	58	80	92	1013.8	1017.0	1019.5	1.4	9.6	22.1	0.0	2.9	73.4	377.9	-1.40	-0.17	1.00	0.80	4.34	64.60
17/06/2011	7.2	12.2	17.6	7.4	12.0	16.6	41	65	94	1006.8	1010.4	1013.6	2.7	13.4	28.8	0.0	2.5	75.9	363.9	-1.40	-0.17	0.50	0.70	2.90	9.40
18/06/2011	8	11.7	16.8	8.1	11.4	16.0	43	60	72	1010.6	1012.5	1014.6	7.9	14.1	23.7	0.0	3.2	89.5	338.9	-1.60	-0.30	0.60	0.90	2.67	9.90
19/06/2011	6	11.5	17.2	6.7	11.4	16.0	44	66	88	1014.2	1015.4	1016.9	1	10.1	18.6	0.0	3.4	90.1	345.2	-1.60	-0.08	1.20	0.50	2.97	26.10
20/06/2011	6.2	11.5	16.8	6.5	11.5	15.8	45	62	83	1013.1	1015.1	1016.8	1.3	10.2	26	0.0	3.3	70.3	386.6	-1.60	0.00	1.00	0.50	4.08	75.60
21/06/2011	6.8	12.0	19.2	6.8	11.8	18.4	39	64	84	1002.3	1008.6	1013.1	7.6	21.7	40.9	4.2	3.0	74.0	332.6	-1.30	-0.17	1.90	0.70	2.28	6.60
22/06/2011	6.4	9.5	13.6	6.6	9.3	12.5	46	64	80	1011.8	1013.9	1016.8	8.4	16.3	30.7	0.0	3.2	84.2	361.3	-1.30	-0.19	0.60	0.80	2.70	10.90
23/06/2011	8	11.3	16	8.3	11.1	15.3	54	66	82	1016.3	1018.9	1023.2	1.6	16.2	30.2	0.0	2.9	77.8	369.9	-1.50	-0.15	0.80	0.70	2.89	80.40
24/06/2011	2.8	9.8	17.6	3.5	9.9	16.6	48	75	95	1023.1	1025.1	1027.6	0.7	5.4	13.5	0.0	3.2	90.5	345.1	-1.70	0.07	1.40	0.40	6.54	88.30
25/06/2011	2	8.9	16.8	2.6	9.0	16.1	52	77	95	1026.4	1028.1	1030.3	0.7	5.5	9.2	0.0	3.3	89.6	344.2	-1.30	0.15	1.40	0.50	4.54	32.70
26/06/2011	2.4	10.4	20.4	2.6	10.5	19.3	40	72	96	1023.6	1025.8	1027.9	1.8	8.1	19.5	0.0	3.2	89.3	345.6	-1.80	0.16	2.20	0.70	3.28	52.90
27/06/2011	4	10.7	19.2	4.7	10.8	18.1	38	68	92	1024.5	1026.6	1029.8	1.6	5.4	11.7	0.0	3.0	90.0	345.3	-1.60	0.08	1.40	0.90	5.72	43.40
28/06/2011	5.6	11.7	17.6	6.1	11.6	16.7	52	74	92	1029.7	1031.1	1032.6	0.4	8.7	29.7	0.0	3.1	88.5	345.8	-1.30	-0.10	1.20	0.50	7.00	65.40
29/06/2011	10.4	12.7	16.8	10.7	12.5	15.7	59	84	95	1031.6	1033.5	1035.7	2.5	13.0	33.6	0.1	2.8	58.8	398.7	-1.50	-0.19	0.50	0.90	2.46	10.70
30/06/2011	7.6	11.4	16.8	8.5	11.5	15.5	58	79	93	1031.2	1033.5	1035.7	0.6	8.0	23.3	0.0	3.2	56.8	328.5	-1.00	0.14	1.80	0.60	5.28	46.30

Mangoola Coal AEMR 2010-2011
Meterological Monitoring Data
Monitor: WSN

Date	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (m/s)	Wind Speed Ave (m/s)	Wind Speed Max (m/s)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/07/2010	-4.2	4.8	14.8	-3.4	5.2	14.4	43	77	97	1022.5	1024.4	1026.5	0.1	1.0	3.7	0.0	7.9	97.2	527.9	-1.10	0.41	2.60	1.20	12.78	67.2
2/07/2010	3.2	7.8	11.8	3.7	7.7	11.4	63	83	93	1023.7	1025.2	1027.4	0.1	1.1	4.1	0.3	7.9	44.0	218.4	-0.80	-0.07	1.00	1.10	15.27	94.7
3/07/2010	-1.6	8.4	15.4	-0.5	8.5	14.4	41	69	96	1024.2	1026.4	1029.3	0.2	2.9	6.9	0.2	6.6	123.0	506.9	-1.10	0.11	2.30	0.90	7.95	62.5
4/07/2010	-2.8	4.3	15.2	-1.7	4.7	14.5	50	83	97	1025.9	1028.0	1030.3	0.1	0.8	2.8	0.0	5.8	94.7	450.7	-1.30	0.43	2.00	1.20	13.98	59.2
5/07/2010	-1	8.5	15.2	-0.2	8.4	14.5	68	86	97	1019.6	1024.1	1027.1	0.1	1.1	3.6	0.0	7.0	78.6	628.1	-1.20	-0.13	1.10	1.70	13.00	73.9
6/07/2010	4.8	11.2	18	7.5	11.7	17.0	45	76	95	1014.1	1017.3	1020.5	0.1	1.6	5.8	1.3	7.9	78.4	456.7	-1.20	0.51	5.00	1.20	14.10	86.2
7/07/2010	3.8	10.5	15.2	5.5	10.6	14.6	63	77	89	1019.9	1022.4	1024.3	0.1	1.2	4.0	0.1	6.6	68.6	338.5	-1.00	0.15	1.90	1.20	12.84	95.3
8/07/2010	6	11.1	14.8	6.6	11.2	14.1	67	79	95	1023.6	1025.0	1026.6	0.1	1.5	4.6	0.0	6.6	61.7	555.8	-1.10	0.14	1.50	0.90	10.02	90.2
9/07/2010	2.8	9.2	14	2.9	9.1	13.8	77	91	97	1026.0	1027.1	1028.5	0.2	1.5	4.6	0.0	6.6	65.0	373.2	-1.40	-0.14	1.40	1.40	13.17	68.8
10/07/2010	6	10.7	17.6	6.1	10.8	16.8	61	87	96	1022.7	1025.6	1028.3	0.2	1.2	3.5	0.0	7.9	96.2	549.2	-1.20	0.10	2.00	0.60	10.72	72.6
11/07/2010	5.8	11.8	18.2	6.2	11.8	17.6	61	85	96	1020.3	1021.8	1023.2	0.1	1.8	6.3	0.7	7.9	51.5	269.9	-1.10	-0.02	1.40	1.30	17.75	82.6
12/07/2010	11	13.0	15.6	11.1	12.8	15.4	88	94	96	1020.3	1021.4	1022.9	0.1	0.9	3.2	3.2	7.9	35.8	282.2	-0.60	-0.23	0.30	1.40	12.15	85.4
13/07/2010	11.4	13.5	18	11.7	13.3	18.3	69	92	96	1010.3	1016.9	1021.0	0.1	0.9	5.6	0.0	7.9	56.6	299.5	-0.90	-0.22	0.70	1.30	13.29	90.3
14/07/2010	11.4	14.1	18.4	11.8	14.0	18.6	46	66	93	1006.7	1012.3	1015.6	0.9	5.2	9.8	22.5	6.6	100.2	551.8	-1.10	-0.13	0.70	0.90	6.37	61.8
15/07/2010	2.8	11.7	15.2	5.1	11.6	14.5	44	58	78	1014.0	1018.5	1023.4	0.5	5.0	9.0	0.0	7.9	128.0	508.4	-1.20	-0.09	2.70	1.10	4.42	40.2
16/07/2010	-2.2	5.2	14.8	-1.7	5.5	14.3	45	78	97	1023.2	1024.8	1026.5	0.1	0.8	3.3	0.0	7.9	132.5	485.5	-1.20	0.26	2.50	0.50	14.06	76.0
17/07/2010	-3	5.1	16.8	-2.7	5.4	15.9	51	83	98	1023.6	1025.6	1028.2	0.1	0.9	3.4	0.0	7.9	130.6	485.5	-1.20	0.20	2.30	1.10	16.37	90.8
18/07/2010	-0.6	7.5	20.4	-0.5	7.6	19.3	39	78	98	1017.7	1020.7	1023.9	0.1	1.9	13.8	0.0	6.6	129.2	484.2	-1.40	0.06	2.70	0.90	16.07	62.0
19/07/2010	-0.4	5.8	16.4	-0.1	6.1	15.8	50	87	97	1015.3	1017.1	1018.8	0.1	0.7	2.5	0.0	7.9	66.4	471.5	-1.10	0.28	1.70	1.50	15.16	79.6
20/07/2010	1.4	8.3	15.6	2.7	8.3	14.5	48	79	97	1018.6	1021.2	1023.8	0.1	0.9	3.7	0.0	7.9	102.1	586.7	-1.40	-0.01	2.30	1.40	15.41	79.8
21/07/2010	0.8	6.9	14.8	1.3	6.9	14.1	52	81	97	1023.7	1024.9	1026.7	0.1	1.3	4.6	0.1	7.0	107.5	606.9	-1.40	0.02	1.70	1.10	11.87	93.3
22/07/2010	-1	5.4	16	-1.1	5.4	15.3	46	83	98	1026.4	1028.3	1030.8	0.1	0.9	3.9	1.1	7.9	123.7	496.1	-1.40	-0.02	1.60	1.40	16.38	89.8
23/07/2010	1.2	7.8	16.8	1.6	7.7	16.1	50	83	97	1028.9	1030.4	1032.6	0.1	1.0	3.8	0.0	7.9	113.9	525.0	-1.10	-0.05	2.00	0.90	12.26	100.8
24/07/2010	4.4	9.9	17.2	4.9	10.1	16.4	56	82	96	1025.7	1028.1	1030.4	0.1	0.9	2.5	0.0	7.9	117.5	608.5	-1.30	0.17	2.40	1.70	16.87	91.2
25/07/2010	5.4	11.4	17.2	6.3	11.4	16.6	56	81	96	1025.6	1027.7	1029.3	0.1	1.6	4.4	0.0	6.6	94.6	511.7	-1.20	-0.05	2.00	0.90	8.93	57.4
26/07/2010	4.6	11.1	17.2	6.1	11.3	16.3	50	77	95	1029.3	1031.4	1033.2	0.1	1.7	5.5	0.1	7.9	112.9	624.0	-1.40	0.14	1.90	0.80	11.12	89.8
27/07/2010	3.4	10.0	17.2	3.6	10.0	16.7	62	86	97	1029.7	1031.8	1034.1	0.1	1.7	5.9	0.0	7.9	69.3	443.9	-1.00	0.01	2.10	1.10	12.02	79.7
28/07/2010	6	11.2	13.2	6.8	11.1	12.8	93	94	96	1020.7	1024.9	1030.2	0.1	1.2	3.8	19.4	6.6	23.3	73.7	-0.60	-0.05	1.80	1.00	9.42	52.3
29/07/2010	8.6	12.8	16.4	9.5	13.2	16.8	78	90	96	1015.2	1018.0	1020.6	0.1	0.9	2.7	0.2	7.9	54.9	241.6	-0.80	0.43	4.10	1.30	17.26	90.8
30/07/2010	6.2	13.7	20.4	6.5	13.7	19.9	63	87	97	1012.8	1016.0	1018.0	0.1	1.8	6.4	3.2	7.9	85.0	494.1	-1.50	0.03	1.80	1.00	11.01	67.7
31/07/2010	11.4	15.2	18.6	11.5	15.1	18.2	56	76	95	1010.6	1015.3	1021.0	0.2	3.7	9.8	3.2	7.9	109.9	602.0	-1.10	-0.16	0.70	0.90	7.30	89.4

Date	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (m/s)	Wind Speed Ave (m/s)	Wind Speed Max (m/s)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/08/2010	5.6	12.6	18.6	6.8	12.5	17.9	39	63	87	1016.5	1020.2	1023.1	0.4	4.5	8.0	2.3	7.9	141.9	567.9	-1.40	-0.12	2.00	0.80	5.87	70.8
2/08/2010	7.6	9.6	12.4	7.5	9.3	11.5	56	67	75	1014.7	1017.7	1020.1	3.7	6.5	10.6	0.2	7.9	83.6	593.9	-1.10	-0.24	0.30	1.40	4.38	12.5
3/08/2010	5	11.7	18	5.2	11.8	17.3	43	66	94	1013.9	1016.6	1019.3	0.1	2.8	6.7	0.0	7.9	94.7	543.3	-1.10	0.04	2.50	1.00	10.65	106.8
4/08/2010	0.6	7.8	18.8	0.8	8.0	17.9	34	77	97	1015.3	1017.7	1019.8	0.1	1.6	5.9	0.1	6.6	151.6	582.4	-1.70	0.24	4.20	0.80	13.35	98.1
5/08/2010	0	7.9	16.8	1.1	8.9	16.0	32	66	96	1015.8	1017.8	1019.9	0.1	1.9	6.5	0.0	5.8	145.7	627.0	-1.20	0.95	4.40	1.30	12.08	64.9
6/08/2010	1.8	8.8	16	4.1	9.4	14.8	36	61	83	1018.7	1020.4	1023.4	0.2	2.2	4.8	0.0	7.9	152.6	563.5	-1.20	0.58	4.10	1.30	12.08	66.2
7/08/2010	-2.6	5.5	16.4	-1.3	5.8	15.6	31	73	97	1020.6	1023.1	1025.6	0.1	0.9	2.9	0.0	7.9	156.3	553.9	-1.40	0.30	2.60	1.40	17.86	101.1
8/08/2010	-3.8	5.2	17.6	-3.3	5.4	16.8	35	75	97	1017.8	1020.4	1022.6	0.1	0.8	3.4	0.1	7.9	156.4	555.3	-1.40	0.16	2.30	1.50	15.84	82.8
9/08/2010	-4	7.6	19.6	-3.3	7.9	18.9	38	71	97	1018.2	1020.5	1023.4	0.1	1.2	5.1	0.0	5.3	154.5	543.4	-1.40	0.20	3.70	1.30	15.01	83.1
10/08/2010	6	11.4	14	6.8	11.3	13.7	85	92	95	1012.1	1015.4	1019.0	0.1	0.9	6.5	4.7	7.9	36.1	204.6	-0.70	-0.11	1.00	1.00	15.80	86.3
11/08/2010	10	13.2	16	10.0	13.1	15.3	47	60	95	1005.6	1009.4	1012.9	0.9	4.5	9.4	1.4	5.8	96.4	609.4	-1.30	-0.16	1.40	1.20	5.68	53.0
12/08/2010	9.4	11.5	14.8	9.4	11.3	13.3	56	69	79	1003.7	1006.8	1010.9	3.6	7.0	12.6	0.1	7.5	90.0	599.5	-1.50	-0.21	0.40	1.40	3.99	8.8
13/08/2010	9	12.4	17.6	9.0	12.3	16.8	42	61	77	1010.6	1013.0	1016.0	1.1	3.4	6.7	0.0	7.0	152.6	591.1	-1.30	-0.14	2.00	1.10	6.67	56.7
14/08/2010	-0.2	9.2	19.2	0.5	9.5	18.2	38	72	97	1009.7	1013.5	1016.9	0.1	1.8	5.6	0.0	7.9	166.1	576.3	-1.40	0.30	2.70	1.80	16.94	82.4
15/08/2010	4.8	13.3	19.2	5.0	13.2	18.6	35	60	92	1006.5	1009.1	1013.8	0.2	4.4	10.0	0.1	7.9	135.8	717.9	-1.10	-0.07	1.20	1.50	9.55	80.9
16/08/2010	11	13.1	16	11.2	12.9	15.3	42	58	80	1012.9	1015.4	1019.0	2.3	5.1	9.9	0.0	7.9	151.9	710.7	-1.40	-0.24	0.60	1.40	4.72	12.2
17/08/2010	-0.6	9.0	17.2	0.0	9.3	16.5	25	62	94	1018.8	1020.6	1023.2	0.2	1.7	4.8	0.0	7.0	163.3	610.7	-1.40	0.22	2.20	1.70	15.41	87.2
18/08/2010	-2	11.4	22.4	-1.7	11.3	21.7	36	65	97	1010.4	1015.9	1020.9	0.1	1.5	6.1	0.9	6.6	163.7	576.3	-1.30	-0.05	1.80	1.90	19.54	75.4
19/08/2010	14	17.6	20.8	13.9	17.4	19.9	56	67	91	1009.1	1010.9	1012.5	0.4	4.5	8.9	6.7	7.9	109.0	664.5	-1.30	-0.19	0.70	1.50	6.97	58.6
20/08/2010	7.4	13.2	17.6	8.3	13.0	16.8	34	55	83	1011.5	1014.5	1018.2	1.1	4.5	8.7	1.5	7.9	170.7	603.5	-1.20	-0.18	0.90	1.50	4.68	31.0
21/08/2010	3.2	10.1	15.6	4.5	10.6	14.7	37	49	79	1017.5	1019.0	1021.6	0.4	3.1	6.8	0.0	7.0	128.9	779.9	-1.00	0.46	3.50	0.80	6.09	48.3
22/08/2010	-1	8.2	16.4	0.1	8.6	15.6	38	70	95	1019.1	1021.4	1024.1	0.1	0.9	2.7	0.0	6.6	149.3	610.7	-1.10	0.47	3.40	1.40	15.27	82.7
23/08/2010	7.8	9.4	11.8	7.8	9.2	11.5	77	90	95	1010.5	1014.8	1019.0	0.1	1.5	5.3	2.7	7.9	28.3	118.6	-0.70	-0.26	0.20	1.40	9.80	77.6
24/08/2010	9.6	12.9	17.2	9.7	12.6	16.1	46	63	78	1011.0	1012.9	1015.4	2.7	5.2	8.4	0.0	5.8	146.0	707.3	-1.20	-0.26	0.40	1.30	4.16	10.7
25/08/2010	11	13.3	16.8	11.0	13.0	16.1	38	54	70	1007.2	1009.2	1011.1	1.6	5.2	9.6	0.0	6.6	149.4	759.5	-1.20	-0.25	0.50	1.60	5.56	18.3
26/08/2010	9.8	12.2	15.8	10.1	12.0	15.0	44	56	76	1004.4	1006.9	1008.4	3.0	6.5	12.8	1.0	6.6	118.6	660.4	-1.00	-0.20	1.20	1.60	4.54	12.4
27/08/2010	9.8	11.9	14.2	9.8	11.7	13.7	53	65	75	1008.3	1012.7	1017.9	2.2	5.4	9.1	0.0	7.0	75.9	358.6	-0.70	-0.18	0.40	1.40	4.44	11.6
28/08/2010	1.4	9.9	17.2	2.1	10.2	16.5	38	66	94	1017.9	1021.5	1026.1	0.2	1.8	5.6	0.0	7.0	181.6	684.7	-1.20	0.24	3.00	0.90	12.45	72.7
29/08/2010	-1.4	7.6	19.2	-0.9	7.7	18.8	34	73	97	1024.2	1026.5	1029.0	0.1	0.8	3.0	0.0	7.9	185.6	634.2	-1.40	0.11	2.10	1.00	17.49	85.6
30/08/2010	-0.6	8.5	20	-0.3	8.6	19.2	39	77	97	1022.4	1025.1	1027.5	0.1	0.9	3.0	0.0	8.2	181.2	676.0	-1.30	0.14	2.70	1.40	17.18	96.0
31/08/2010	1	10.3	22	1.2	10.8	21.2	36	72	97	1018.9	1022.7	1025.7	0.1	1.2	3.9	0.0	5.3	159.5	679.1	-1.40	0.46	4.20	1.00	20.06	99.9

Mangoola Coal AEMR 2010-2011
Meterological Monitoring Data
Monitor: WSN

Date	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (m/s)	Wind Speed Ave (m/s)	Wind Speed Max (m/s)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/09/2010	3.8	16.7	24	5.2	16.9	23.2	37	56	93	1014.9	1017.4	1020.4	0.2	3.8	9.4	0.0	6.6	156.2	619.9	-1.20	0.18	3.10	1.30	10.42	63.20
2/09/2010	13.4	19.5	28.2	13.7	19.4	27.0	36	65	87	1011.6	1014.9	1019.0	0.1	2.2	6.0	0.0	7.9	166.0	706.4	-1.50	-0.15	2.30	1.50	12.47	91.40
3/09/2010	13.8	14.9	16.6	13.7	14.7	15.9	78	84	93	1019.0	1021.6	1024.3	0.2	3.1	6.7	2.1	7.9	45.5	264.5	-1.10	-0.25	0.30	1.00	7.45	68.80
4/09/2010	14.2	17.2	22.4	14.1	17.1	22.4	51	81	94	1006.0	1012.5	1019.5	0.1	2.6	9.4	5.4	6.6	40.4	177.0	-0.80	-0.15	0.60	1.30	11.42	74.40
5/09/2010	8.8	16.2	18.8	10.1	16.0	18.4	47	56	79	1011.5	1015.0	1018.8	0.6	5.3	9.4	1.3	7.9	188.3	658.5	-1.10	-0.18	1.30	1.60	4.57	9.30
6/09/2010	4.2	11.5	18	5.9	11.9	17.3	35	63	91	1018.3	1019.9	1022.0	0.2	2.2	6.2	0.0	7.9	139.2	845.9	-1.80	0.43	2.60	1.30	10.68	107.30
7/09/2010	1.2	10.6	18.4	1.7	10.8	17.8	30	67	96	1021.2	1023.0	1026.4	0.2	2.0	5.7	0.0	7.9	168.2	796.1	-1.20	0.13	4.20	1.60	11.52	88.10
8/09/2010	1.8	9.5	18.2	2.2	9.8	17.5	38	73	97	1021.3	1024.2	1027.4	0.1	1.3	4.1	0.0	7.9	192.0	758.3	-1.40	0.29	3.60	1.20	15.68	83.00
9/09/2010	3	10.4	15.4	3.5	10.4	15.1	66	87	96	1008.8	1015.2	1021.4	0.2	1.1	4.2	2.4	7.9	83.2	489.8	-0.90	-0.10	1.20	1.00	12.66	81.90
10/09/2010	10.6	15.7	22.8	11.9	15.9	22.2	39	67	95	1003.3	1007.8	1014.0	0.3	4.0	10.5	1.5	8.2	149.1	710.9	-1.00	0.15	2.10	1.30	10.60	83.60
11/09/2010	7.4	15.1	21.2	9.3	15.1	20.4	32	49	72	1014.1	1017.4	1020.4	0.3	2.9	6.2	0.0	6.6	211.8	687.7	-1.10	-0.01	2.50	0.50	10.19	60.00
12/09/2010	1.4	13.1	21.6	1.7	13.2	20.9	38	63	96	1016.5	1019.6	1022.7	0.1	1.3	3.7	0.0	7.9	188.9	707.9	-1.50	0.11	1.70	1.20	15.58	70.40
13/09/2010	11	16.8	23	11.5	17.1	22.4	34	56	81	1013.5	1015.7	1017.5	0.1	2.2	7.7	0.0	6.6	158.9	763.3	-1.20	0.30	2.30	1.00	12.74	92.30
14/09/2010	12.4	15.4	21.4	12.8	15.4	20.4	52	78	94	1008.2	1012.6	1016.1	0.1	1.4	6.8	14.9	6.6	119.0	781.4	-1.30	-0.06	1.40	0.80	17.04	103.50
15/09/2010	10.6	15.4	21	10.7	15.3	20.2	27	59	94	1008.2	1012.2	1017.3	0.4	4.2	8.0	0.0	5.3	193.1	839.1	-1.00	-0.11	1.10	1.20	5.39	46.70
16/09/2010	9	12.6	17.6	9.1	12.4	17.0	43	55	64	1014.8	1017.4	1020.5	2.9	5.4	8.4	0.0	7.0	140.4	764.0	-1.20	-0.24	0.40	1.20	3.84	13.10
17/09/2010	7.4	12.2	17.6	7.8	12.1	16.9	32	50	62	1018.8	1020.6	1022.7	0.9	3.8	7.9	0.0	7.9	179.2	720.9	-1.10	-0.20	0.60	1.30	5.93	58.40
18/09/2010	8.2	13.5	19.4	8.8	13.3	18.7	44	56	66	1015.2	1018.2	1020.9	2.0	4.8	8.3	0.0	8.2	211.4	739.6	-1.30	-0.22	0.60	1.40	4.00	12.80
19/09/2010	5.8	12.7	17.6	6.0	12.8	17.1	51	68	92	1018.8	1020.2	1022.4	0.1	1.0	3.4	0.0	7.0	115.3	449.3	-1.00	0.05	1.20	1.50	18.75	92.20
20/09/2010	8	14.9	21.2	8.6	15.0	20.7	41	67	91	1020.6	1022.0	1023.6	0.2	2.1	5.8	0.0	6.6	190.0	766.8	-1.50	0.11	2.30	0.90	11.75	77.80
21/09/2010	6.6	15.8	25.6	6.8	15.6	24.8	32	70	96	1019.6	1022.7	1026.6	0.1	2.0	7.2	0.0	8.2	193.6	709.2	-1.40	-0.19	2.10	1.20	14.66	70.60
22/09/2010	8.8	16.2	24.4	9.8	16.3	23.8	41	66	91	1019.1	1023.1	1026.7	0.2	1.7	4.8	0.0	6.6	213.4	706.6	-1.30	0.13	2.90	0.60	13.20	82.40
23/09/2010	8.2	14.9	21.2	9.0	15.0	20.5	54	78	95	1020.0	1021.9	1023.4	0.1	1.5	4.0	0.0	7.0	112.2	681.7	-1.30	0.09	2.60	1.30	10.90	94.60
24/09/2010	7.8	15.2	25.8	8.5	15.4	25.3	34	75	95	1017.6	1020.5	1023.7	0.1	1.3	4.7	0.0	5.3	176.7	727.8	-1.20	0.19	2.90	0.80	14.78	86.80
25/09/2010	3.6	14.5	25.6	4.3	15.0	24.8	25	60	96	1014.8	1017.4	1019.6	0.1	2.2	8.3	0.0	7.9	207.5	813.2	-1.10	0.55	3.90	0.60	11.50	80.60
26/09/2010	2.4	13.7	26.4	3.1	13.9	25.1	20	62	95	1016.2	1018.2	1020.5	0.1	1.0	3.4	0.0	7.9	226.4	723.4	-3.40	0.23	2.00	1.10	18.48	95.00
27/09/2010	3.8	15.1	26	4.1	15.2	25.6	43	72	94	1010.4	1014.0	1017.7	0.1	1.9	10.0	1.2	6.6	167.5	817.6	-1.30	0.16	3.20	1.20	17.49	90.40
28/09/2010	7	17.0	25.6	8.0	17.2	24.9	25	56	96	1010.6	1013.0	1015.0	0.1	2.4	7.1	0.0	7.0	220.0	748.7	-1.40	0.23	2.70	0.80	9.78	48.70
29/09/2010	6	13.3	21.2	7.4	13.3	20.2	22	54	81	1013.5	1016.6	1021.7	0.4	2.5	8.3	0.0	7.0	217.0	766.6	-1.20	-0.04	2.80	1.10	9.70	56.50
30/09/2010	1.8	10.4	19.2	1.9	10.7	18.1	23	62	96	1021.5	1023.3	1025.3	0.1	1.2	3.9	0.0	6.6	234.5	807.7	-1.60	0.23	3.30	0.90	19.44	81.10

Date	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (m/s)	Wind Speed Ave (m/s)	Wind Speed Max (m/s)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/10/2010	2.2	13.2	21.2	2.5	13.1	20.3	43	64	94	1023.1	1025.2	1027.3	0.2	1.6	4.4	0.0	5.8	162.3	843.4	-1.40	-0.06	1.20	2.00	12.38	81.7
2/10/2010	11.4	15.3	20.4	11.7	15.1	19.6	45	73	89	1025.1	1026.6	1028.0	0.1	2.1	5.3	1.2	6.6	138.7	844.9	-1.20	-0.13	1.80	1.50	14.05	102.3
3/10/2010	13.4	15.5	19.2	13.5	15.3	18.6	71	87	93	1024.0	1025.6	1027.2	0.1	2.5	5.6	12.8	6.6	67.8	359.6	-0.90	-0.20	0.30	1.30	7.14	66.6
4/10/2010	14.6	17.4	20.8	14.7	17.2	20.2	66	82	92	1019.3	1021.7	1024.2	1.1	3.3	5.6	1.0	6.6	114.7	557.6	-0.90	-0.25	0.30	1.40	5.08	14.4
5/10/2010	15.8	18.9	24.4	15.9	18.7	24.0	51	77	92	1018.3	1020.4	1021.7	0.8	2.6	5.5	0.1	8.2	144.8	872.2	-1.20	-0.25	0.40	1.40	5.15	20.8
6/10/2010	12.8	19.2	24.8	13.9	19.1	24.2	51	76	94	1015.3	1018.6	1021.3	0.2	2.4	5.1	0.0	8.2	171.0	869.0	-1.30	-0.10	1.70	1.00	8.34	93.6
7/10/2010	12.2	18.8	24.4	13.2	18.5	23.6	42	72	95	1014.0	1016.9	1020.9	0.1	2.7	6.0	0.0	7.9	152.1	755.3	-1.00	-0.25	1.40	1.00	10.62	100.4
8/10/2010	14.6	16.3	20	14.6	16.1	19.3	63	75	84	1019.8	1021.6	1023.7	0.6	2.9	5.8	0.1	7.9	82.1	394.6	-0.80	-0.24	0.20	1.30	5.24	14.8
9/10/2010	10.2	16.8	21.6	12.4	16.6	20.9	55	69	82	1022.0	1023.9	1026.4	0.3	3.2	7.3	0.0	7.9	195.9	1000.5	-1.40	-0.15	2.40	1.40	7.06	75.9
10/10/2010	6.2	15.2	20.4	7.6	15.2	19.7	41	67	95	1025.8	1028.4	1030.5	0.1	4.0	9.1	0.0	5.3	168.5	934.4	-1.50	-0.03	2.00	1.30	7.54	76.3
11/10/2010	10	17.6	22.4	10.9	17.4	21.7	43	66	88	1027.8	1029.4	1030.8	0.2	4.1	7.3	0.0	7.9	185.0	871.3	-1.30	-0.20	1.90	1.30	5.96	67.5
12/10/2010	7.2	16.6	26	7.8	16.7	25.1	39	71	95	1022.0	1025.7	1029.9	0.1	1.5	4.7	0.1	7.9	225.7	782.7	-1.60	0.10	1.90	1.20	15.58	80.8
13/10/2010	10.6	18.2	25.6	11.1	18.1	24.5	44	69	95	1014.2	1018.1	1022.1	0.1	1.9	5.7	0.0	7.9	147.2	723.7	-1.50	-0.12	1.00	1.30	15.83	72.9
14/10/2010	14.4	19.5	25.8	14.9	19.4	24.7	53	72	90	1008.1	1011.5	1014.4	0.1	2.5	6.6	0.1	8.2	162.4	831.7	-1.40	-0.13	1.20	1.10	12.86	86.4
15/10/2010	13.8	18.1	23	14.0	18.0	22.6	61	79	93	990.5	998.2	1007.9	0.2	4.2	11.8	7.7	7.9	77.8	444.1	-0.70	-0.08	0.80	1.30	14.99	68.5
16/10/2010	7.4	11.0	14.4	7.3	10.7	14.2	39	55	81	996.7	1006.8	1014.2	3.0	7.0	13.4	1.8	7.9	207.7	863.6	-1.60	-0.28	0.40	1.20	4.23	11.6
17/10/2010	7.8	14.2	20.8	7.8	13.9	19.9	40	52	66	1013.2	1015.1	1018.0	2.1	4.7	7.3	0.0	7.9	265.3	818.9	-1.50	-0.31	0.50	1.10	4.65	15.5
18/10/2010	4	15.7	24.4	5.8	15.9	23.3	30	54	89	1015.8	1018.2	1021.1	0.2	2.9	7.2	0.0	6.6	268.5	810.5	-1.40	0.13	2.30	1.10	8.52	64.4
19/10/2010	3.8	13.8	20.4	4.5	13.9	19.7	46	69	95	1020.7	1024.2	1027.8	0.1	2.5	7.1	0.0	7.9	241.5	970.2	-1.50	0.12	3.30	1.40	9.55	75.6
20/10/2010	5.2	15.7	24.8	5.9	15.7	23.9	33	67	96	1022.6	1025.6	1028.3	0.1	1.6	4.0	0.0	7.9	258.4	900.9	-1.70	0.05	2.50	1.30	14.84	88.7
21/10/2010	5.8	16.8	26.6	6.5	16.8	25.6	26	63	95	1019.1	1022.7	1026.0	0.1	1.4	5.3	0.0	7.9	253.8	807.9	-1.60	-0.02	1.90	1.60	14.24	82.9
22/10/2010	10.2	16.9	27.4	10.9	16.9	25.7	37	74	94	1017.6	1019.9	1022.2	0.1	1.3	5.8	4.6	7.9	175.6	902.0	-1.50	0.03	1.40	1.50	16.69	117.5
23/10/2010	7.4	18.0	28.8	8.3	17.9	27.8	35	72	96	1013.6	1017.2	1019.3	0.1	2.4	9.0	8.6	7.9	225.5	849.6	-1.20	-0.16	1.30	0.70	10.48	54.6
24/10/2010	13	14.7	16.8	13.0	14.5	16.4	81	89	94	1016.8	1019.1	1021.1	0.1	1.6	4.2	26.1	6.6	39.9	160.9	-0.70	-0.23	0.20	1.60	7.72	67.4
25/10/2010	11.8	15.9	21.2	12.2	15.7	20.0	56	77	93	1016.9	1018.9	1020.8	0.1	1.8	5.2	0.0	7.9	147.7	825.4	-1.30	-0.18	1.40	0.60	11.04	71.2
26/10/2010	11.4	17.8	27.2	11.7	17.9	26.2	30	67	95	1014.2	1016.8	1018.8	0.2	1.4	5.0	0.0	8.2	239.7	951.8	-1.40	0.04	2.50	0.90	14.18	92.8
27/10/2010	8.2	19.2	28.4	8.8	19.0	27.6	24	62	95	1012.4	1015.5	1018.5	0.1	2.4	6.6	0.0	6.6	233.8	938.0	-1.20	-0.17	1.10	1.60	10.85	101.7
28/10/2010	15.8	18.0	22.4	15.8	17.7	21.6	53	68	80	1017.1	1018.7	1020.1	1.7	4.2	8.0	0.1	7.9	173.5	877.8	-1.30	-0.30	0.40	1.00	4.40	10.9
29/10/2010	9.8	18.5	25.2	10.8	18.4	24.5	49	69	93	1014.4	1017.0	1019.3	0.3	2.2	5.1	0.0	7.9	239.3	968.7	-1.60	-0.12	1.40	1.00	10.97	94.8
30/10/2010	10.6	20.8	30	10.8	20.9	29.1	36	65	95	1011.6	1013.7	1015.9	0.1	1.9	7.1	0.0	7.9	220.8	963.0	-1.50	0.08	2.70	1.30	19.89	92.2
31/10/2010	15	21.6	29	15.6	21.6	28.3	41	67	87	1010.3	1012.4	1013.8	0.1	2.5	7.6	0.0	6.6	185.8	980.3	-1.50	-0.02	2.30	0.90	15.52	91.5

Mangoola Coal AEMR 2010-2011
Meterological Monitoring Data
Monitor: WSN

Date	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (m/s)	Wind Speed Ave (m/s)	Wind Speed Max (m/s)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/11/2010	12.6	16.3	19.6	12.9	16.3	19.3	69	85	95	1010.6	1012.8	1014.6	0.2	1.8	6.6	26.6	6.6	70.9	717.8	-0.90	0.03	1.70	1.30	12.04	90.40
2/11/2010	9	15.4	21.2	10.3	15.3	20.1	36	57	81	1012.2	1014.5	1017.5	0.2	3.9	7.5	0.0	8.2	240.0	1039.5	-1.30	-0.09	1.50	1.30	7.71	63.40
3/11/2010	6.4	17.1	25.6	6.8	17.1	24.6	28	56	94	1014.9	1017.4	1019.3	0.1	1.9	5.1	0.0	7.9	261.4	906.6	-1.40	0.00	2.10	1.50	12.47	76.80
4/11/2010	10.6	16.4	21.4	11.4	16.1	20.7	50	72	91	1016.4	1018.8	1020.5	0.1	3.2	8.3	0.0	6.6	209.3	1013.7	-1.30	-0.25	1.20	1.30	7.96	93.50
5/11/2010	11.6	13.1	14.6	11.8	13.0	14.7	80	87	91	1019.4	1020.9	1022.1	0.2	2.2	5.6	14.4	6.6	57.5	255.6	-0.70	-0.19	0.30	1.00	6.34	78.70
6/11/2010	10.4	15.0	19.8	11.9	14.9	18.8	58	79	91	1018.4	1020.4	1021.9	0.6	3.0	7.5	0.9	7.9	152.5	867.8	-1.20	-0.20	1.50	1.00	5.50	40.50
7/11/2010	7	16.8	25.4	7.4	16.7	24.8	42	74	96	1015.1	1018.1	1020.8	0.1	1.4	3.9	0.4	7.0	249.7	839.5	-1.70	-0.08	1.70	1.20	16.44	88.90
8/11/2010	12.6	22.1	30	12.9	22.1	29.3	35	62	95	1014.4	1017.3	1021.6	0.1	2.5	7.4	0.1	6.6	271.8	882.2	-1.20	0.00	2.80	0.70	16.84	86.40
9/11/2010	16.6	21.3	28.2	16.8	21.0	26.8	48	75	94	1021.6	1023.5	1024.8	0.1	1.4	4.4	12.2	7.9	195.9	1032.6	-1.30	-0.27	0.70	1.40	12.80	69.90
10/11/2010	15	20.7	28.4	15.5	20.5	27.4	54	78	94	1016.7	1020.0	1023.0	0.2	1.6	5.6	1.7	7.9	177.4	1013.5	-1.40	-0.23	0.60	1.10	15.82	81.40
11/11/2010	17	21.6	28.4	17.8	21.5	27.2	46	74	94	1011.9	1015.0	1017.7	0.1	1.9	5.8	0.6	8.2	182.5	876.3	-1.30	-0.17	1.30	1.00	18.06	85.80
12/11/2010	14.2	22.4	31.6	14.7	22.4	30.9	26	63	94	1010.8	1013.0	1015.2	0.1	1.4	4.2	0.0	7.9	279.8	842.1	-1.40	-0.04	2.00	1.20	20.85	87.10
13/11/2010	15.4	23.9	31.4	15.7	23.7	30.3	44	67	92	1013.3	1015.2	1016.9	0.2	2.0	6.6	0.0	6.6	254.8	979.1	-1.30	-0.16	1.40	1.50	19.35	86.50
14/11/2010	18.8	26.2	31.4	19.6	25.9	30.4	40	57	90	1012.6	1015.3	1017.8	0.2	2.8	6.1	0.0	6.6	264.4	932.7	-1.40	-0.28	1.90	0.90	16.95	77.90
15/11/2010	19	21.6	25.6	18.9	21.3	24.8	64	82	93	1011.6	1012.6	1013.5	0.1	1.6	4.9	15.7	7.9	73.7	485.7	-1.00	-0.25	0.40	0.80	18.68	82.80
16/11/2010	16.8	20.7	25.6	16.7	20.3	24.7	52	76	93	1009.4	1012.1	1014.8	0.1	2.4	6.5	2.2	7.9	220.3	942.9	-1.60	-0.40	0.30	0.90	12.26	91.50
17/11/2010	15	18.1	20.6	15.4	17.9	20.2	65	78	88	1013.3	1014.9	1016.3	0.2	2.9	5.4	0.3	7.9	97.7	523.0	-1.10	-0.21	0.60	1.30	5.64	33.00
18/11/2010	13.4	18.5	23.4	13.5	18.3	22.8	61	80	94	1011.5	1013.8	1015.4	0.1	1.1	3.7	0.1	7.0	140.8	810.2	-1.60	-0.18	1.00	0.90	14.08	89.60
19/11/2010	14.2	16.8	19.2	14.4	16.6	19.0	67	78	95	1014.1	1020.7	1025.8	0.2	2.9	6.5	0.0	7.9	66.4	429.3	-1.10	-0.17	0.90	1.50	6.68	58.30
20/11/2010	13.2	18.6	24.2	14.0	18.2	23.6	45	65	88	1021.7	1024.1	1026.5	0.2	3.1	6.2	0.0	9.2	291.3	934.2	-1.40	-0.37	1.30	1.20	5.91	81.60
21/11/2010	9.8	18.5	26.8	10.1	18.3	25.6	33	68	95	1019.3	1022.0	1024.0	0.1	2.3	5.9	0.1	7.9	276.8	922.7	-1.60	-0.21	1.80	1.90	12.45	99.90
22/11/2010	9.6	19.0	25.4	10.2	19.0	24.7	43	65	95	1020.8	1022.6	1024.6	0.1	2.0	5.4	0.0	7.0	238.0	929.1	-1.30	-0.08	2.70	1.40	13.78	91.90
23/11/2010	11.2	20.1	26.8	11.9	20.0	26.2	36	62	93	1021.3	1023.8	1026.1	0.1	1.8	4.5	0.0	7.9	249.7	854.8	-1.60	-0.12	2.00	1.30	15.82	95.40
24/11/2010	12	21.3	29	12.2	21.2	28.2	33	62	94	1019.1	1022.3	1024.9	0.1	1.6	4.4	0.0	6.6	274.4	865.8	-1.60	-0.08	2.50	1.00	13.85	98.10
25/11/2010	12.6	22.0	31	12.9	21.9	30.2	26	60	94	1015.9	1019.0	1021.3	0.1	1.2	4.2	0.0	7.9	272.2	922.4	-1.60	-0.08	2.10	1.00	19.21	80.60
26/11/2010	11.4	21.8	30.4	11.8	21.8	29.3	28	59	94	1013.6	1016.2	1018.4	0.1	1.5	5.4	0.0	7.9	227.0	896.5	-1.60	-0.05	1.70	0.60	16.87	99.10
27/11/2010	14.6	23.6	30.8	15.2	23.5	29.9	27	54	90	1009.6	1013.1	1016.1	0.1	1.5	5.2	0.0	8.2	250.1	985.5	-1.40	-0.07	2.20	0.70	17.32	89.00
28/11/2010	15.4	20.1	25.8	16.4	19.7	24.7	46	71	89	1010.1	1011.1	1012.4	0.1	1.9	6.7	0.8	7.9	120.0	639.2	-3.60	-0.35	2.70	0.00	9.00	83.20
29/11/2010	17.4	20.1	24.4	17.6	19.8	23.7	62	81	93	1009.6	1011.6	1014.0	0.1	2.3	5.5	8.0	7.9	100.2	828.9	-1.10	-0.26	0.30	1.10	6.96	49.90
30/11/2010	17.4	20.3	23.4	17.5	20.1	22.8	64	81	92	1010.8	1012.7	1014.6	0.2	2.8	6.0	2.9	7.9	93.1	627.0	-0.90	-0.23	0.60	1.40	6.09	40.90

Date	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (km/h)	Wind Speed Ave (km/h)	Wind Speed Max (km/h)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/12/2010	18.2	19.4	21.6	18.3	19.2	21.1	81	88	92	1012.2	1014.2	1016.4	1.7	7.8	19.7	21.0	8.2	66.9	348.1	-0.80	-0.21	0.30	1.60	5.94	37.7
2/12/2010	17.4	21.6	28	17.6	21.2	27.1	53	78	93	1013.0	1015.4	1017.6	0.5	6.3	18.0	8.6	7.9	214.9	905.3	-1.70	-0.34	1.00	1.50	11.64	63.2
3/12/2010	16.8	21.0	26.4	17.1	20.7	25.8	58	85	94	1011.8	1014.3	1016.9	0.3	4.3	15.0	46.2	7.9	145.3	857.9	-1.40	-0.24	0.80	1.40	15.75	80.2
4/12/2010	18.8	21.5	27.2	18.7	21.1	26.1	56	83	93	1007.8	1011.0	1013.2	0.3	4.9	20.1	13.4	6.6	162.1	1025.4	-1.30	-0.41	0.40	1.50	9.18	53.5
5/12/2010	19	21.4	26.4	19.1	21.1	25.7	58	83	94	1008.7	1010.4	1012.0	0.3	4.7	19.3	2.0	7.9	152.1	1044.1	-1.60	-0.37	0.30	1.10	11.80	70.8
6/12/2010	19	22.4	27.8	19.1	22.0	26.9	47	73	86	1010.0	1012.0	1013.9	0.8	8.0	23.3	0.5	7.9	204.4	1060.2	-1.60	-0.38	0.40	1.40	8.66	67.0
7/12/2010	16	23.0	29.6	16.7	22.8	28.4	43	68	94	1011.3	1013.7	1015.8	0.6	8.8	23.1	0.2	7.9	293.2	929.8	-1.70	-0.26	1.10	1.60	11.39	88.5
8/12/2010	16.4	24.7	32.8	16.4	24.4	31.9	40	66	94	1010.4	1013.4	1016.7	0.6	6.1	20.3	0.1	6.6	266.3	903.9	-1.50	-0.34	1.10	1.00	21.35	106.1
9/12/2010	21.2	27.0	31.6	22.2	27.5	29.3	52	58	82	1011.2	1011.8	1013.4	0.7	17.1	32.2	0.2	7.9	589.7	950.0	-2.40	0.44	7.60	0.00	7.66	80.9
10/12/2010	19.6	23.9	28.8	21.5	27.4	29.2	49	56	77	1006.6	1009.5	1011.2	1.0	15.4	24.2	0.1	8.2	579.2	950.0	-1.10	3.54	9.00	0.00	4.31	60.3
11/12/2010	16.2	22.8	29	16.4	22.9	27.7	35	59	94	1003.2	1006.0	1008.6	0.4	7.6	20.4	0.1	7.9	252.6	976.5	-1.40	0.12	2.60	0.90	10.45	87.3
12/12/2010	13.2	22.5	30.6	13.4	22.7	29.7	28	53	92	1004.4	1005.6	1008.6	0.7	9.1	26.7	0.0	7.0	286.2	965.2	-1.30	0.20	3.10	1.50	7.90	65.6
13/12/2010	12	21.8	30.2	12.4	21.5	29.0	29	58	92	1008.6	1011.7	1014.6	0.4	7.5	21.9	0.3	6.6	300.5	900.0	-1.80	-0.30	1.90	1.00	13.23	72.9
14/12/2010	15.2	21.8	27.8	16.0	21.7	26.9	48	67	85	1010.4	1013.1	1015.8	1.1	10.8	23.7	0.2	7.9	224.1	1053.9	-1.80	-0.20	1.80	1.00	8.00	72.4
15/12/2010	17.4	24.5	33.2	17.6	24.2	32.1	26	64	94	1004.8	1008.5	1012.1	0.5	5.5	19.2	0.0	7.9	284.8	916.8	-1.70	-0.26	2.00	1.00	20.00	94.6
16/12/2010	18	22.3	28	18.1	22.2	27.4	43	71	93	1002.6	1004.4	1006.3	0.3	6.7	27.5	6.0	7.9	123.6	929.3	-1.20	-0.14	1.00	1.00	17.64	82.2
17/12/2010	17.2	21.3	26.4	17.7	21.1	25.7	34	67	94	1004.1	1005.3	1006.4	0.3	9.8	28.8	0.5	6.6	119.3	575.3	-1.20	-0.23	0.80	1.40	7.90	87.3
18/12/2010	16.2	20.3	23.6	17.1	20.1	22.5	46	57	73	1002.9	1005.6	1007.0	1.3	15.0	33.5	0.2	7.9	134.4	735.4	-1.10	-0.23	1.00	1.30	5.27	48.8
19/12/2010	14.6	19.3	23.2	14.9	19.1	22.2	48	68	86	996.3	1001.7	1006.3	0.8	12.9	28.5	8.5	7.9	131.4	837.7	-1.20	-0.25	1.20	1.50	9.51	80.7
20/12/2010	10.8	16.1	21.4	10.7	15.8	20.4	36	50	71	999.2	1004.1	1008.7	5.6	21.2	40.3	0.0	6.6	296.4	982.9	-1.60	-0.35	1.10	1.60	4.83	14.5
21/12/2010	8.2	18.9	27	10.3	19.1	25.9	28	45	82	1008.4	1010.4	1014.0	0.5	10.2	25.3	0.2	7.9	310.0	888.2	-1.50	0.20	3.10	1.30	11.59	70.6
22/12/2010	7.8	19.8	29.6	8.7	19.7	28.2	28	60	94	1014.1	1015.9	1018.0	0.7	6.7	24.7	0.3	6.6	277.3	895.9	-1.60	-0.16	2.00	1.40	11.94	62.6
23/12/2010	14.2	22.2	30.6	14.7	22.1	29.2	27	63	93	1015.9	1017.4	1021.3	0.3	5.0	25.8	0.0	6.6	211.4	926.3	-1.80	-0.15	2.20	0.60	13.44	63.4
24/12/2010	17.6	20.6	24.4	17.1	20.3	23.9	53	67	81	1020.2	1022.1	1024.8	6.0	14.8	26.2	0.2	8.2	132.3	761.0	-1.40	-0.37	0.20	1.50	4.49	14.3
25/12/2010	13.6	23.3	33.6	14.3	22.9	32.0	34	67	93	1008.6	1014.1	1020.3	0.3	5.4	16.4	0.1	7.9	279.6	848.0	-1.80	-0.41	1.30	1.20	16.89	95.1
26/12/2010	18.6	21.3	26	19.3	21.2	25.2	64	82	92	1002.5	1006.6	1010.1	0.6	5.7	19.5	11.8	8.2	78.6	264.8	-0.80	-0.09	1.20	1.40	18.68	83.5
27/12/2010	16.8	21.4	29.6	16.6	21.1	28.4	45	77	94	1001.1	1005.0	1013.7	0.7	9.7	32.3	0.5	7.9	206.5	1030.9	-1.70	-0.37	0.50	1.40	11.51	80.7
28/12/2010	15	18.2	22.4	14.9	17.8	21.4	51	65	82	1013.7	1016.7	1018.6	1.8	14.9	28.3	0.1	7.9	192.4	1076.0	-1.70	-0.42	0.40	1.60	5.31	53.8
29/12/2010	11.4	17.9	30.6	11.6	18.0	29.7	39	79	95	1012.9	1016.4	1018.8	0.4	3.2	9.7	0.0	5.8	200.1	861.5	-1.80	0.12	2.70	1.20	17.81	65.2
30/12/2010	15	24.3	34.8	15.5	24.4	33.3	31	64	94	1012.2	1014.8	1016.8	0.4	4.2	26.3	2.0	7.9	249.5	927.8	-1.70	0.01	3.30	1.80	18.17	91.5
31/12/2010	15.8	26.8	36	16.2	26.6	34.8	25	56	94	1011.6	1014.0	1016.2	0.5	4.9	15.5	0.0	7.9	335.6	864.5	-1.80	-0.17	2.10	1.70	19.18	80.4

Mangoola Coal AEMR 2010-2011
Meterological Monitoring Data
Monitor: WSN

Date	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (km/h)	Wind Speed Ave (km/h)	Wind Speed Max (km/h)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/01/2011	14.6	26.4	38	15.4	26.6	37.1	17	53	94	1008.6	1012.1	1015.2	0.4	4.1	12.3	0.1	7.9	300.6	880.8	-1.50	0.19	4.20	0.80	16.09	83.2
2/01/2011	16.8	26.3	37.6	17.4	26.1	36.5	27	60	90	1006.7	1010.8	1014.1	0.5	9.0	28.2	3.4	7.9	281.3	843.6	-1.40	-0.21	1.50	1.20	11.97	97.5
3/01/2011	19.4	21.9	26	19.3	21.6	25.3	59	76	91	1009.6	1012.1	1013.7	1.0	12.3	23.9	0.5	7.9	143.9	839.1	-1.50	-0.36	0.40	1.40	5.54	23.2
4/01/2011	17.8	20.3	24.8	17.6	19.9	24.0	56	72	91	1008.8	1011.3	1013.6	3.2	11.2	20.9	0.1	8.2	131.0	571.3	-1.30	-0.36	0.50	1.10	5.38	23.6
5/01/2011	16.6	20.4	26.8	16.7	20.1	26.0	53	72	91	1003.8	1007.1	1010.1	0.8	6.8	26.3	22.1	8.2	132.2	876.5	-1.40	-0.31	1.00	1.30	10.35	92.8
6/01/2011	17	20.5	25	17.1	20.3	24.5	52	76	93	1007.3	1009.7	1012.4	0.7	9.4	25.3	4.7	7.9	176.1	963.2	-1.40	-0.26	0.40	1.00	6.18	75.5
7/01/2011	15.8	22.0	28.4	16.1	21.7	27.0	52	76	93	1009.8	1011.6	1013.1	0.5	11.5	25.8	0.0	7.9	224.7	981.6	-1.70	-0.30	1.30	1.80	7.66	59.6
8/01/2011	19.8	24.3	30	19.9	23.9	29.1	43	67	88	1009.1	1011.5	1013.0	0.6	12.5	26.9	0.0	9.0	274.0	1025.0	-1.50	-0.46	0.30	1.50	5.87	34.3
9/01/2011	21.8	25.5	31	21.9	25.1	30.3	40	67	85	1010.0	1011.8	1014.2	1.7	16.0	35.3	0.0	7.9	254.6	853.5	-1.70	-0.39	0.30	1.40	4.92	33.7
10/01/2011	21	23.5	27.6	21.2	23.2	27.0	54	77	89	1010.8	1012.4	1014.0	7.2	17.5	31.3	0.1	7.9	161.5	817.4	-1.50	-0.36	0.70	1.60	4.46	12.3
11/01/2011	20.6	22.0	26	20.6	21.9	25.4	75	88	94	1008.1	1010.7	1012.7	0.6	10.7	23.9	22.4	7.9	76.1	517.4	-0.80	-0.20	0.30	1.30	7.42	54.8
12/01/2011	20.2	25.2	32	20.7	25.0	31.0	49	74	93	1007.6	1010.0	1011.8	0.5	7.5	20.3	0.1	7.9	214.7	981.9	-1.60	-0.25	0.70	1.70	11.17	72.9
13/01/2011	20.6	24.9	28.8	21.0	24.6	28.1	58	71	85	1010.1	1011.7	1013.6	1.0	7.5	17.1	0.0	7.9	156.9	844.9	-1.50	-0.27	0.80	1.60	10.85	82.8
14/01/2011	17	24.5	31.6	17.6	24.3	30.5	37	65	93	1007.1	1010.1	1012.6	0.4	4.6	12.7	0.0	7.0	244.4	1022.4	-1.60	-0.19	1.70	1.30	19.02	98.5
15/01/2011	19.2	24.1	28.8	19.4	23.9	28.0	55	76	93	1007.2	1008.5	1009.9	0.2	4.0	16.8	0.1	7.9	125.9	666.5	-1.20	-0.17	1.10	0.70	13.35	85.5
16/01/2011	20.8	25.8	30.4	22.0	25.5	29.5	42	64	86	1005.2	1007.7	1009.9	0.8	9.8	19.3	0.0	6.6	205.1	895.1	-1.70	-0.31	1.20	0.90	6.14	75.9
17/01/2011	15.6	26.3	36.8	16.1	26.2	36.1	27	60	94	999.0	1003.0	1006.0	0.4	7.9	25.0	0.1	7.9	275.0	842.1	-1.40	-0.16	1.90	0.90	11.55	76.0
18/01/2011	20.8	23.6	29.6	20.9	23.3	28.3	43	68	79	1004.6	1006.0	1008.0	3.2	11.6	23.3	0.1	7.9	178.6	981.9	-1.50	-0.36	0.40	1.70	5.47	39.2
19/01/2011	20.6	24.2	29.4	20.6	23.9	28.7	50	69	83	1006.1	1008.0	1010.2	1.8	10.3	22.6	0.0	7.0	161.5	925.3	-1.50	-0.31	0.40	1.50	5.73	56.5
20/01/2011	21	24.6	30	21.0	24.2	29.1	43	67	85	1009.6	1011.2	1013.5	4.0	14.9	29.3	0.0	7.0	251.5	965.2	-1.40	-0.41	0.20	1.10	5.04	15.6
21/01/2011	17.8	24.8	32	18.8	24.5	31.1	27	59	89	1010.5	1013.0	1015.3	0.2	6.4	19.8	0.0	8.2	282.7	858.5	-1.60	-0.38	1.20	1.00	13.09	76.3
22/01/2011	15	24.1	31.2	15.9	23.9	30.5	24	57	93	1012.0	1014.0	1016.1	0.3	10.5	23.5	0.1	7.9	281.8	870.4	-1.70	-0.24	1.70	1.30	8.15	71.3
23/01/2011	16.2	24.4	33.2	16.6	24.2	32.0	20	55	89	1006.8	1010.5	1014.2	0.7	5.2	16.2	0.0	7.9	257.4	842.1	-1.80	-0.25	1.90	1.60	15.16	92.9
24/01/2011	16.6	26.0	34.2	17.4	25.9	32.6	34	56	90	1002.6	1005.5	1007.7	0.8	8.3	24.2	0.1	7.9	202.9	881.7	-1.40	-0.04	1.90	1.60	15.95	85.2
25/01/2011	20.2	29.3	39.4	21.2	29.1	38.2	22	53	81	1004.6	1007.0	1009.7	0.4	7.2	21.0	0.0	7.0	274.5	821.1	-1.50	-0.20	1.30	1.00	11.58	97.0
26/01/2011	19.8	30.7	42.4	20.5	30.8	41.3	18	55	93	1008.3	1010.5	1012.7	0.5	4.0	14.6	0.0	7.0	236.4	916.8	-1.60	0.06	2.40	1.10	19.29	83.4
27/01/2011	22.2	31.0	43.2	22.7	30.7	42.3	14	55	81	1007.5	1011.4	1014.8	0.4	9.4	25.5	0.0	7.9	271.4	809.1	-4.70	-0.33	1.50	1.20	13.32	96.6
28/01/2011	20.4	24.9	29.6	20.1	24.5	27.9	42	62	80	1014.5	1016.9	1020.3	7.5	18.2	29.1	0.1	8.2	217.3	898.2	-2.20	-0.47	0.30	1.30	4.20	13.1
29/01/2011	17.8	23.1	29.2	17.9	22.5	28.1	33	56	79	1017.4	1019.8	1021.4	2.4	14.1	24.8	0.3	7.9	271.2	860.5	-1.90	-0.54	0.50	1.70	5.35	15.5
30/01/2011	11.4	23.3	36	11.9	23.3	34.6	13	52	93	1014.6	1018.4	1021.4	0.4	4.3	13.1	0.0	7.9	286.5	858.5	-1.80	-0.05	1.90	0.70	20.62	84.2
31/01/2011	13	27.2	40	13.9	27.2	38.8	18	41	77	1009.9	1013.9	1017.2	0.4	5.1	15.7	0.0	7.9	277.1	830.3	-1.70	0.03	4.00	1.30	21.44	104.1

Date	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (m/s)	Wind Speed Ave (m/s)	Wind Speed Max (m/s)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/02/2011	17	29.7	39.2	18.1	29.6	38.0	22	44	80	1008.9	1011.5	1013.9	0.3	11.0	29.1	0.1	5.8	276.5	840.6	-1.90	-0.14	2.30	0.90	11.56	98.40
2/02/2011	21.2	30.5	40	22.1	30.3	38.7	26	46	69	1010.5	1013.0	1015.6	0.5	7.8	27.7	0.1	7.0	264.6	941.4	-2.20	-0.20	2.20	1.30	21.06	85.00
3/02/2011	23.8	31.3	38.8	24.5	31.0	37.6	30	51	73	1010.3	1012.6	1014.8	0.4	12.4	29.1	0.8	7.9	207.5	844.9	-1.80	-0.29	2.40	1.50	9.72	54.30
4/02/2011	24.2	31.2	40.2	24.2	31.0	38.7	25	52	80	1009.2	1012.9	1016.0	0.6	7.3	19.0	0.1	7.9	228.4	892.3	-2.00	-0.21	2.70	1.30	13.70	77.50
5/02/2011	25	33.0	39.2	25.7	32.7	38.0	24	39	70	1007.9	1010.9	1013.5	0.3	15.4	34.1	0.1	6.6	262.0	879.3	-1.80	-0.37	1.60	1.20	11.38	72.40
6/02/2011	18	28.4	36	18.1	28.2	34.5	36	58	88	1010.8	1015.2	1023.3	1.6	15.3	32.2	2.4	7.0	157.1	966.5	-2.20	-0.23	3.30	1.60	9.12	68.40
7/02/2011	16	19.4	23.2	16.1	19.0	22.4	57	72	90	1017.5	1020.9	1023.7	6.4	14.6	21.3	0.2	7.5	113.4	500.7	-1.50	-0.40	0.10	1.00	4.44	17.60
8/02/2011	15.8	21.9	27.8	16.1	21.4	26.7	39	60	83	1015.6	1018.0	1020.4	0.3	12.9	26.8	0.1	7.9	212.9	953.0	-2.00	-0.48	0.50	1.20	6.33	81.10
9/02/2011	12.2	21.2	29.4	12.9	21.0	28.1	33	63	93	1020.1	1021.6	1023.9	0.3	11.7	27.8	0.1	7.9	238.3	957.2	-2.20	-0.29	1.70	1.30	9.15	79.30
10/02/2011	13.8	23.1	31.6	14.0	22.7	30.6	27	62	93	1017.1	1020.6	1023.6	0.4	6.7	16.9	0.0	7.9	246.5	889.6	-2.10	-0.44	1.00	1.20	13.67	90.50
11/02/2011	15	26.0	36.8	15.2	25.9	35.6	25	55	93	1010.4	1014.9	1018.7	0.3	7.2	21.8	0.0	7.9	249.2	823.4	-1.80	-0.14	3.70	0.70	14.76	103.10
12/02/2011	18.6	24.6	31.6	19.8	24.7	30.6	39	60	91	1011.4	1014.0	1018.5	0.6	8.5	28.7	5.8	8.2	108.1	645.9	-3.60	0.14	2.80	0.90	7.89	68.50
13/02/2011	19.4	21.3	25.2	19.4	21.1	24.6	68	84	92	1013.8	1017.0	1021.0	2.2	9.1	24.1	2.8	7.9	80.0	615.5	-1.10	-0.29	0.20	1.50	5.65	29.30
14/02/2011	17.8	19.2	21.6	17.8	18.9	20.6	74	84	91	1019.0	1021.6	1023.1	1.5	10.6	21.5	0.1	7.9	54.3	361.3	-1.00	-0.23	0.30	1.00	4.90	20.10
15/02/2011	18.4	20.4	24	18.4	20.2	23.2	66	75	83	1019.9	1021.3	1023.0	0.9	9.3	24.8	0.7	7.9	78.5	394.9	-1.20	-0.26	0.30	1.20	5.04	20.00
16/02/2011	18.2	23.3	30.4	18.4	22.8	28.8	45	69	84	1013.6	1017.0	1020.4	1.3	8.9	19.5	0.1	9.0	192.9	882.4	-1.80	-0.44	0.30	1.30	7.53	71.80
17/02/2011	19.4	24.8	33.2	19.6	24.5	31.4	42	73	93	1010.3	1012.8	1014.7	0.3	5.2	23.1	0.3	9.2	178.2	921.4	-2.00	-0.34	0.90	1.00	15.39	86.50
18/02/2011	17.8	23.9	31.2	18.3	23.6	30.3	50	78	94	1011.3	1013.2	1015.3	0.4	8.3	22.2	0.0	7.9	130.7	777.8	-1.90	-0.29	1.20	1.50	10.54	91.90
19/02/2011	22.8	29.7	38.4	22.8	29.2	37.1	29	56	86	1006.8	1010.2	1014.0	0.8	8.7	26.1	0.1	7.9	234.1	823.4	-1.70	-0.44	2.50	1.10	11.39	63.00
20/02/2011	24.6	31.5	38	25.1	31.2	36.8	33	47	78	1004.8	1007.5	1010.3	0.9	12.7	32.0	0.3	7.9	215.0	917.5	-1.80	-0.31	2.80	1.00	7.83	62.80
21/02/2011	19	24.1	30.4	19.1	23.6	29.2	42	67	93	1009.0	1011.4	1017.3	0.3	11.4	30.4	0.1	7.9	206.7	864.8	-2.20	-0.45	1.00	1.70	9.59	87.90
22/02/2011	17.2	20.0	24.4	17.2	19.6	23.3	41	60	76	1017.3	1020.2	1023.2	5.7	16.9	29.7	0.4	7.9	146.7	701.8	-1.50	-0.47	0.20	1.20	4.30	12.50
23/02/2011	13.4	20.0	26	14.1	19.7	24.9	37	61	87	1018.9	1021.0	1022.9	0.5	10.6	24.5	0.1	7.0	187.5	860.7	-1.80	-0.32	1.70	1.10	8.02	84.30
24/02/2011	12.4	20.7	30.4	12.8	20.6	29.0	26	60	91	1013.4	1017.4	1020.6	0.5	5.7	15.6	0.0	7.9	251.2	791.6	-1.80	-0.07	2.80	1.00	17.67	85.80
25/02/2011	10.4	21.8	33.2	11.0	21.7	32.5	20	59	94	1009.9	1013.1	1015.3	0.3	5.6	21.4	0.1	7.9	205.3	909.9	-1.90	-0.09	1.80	1.10	14.11	86.40
26/02/2011	17.8	24.3	34	18.6	24.3	32.6	25	53	81	1007.8	1010.7	1013.3	0.5	5.6	20.0	0.2	6.6	178.0	784.4	-1.80	0.00	3.50	0.60	24.00	90.80
27/02/2011	13.6	22.9	33.6	14.3	23.0	32.0	32	62	88	1008.2	1009.3	1011.2	0.5	4.4	17.8	3.5	7.9	110.3	812.4	-1.60	0.08	1.30	1.20	14.65	90.80
28/02/2011	20.2	26.1	37.6	20.3	25.8	36.7	25	68	92	1004.3	1008.4	1011.3	1.3	7.5	26.4	3.2	7.9	195.7	842.0	-1.60	-0.33	1.00	1.30	11.99	78.70

Mangoola Coal AEMR 2010-2011
Meterological Monitoring Data
Monitor: WSN

Date	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (km/h)	Wind Speed Ave (km/h)	Wind Speed Max (km/h)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/03/2011	20.6	26.8	36	21.2	26.7	34.9	30	62	90	1004.2	1006.4	1013.3	0.7	12.1	35.7	5.6	7.9	173.5	863.5	-1.70	-0.09	2.40	1.20	12.50	67.1
2/03/2011	18.8	20.3	22	18.8	20.1	21.7	65	74	89	1011.8	1014.1	1016.4	1.8	12.3	20.6	0.7	8.2	60.7	356.0	-1.20	-0.27	0.30	1.40	5.35	66.5
3/03/2011	17.8	22.6	31.2	18.2	22.6	30.0	21	64	93	1007.5	1009.7	1012.6	0.4	7.2	24.2	1.6	7.9	153.5	663.0	-1.40	0.00	3.10	1.10	11.28	89.0
4/03/2011	17.8	24.5	32.8	19.6	24.1	32.0	20	57	79	1007.9	1010.8	1014.3	0.5	6.5	20.5	0.0	7.5	204.6	812.6	-1.80	-0.37	2.50	2.10	10.99	70.8
5/03/2011	17	20.4	24.8	17.1	20.0	22.8	45	61	75	1014.4	1020.2	1025.9	7.0	18.1	31.6	0.0	6.6	133.0	770.0	-1.90	-0.35	0.40	1.40	3.94	10.9
6/03/2011	14.6	19.4	25.2	14.7	19.0	24.3	39	56	70	1022.4	1024.6	1025.9	5.0	14.1	28.0	0.0	7.9	184.2	832.9	-2.30	-0.37	0.50	1.30	3.99	10.3
7/03/2011	12.6	20.1	26.6	13.6	19.8	25.5	38	63	87	1018.8	1022.1	1024.8	0.3	8.2	21.2	0.2	7.9	154.2	825.8	-1.70	-0.25	1.40	1.80	10.46	53.3
8/03/2011	9.4	20.2	31.2	10.2	20.3	30.2	27	62	94	1013.5	1017.3	1020.7	0.4	4.3	15.4	0.0	6.6	233.7	826.2	-1.70	0.10	2.50	1.20	19.23	94.1
9/03/2011	14.6	22.0	28.8	15.0	22.0	28.0	40	61	88	1013.4	1015.0	1016.8	0.2	4.4	14.2	0.2	7.9	117.4	466.8	-1.40	-0.01	2.10	0.90	16.12	76.8
10/03/2011	15.4	20.8	28	15.9	20.8	27.3	43	71	91	1012.6	1013.8	1015.3	0.4	4.3	20.5	0.8	6.6	102.9	511.2	-1.00	0.01	1.10	0.50	14.13	92.2
11/03/2011	16.4	21.2	27.2	16.8	20.9	26.6	55	81	93	1013.0	1015.7	1018.3	0.4	4.7	20.4	3.4	7.9	122.0	769.4	-1.50	-0.31	0.70	1.20	11.99	92.2
12/03/2011	17.2	23.1	31	17.6	22.8	30.2	39	73	94	1017.1	1019.1	1021.4	0.4	4.7	19.6	0.0	7.9	167.8	800.2	-1.70	-0.28	1.40	1.10	14.36	87.6
13/03/2011	15.4	22.9	34	15.8	22.7	32.4	30	73	94	1016.3	1019.5	1022.1	0.3	4.8	20.7	6.4	7.0	190.4	760.5	-1.70	-0.20	1.30	1.10	16.90	73.3
14/03/2011	16.2	23.0	34	16.6	22.8	32.3	35	73	94	1016.5	1019.3	1022.4	0.3	9.4	30.2	0.0	7.9	199.0	782.9	-1.70	-0.24	1.10	1.40	13.68	93.4
15/03/2011	19	22.6	28.4	19.0	22.1	27.2	50	67	80	1015.6	1019.2	1022.1	1.3	7.5	17.1	0.1	7.9	164.1	827.6	-1.90	-0.49	0.20	1.80	8.23	71.4
16/03/2011	15	22.7	32.4	15.3	22.4	31.5	37	72	94	1013.5	1016.7	1018.9	0.3	6.9	32.9	0.0	7.9	184.1	762.2	-1.70	-0.26	1.10	1.20	12.09	90.0
17/03/2011	20.8	22.5	25.2	20.8	22.2	24.4	68	80	87	1014.8	1016.9	1019.0	1.3	6.7	15.8	0.3	7.9	89.4	847.7	-1.60	-0.31	0.70	1.70	7.68	67.9
18/03/2011	19.6	21.5	24.2	19.6	21.3	23.7	64	80	90	1012.3	1014.0	1015.6	0.6	6.9	16.5	0.2	7.9	53.0	359.8	-0.90	-0.24	0.30	1.20	6.36	43.2
19/03/2011	16.2	20.6	26	16.5	20.4	25.3	58	78	92	1009.0	1012.3	1014.5	0.3	5.7	16.6	0.1	7.9	82.6	590.5	-1.30	-0.19	0.90	1.20	12.84	94.2
20/03/2011	19.8	23.3	29.4	19.7	22.9	28.4	42	70	87	1005.8	1009.0	1011.3	2.1	10.4	26.7	0.0	9.2	155.1	770.3	-1.50	-0.43	0.30	1.50	5.32	15.0
21/03/2011	20.2	23.7	29.6	20.3	23.2	28.4	50	76	93	1000.9	1004.5	1007.9	0.7	6.6	15.8	9.4	7.5	129.9	782.7	-1.80	-0.43	0.50	1.50	10.08	71.7
22/03/2011	20.2	25.1	32	20.2	25.0	30.9	31	64	94	999.8	1001.8	1003.9	0.5	9.0	23.3	0.0	8.2	182.1	794.4	-1.30	-0.14	2.70	1.60	9.86	80.7
23/03/2011	20.6	24.6	30.4	20.7	24.4	29.3	33	52	72	1002.1	1004.3	1007.0	5.5	14.6	28.3	0.0	7.9	192.1	760.9	-1.60	-0.26	1.80	1.10	4.41	12.3
24/03/2011	11.2	20.1	25.6	12.3	20.2	24.6	35	50	82	1006.2	1007.5	1009.5	1.1	13.3	34.9	0.0	4.7	178.8	771.2	-1.70	-0.01	2.90	1.20	7.22	50.1
25/03/2011	17	20.3	24.8	17.1	19.9	23.8	38	54	70	1007.7	1011.0	1015.7	1.6	18.4	35.5	0.1	7.9	188.9	826.2	-1.70	-0.41	0.30	1.00	4.63	17.1
26/03/2011	15.6	19.1	23.2	15.7	18.7	22.2	49	61	76	1015.8	1018.7	1022.5	0.4	9.2	22.3	0.2	7.9	126.3	653.0	-1.40	-0.37	0.50	0.90	11.47	84.9
27/03/2011	11.6	17.9	23	12.1	17.8	22.0	49	69	92	1021.8	1023.4	1025.5	0.9	9.3	25.1	0.2	7.9	165.8	831.7	-1.80	-0.18	1.80	0.50	9.21	77.4
28/03/2011	11.8	18.7	26	12.8	18.7	25.2	45	72	92	1022.6	1024.7	1026.5	0.6	9.2	28.5	0.1	6.6	142.8	801.8	-1.70	-0.06	1.90	1.50	9.18	83.8
29/03/2011	10.6	19.7	28.4	11.2	19.7	27.2	38	69	95	1019.9	1023.0	1025.8	0.3	5.6	16.1	0.0	7.9	177.1	704.7	-1.80	0.02	1.60	1.00	13.82	91.6
30/03/2011	13.2	21.2	31.2	13.9	21.2	30.4	25	66	93	1014.9	1018.9	1021.5	0.4	5.2	20.8	0.3	7.9	181.6	693.4	-1.60	0.00	1.60	1.70	17.39	80.5
31/03/2011	11.4	18.0	24.6	12.3	18.0	23.6	58	78	94	1018.4	1021.3	1024.5	0.6	9.7	24.7	0.1	9.0	114.6	546.4	-1.40	0.00	1.90	1.30	8.83	59.6

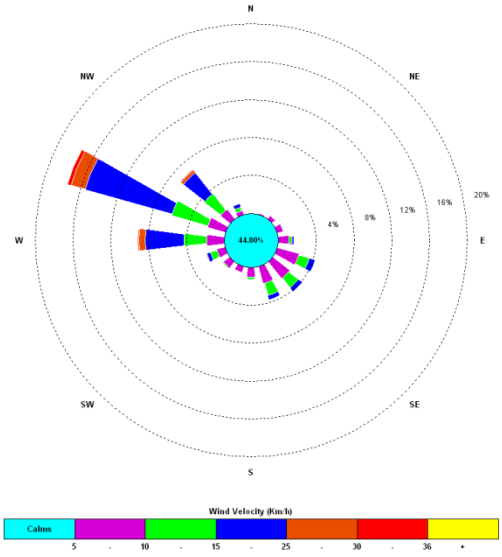
Date	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (km/h)	Wind Speed Ave (km/h)	Wind Speed Max (km/h)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/04/2011	11.2	19.6	27.4	11.8	19.5	26.2	41	67	94	1018.0	1021.7	1024.7	0.5	6.0	16.6	0.2	7.0	174.0	751.2	-1.80	-0.06	2.20	1.40	12.00	74.1
2/04/2011	10.8	19.0	28.6	11.7	18.9	27.5	38	68	94	1017.5	1019.6	1023.8	0.4	9.5	29.1	0.0	7.9	178.2	724.0	-1.40	-0.17	1.00	1.30	12.59	73.2
3/04/2011	10.8	18.9	26.4	11.5	18.9	25.7	32	61	88	1020.1	1022.6	1024.4	0.6	5.5	14.9	0.0	7.9	192.9	696.2	-1.70	0.02	2.30	0.90	15.35	85.3
4/04/2011	8.2	17.2	25.6	9.0	17.2	24.3	39	68	94	1023.3	1025.3	1028.0	0.3	7.8	23.8	0.1	7.9	163.3	791.6	-1.60	0.03	1.80	0.70	9.75	73.0
5/04/2011	15.6	18.3	22.2	15.4	17.9	21.7	47	68	90	1026.7	1028.0	1029.4	2.4	11.3	24.6	0.0	6.6	106.2	517.3	-1.70	-0.37	0.20	1.50	5.79	66.2
6/04/2011	13.2	17.6	22.8	13.4	17.4	22.3	51	72	90	1025.9	1027.9	1029.4	0.6	7.9	21.3	0.1	6.6	104.3	612.7	-1.50	-0.17	1.30	1.20	10.56	79.3
7/04/2011	11	16.5	21.6	12.4	16.6	20.9	56	79	92	1027.4	1028.7	1030.1	0.3	7.8	23.1	0.1	7.9	75.8	355.6	-1.00	0.03	1.60	1.00	10.67	75.4
8/04/2011	9.8	16.9	23.2	10.6	16.9	22.1	54	75	93	1025.7	1028.0	1030.2	0.6	7.7	19.8	0.1	6.7	127.8	726.5	-1.50	-0.05	1.60	1.50	10.66	81.8
9/04/2011	9.2	17.4	27.2	9.8	17.5	25.9	30	65	94	1017.8	1022.4	1026.6	0.4	4.5	13.2	0.1	6.6	178.5	635.5	-1.70	0.07	2.20	1.40	19.49	96.8
10/04/2011	5.4	16.3	29	6.3	16.2	27.6	32	74	93	1008.0	1012.9	1017.8	0.3	8.2	35.4	24.0	6.6	131.1	673.8	-1.80	-0.10	2.80	1.10	15.95	102.1
11/04/2011	9	15.4	20.4	10.6	15.5	19.5	36	61	92	1009.1	1011.2	1013.5	0.8	7.6	20.9	0.1	5.3	123.3	648.5	-1.30	0.11	2.60	0.90	9.80	75.0
12/04/2011	4.4	13.1	21.2	4.7	13.4	20.4	35	61	94	1012.5	1014.4	1016.7	0.3	9.0	29.1	0.0	6.6	143.0	785.7	-1.20	0.31	2.80	1.60	9.88	60.7
13/04/2011	4.2	15.1	24.4	5.0	15.5	23.3	29	55	93	1012.3	1015.0	1017.4	0.5	8.5	26.9	0.1	6.6	179.6	620.9	-1.40	0.32	2.40	1.10	9.95	70.2
14/04/2011	6.4	14.4	24.8	7.6	15.1	23.5	30	58	87	1010.6	1013.4	1015.7	0.6	7.4	27.7	0.0	6.6	169.2	612.0	-1.30	0.58	3.70	0.90	13.93	93.9
15/04/2011	5.2	15.0	23.2	5.9	15.0	22.0	35	63	94	1013.3	1015.5	1017.4	0.2	5.4	16.2	0.0	7.0	162.9	622.4	-1.40	0.00	1.20	0.90	11.65	93.1
16/04/2011	14.2	15.3	17.4	14.4	15.3	17.3	74	87	92	1015.8	1018.0	1020.9	0.4	5.5	15.8	5.1	6.6	35.6	200.0	-0.70	0.01	1.20	1.50	10.54	82.8
17/04/2011	9.8	16.8	22.4	10.5	16.6	21.3	45	69	92	1020.7	1022.2	1024.0	0.8	9.8	24.1	0.1	7.9	143.0	640.5	-1.40	-0.19	1.90	0.00	7.48	82.6
18/04/2011	8	15.0	23.6	8.5	15.0	22.5	43	76	95	1017.8	1020.8	1023.7	0.3	4.1	12.2	0.0	7.9	170.3	588.2	-1.60	0.04	2.80	1.10	16.70	92.4
19/04/2011	7.8	15.3	26.4	8.1	15.5	25.6	33	75	95	1017.4	1019.5	1021.4	0.5	3.5	13.1	0.0	7.9	147.9	619.7	-1.40	0.23	1.70	2.00	15.15	85.2
20/04/2011	9.8	16.1	23.2	10.2	16.1	22.7	46	78	94	1015.8	1018.1	1020.3	0.4	3.3	11.9	0.0	9.2	93.3	618.7	-1.20	0.00	1.30	1.30	15.05	66.5
21/04/2011	8.2	17.9	27.2	9.1	18.2	26.4	26	61	91	1011.5	1014.0	1017.1	0.5	7.5	24.8	0.3	5.8	166.3	613.7	-1.40	0.28	2.80	1.00	12.58	91.9
22/04/2011	7	16.1	26.8	7.1	16.4	25.8	30	60	94	1010.3	1013.2	1016.7	0.3	7.2	30.5	0.0	8.2	167.8	576.3	-1.40	0.29	3.70	1.00	12.91	89.3
23/04/2011	3.8	14.6	23.2	4.7	14.6	22.2	42	68	95	1016.7	1019.3	1021.9	0.4	6.1	18.6	0.0	6.6	165.3	576.3	-1.50	-0.04	2.60	1.70	12.86	69.4
24/04/2011	14.2	18.6	24	15.5	18.4	23.0	50	72	92	1020.6	1022.0	1023.5	0.4	6.3	15.8	0.0	7.0	146.8	589.5	-1.40	-0.22	1.60	1.40	10.78	77.4
25/04/2011	11.8	17.3	23.2	12.6	17.1	21.9	54	79	94	1022.6	1024.7	1027.1	0.2	7.8	21.9	0.0	5.3	116.3	686.2	-1.30	-0.18	1.60	1.40	9.58	89.2
26/04/2011	12.4	16.8	20.4	13.5	16.7	19.9	57	77	92	1026.2	1027.5	1028.9	0.5	10.1	25.6	0.2	5.3	70.2	515.6	-1.10	-0.17	1.10	1.60	5.73	39.7
27/04/2011	9.6	15.0	20.8	10.9	15.2	20.1	49	75	92	1025.7	1027.4	1029.0	0.6	10.4	27.2	0.0	7.9	117.0	667.5	-1.30	0.13	2.10	1.00	8.12	65.6
28/04/2011	12.8	15.5	20.4	13.1	15.4	19.7	61	84	94	1022.6	1024.7	1026.6	0.4	5.1	16.2	2.1	5.8	83.6	603.8	-1.20	-0.14	1.00	1.50	11.68	100.8
29/04/2011	10.4	15.6	21.2	10.9	15.5	20.5	59	87	94	1021.4	1023.0	1024.9	0.3	3.9	16.7	0.4	7.9	83.9	564.8	-0.90	-0.06	1.70	1.10	15.51	96.1
30/04/2011	11.2	17.2	22.6	11.9	17.1	21.9	57	81	94	1018.0	1020.2	1022.3	0.4	5.1	19.5	0.2	7.9	114.2	677.8	-1.40	-0.11	0.90	1.30	10.24	76.9

Mangoola Coal AEMR 2010-2011
Meterological Monitoring Data
Monitor: WSN

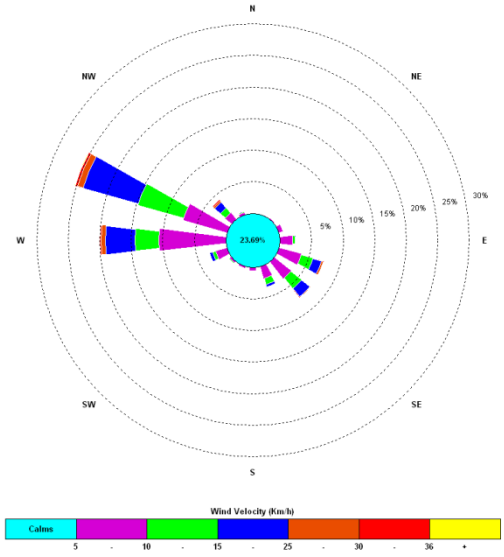
Date	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (km/h)	Wind Speed Ave (km/h)	Wind Speed Max (km/h)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/05/2011	8.6	14.3	23	9.0	14.4	22.2	42	78	95	1014.6	1017.0	1019.7	0.6	4.3	15.2	0.0	7.0	133.5	632.9	-1.40	0.17	2.20	1.00	15.28	88.3
2/05/2011	6.2	12.2	18.8	6.6	12.2	18.1	63	85	95	1014.5	1015.4	1017.4	0.2	2.6	7.3	0.0	7.9	71.9	292.6	-1.00	0.00	0.90	0.80	15.14	92.1
3/05/2011	9.8	14.2	21.2	10.1	14.1	20.2	52	82	94	1012.6	1014.3	1015.9	0.3	4.1	20.1	0.0	7.0	93.6	515.8	-1.00	-0.10	1.00	1.50	14.17	99.6
4/05/2011	7.2	13.3	22	8.3	13.4	21.4	44	79	95	1014.8	1016.4	1018.4	0.5	4.1	12.6	0.0	7.9	139.3	538.2	-1.30	0.01	2.00	1.20	15.59	87.1
5/05/2011	3.6	11.0	20.6	4.1	11.2	19.8	39	74	96	1018.1	1020.4	1023.3	0.3	5.6	20.9	0.0	7.9	141.1	570.7	-1.60	0.16	2.40	1.10	12.96	95.2
6/05/2011	0.6	8.9	19.4	0.9	9.2	18.6	40	75	96	1019.0	1021.6	1024.3	0.2	3.4	11.4	0.0	7.9	133.5	552.5	-1.20	0.28	1.60	0.80	17.54	96.7
7/05/2011	0	9.3	21.6	0.3	9.6	20.7	35	74	96	1014.6	1017.4	1020.1	0.2	2.7	9.2	0.0	7.9	143.2	518.4	-1.40	0.21	2.20	0.80	17.68	89.9
8/05/2011	0	10.8	22.4	0.8	11.2	21.8	28	64	96	1010.7	1013.1	1015.0	0.4	4.9	18.7	0.0	7.0	132.9	573.7	-1.00	0.47	2.40	1.90	13.57	67.2
9/05/2011	0.6	10.5	17.4	1.5	10.7	16.6	48	68	95	1012.2	1013.6	1014.9	0.4	7.0	18.0	0.0	7.9	112.0	557.7	-1.30	0.21	3.00	1.20	12.34	85.4
10/05/2011	1	9.9	19.2	2.1	10.3	18.0	37	69	93	1012.3	1014.1	1015.9	0.5	5.0	21.0	0.0	6.6	134.6	606.4	-1.70	0.37	2.10	1.50	16.25	80.3
11/05/2011	-0.2	9.7	16.2	1.5	10.2	15.3	41	57	94	1009.4	1011.9	1013.9	0.6	15.7	30.7	0.1	6.6	109.6	540.6	-1.10	0.53	4.30	1.30	6.91	37.7
12/05/2011	7	11.0	14.8	7.4	10.8	14.1	38	59	84	1010.2	1012.6	1015.1	3.7	15.8	27.8	1.6	6.6	143.6	573.7	-1.20	-0.21	0.50	1.50	4.60	12.1
13/05/2011	10	14.1	19.2	10.4	13.9	18.3	47	62	75	1010.9	1013.3	1015.1	10.0	18.0	31.8	0.2	6.6	92.8	547.5	-1.10	-0.15	0.50	1.40	4.24	12.7
14/05/2011	-0.6	11.8	18	0.7	12.0	17.0	25	49	81	1013.7	1018.3	1024.9	1.0	13.1	29.5	0.0	7.9	143.6	518.4	-1.30	0.21	3.30	1.20	7.50	72.7
15/05/2011	-4.2	5.2	18.4	-2.9	6.0	17.5	23	64	95	1025.0	1028.0	1030.0	0.4	3.3	13.1	0.0	8.2	142.8	510.5	-1.30	0.70	3.20	0.80	16.89	68.9
16/05/2011	-4.8	7.2	22.4	-4.1	8.4	21.7	16	54	95	1025.7	1028.4	1030.7	0.4	4.7	16.0	0.0	7.9	142.3	508.1	-1.30	1.15	6.70	0.70	11.86	76.6
17/05/2011	-4	7.1	19.6	-3.3	7.8	18.8	33	65	94	1026.1	1028.3	1030.0	0.3	4.1	15.1	0.0	8.2	136.9	496.1	-1.20	0.70	3.40	1.40	16.18	89.5
18/05/2011	1.2	10.4	20.8	1.8	10.8	20.0	43	76	95	1027.9	1029.9	1032.2	0.2	4.2	13.8	0.3	6.6	130.2	484.2	-1.20	0.42	2.70	1.30	15.10	84.8
19/05/2011	4.4	12.2	21.4	5.3	12.4	20.6	43	79	95	1027.0	1028.9	1031.1	0.3	3.7	9.5	0.0	7.9	109.7	527.3	-1.50	0.18	2.70	1.20	17.99	86.1
20/05/2011	2	9.8	22.8	2.5	10.1	22.1	35	77	96	1023.7	1026.2	1028.9	0.3	2.9	10.2	0.0	7.9	97.5	458.2	-1.10	0.32	2.50	0.70	18.52	97.7
21/05/2011	0.6	10.0	24.4	1.4	10.5	23.5	30	73	96	1021.5	1023.7	1026.2	0.4	2.9	10.6	0.0	7.0	97.4	539.3	-1.10	0.46	2.30	0.70	16.71	110.6
22/05/2011	1.8	11.4	25.2	2.4	11.9	24.2	33	71	96	1011.4	1017.7	1022.4	0.3	3.3	12.6	0.2	6.6	109.9	521.4	-1.10	0.42	2.30	1.00	19.78	82.0
23/05/2011	10.2	16.4	22	10.6	16.3	21.0	42	67	93	1004.9	1007.6	1011.3	0.7	14.0	31.4	18.1	7.9	110.7	538.2	-1.20	-0.11	1.00	1.30	12.43	78.8
24/05/2011	10.4	13.5	16.4	10.5	13.3	15.6	60	72	91	1004.6	1006.6	1009.1	0.6	8.5	19.4	0.1	7.9	74.8	517.1	-1.00	-0.20	0.80	1.30	8.25	61.3
25/05/2011	4	11.5	16.8	4.7	11.7	16.3	47	69	92	1008.4	1011.2	1014.5	1.0	7.0	22.4	0.1	7.9	63.6	339.3	-1.10	0.23	3.00	1.30	13.12	79.3
26/05/2011	2.2	9.0	17.6	2.7	9.4	17.0	50	78	95	1014.2	1016.3	1018.0	0.4	3.9	12.4	0.0	8.2	97.4	487.0	-1.00	0.35	2.90	0.80	17.34	95.5
27/05/2011	-0.2	7.3	17.2	1.0	7.9	16.4	42	75	96	1017.5	1019.0	1021.5	0.5	5.8	18.0	0.0	7.0	123.8	465.0	-1.10	0.59	3.70	2.00	15.57	85.9
28/05/2011	-2.2	8.5	17.8	-1.4	8.7	17.0	48	77	96	1021.0	1022.8	1024.4	0.3	4.0	15.1	0.0	6.6	108.4	509.6	-1.10	0.19	2.00	1.00	12.85	88.5
29/05/2011	6.4	12.3	17	7.1	12.4	16.3	65	83	95	1021.2	1022.9	1025.0	0.4	3.8	10.2	0.0	6.6	66.6	439.5	-1.00	0.08	2.30	0.60	13.00	85.6
30/05/2011	6.8	10.9	13.2	7.1	10.8	13.1	89	93	95	1015.3	1018.5	1021.9	0.3	4.0	22.5	22.4	6.6	24.6	77.3	-0.60	-0.09	0.50	0.90	11.63	77.8
31/05/2011	12.6	14.3	16.8	12.7	14.1	16.5	69	87	93	1013.9	1016.7	1020.4	1.6	9.5	21.9	28.1	6.6	47.7	220.2	-0.80	-0.15	0.50	1.00	5.03	39.7

Date	Temp 2m Min	Temp 2m Ave	Temp 2m Max	10m Temp Min	10m Temp Ave	10m Temp Max	Humidity Min	Humidity Ave	Humidity Max	Barometer Min	Barometer Ave	Barometer Max	Wind Speed Min (km/h)	Wind Speed Ave (km/h)	Wind Speed Max (km/h)	Rain (mm)	Solar Rad Min	Solar Rad Ave	Solar Rad Max	Delta Temp Min	Delta Temp Ave	Delta Temp Max	Sigma Theta Min	Sigma Theta Ave	Sigma Theta Max
1/06/2011	12.8	15.8	20	13.6	15.7	19.3	58	75	93	1020.3	1022.0	1024.3	0.5	11.7	28.5	1.4	7.9	69.8	504.1	-1.10	-0.09	1.00	1.50	5.29	30.3
2/06/2011	7.8	12.3	17.2	8.6	12.6	16.8	71	87	95	1020.9	1022.5	1024.2	0.5	4.4	16.4	0.1	7.5	56.3	364.3	-0.60	0.22	1.30	1.50	15.83	77.4
3/06/2011	5.6	11.5	19.6	6.5	11.9	18.6	46	77	95	1015.6	1018.3	1021.3	0.4	5.2	18.0	0.0	7.9	110.6	516.2	-1.10	0.36	3.40	1.20	10.68	61.4
4/06/2011	3.6	13.2	21.6	4.5	13.4	21.0	43	68	95	1014.1	1016.4	1018.0	0.4	7.2	22.7	0.1	7.9	117.4	473.7	-1.00	0.13	1.50	1.50	9.60	64.5
5/06/2011	5.2	12.9	18.8	6.0	13.1	18.3	46	66	94	1013.3	1016.2	1018.5	0.8	6.5	17.3	0.1	7.9	104.3	487.0	-1.00	0.26	4.90	1.40	11.80	62.9
6/06/2011	3.2	10.6	17.6	4.5	11.1	16.9	45	66	93	1015.7	1017.4	1019.8	0.3	9.2	23.8	0.1	6.6	113.1	464.5	-1.10	0.58	4.90	1.30	8.46	56.8
7/06/2011	0.6	8.7	15.4	1.4	8.8	14.9	43	68	95	1015.6	1018.0	1020.0	0.6	11.0	35.8	0.0	7.9	78.9	470.9	-0.90	0.08	1.80	1.20	10.36	63.0
8/06/2011	6.8	10.3	13.8	7.0	10.2	13.5	31	50	68	1015.3	1016.8	1018.3	2.8	16.3	30.8	0.0	6.6	121.2	463.7	-1.10	-0.13	0.80	1.50	4.65	12.9
9/06/2011	5.4	8.8	13.2	5.8	8.7	12.5	49	59	66	1014.6	1016.6	1017.5	9.7	19.7	34.0	0.1	7.5	117.1	451.3	-1.00	-0.16	0.50	1.40	4.34	12.7
10/06/2011	2.2	10.0	16.4	3.1	10.1	15.8	46	68	94	1016.0	1018.0	1021.3	0.5	10.0	22.8	0.0	7.9	113.8	447.0	-1.10	0.10	1.80	1.30	10.94	90.3
11/06/2011	0.8	9.9	15.6	1.6	9.8	15.2	58	80	95	1020.4	1023.0	1024.9	0.5	5.8	19.0	0.2	6.6	55.6	441.7	-0.70	-0.10	1.00	2.20	13.50	91.8
12/06/2011	10.2	11.8	14.4	10.1	11.6	13.9	74	88	93	1020.8	1022.2	1023.7	0.8	7.6	18.4	2.8	7.0	45.4	215.6	-0.70	-0.15	0.30	1.40	8.51	69.2
13/06/2011	11	13.1	15.2	11.3	13.0	14.8	68	78	92	1018.2	1019.7	1021.6	4.1	10.1	18.2	0.4	7.0	44.1	213.2	-0.60	-0.13	0.40	1.50	5.04	15.6
14/06/2011	11.8	13.5	16.4	11.7	13.4	16.1	67	82	91	1015.4	1017.0	1018.4	1.2	11.4	28.7	7.0	7.9	43.5	429.1	-0.80	-0.12	0.30	1.30	5.65	41.3
15/06/2011	12	13.4	15.4	12.1	13.3	15.2	69	85	94	1016.8	1018.7	1020.9	0.6	12.9	26.2	33.2	6.6	43.0	285.4	-0.70	-0.10	0.30	1.50	5.51	41.0
16/06/2011	6.2	12.4	17.6	7.3	12.6	17.0	56	82	95	1014.6	1017.7	1020.2	0.4	6.2	15.5	0.1	7.9	83.4	474.2	-0.90	0.15	1.20	0.90	11.44	78.1
17/06/2011	5	11.7	17.8	5.9	11.7	17.3	40	66	95	1007.6	1011.3	1014.3	0.3	12.9	30.5	0.0	7.9	99.9	453.5	-0.90	0.02	1.80	1.50	8.92	72.2
18/06/2011	8.6	12.2	17.2	8.7	12.0	16.6	43	57	68	1011.5	1013.4	1015.6	9.0	16.7	26.8	0.0	7.9	117.0	432.9	-1.10	-0.19	0.50	1.40	4.05	15.7
19/06/2011	2.2	11.0	17.2	3.2	11.4	16.5	43	65	94	1014.9	1016.2	1017.6	0.4	9.5	24.4	0.0	7.9	118.6	445.6	-1.00	0.32	3.00	1.40	9.89	65.6
20/06/2011	3	10.3	17.2	4.1	10.8	16.3	44	65	91	1013.9	1015.9	1017.7	0.9	9.5	28.6	0.1	6.6	96.2	563.7	-1.10	0.46	2.80	1.00	9.78	49.6
21/06/2011	5.2	12.3	19.6	7.2	12.2	19.1	39	62	82	1003.3	1009.6	1013.9	1.2	20.7	35.6	5.1	7.0	99.7	426.3	-1.10	-0.13	2.10	0.90	7.04	29.8
22/06/2011	6.6	9.9	13.2	7.0	9.7	12.9	46	61	76	1012.8	1014.9	1017.9	6.8	18.5	35.6	0.4	6.6	104.1	462.5	-0.90	-0.12	0.50	1.10	3.98	10.4
23/06/2011	4.8	11.6	16.4	6.4	11.6	15.8	53	63	89	1017.3	1019.9	1024.0	0.9	16.6	29.7	0.1	7.9	107.6	447.4	-1.10	-0.03	2.10	1.50	6.49	66.1
24/06/2011	-0.2	6.8	18	0.0	7.2	17.0	47	80	96	1023.9	1025.9	1028.6	0.3	3.7	13.2	0.0	7.9	118.3	446.1	-1.20	0.40	1.80	0.80	15.14	85.0
25/06/2011	-1.4	5.8	17.2	-1.1	6.1	16.5	49	83	96	1027.0	1028.9	1031.3	0.2	2.9	9.4	0.0	7.0	117.2	439.6	-1.20	0.21	2.00	0.80	13.93	84.2
26/06/2011	-0.8	7.3	20.4	-0.3	7.7	19.8	39	79	96	1024.2	1026.6	1028.9	0.4	4.5	18.2	0.0	7.9	113.2	441.1	-1.20	0.43	2.60	1.30	12.97	66.7
27/06/2011	-0.6	7.4	19.2	0.3	8.1	18.6	36	76	96	1025.4	1027.4	1030.7	0.4	3.2	10.1	0.0	7.9	117.4	447.0	-1.20	0.65	2.80	1.20	18.03	73.8
28/06/2011	3	11.0	18	3.5	10.9	17.3	52	77	95	1030.5	1031.9	1033.4	0.4	5.9	19.8	0.0	6.6	110.6	473.7	-1.00	-0.12	1.30	1.30	12.29	91.5
29/06/2011	10.8	13.0	16.8	11.0	12.9	16.5	57	83	94	1032.4	1034.2	1036.4	0.5	8.9	22.1	0.1	7.9	76.7	465.3	-0.90	-0.12	0.80	1.60	5.85	69.1
30/06/2011	4.6	9.9	16.4	5.0	10.2	15.6	57	82	95	1032.0	1034.4	1036.6	0.4	5.6	17.1	0.0	6.6	76.4	554.8	-1.20	0.30	2.70	1.20	16.36	97.6

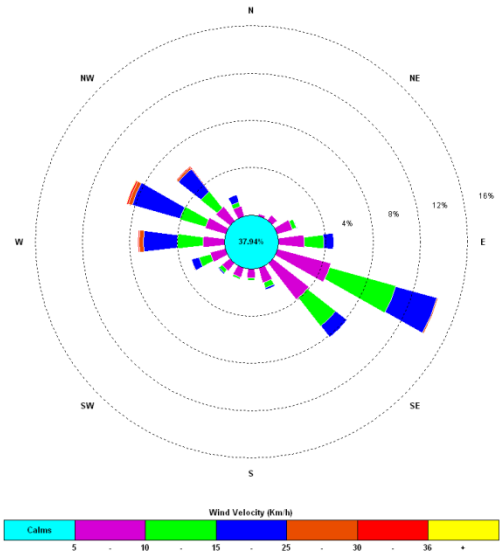
Mangoola Coal 2010-11 AEMR
Season and Annual Windroses



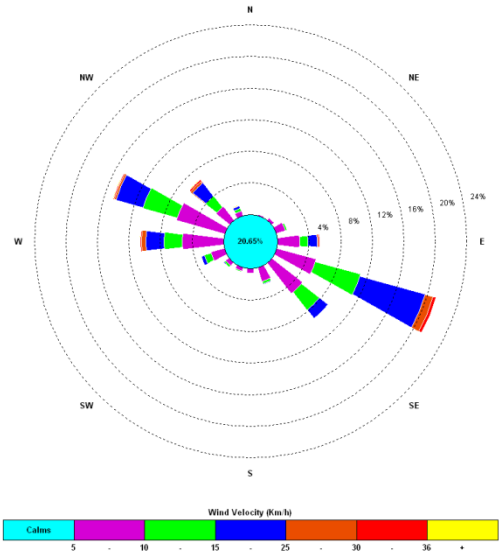
Mangoola North, Winter



Mangoola South, Winter

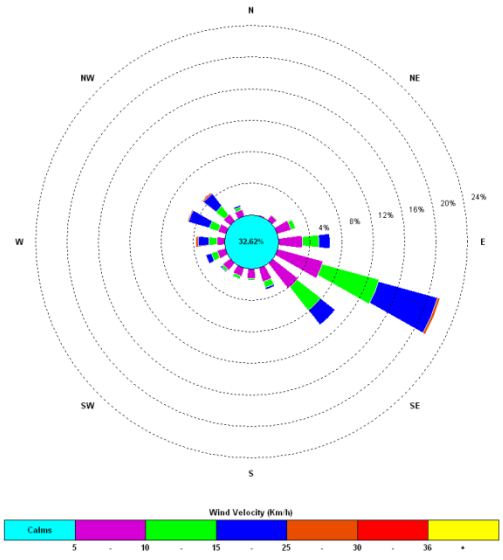


Mangoola North, Spring

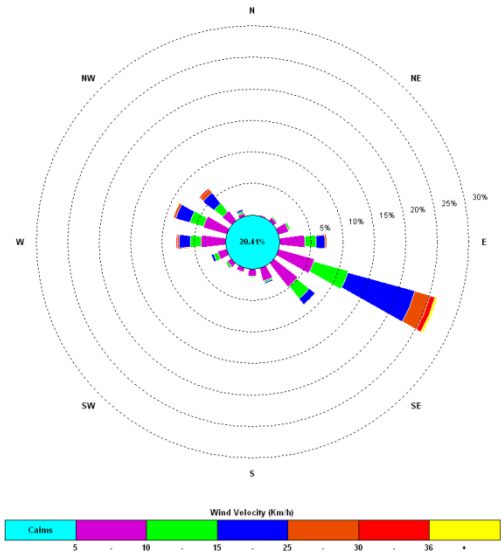


Mangoola South, Spring

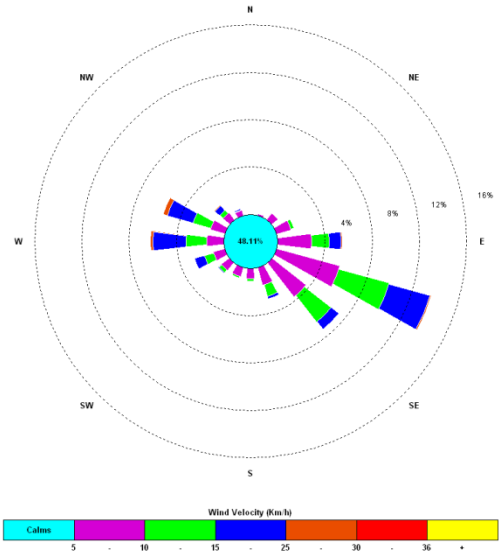
Mangoola Coal 2010-11 AEMR
Season and Annual Windroses



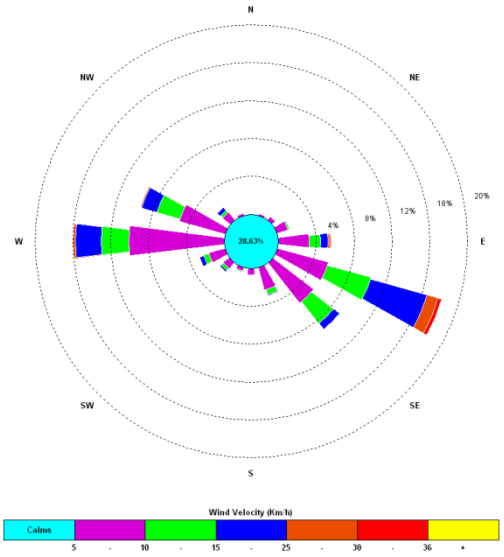
Mangoola North, Summer



Mangoola South, Summer

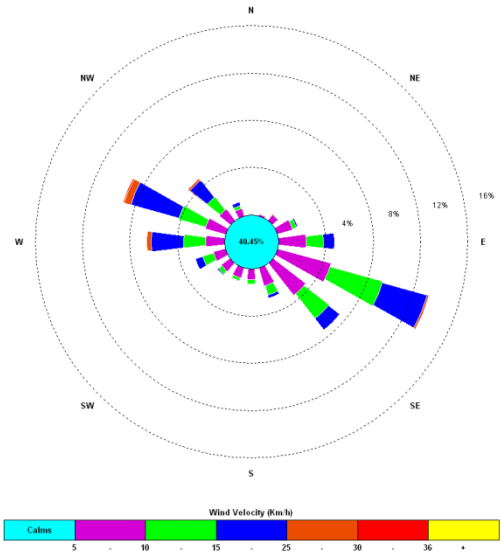


Mangoola North, Autumn

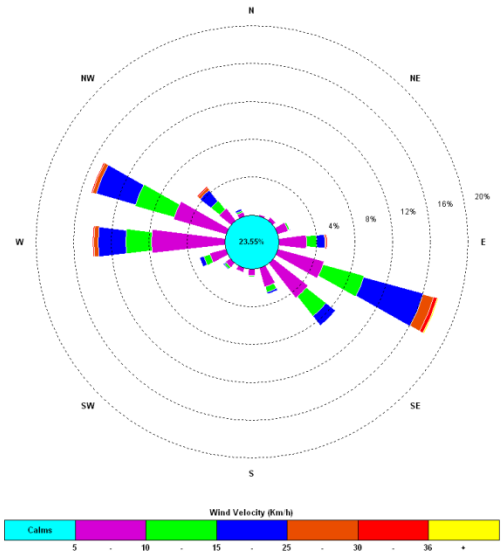


Mangoola South, Autumn

Mangoola Coal 2010-11 AEMR
Season and Annual Windroses



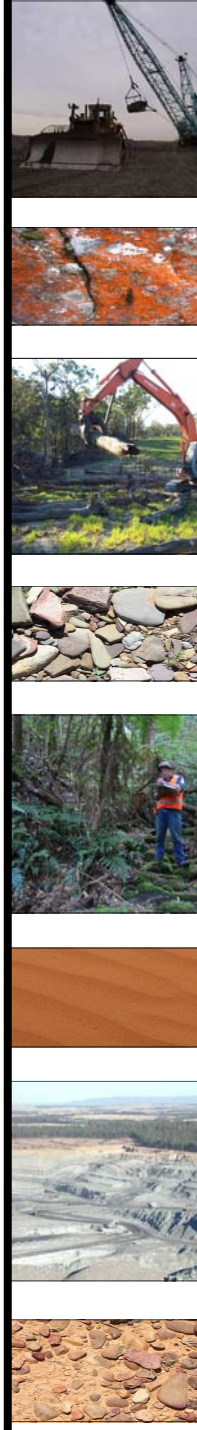
Mangoola North, Annual



Mangoola South, Annual

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Air Quality Monitoring Data



APPENDIX E

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Mangoola Coal 2010-2011 AEMR
Depositional Dust Gauge Data
(all results in g/m^2)

Month	DG01			DG02			DG03			DG04			DG05			DG06			DG07		
	Insoluble Matter	Annual Average	Ash	Insoluble Matter	Annual Average	Ash	Insoluble Matter	Annual Average	Ash	Insoluble Matter	Annual Average	Ash	Insoluble Matter	Annual Average	Ash	Insoluble Matter	Annual Average	Ash	Insoluble Matter	Annual Average	Ash
Jul-10	1.6	1.6	0.7	1.5	1.5	0.7	0.9	0.9	0.3	0.7	0.7	0.4	1.9	1.9	1.1	1	1.0	0.4	1.5	1.5	0.8
Aug-10	0.5	1.1	0.3	3.1	2.3	1.1	2.8	1.9	0.7	0.5	0.6	0.2	1.4	1.7	1.1	2.1	1.6	0.6	1	1.3	0.3
Sep-10	1.5	1.2	0.9	3	2.5	1.9	0.8	1.5	0.8	2.5	1.2	1.1	1.5	1.6	1.1	0.9	1.3	0.6	0.9	1.1	0.6
Oct-10	0.6	1.1	0.4	4.2	3.0	2.3	0.6	1.3	0.4	1.5	1.3	0.8	1.4	1.6	1	3.3	1.8	1.1	0.9	1.1	0.5
Nov-10	c6.5	1.1	c4.3	c7.3	3.0	c1.3	0.3	1.1	0.1	1.4	1.3	0.6	5.9	2.4	3.2	c5.6	1.8	c1.8	0.6	1.0	0.1
Dec-10	c7.1	1.1	c2.6	c12.8	3.0	c4.4	1.4	1.1	0.5	4.9	1.9	2.7	1.3	2.2	0.8	c20.0	1.8	c4.8	1.6	1.1	1.1
Jan-11	1.9	1.2	0.7	3.3	3.0	0.9	0.7	1.1	0.4	3.7	2.2	1.7	1.5	2.1	0.7	c7.9	1.8	1.5	1.3	1.1	0.8
Feb-11	2.9	1.5	1.6	c12.2	3.0	5.7	0.9	1.1	0.5	3.2	2.3	1.5	3.9	2.4	1.9	c4.9	1.8	1.5	2.9	1.3	1
Mar-11	c6.2	1.5	3.7	c14.2	3.0	5.8	0.8	1.0	0.5	2.1	2.3	1.3	0.9	2.2	0.5	c25.6	1.8	2.9	1.7	1.4	1.2
Apr-11	2.7	1.7	1.5	c6.4	3.0	4.6	1.3	1.1	0.7	2.3	2.3	1.3	0.8	2.1	0.5	c4.8	1.8	1.9	1.5	1.4	1
May-11	3.6	1.9	2.1	c4.9	3.0	2.8	0.9	1.0	0.6	0.8	2.1	0.5	1.5	2.0	0.9	2.3	1.9	1.3	0.7	1.3	0.5
Jun-11	1.4	1.9	0.8	3.3	3.1	1.7	0.6	1.0	0.2	2.9	2.2	1.7	2.5	2.0	1.2	5.5	2.5	2.7	0.5	1.3	0.2

Month	DG08			DG09			DG010			DG11			DG12			DG13			DG14		
	Insoluble Matter	Annual Average	Ash	Insoluble Matter	Annual Average	Ash	Insoluble Matter	Annual Average	Ash	Insoluble Matter	Annual Average	Ash	Insoluble Matter	Annual Average	Ash	Insoluble Matter	Annual Average	Ash	Insoluble Matter	Annual Average	Ash
Jul-10	0.6	0.6	0.3	1.7	1.7	0.5	0.5	0.5	0.2	0.5	0.5	0.2	1.3	1.3	0.5	1.2	1.2	0.6	2.3	2.3	0.9
Aug-10	1.2	0.9	0.4	0.7	1.2	0.4	0.6	0.6	0.4	c18	0.5	16.5	0.7	1.0	0.4	0.5	0.9	0.3	4.7	3.5	2.4
Sep-10	1.3	1.0	0.7	0.6	1.0	0.4	1.4	0.8	0.9	1.5	1.0	0.5	c6.4	1.0	c1.3	0.6	0.8	0.4	c10.5	3.5	c5.5
Oct-10	0.8	1.0	0.5	3.5	1.6	1.3	1.4	1.0	0.8	1.4	1.1	0.6	1.2	1.1	0.6	1.1	0.9	0.6	c22.3	3.5	c17.2
Nov-10	0.8	0.9	0.3	1.7	1.6	0.7	2.1	1.2	0.9	1.1	1.1	0.5	4.4	1.9	0.9	2	1.1	0.6	5	4.0	2.9
Dec-10	1.5	1.0	0.8	1.3	1.6	0.8	2.6	1.4	1.4	1.6	1.2	0.6	3.2	2.2	1.8	3.8	1.5	2	1	3.3	0.6
Jan-11	5.3	1.6	2	1.1	1.5	0.5	1.1	1.4	0.7	1.2	1.2	0.7	1.2	2.0	0.4	2.5	1.7	0.5	1.1	2.8	0.6
Feb-11	1.8	1.7	1	c5.5	1.5	2	c6.1	1.4	1.6	1.6	1.3	0.4	c3.5	2.0	1	2.6	1.8	1.2	1.4	2.6	0.7
Mar-11	1.5	1.6	1	2.4	1.6	1.2	c5	1.4	2.5	1.4	1.3	0.9	2	2.0	0.8	2.3	1.8	0.9	c36.3	2.6	30.8
Apr-11	1	1.6	0.6	c3.8	1.6	1.6	2.2	1.5	1.2	1.3	1.3	0.7	c3.8	2.0	1.2	1.3	1.8	0.6	2.6	2.6	2.3
May-11	1	1.5	0.7	1	1.6	0.7	1	1.4	0.7	1	1.3	0.7	c4.8	2.0	2	0.9	1.7	0.4	3.7	2.7	2
Jun-11	0.4	1.4	0.2	1.6	1.6	0.9	0.6	1.4	0.3	0.3	1.2	0.1	4.3	2.3	2.5	0.5	1.6	0.2	c15.2	2.7	7.5

Month	DG15			DG16			DG17			DG18			DG19			DG20			JONES		
	Insoluble Matter	Annual Average	Ash	Insoluble Matter	Annual Average	Ash	Insoluble Matter	Annual Average	Ash	Insoluble Matter	Annual Average	Ash	Insoluble Matter	Annual Average	Ash	Insoluble Matter	Annual Average	Ash	Insoluble Matter	Annual Average	Ash
Jul-10	2.3	2.3	0.7	0.6	0.6	0.4	c7.6	0.0	4	1.1	1.1	0.7	2.7	2.7	1.5	2.2	2.2	0.8	0.4	0.4	0.3
Aug-10	1.2	1.8	0.8	0.6	0.6	0.3	c16.3	0.0	9.2	0.8	1.0	0.6	3.3	3.0	1.3	1.1	1.7	0.6	0.4	0.4	0.2
Sep-10	3	2.2	1.7	0.6	0.6	0.4	c8.3	0.0	c3.2	3.1	1.7	1.8	3.3	3.1	1.5	6.9	3.4	3.7	0.5	0.4	0.3
Oct-10	1.7	2.1	0.8	0.5	0.6	0.2	c19.1	0.0	c5.6	1.3	1.6	0.4	0.9	2.6	0.5	1.2	2.9	0.3	0.5	0.5	0.3
Nov-10	1	1.8	0.4	0.9	0.6	0.3	3.7	3.7	0.8	0.9	1.4	0.3	1.5	2.3	0.7	1.8	2.6	0.6	0.5	0.5	0.2
Dec-10	1.4	1.8	0.7	1.7	0.8	0.5	c26.8	3.7	c5.0	4.9	2.0	2.1	4.3	2.7	1	c8.2	2.6	1.9	1.1	0.6	0.5
Jan-11	1.4	1.7	0.5	0.9	0.8	0.4	2.2	3.0	1	1.6	2.0	0.9	2.6	2.7	0.8	2.9	2.7	0.6	1.4	0.7	0.6
Feb-11	c5.3	1.7	0.9	1.2	0.9	0.4	1.3	2.4	0.6	c5.0	2.0	1.1	1.5	2.5	0.4	4	2.9	1.5	2.7	0.9	0.8
Mar-11	c4.7	1.7	2.2	1.4	0.9	0.9	2.6	2.5	1.3	1.7	1.9	1	1.4	2.4	0.9	3.9	3.0	1.5	0.9	0.9	0.5
Apr-11	1.1	1.6	0.7	0.9	0.9	0.5	0.4	2.0	0.2	3.3	2.1	2	2.1	2.4	1.3	1.3	2.8	0.7	0.5	0.9	0.4
May-11	0.8	1.5	0.4	0.7	0.9	0.3	c12.9	2.0	2.7	0.6	1.9	0.3	2.4	2.4	1	c4.4	2.8	1.9	0.3	0.8	0.2
Jun-11	2.7	1.7	0.2	0.5	0.9	0.2	c3.8	2.0	1.1	0.4	1.8	0.2	3.3	2.4	1.9	1.9	2.7	0.7	0.8	0.8	0.7

Mangoola Coal AEMR 2010-2011

HVAS Data (all results in µg/m^3)

Date	1 Wybong PO Rd- 24hr PM_{10}	Monthly Average	Current Annual Average	2 Coolabah Rd - 24 hr PM_{10}	Monthly Average	Current Annual Average
6/07/2010	7		7.0	7		7.0
12/07/2010	3		5.0	5		6.0
18/07/2010	3		4.3	5		5.7
24/07/2010	11		6.0	15		8.0
30/07/2010	17	8.2	8.2	19	10.2	10.2
5/08/2010	17		9.7	18		11.5
11/08/2010	17		10.7	20		12.7
17/08/2010	19		11.8	26		14.4
23/08/2010	19		12.6	22		15.2
29/08/2010	7	15.8	12.0	11	19.4	14.8
4/09/2010	18		12.5	3		13.7
10/09/2010	7		12.1	11		13.5
16/09/2010	5		11.5	9		13.2
22/09/2010	23		12.4	26		14.1
28/09/2010	29	16.4	13.5	6	11.0	13.5
4/10/2010	11		13.3	24		14.2
10/10/2010	19		13.6	21		14.6
16/10/2010	5		13.2	11		14.4
22/10/2010	10		13.0	22		14.8
28/10/2010	20	13.0	13.4	23	20.2	15.2
3/11/2010	2		12.8	6		14.8
9/11/2010	8		12.6	12		14.6
15/11/2010	5		12.3	9		14.4
21/11/2010	16		12.4	18		14.5
27/11/2010	9	8.0	12.3	25	14.0	15.0
3/12/2010	14		12.3	17		15.0
9/12/2010	9		12.2	23		15.3
15/12/2010	20		12.5	21		15.5
21/12/2010	6		12.3	6		15.2
27/12/2010	13	12.4	12.3	15	16.4	15.2
2/01/2011	25		12.7	32		15.7
8/01/2011	20		12.9	16		15.8
14/01/2011	12		12.9	13		15.7
20/01/2011	31		13.4	16		15.7
26/01/2011	35	24.6	14.1	40	23.4	16.4
1/02/2011	34		14.6	**53**		17.4
7/02/2011	19		14.7	14		17.3
13/02/2011	10		14.6	8		17.1
19/02/2011	22		14.8	28		17.3
25/02/2011	38	24.6	15.4	27	26.0	17.6
3/03/2011	16		15.4	15		17.5
9/03/2011	16		15.4	22		17.6
15/03/2011	34		15.8	25		17.8
21/03/2011	18		15.9	20		17.8
27/03/2011	24	21.6	16.1	13	19.0	17.7
2/04/2011	38		16.5	23		17.8
8/04/2011	12		16.4	6		17.6
14/04/2011	6		16.2	9		17.4
20/04/2011	17		16.2	22		17.5
26/04/2011	18	18.2	16.3	4	12.8	17.2
2/05/2011	8		16.1	14		17.2
8/05/2011	17		16.1	14		17.1
14/05/2011	5		15.9	1		16.8
20/05/2011	13		15.9	21		16.9
26/05/2011	4	9.4	15.7	4	10.8	16.7
1/06/2011	10		15.6	13		16.6
7/06/2011	4		15.4	4		16.4
13/06/2011	5		15.2	5		16.2
19/06/2011	3		15.0	4		16.0
25/06/2011	9	6.2	14.9	14	8.0	15.9
Average	14.9			15.9		
Standard Deviation	9.3			9.6		
Minimum	2			1		
Maximum	38			53		
Count	60			60		

Mangoola Coal AEMR 2010-2011

HVAS Data (all results in µg/m^3)

Date	3 Coolabah Rd- 24 hr TSP	Monthly Average	Current Annual Average	4 Mangoola Rd North- 24 hr TSP	Monthly Average	Current Annual Average
6/07/2010	17		17.0	25		25.0
12/07/2010	8		12.5	12		18.5
18/07/2010	11		12.0	14		17.0
24/07/2010	41		19.3	35		21.5
30/07/2010	23	20.0	20.0	21	21.4	21.4
5/08/2010	23		20.5	23		21.7
11/08/2010	40		23.3	24		22.0
17/08/2010	55		27.3	31		23.1
23/08/2010	31		27.7	30		23.9
29/08/2010	30	35.8	27.9	32	28.0	24.7
4/09/2010	17		26.9	7		23.1
10/09/2010	12		25.7	14		22.3
16/09/2010	33		26.2	20		22.2
22/09/2010	69		29.3	61		24.9
28/09/2010	19	30.0	28.6	35	27.4	25.6
4/10/2010	48		29.8	21		25.3
10/10/2010	67		32.0	63		27.5
16/10/2010	11		30.8	21		27.2
22/10/2010	54		32.1	91		30.5
28/10/2010	67	49.4	33.8	45	48.2	31.3
3/11/2010	21		33.2	21		30.8
9/11/2010	23		32.7	26		30.5
15/11/2010	22		32.3	16		29.9
21/11/2010	47		32.9	51		30.8
27/11/2010	92	41.0	35.2	46	32.0	31.4
3/12/2010	22		34.7	36		31.6
9/12/2010	60		35.7	36		31.7
15/12/2010	46		36.0	44		32.2
21/12/2010	22		35.6	34		32.2
27/12/2010	27	35.4	35.3	41	38.2	32.5
2/01/2011	59		36.0	80		34.1
8/01/2011	34		36.0	38		34.2
14/01/2011	27		35.7	32		34.1
20/01/2011	68		36.6	61		34.9
26/01/2011	93	56.2	38.3	94	61.0	36.6
1/02/2011	134		40.9	68		37.5
7/02/2011	38		40.8	39		37.5
13/02/2011	15		40.2	17		37.0
19/02/2011	45		40.3	38		37.0
25/02/2011	58	58.0	40.7	60	44.4	37.6
3/03/2011	29		40.4	41		37.7
9/03/2011	56		40.8	45		37.8
15/03/2011	40		40.8	50		38.1
21/03/2011	40		40.8	44		38.3
27/03/2011	33	39.6	40.6	40	44.0	38.3
2/04/2011	52		40.8	58		38.7
8/04/2011	17		40.3	28		38.5
14/04/2011	31		40.1	29		38.3
20/04/2011	34		40.0	50		38.5
26/04/2011	12	29.2	39.5	20	37.0	38.2
2/05/2011	34		39.4	36		38.1
8/05/2011	No Result - Did not run		39.4	54		38.4
14/05/2011	53		39.6	26		38.2
20/05/2011	46		39.7	53		38.5
26/05/2011	13	36.5	39.2	16	37.0	38.1
1/06/2011	No Result - Machine Faulty		39.2	15		37.6
7/06/2011	6		38.6	15		37.2
13/06/2011	8		38.1	7		36.7
19/06/2011	12		37.6	14		36.3
25/06/2011	22	12.0	37.4	9	12.0	35.9
Average	37.4			35.9		
Standard Deviation	24.2			19.7		
Minimum	6			7		
Maximum	134			94		
Count	58			60		

Mangoola Coal AEMR 2010-2011

HVAS Data (all results in µg/m^3)

Date	5 Mangoola Rd South - 24 hr TSP	Monthly Average	Current Annual Average	6 Ridgelands Rd- 24 hr TSP	Monthly Average	Current Annual Average
6/07/2010	16		16.0	21		21.0
12/07/2010	8		12.0	10		15.5
18/07/2010	11		11.7	16		15.7
24/07/2010	28		15.8	37		21.0
30/07/2010	21	16.8	16.8	31	23.0	23.0
5/08/2010	17		16.8	20		22.5
11/08/2010	19		17.1	21		22.3
17/08/2010	24		18.0	30		23.3
23/08/2010	23		18.6	28		23.8
29/08/2010	27	22.0	19.4	No Result - Paper lost by lab	24.8	23.8
4/09/2010	4		18.0	13		22.7
10/09/2010	7		17.1	12		21.7
16/09/2010	11		16.6	11		20.8
22/09/2010	58		19.6	66		24.3
28/09/2010	24	20.8	19.9	12	22.8	23.4
4/10/2010	18		19.8	29		23.8
10/10/2010	47		21.4	67		26.5
16/10/2010	12		20.8	10		25.5
22/10/2010	52		22.5	42		26.4
28/10/2010	40	33.8	23.4	69	43.4	28.7
3/11/2010	20		23.2	17		28.1
9/11/2010	25		23.3	21		27.8
15/11/2010	20		23.1	10		27.0
21/11/2010	46		24.1	61		28.4
27/11/2010	54	33.0	25.3	26	27.0	28.3
3/12/2010	23		25.2	27		28.3
9/12/2010	32		25.4	22		28.0
15/12/2010	49		26.3	38		28.4
21/12/2010	18		26.0	19		28.1
27/12/2010	30	30.4	26.1	102	41.6	30.6
2/01/2011	65		27.4	199		36.2
8/01/2011	33		27.6	58		36.9
14/01/2011	29		27.6	29		36.7
20/01/2011	56		28.4	119		39.2
26/01/2011	90	54.6	30.2	67	94.4	40.0
1/02/2011	72		31.4	53		40.4
7/02/2011	37		31.5	50		40.6
13/02/2011	12		31.0	22		40.1
19/02/2011	36		31.1	37		40.1
25/02/2011	56	42.6	31.8	83	49.0	41.2
3/03/2011	33		31.8	31		40.9
9/03/2011	31		31.8	44		41.0
15/03/2011	38		31.9	66		41.6
21/03/2011	40		32.1	39		41.5
27/03/2011	28	34.0	32.0	59	47.8	41.9
2/04/2011	50		32.4	79		42.7
8/04/2011	20		32.1	37		42.6
14/04/2011	15		31.8	12		42.0
20/04/2011	36		31.9	34		41.8
26/04/2011	12	26.6	31.5	21	36.6	41.4
2/05/2011	21		31.3	20		40.9
8/05/2011	24		31.1	31		40.7
14/05/2011	5		30.6	12		40.2
20/05/2011	46		30.9	39		40.2
26/05/2011	10	21.2	30.5	9	22.2	39.6
1/06/2011	13		30.2	14		39.1
7/06/2011	9		29.8	11		38.6
13/06/2011	6		29.4	6		38.1
19/06/2011	2		29.0	7		37.5
25/06/2011	18	9.6	28.8	31	13.8	37.4
Average	28.8			37.4		
Standard Deviation	18.4			32.5		
Minimum	2			6		
Maximum	90			199		
Count	60			59		

Mangoola Coal AEMR 2010-2011

HVAS Data (all results in µg/m^3)

Date	7 Wybong PO Rd - 24 hr TSP	Monthly Average	Current Annual Average
6/07/2010	9		9.0
12/07/2010	6		7.5
18/07/2010	9		8.0
24/07/2010	29		13.3
30/07/2010	20	14.6	14.6
5/08/2010	17		15.0
11/08/2010	20		15.7
17/08/2010	24		16.8
23/08/2010	26		17.8
29/08/2010	17	20.8	17.7
4/09/2010	5		16.5
10/09/2010	10		16.0
16/09/2010	8		15.4
22/09/2010	65		18.9
28/09/2010	26	22.8	19.4
4/10/2010	23		19.6
10/10/2010	57		21.8
16/10/2010	7		21.0
22/10/2010	33		21.6
28/10/2010	47	33.4	22.9
3/11/2010	15		22.5
9/11/2010	19		22.4
15/11/2010	8		21.7
21/11/2010	47		22.8
27/11/2010	25	22.8	22.9
3/12/2010	23		22.9
9/12/2010	18		22.7
15/12/2010	40		23.3
21/12/2010	15		23.0
27/12/2010	33	25.8	23.4
2/01/2011	64		24.7
8/01/2011	53		25.6
14/01/2011	29		25.7
20/01/2011	77		27.2
26/01/2011	71	58.8	28.4
1/02/2011	39		28.7
7/02/2011	48		29.2
13/02/2011	21		29.0
19/02/2011	38		29.3
25/02/2011	69	43.0	30.3
3/03/2011	41		30.5
9/03/2011	31		30.5
15/03/2011	60		31.2
21/03/2011	44		31.5
27/03/2011	57	46.6	32.1
2/04/2011	92		33.4
8/04/2011	44		33.6
14/04/2011	13		33.2
20/04/2011	31		33.1
26/04/2011	33	42.6	33.1
2/05/2011	21		32.9
8/05/2011	28		32.8
14/05/2011	6		32.3
20/05/2011	36		32.4
26/05/2011	6	19.4	31.9
1/06/2011	16		31.6
7/06/2011	6		31.1
13/06/2011	5		30.7
19/06/2011	6		30.3
25/06/2011	23	11.2	30.2
Average	30.2		
Standard Deviation	20.7		
Minimum	5		
Maximum	92		
Count	60		

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Surface Water Quality Monitoring Summary










APPENDIX F

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Mangoola Coal 2010-11 AEMR
Surface Water Monitoring

Monitoring Site	SW01					SW02					SW03					SW04				
	Flow	pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)		pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)		pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)		pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)
9/07/2010	Dry					Flow	8.4	5495	6	2805	No Flow	9.0	15810	8	8525	Flow	8.7	1181	5	1146
20/08/2010	No Flow	8.6	287	3	182	Flow	8.2	5330	11	2865	Flow	8.2	14525	39	8140	Flow	8.5	772	8	408
16/09/2010	No Flow	8.0	336	8	178	Flow	7.8	5465	14	2915	Flow	8.0	8260	118	4405	Flow	8.3	860	10	376
19/10/2010	Dry					No Flow	8.1	5630	232	3050	No Flow	8.3	22600	44	13200	Flow	8.3	674	18	364
10/11/2010	No Flow	7.8	318	8	242	No Flow	7.7	4020	4	2570	No Flow	7.6	575	40	544	Flow	8.2	664	15	448
2/12/2010	No Flow	7.7	334	15	282	No Flow	7.7	4310	26	2440	No Flow	7.8	3550	56	2060	Flow	8.2	757	12	438
10/01/2011	No Flow	8.2	297	35	380	No Flow	8.2	5440	19	3080	No Flow	8.6	18500	32	11080	Flow	8.3	949	13	556
14/02/2011	No Flow	7.5	859	249	580	No Flow	7.7	6470	23	4070	Dry					Flow	8.0	1231	16	742
10/03/2011	No Flow	7.5	999	394	694	Dry					Dry					Flow	8.3	1647	3	988
14/04/2011	No Flow	7.4	678	725	514	Dry					Flow	7.8	5510	3310	3010	Flow	8.2	1163	16	716
11/05/2011	Dry					Dry					Dry					Flow	8.2	1684	2	946
9/06/2011	No Flow	8.8	383	48	228	No Flow	8.0	3890	5	2220	No Flow					Flow	8.5	982	5	522
2010- 2011																				
Average		7.9	499	165	364		8.0	5117	38	2891		8.2	11166	456	6371		8.3	1047	10	638
Standard Deviation		0.5	273	250	189		0.3	856	73	526		0.5	7819	1154	4540		0.2	347	6	267
Minimum		7.4	287	3	178		7.7	3890	4	2220		7.6	575	8	544		8.0	664	2	364
Maximum		8.8	999	725	694		8.4	6470	232	4070		9.0	22600	3310	13200		8.7	1684	18	1146

Monitoring Site	SW05					SW06					SW07					SW08				
		pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)		pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)		pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)		pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)
9/07/2010	Flow	8.6	1459	6	780	Flow	8.6	1473	6	808	No Flow	8.9	8645	2	4100	Dry				
20/08/2010	Flow	8.5	842	10	446	Flow	8.4	909	6	450	No Flow	8.6	7730	2	4300	No Flow	7.7	191	31	1656
16/09/2010	Flow	8.0	985	9	486	Flow	8.3	981	10	448	Flow	8.1	11760	9	5940	Dry				
19/10/2010	Flow	8.2	757	20	364	Flow	8.3	814	15	422	No Flow	9.3	12500	18	7260	Dry				
10/11/2010	Flow	8.2	741	10	460	Flow	8.2	775	14	532	Flow	7.9	3810	23	2610	No Flow	7.1	122	7	1180
2/12/2010	Flow	8.1	851	10	452	Flow	8.2	847	11	596	No Flow	7.5	1620	108	1220	Dry				
10/01/2011	Flow	8.4	1038	11	594	Flow	8.4	1035	8	566	No Flow	8.8	9710	8	5590	No Flow	6.8	164	4	98
14/02/2011	Flow	8.1	1558	5	948	Flow	8.1	1716	3	1060	No Flow	9.1	9810.0	24.0	6060.0	Dry				
10/03/2011	Flow	8.3	1649	8	902	Flow	8.3	1646.0	3.0	996.0	Dry					Dry				
14/04/2011	Flow	8.2	1715	31	1060	Flow	8.2	1714.0	72.0	1060.0	Dry	Too low				Dry				
11/05/2011	Flow	8.2	1691	3	946	Flow	8.2	1686	2	946	Dry					Dry				
9/06/2011	Flow	8.4	1160	6	594	Flow	8.4	1220	5	636	No Flow	8.1	10900	6490	5	Dry				
2010- 2011																				
Average		8.3	1204	11	669		8.3	1235	13	710		8.5	8498	743	4121		7.2	159	14	978
Standard Deviation		0.2	385	8	244		0.1	386	19	249		0.6	3632	2155	2417		0.5	35	15	798
Minimum		8.0	741	3	364		8.1	775	2	422		7.5	1620	2	5		6.8	122	4	98
Maximum		8.6	1715	31	1060		8.6	1716	72	1060		9.3	12500	6490	7260		7.7	191	31	1656

Monitoring Site	SW09					SW10					SW11					SW12				
		pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)		pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)		pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)		pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)
9/07/2010	Flow	8.7	1690	14	1430	Dry					Flow	8.5	1798	8	880	Flow	8.7	806	2	472
20/08/2010	Flow	8.4	938	17	490	Dry					Flow	8.4	988	18	504	Flow	8.3	578	31	256
16/09/2010	Flow	8.4	1192	20	724	Dry					Flow	8.3	1144	23	536	Flow	8.3	627	31	324
19/10/2010	Flow	8.3	866	17	440	Dry					Flow	8.1	1050	42	522	Flow	8.0	432	81	260
10/11/2010	Flow	8.2	990	18	626	Dry					Flow	8.2	898	22	588	Flow	8.3	627	25	372
2/12/2010	Flow	8.2	842	5	538	Dry					Flow	7.5	214	484	348	Flow	7.4	217	480	480
10/01/2011	Flow	8.4	1043	9	548	Dry					Flow	8.2	1229	20	684	Flow	8.3	630	30	364
14/02/2011	Flow	8.1	2010	8	1310	Dry					Flow	7.9	1783.0	13.0	1110.0	Flow	8.3	794	10	460
10/03/2011	Flow	8.3	1652	9	976	Dry					Flow	8.0	2040.0	9.0	1160.0	Flow	8.3	846	26	500
14/04/2011	Flow	8.2	1714	7	1070	Dry					Flow	8.0	2140	5	1220	Flow	8.2	796	43	562
11/05/2011	Flow	8.2	1686	2	934	Dry					Flow	8.1	2090	5	1180	Flow	8.3	804	4	448
9/06/2011	Flow	8.4	1300	6	706	Dry					Flow	8.3	1380	5	756	Flow	8.3	686	11	352
2010- 2011																				
Average		8.3	1327	11	816		0.0	0	0	0		8.1	1396	55	791		8.2	654	65	404
Standard Deviation		0.2	404	6	327		0.0	0	0	0		0.3	587	136	309		0.3	184	133	97
Minimum		8.1	842	2	440		0.0	0	0	0		7.5	214	5	348		7.4	217	2	256
Maximum		8.7	2010	20	1430		0.0	0	0	0		8.5	2140	484	1220		8.7	846	480	562

Mangoola Coal 2010-11 AEMR
Surface Water Monitoring

Monitoring Site	SW13					SW14					SW15					SW16				
		pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)		pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)		pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)		pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)
9/07/2010	Flow	8.5	982	2	452	Flow	8.4	694	7	342	Flow	8.0	737	12	394	Dam	6.5	246	671	196
20/08/2010	Flow	8.2	623	40	322	Flow	8.2	492	19	264	Flow	8.2	501	21	252	Pond	8.0	34	24	413
16/09/2010	Flow	8.3	667	34	346	Flow	8.2	625	17	280	Flow	8.1	631	19	328	Dam	7.5	166	74	438
19/10/2010	Flow	8.1	442	808	258	Flow	7.8	730	60	408	Flow	8.1	825	14	488	Dam	7.4	2060	194	937
10/11/2010	Flow	8.3	684	28	430	Flow	8.0	423	43	280	Flow	8.0	423	39	254	Dam	No access			
2/12/2010	Flow	7.4	213	392	324	Flow	8.0	645	20	408	Flow	8.0	646	8	394	Dam	No access			
10/01/2011	Flow	8.3	601	24	352	Flow	8.1	712	32	434	Flow	8.2	703	43	400	Dam	7.4	255	68	414
14/02/2011	Flow	8.2	848	13	512	Flow	7.9	571	37	322	Flow	7.8	621.0	18.0	364.0	Dam	No access			
10/03/2011	Flow	8.3	842	12	492	Flow	8.0	639.0	23.0	368.0	Flow	8.0	672.0	24.0	394.0	Dam	7.2	414	920	612
14/04/2011	Flow	8.3	783	16	536	Flow	8.0	327.0	45.0	224.0	Flow	8.0	326	30	222	Dam	7.1	310	455	980
11/05/2011	Flow	8.3	799	3	468	Flow	8.0	445	11	264	Flow	8.0	443	10	244	Dam	7.1	374	150	1880
9/06/2011	Flow	8.4	740	18	392	Flow	8.1	509	7	282	Flow	8.0	524	8	295	Dam	7.4	154	217	4440
2010- 2011																				
Average		8.2	685	116	407		8.1	568	27	323		8.0	588	21	336		7.3	446	308	1146
Standard Deviation		0.3	204	243	88		0.2	128	17	68		0.1	146	12	83		0.4	616	310	1333
Minimum		7.4	213	2	258		7.8	327	7	224		7.8	326	8	222		6.5	34	24	196
Maximum		8.5	982	808	536		8.4	730	60	434		8.2	825	43	488		8.0	2060	920	4440

Monitoring Site	SW17					Rail Loop Sed Dam					Dirty Water Dam CHPP					Anvil Creek Sed Dam				
		pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)	Turbidity (NTU)	pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)	Turbidity (NTU)	pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)	Turbidity (NTU)
9/07/2010	Flow	8.1	737	7	364															
20/08/2010	Flow	8.1	497	27	222															
16/09/2010	Flow	8.1	642	19	242															
19/10/2010	Flow	8.1	635	28	350															
10/11/2010	Flow	8.0	420	50	224															
2/12/2010	Flow	7.9	665	28	498															
10/01/2011	Flow	8.1	707	21	426															
14/02/2011	Flow	7.9	530	14	310	8.4	634	40	390	95	7.5	425	1290	3190	850	7.5	339	75	1150	800
10/03/2011	Flow	8.3	1653	19	926	No access	No access	No access	No access	No access	8	523	1180	794	2200	7.6	385	123	1240	750
14/04/2011	Flow	8.0	314	38	238	8	455	273	466	26	7.8	456	618	340	700	7.4	291	175	1230	850
11/05/2011	Flow	8.0	443	9	302	8.5	586	16	390	65	8.1	751	71	578	340	7.5	313	31	1390	750
9/06/2011	Flow	8.0	509	8	292	8	787	14	488	70	8.1	940	116	511	280	7.2	176	108	793	770
2010- 2011																				
Average		8.1	646	22	366	8	616	86	434	64	8	619	655	1083	874	7	301	102	1161	784
Standard Deviation		0.1	342	13	195	0	137	125	51	29	0	220	573	1189	779	0	78	54	223	42
Minimum		7.9	314	7	222	8	455	14	390	26	8	425	71	340	280	7	176	31	793	750
Maximum		8.3	1653	50	926	9	787	273	488	95	8	940	1290	3190	2200	8	385	175	1390	850

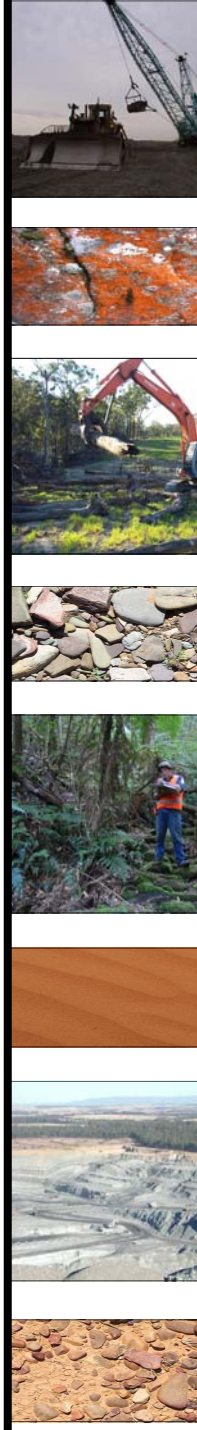
Monitoring Site	Haul Road A/B Sed Dam					Farm Dam					NOOP Sed Dam					Haul Road B North Sed Dam				
	pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)	Turbidity (NTU)	pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)	Turbidity (NTU)	pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)	Turbidity (NTU)	pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)	Turbidity (NTU)
9/07/2010																				
20/08/2010																				
16/09/2010																				
19/10/2010																				
10/11/2010																				
2/12/2010																				
10/01/2011																				
14/02/2011	8	338.0	472	444	950	8.7	2210	92	1260	150	7.8	1596	23	912	55	8.3	1597	97	930	170
10/03/2011	8.6	507.0	33	344	85	9.3	2990	51	1650	27	8	3370	9	1900	5.6	8.5	2150	472	1230	500
14/04/2011	No access					Too low					7.7	5760	15	3690	19	7.7	661	966	616	700
11/05/2011	8	328.0	40	756	700	8.8	1996	114	1160	150	8.2	6770	20	3960	37	8.4	1764	318	1320	650
9/06/2011	7.8	243.0	1040	402	1600	9.5	1418	10	820	17	8.1	5050	13	2830	13	8.2	1413	167	798	380
2010- 2011																				
Average	8	354.0	396	487	834	9	2154	67	1223	86	8	4509	16	2658	26	8	1517	404	979	480
Standard Deviation	0	110.5	476	184	627	0	650	46	342	74	0	2047	6	1266	20	0	550	346	294	214
Minimum	8	243.0	33	344	85	9	1418	10	820	17	8	1596	9	912	6	8	661	97	616	170
Maximum	9	507.0	1040	756	1600	10	2990	114	1650	150	8	6770	23	3960	55	9	2150	966	1320	700

Mangoola Coal 2010-11 AEMR
Surface Water Monitoring

Monitoring Site	Pit Water Dam					Raw Water Dam				
	pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)	Turbidity (NTU)	pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)	Turbidity (NTU)
9/07/2010										
20/08/2010										
16/09/2010										
19/10/2010										
10/11/2010										
2/12/2010										
10/01/2011										
14/02/2011	8.3	686	35	404	95	8.4	766	4	416	7.7
10/03/2011	8.6	666	66	394	70	8.5	788	4	468	9.2
14/04/2011	8.4	615	73	440	90	8.5	651	15	440	14
11/05/2011	8.2	935	212	556	160	8.4	695	<1	392	7.6
9/06/2011	8.3	1095	87	592	88	8.5	628	9	362	6.6
2010- 2011										
Average	8	799	95	477	101	8	706	8	416	9
Standard Deviation	0	206	68	91	35	0	70	5	41	3
Minimum	8	615	35	394	70	8	628	4	362	7
Maximum	9	1095	212	592	160	9	788	15	468	14

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Groundwater Monitoring Summary



APPENDIX G

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Mangoola Coal 2010-11 AEMR
Groundwater Data - EC (µS/cm)

BoreID	9-Sep-10	21-Jan-11	28-Mar-11	23-Jun-11	min	max	average
GW02	13530	14040	13620	13430	13430	14040	13655
GW03-S	Dry						
GW03-D	27000	27000	27100	28300	27000	28300	27350
GW04	7730	7770	7340	7520	7340	7770	7590
GW06	162.3	176	156	157	156	176	162.825
GW07-S	19000	15960	18250	20010	15960	20010	18305
GW07-D	8330	8610	18500	19440	8330	19440	13720
GW08	No Data						
GW09	8440	6020	5690	1223	1223	8440	5343.25
GW10-A1	Blocked						
GW10-A2	804	617	719	750	617	804	722.5
GW10-P1	7560	8200	8080	10520	7560	10520	8590
GW10-P2	7090	7360	7280	7360	7090	7360	7272.5
GW11	13160	12760	12660	12960	12660	13160	12885
GW12	13950	13630	13190	13890	13190	13950	13665
GW13	266	187.3	258	321	187.3	321	258.075
GW14	2438	2670	2670	2740	2438	2740	2629.5
GW15	10860	11040	10370	10900	10370	11040	10792.5
GW16	20430	19920	20080	20770	19920	20770	20300
GW17	18060	4900	9870	2780	2780	18060	8902.5
GW18	Contaminated	Contaminated	Contaminated	109	109	109	109
GW19	7430	7010	6710	6920	6710	7430	7017.5
GW20	5470	5120	5210	5310	5120	5470	5277.5
GW22	4490	3050	2950	1924	1924	4490	3103.5
GW23	5790	5710	5660	Gone	5660	5790	5720
GW25	Excavated by Mining						
GW26	2277	2284	2227	2252	2227	2284	2260
GW27	17500	12890	13150	14010	12890	17500	14387.5
GW28	11190	11100	10710	11150	10710	11190	11037.5
GW29	29500	27700	30000	29900	27700	30000	29275
GW30	11830	11270	10890	11680	10890	11830	11417.5
GW31	21330	21180	19970	20750	19970	21330	20807.5
GW32	24470	24320	22930	24700	22930	24700	24105
GW33	14580	14250	14010	15130	14010	15130	14492.5
GW34	2219	2219	2224	2284	2219	2284	2236.5
GW35	1535	1705	2154	2570	1535	2570	1991
GW36	6860	Removed	Removed	Removed	6860	6860	6860
GW37	Excavated by Mining						
GW38-S	Excavated by Mining						
GW38-D	Excavated by Mining						
GW39	Excavated by Mining						
GW40	4020	3990	3880	4060	3880	4060	3987.5
GW41	22650	18060	17890	18360	17890	22650	19240
GW43	415	303	No Access	No Access	303	415	359
GW44	7460	7570	No Access	No Access	7460	7570	7515
GW46	7640	7400	7070	7540	7070	7640	7412.5
GW47	6540	5210	5370	12510	5210	12510	7407.5
GW48	3440	5450	10710	12010	3440	12010	7902.5
GW49	Excavated by Mining						
GW50	Too low to sample						
McInerney - Piezo shallow	No Data						
McInerney - Piezo deep	No Data						
Ranch Spring	No Data						
Black Jack pond above BM bore	No Data						
Jennarr well	1675	2062	1757	1877	1675	2062	1842.75

Mangoola Coal 2010-11 AEMR
Groundwater Data - pH

BoreID	9-Sep-10	21-Jan-11	28-Mar-11	23-Jun-11	min	max	ave
GW02	8.5	6.86	7.65	8.85	6.9	8.9	8.0
GW03-S	Dry						
GW03-D	7.29	6.05	6.39	7.14	6.1	7.3	6.7
GW04	7.09	6.87	6.22	7.06	6.2	7.1	6.8
GW06	7.1	8.25	7.17	7.4	7.1	8.3	7.5
GW07-S	6.47	6.35	7.01	7.36	6.4	7.4	6.8
GW07-D	6.88	7.18	6.25	8.07	6.3	8.1	7.1
GW08	No Data						
GW09	7.64	7.35	6.75	7.78	6.8	7.8	7.4
GW10-A1	Blocked						
GW10-A2	7.21	8.03	6.44	7.3	6.4	8.0	7.2
GW10-P1	6.89	7.36	6.82	7.65	6.8	7.7	7.2
GW10-P2	7.25	7.45	6.52	7.77	6.5	7.8	7.2
GW11	6.3	7.15	6.15	6.98	6.2	7.2	6.6
GW12	6.58	7.19	6.8	7.1	6.6	7.2	6.9
GW13	8.26	7.89	7.45	9.14	7.5	9.1	8.2
GW14	7.71	7.98	6.23	7.98	6.2	8.0	7.5
GW15	6.56	7.08	6.18	6.8	6.2	7.1	6.7
GW16	5.99	7.06	6.21	6.96	6.0	7.1	6.6
GW17	6.72	7.58	6.46	6.86	6.5	7.6	6.9
GW18	6.45	8.22	5.79	7.46	5.8	8.2	7.0
GW19	6.11	6.88	5.81	6.51	5.8	6.9	6.3
GW20	6.36	7.08	5.83	6.5	5.8	7.1	6.4
GW22	6.35	7.51	6.53	6.92	6.4	7.5	6.8
GW23	6.62	7.44	5.44	Gone	5.4	7.4	6.5
GW25	Excavated by Mining						
GW26	6.73	6.83	6.38	7.5	6.4	7.5	6.9
GW27	5.95	7.25	6.88	6.94	6.0	7.3	6.8
GW28	6.56	6.83	6.14	6.65	6.1	6.8	6.5
GW29	4.51	7.08	6.46	7.02	4.5	7.1	6.3
GW30	7.6	7.06	5.95	6.9	6.0	7.6	6.9
GW31	4.65	7.01	5.44	6.75	4.7	7.0	6.0
GW32	5.05	7.12	6.69	6.75	5.1	7.1	6.4
GW33	5.44	7	6.27	6.99	5.4	7.0	6.4
GW34	7.17	7.25	6.47	6.94	6.5	7.3	7.0
GW35	7.55	7.44	6.85	6.94	6.9	7.6	7.2
GW36	6.16	Removed	Removed	Removed	6.2	6.2	6.2
GW37	Excavated by Mining						
GW38-S	Excavated by Mining						
GW38-D	Excavated by Mining						
GW39	Excavated by Mining						
GW40	6.67	7.2	6.33	6.8	6.3	7.2	6.8
GW41	6.42	7.36	6.15	7.06	6.2	7.4	6.7
GW43	7	6.59	No Access	No Access	6.6	7.0	6.8
GW44	6.78	5.07	No Access	No Access	5.1	6.8	5.9
GW46	6.88	7.2	6.08	6.94	6.1	7.2	6.8
GW47	6.56	7.22	6.32	6.63	6.3	7.2	6.7
GW48	6.86	7.21	6.14	6.52	6.1	7.2	6.7
GW49	Excavated by Mining						
GW50	Too low to sample						
McInerney - Piezo shallow	No Data						
McInerney - Piezo deep	No Data						
Ranch Spring	No Data						
Black Jack pond above BM bore	No Data						
Jennarr well	6.99	6.82	6.54	7.23	6.5	7.2	6.9

Mangoola Coal 2010-11 AEMR
Groundwater Data - Piezometer Depths

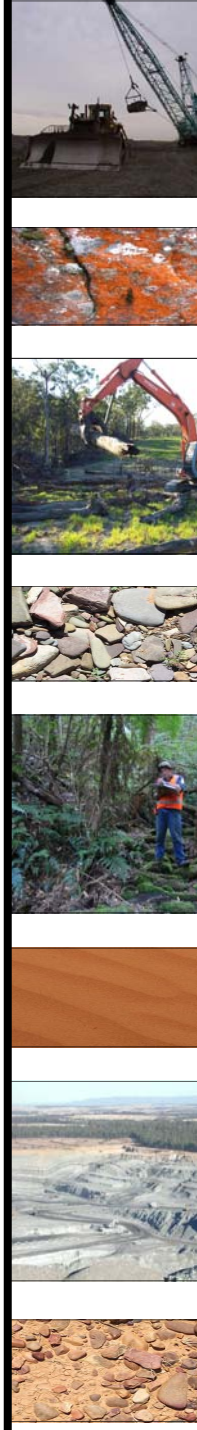
	Depth (m) TOC to Water														
	Pit Water Dam										Raw Water Dam				
	P1	P2	P3	P4	P5	P6	P7	B1	B2	B3	P1	P2	P4	P5	P6
Nov-2010	6.38	6.06	6.43	6.48	3.94	2.56	2.94	5.93	4.48	5.02	19.4	20.5	16.42	Not installed	Not installed
Dec-2010	6.16	6.1	6.2	6.24	3.64	2.4	3	5.95	4.5	4.94	19.84	20.32	15.65	Not installed	Not installed
Jan-2011	5.87	5.65	6.45	6.36	4.37	2.74	3.06	6.55	5.07	5.49	19.08	20.33	15.46	9.29	3.17
Feb-2011	Inaccessible	Inaccessible	Inaccessible	Inaccessible	5.4	3.38	3.26	7.83	6.48	7.06	18.96	20.36	15.07	9.3	3.24
Mar-2011	7.83	6.67	7.23	7.48	5.09	3.48	3.47	7.53	6.03	8.2	18.86	20.4	14.63	9.44	3.29
Apr-2011	7.26	6.22	7.1	7.25	4.45	3.5	3.55	9.42	7.64	8.18	18.74	20.39	14.39	8.69	3.29
May-2011	6.71	6.05	6.91	7.03	4.31	3.09	3.6	9.5	7.61	8.03	18.74	20.39	14.34	9.53	3.28
Jun-2011	6.71	5.88	6.82	6.99	4.17	3.06	3.65	9.52	7.39	7.97	18.62	20.13	13.72	9.53	3.11

	% Change in Depth														
	Pit Water Dam										Raw Water Dam				
	P1	P2	P3	P4	P5	P6	P7	B1	B2	B3	P1	P2	P4	P5	P6
Dec-2010	-3.4%	0.7%	-3.6%	-3.7%	-7.6%	-6.3%	2.0%	0.3%	0.4%	-1.6%	2.3%	-0.9%	-4.7%	No Data	No Data
Jan-2011	-4.7%	-7.4%	4.0%	1.9%	**20.1%**	**14.2%**	2.0%	**10.1%**	**12.7%**	**11.1%**	-3.8%	0.0%	-1.2%	No Data	No Data
Feb-2011	No Data	No Data	No Data	No Data	**23.6%**	**23.4%**	6.5%	**19.5%**	**27.8%**	**28.6%**	-0.6%	0.1%	-2.5%	0.1%	2.2%
Mar-2011	No Data	No Data	No Data	No Data	-5.7%	3.0%	6.4%	-3.8%	-6.9%	**16.1%**	-0.5%	0.2%	-2.9%	1.5%	1.5%
Apr-2011	-7.3%	-6.7%	-1.8%	-3.1%	**-12.6%**	0.6%	2.3%	**25.1%**	**26.7%**	-0.2%	-0.6%	0.0%	-1.6%	-7.9%	0.0%
May-2011	-7.6%	-2.7%	-2.7%	-3.0%	-3.1%	**-11.7%**	1.4%	0.8%	-0.4%	-1.8%	0.0%	0.0%	-0.3%	9.7%	-0.3%
Jun-2011	0.0%	-2.8%	-1.3%	-0.6%	-3.2%	-1.0%	1.4%	0.2%	-2.9%	-0.7%	-0.6%	-1.3%	-4.3%	0.0%	-5.2%

Mangoola Coal 2010-11 AEMR
Groundwater Data - Dip Depth to Standing Water (m)

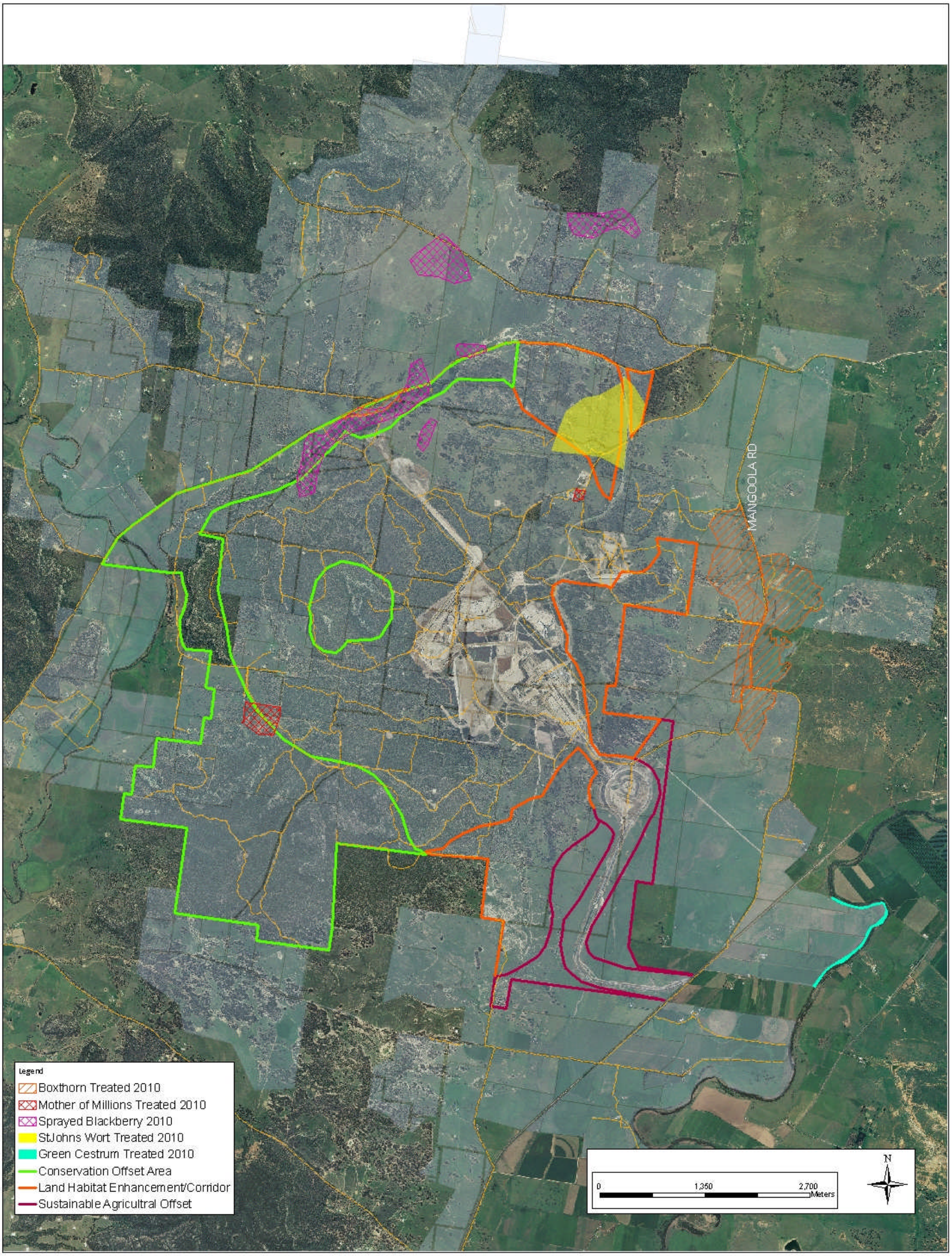
BoreID	Top of pipe Piezo Datum	9-Sep-10	21-Jan-11	28-Mar-11	23-Jun-11
GW02	171.051	2.72	2.48	2.94	2.68
GW03-S	171.319	dry	3.38	Dry	Dry
GW03-D	171.339	3.8	3.73	3.15	3.81
GW04	185.000	11.55	11.53	12.6	11.5
GW06	174.170	0.66	0.74	0.68	0.68
GW07-S	155.744	2.2	2.08	2.72	2.2
GW07-D	155.744	2.2	2.11	2.7	2.21
GW09	148.860	2.23	1.52	1.83	1.76
GW10-A1	151.840	Blocked			
GW10-A2	151.840	5.1	4.87	5.12	5.13
GW10-P1	151.840	6.5	6.21	6.33	6.4
GW10-P2	151.840	5.27	5.07	5.57	5.14
GW11	157.250	10.35	9.77	9.89	9.92
GW12	156.410	9.61	9.04	9.13	9.18
GW13	No Data	7.89	7.52	9.46	8.28
GW14	142.250	3.53	3.62	3.67	3.48
GW15	142.320	5.33	5.25	5.58	5.48
GW16	145.370	7.06	6.96	7.34	7.19
GW17	147.730	8.85	8.71	9.01	8.9
GW18	154.845	7.7	7.39	6.47	7.51
GW19	160.667	13.8	13.78	13.84	13.82
GW20	168.665	22.5	22.64	22.72	22.75
GW22	175.220	17.6	18	18.12	18.07
GW23	187.116	15.84	15.98	16.04	Gone
GW25	211.540	Excavated by Mining			
GW26	No Data	15.2	15.21	15.28	15.28
GW27	144.200	6.43	6.24	6.67	6.5
GW28	146.760	8.16	8.13	8.27	8.25
GW29	144.597	6.79	6.52	7.02	6.85
GW30	145.810	7.49	7.26	7.64	7.55
GW31	145.220	7.44	7.13	7.55	7.43
GW32	144.560	7.65	7.36	7.74	7.64
GW33	146.490	7.52	7.31	7.62	7.62
GW34	182.702	36.52	36.7	36.78	36.79
GW35	206.482	60.42	60.6	60.67	60.69
GW36	205.170	21.72	Removed	Removed	Removed
GW37	197.600	Excavated by Mining			
GW38-S	187.020	Excavated by Mining			
GW38-D	186.960	Excavated by Mining			
GW39	168.573	Excavated by Mining			
GW40	182.431	36.35	36.56	36.58	36.64
GW41	155.200	10.21	10.13	10.24	10.31
GW43	139.670	2.09	0.54	No Access	No Access
GW44	140.020	11.66	11.57	No Access	No Access
GW46	175.660	18.63	18.44	17.43	18.58
GW47	181.300	17.39	21.04	25.33	24.1
GW48	181.590	17.54	21.45	25.72	24.31
GW49	187.130	Excavated by Mining			
GW50	203.530	27.64	27.65	Too low	27.62
Jennar well	No Data	4.22	3.66	4.19	3.6

Weed Control Maps



APPENDIX H

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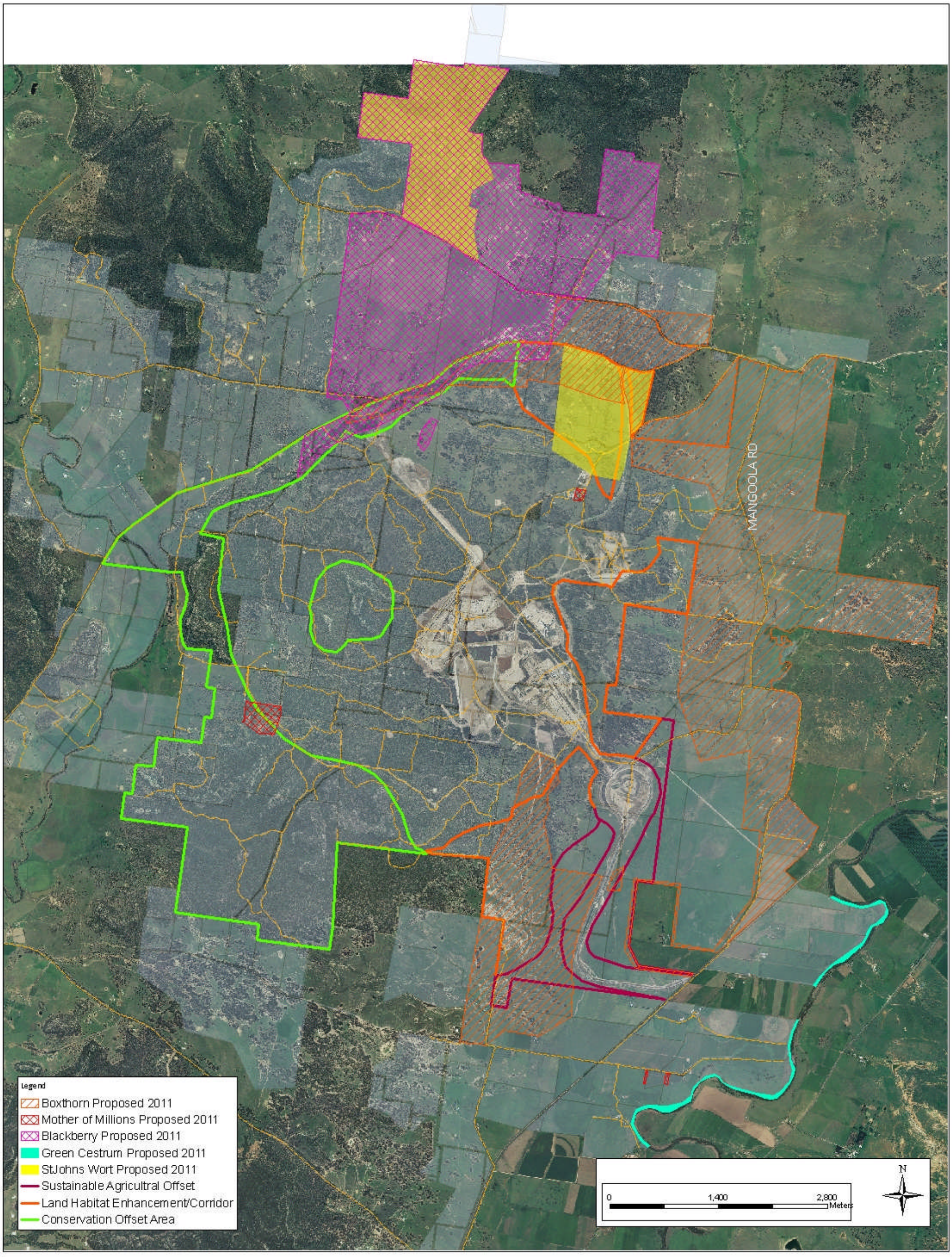
HUNTER LAND MANAGEMENT

Weed Action Plan 2010

Weeds Treated 2010

Compiled by: J. Milling Date: 2-2011

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HUNTER LAND MANAGEMENT

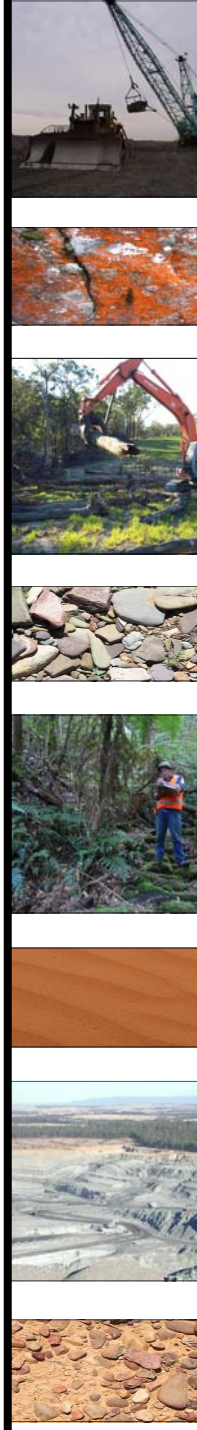
Xstrata Mangoola Weed Action Plan 2011

Weeds Proposed 2011

Compiled by: P. Milling Date: 2-2011

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Noise Monitoring Data



APPENDIX I

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Mangoola Coal
EPL Annual Return 2010/2011
Environmental Noise Monitoring

Prepared for
Xstrata Mangoola Coal

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Noise and Vibration Specialists
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Mangoola Coal, EPL Annual Return 2010/2011
Environmental Noise Monitoring

Reference: 11228_R01.doc

Report date: 15 August 2011

Prepared for:
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Prepared: Robert Kirwan
Acoustics Engineer

QA review: Katie Weekes
Environmental Scientist

Global Acoustics Pty Ltd ~ Environmental noise modelling and impact assessment ~ Sound power testing ~ Noise control advice ~ Noise and vibration monitoring ~ OHS noise monitoring and advice ~ Expert evidence in Land and Environment and Compensation Courts ~ Architectural acoustics ~ Blasting assessments and monitoring ~ Noise management plans (NMP) ~ Sound level meter and noise logger sales and hire

EXECUTIVE SUMMARY

Global Acoustics was engaged by Mangoola Coal (MC) to provide a summary of the quarterly environmental noise surveys conducted around Mangoola Coal's operations in 2010/2011.

Xstrata Mangoola Pty Limited obtained a modification to the project approval in November 2009 (06-0014) to continue open cut mining. Schedule 3, Conditions 3 to 11 of the approval contains the noise requirements.

Attended environmental noise monitoring described in this report was undertaken on a quarterly basis over the reporting period from Quarter 3 2010 to Quarter 2 2011. There were five monitoring locations. Measurements were taken in July and October 2010, and January and April 2011.

Attended monitoring was conducted in accordance with the Office of Environment and Heritage (OEH) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. The duration of each measurement was 15 minutes.

Wind speed and/or estimated temperature inversion conditions resulted in development consent criteria not always being applicable.

As shown in Table 4.2, Table 4.3 and Table 4.4, Mangoola Coal complied with the relevant day, evening and night consent $L_{Aeq(15\ minute)}$ and $L_{A1(1\ minute)}$ noise limits, where applicable, during 2010/2011.

TABLE OF CONTENTS

Page

1 INTRODUCTION 3

1.1 BACKGROUND 3

1.2 MONITORING LOCATIONS 3

1.3 TERMINOLOGY 5

2 CONSENTS AND CRITERIA 6

2.1 DEVELOPMENT CONSENT 6

2.2 EPA LICENCE 6

2.3 NOISE MONITORING PROGRAM 6

2.4 PROJECT SPECIFIC CRITERIA 6

3 METHODOLOGY 8

3.1 ATTENDED NOISE MONITORING 8

4 RESULTS 9

4.1 ATTENDED NOISE MONITORING 9

5 SUMMARY 18

5.1 SUMMARY 18

TABLE OF APPENDICES

A: DEVELOPMENT CONSENT

1 INTRODUCTION

1.1 BACKGROUND

Global Acoustics was engaged by Xstrata Mangoola Coal (XMC) to provide a summary of the quarterly environmental noise surveys conducted around Mangoola Coal operations in 2010/2011.

Attended environmental noise monitoring described in this report was undertaken on a quarterly basis over the reporting period from Quarter 3 2010 to Quarter 2 2011. There were five monitoring locations. Measurements were taken in July and October 2010, and January and April 2011.

1.2 MONITORING LOCATIONS

There were five monitoring locations during the surveys as detailed in detailed in Table 1.1 and shown on Figure 1.

Table 1.1 MONITORING LOCATIONS – 2010/2011

Descriptor	EIS Reference	Monitoring Location
A1[1]	96a/111	Mangoola Road
A1	162/111	1925 Castlerock Road
A2	104	Opposite 1711 Denman Road
A3	184	Cnr Bells Line and Mangooa Road
A4	130/148	Yarraman Road
A5	125A/125B	Cnr Mangoola and Roxburgh Road

Notes: 1. Monitoring location for Quarter 3 2010 only.



Figure 1 Monitoring Locations

1.3 TERMINOLOGY

Some definitions of terminology, which may be used in this report, are provided in Table 1.2.

Table 1.2 TERMINOLOGY

Descriptor	Definition
L_A	The A-weighted root mean squared (RMS) noise level at any instant
L_{A10}	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L_{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes
L_{Aeq}	The average noise energy during a measurement period
L_{pk}	The unweighted peak noise level at any instant
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
SEL	Sound exposure level (SEL), the A-weighted noise energy during a measurement period normalised to one second
ABL	Assessment background level (ABL), the 10th percentile background noise level for a single period (day, evening or night) of a 24 hour monitoring period
RBL	Rating background level (RBL), the background noise level for a period (day, evening or night) determined from ABL data
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
Day	This is the period 7:00am to 6:00pm
Evening	This is the period 6:00pm to 10:00pm
Night	The period 10:00pm to 7:00am

2 CONSENTS AND CRITERIA

A project approval and licence apply to the Mangoola Coal Project.

2.1 DEVELOPMENT CONSENT

Xstrata Mangoola Pty Limited obtained a modification to the project approval in November 2009 (06-0014) to continue open cut mining. Schedule 3, Conditions 3 to 11 of the approval contains the noise requirements.

The noise sections of the approval are reproduced in Appendix A.

2.2 EPA LICENCE

Mangoola Coal holds an Office of Environment and Heritage (OEH) Environmental Projection Licence (EPL) No. 12894 for coal mining, crushing, grinding and separating. Noise requirements are detailed in L6 of the licence.

The noise sections of the licence are reproduced in Appendix A.

2.3 NOISE MONITORING PROGRAM

The Noise Monitoring Program (NMP) for Mangoola Coal was finalised in September 2008 and last reviewed in August 2010. The latest version details the monitoring requirements associated with the operational phase of the mine as well as ongoing construction activities.

2.4 PROJECT SPECIFIC CRITERIA

Activities have been assessed against criteria from Table 1 of the project approval, the limiting of which are the impact assessment criteria as set out in Table 2.1.

Table 2.1 MANGOOLA COAL IMPACT ASSESSMENT CRITERIA

Location	EIS Reference	Day L_{Aeq}	Evening L_{Aeq}	Night L_{Aeq}	Night $L_{A1,1min}$
A1	96A/111	34/35	33/34	38/39	45
A2	104	36	36	38	45
A3	184	37	37	39	45
A4	130/148	39	39	37	45
A5[1]	125A/125B	36/33	35/32	38/37	45/45

Notes: 1. See explanation below.

The monitoring location at the intersection of Mangoola and Roxburgh Roads (A5) is at an elevated point with line of sight to Mangoola Coal. The nearest privately-owned residences are 1.25 kilometres or more to the east of this monitoring location. A ridgeline is between the residences and the operation, removing line of sight.

Therefore the criterion applied at this site is that for the nearest privately owned residences (EIS Reference numbers 125A and 125B).

Mangoola Coal land acquisition criteria are set out in Table 2.2.

Table 2.2 MANGOOLA COAL LAND ACQUISITION CRITERIA, L_{Aeq} dB

Location	Day	Evening	Night
All privately owned land	40	40	40

3 METHODOLOGY

3.1 ATTENDED NOISE MONITORING

Attended monitoring was conducted at all sites in accordance with the Office of Environment and Heritage (OEH) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken.

The duration of each measurement was 15 minutes. During 2010/2011 attended monitoring was undertaken once at each measurement location during the day period. From Quarter 1 2011, monitoring was also undertaken in the evening and night period.

Attended monitoring is preferred to the use of noise loggers when determining compliance with prescribed limits; it allows an accurate determination of the contribution, if any, to measured noise levels by the source of interest (in this case Mangoola Coal).

Meteorological data was obtained from Mangoola Coal meteorological stations. This allowed correlation of atmospheric parameters and measured noise levels. Sigma theta is used to calculate vertical temperature gradient (VTG) in accordance with procedures detailed in the INP.

Met data used in this report was sourced from Mangoola Coal's north and south meteorological stations.

The terms "Inaudible" (IA) and "less than 25 dB" (<25 dB) or "less than 20 dB" (<20 dB) may be used in this report. When site noise is noted as IA then there was no site noise at the monitoring location.

However, if site noise is noted as <25 dB or < 20 dB, this means some noise was audible but could not be quantified. In the case of very low site levels we do not consider it necessary to attempt to accurately quantify site noise as it would be significantly less than any criterion and most unlikely to cause annoyance (and in many cases, to be even noticed).

If site noise were not measurable due to masking then we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting if deemed necessary. All site values <25 dB or < 20 dB in this report are due to low absolute values.

4 RESULTS

4.1 ATTENDED NOISE MONITORING

Overall noise levels measured at each location during attended measurement in 2010/2011 are provided in Table 4.1 to Table 4.4.

Table 4.1 DAYTIME MEASURED NOISE LEVELS – QUARTER 3 2010

Location	Start Date And Time	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A90} dB
A1 – Mangoola Rd	27/07/2010 09:24	52	37	53	27
A2 – Denman Rd	27/07/2010 07:52	83	74	71	37
A3 – Bells Lane	27/07/2010 08:25	45	38	37	35
A4 – Yarraman Rd	27/07/2010 09:57	50	39	41	29
A5 – Roxburgh Rd	27/07/2010 08:54	58	48	52	33

Note: Noise levels in this table are not necessarily the result of activities at Mangoola Coal.

Table 4.2 DAYTIME MEASURED NOISE LEVELS – QUARTER 4 2010

Location	Start Date And Time	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A90} dB
A1 – Mangoola Rd	14/10/2010 07:52	45	39	37	28
A2 – Denman Rd	14/10/2010 09:17	79	59	63	33
A3 – Bells Lane	14/10/2010 08:46	42	39	37	34
A4 – Yarraman Rd	14/10/2010 07:21	45	39	37	30
A5 – Roxburgh Rd	14/10/2010 08:20	48	42	40	32

Note: Noise levels in this table are not necessarily the result of activities at Mangoola Coal.

Table 4.3 MEASURED NOISE LEVELS – QUARTER 1 2011

Location	Start Date And Time	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A90} dB
A1 – Mangoola Rd	25/01/2011 08:24	59	57	54	47
A2 – Denman Rd	25/01/2011 09:49	78	67	65	40
A3 – Bells Lane	25/01/2011 09:19	65	64	62	59
A4 – Yarraman Rd	25/01/2011 07:54	54	52	51	49
A5 – Roxburgh Rd	25/01/2011 08:50	46	39	38	35
A1 – Mangoola Rd	24/01/2011 20:26	59	49	46	34
A2 – Denman Rd	24/01/2011 21:47	70	54	56	38
A3 – Bells Lane	24/01/2011 21:16	65	64	62	58
A4 – Yarraman Rd	24/01/2011 19:56	53	51	49	40
A5 – Roxburgh Rd	24/01/2011 20:52	44	42	41	39
A1 – Mangoola Rd	25/01/2011 01:40	42	41	39	37
A2 – Denman Rd	25/01/2011 03:07	55	39	42	34
A3 – Bells Lane	25/01/2011 02:36	52	51	50	49
A4 – Yarraman Rd	25/01/2011 01:10	41	40	39	36
A5 – Roxburgh Rd	25/01/2011 02:07	48	46	44	40

Note: Noise levels in this table are not necessarily the result of activities at Mangoola Coal.

Table 4.4 MEASURED NOISE LEVELS – QUARTER 2 2011

Location	Start Date And Time	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A90} dB
A1 – Mangoola Rd	20/04/11 08:04	46	38	36	32
A2 – Denman Rd	20/04/11 09:57	79	67	66	35
A3 – Bells Lane	20/04/11 09:14	42	35	33	29
A4 – Yarraman Rd	20/04/11 07:00	50	43	40	31
A5 – Roxburgh Rd	20/04/11 08:43	53	46	42	32
A1 – Mangoola Rd	19/04/11 20:36	39	31	31	28
A2 – Denman Rd	21/04/11 21:04	57	49	46	30
A3 – Bells Lane	19/04/11 21:36	81	72	67	40
A4 – Yarraman Rd	19/04/11 20:03	33	31	29	28
A5 – Roxburgh Rd	19/04/11 21:08	41	39	37	35
A1 – Mangoola Rd	20/04/11 01:58	29	28	27	26
A2 – Denman Rd	19/04/11 23:01	32	30	29	28
A3 – Bells Lane	19/04/11 23:49	35	33	32	30
A4 – Yarraman Rd	20/04/11 01:27	34	33	31	30
A5 – Roxburgh Rd	20/04/11 02:31	37	36	34	33

Note: Noise levels in this table are not necessarily the result of activities at Mangoola Coal.

Table 4.5 to Table 4.8 compares measured levels with impact assessment criteria detailed in the consent. Criteria are then applied if weather conditions are in accordance with the project approval.

Table 4.5 $L_{Aeq(15\ min)}$ GENERATED BY MANGOOLA COAL AGAINST IMPACT ASSESSMENT CRITERIA – QUARTER 3 2010

Location	Date And Time	Wind Speed (m/s) [7]	VTG (°/C per 100m) [7]	L_{Aeq} Daytime Criterion dB [8]	Criterion Applies? [1,5]	MC L_{Aeq} dB [2,3]	Exceedance [4,6]
A1	27/07/2010 09:24	1.0	-1.8	35	Y	NM	Nil
A2	27/07/2010 07:52	1.1	3.0	36	N	NM	NA
A3	27/07/2010 08:25	0.9	0.5	37	Y	23	Nil
A4	27/07/2010 09:57	1.6	0.5	39	Y	28	Nil
A5	27/07/2010 08:54	1.6	3.0	33	N	NM	NA

Notes:

1. *Noise emission limits apply for the following meteorological conditions:*
   - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
   - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2m/s at 10 metres above ground level;*
2. *These are results for Mangoola Coal in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable;*
7. *Wind speed and sigma theta data sourced from Mangoola Coal meteorological station. Sigma theta data used to calculate Vertical Temperature Gradient (VTG) in accordance with procedures detailed in the INP; and*
8. *NA in criterion column means there is no criterion for this location as there is an agreement in place or is owned by Mangoola Coal.*

Table 4.6 $L_{Aeq(15\ min)}$ GENERATED BY MANGOOLA COAL AGAINST IMPACT ASSESSMENT CRITERIA – QUARTER 4 2010

Location	Date And Time	Wind Speed (m/s) [7]	VTG (°/C per 100m) [7]	L_{Aeq} Daytime Criterion dB [8]	Criterion Applies? [1,5]	MC L_{Aeq} dB [2,3]	Exceedance [4,6]
A1	14/10/10 07:52	1.6	0.5	35	Y	<20	Nil
A2	14/10/10 09:17	3.4	3.0	36	N	<25	NA
A3	14/10/10 08:46	1.9	-1.0	37	Y	35	Nil
A4	14/10/10 07:21	1.0	3.0	39	N	IA	NA
A5	14/10/10 08:20	2.6	0.5	33	N	32	NA

Notes:

1. *Noise emission limits apply for the following meteorological conditions:*
   - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
   - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2m/s at 10 metres above ground level;*
2. *These are results for Mangoola Coal in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable;*
7. *Wind speed and sigma theta data sourced from Mangoola Coal meteorological station. Sigma theta data used to calculate Vertical Temperature Gradient (VTG) in accordance with procedures detailed in the INP; and*
8. *NA in criterion column means there is no criterion for this location as there is an agreement in place or is owned by Mangoola Coal.*

Table 4.7 $L_{Aeq(15\ min)}$ GENERATED BY MANGOOLA COAL AGAINST IMPACT ASSESSMENT CRITERIA – QUARTER 1 2011

Location	Date And Time	Wind Speed (m/s) [7]	VTG (°/C per 100m) [7]	L_{Aeq} Daytime Criterion dB [8]	Criterion Applies? [1,5]	MC L_{Aeq} dB [2,3]	Exceedance [4,6]
A1	25/01/11 08:24	1.6	0.5	35	Y	<20	Nil
A2	25/01/11 09:49	1.2	-1.9	36	Y	33	Nil
A3	25/01/11 09:19	1.9	-1.0	37	Y	33	Nil
A4	25/01/11 07:54	2.5	-1.0	39	Y	IA	Nil
A5	25/01/11 08:50	2.7	0.5	33	N	30	NA
A1	24/01/11 20:26	2.0	3.0	34	N	IA	NA
A2	24/01/11 21:47	1.3	3.0	36	N	28	NA
A3	24/01/11 21:16	1.4	3.0	37	N	29	NA
A4	24/01/11 19:56	2.5	0.5	39	N	IA	NA
A5	24/01/11 20:52	3.5	0.5	32	N	23	NA
A1	25/01/11 01:40	0.8	3.0	39	N	23	NA
A2	25/01/11 03:07	3.4	3.0	39	N	25	NA
A3	25/01/11 02:36	1.2	4.1	39	N	25	NA
A4	25/01/11 01:10	0.8	3.0	37	N	20	NA
A5	25/01/11 02:07	0.7	-1.0	37	Y	30	Nil

Notes:

1. *Noise emission limits apply for the following meteorological conditions:*
   - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
   - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2m/s at 10 metres above ground level;*
2. *These are results for Mangoola Coal in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable;*
7. *Wind speed and sigma theta data sourced from Mangoola Coal meteorological station. Sigma theta data used to calculate Vertical Temperature Gradient (VTG) in accordance with procedures detailed in the INP; and*
8. *NA in criterion column means there is no criterion for this location as there is an agreement in place or is owned by Mangoola Coal.*

Table 4.8 $L_{Aeq(15\ min)}$ GENERATED BY MANGOOLA COAL AGAINST IMPACT ASSESSMENT CRITERIA – QUARTER 2 2011

Location	Date And Time	Wind Speed (m/s) [7]	VTG (°/C per 100m) [7]	L_{Aeq} Daytime Criterion dB [8]	Criterion Applies? [1,5]	MC L_{Aeq} dB [2,3]	Exceedance [4,6]
A1	20/04/11 08:04	2.0	-1.9	34	Y	32	Nil
A2	20/04/11 09:57	0.6	-1.9	36	Y	30	Nil
A3	20/04/11 09:14	1.2	-1.6	37	Y	28	Nil
A4	20/04/11 07:00	1.3	4.1	39	N	29	NA
A5	20/04/11 08:43	1.4	3.0	32	N	26	NA
A1	19/04/11 20:36	0.6	-1.0	39	Y	IA	Nil
A2	21/04/11 21:04	1.4	3.0	39	N	IA	NA
A3	19/04/11 21:36	1.1	3.0	39	N	<20	NA
A4	19/04/11 20:03	1.1	3.0	37	N	28	NA
A5	19/04/11 21:08	1.4	3.0	37	N	IA	NA
A1	20/04/11 01:58	0.3	0.5	35	Y	<20	Nil
A2	19/04/11 23:01	1.4	3.0	36	N	IA	NA
A3	19/04/11 23:49	0.6	0.5	37	Y	IA	Nil
A4	20/04/11 01:27	0.2	3.0	39	N	31	NA
A5	20/04/11 02:31	1.6	4.1	33	N	<20	NA

Notes:

1. *Noise emission limits apply for the following meteorological conditions:*
   - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
   - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2m/s at 10 metres above ground level;*
2. *These are results for Mangoola Coal in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable;*
7. *Wind speed and sigma theta data sourced from Mangoola Coal meteorological station. Sigma theta data used to calculate Vertical Temperature Gradient (VTG) in accordance with procedures detailed in the INP; and*
8. *NA in criterion column means there is no criterion for this location as there is an agreement in place or is owned by Mangoola Coal.*

Table 4.9 to Table 4.12 compares measured levels with land acquisition criteria. Criteria are then applied if weather conditions are in accordance with the project approval.

Table 4.9 $L_{Aeq(15\ min)}$ GENERATED BY MANGOOLA COAL AGAINST LAND ACQUISITION CRITERIA – QUARTER 3 2010

Location	Date And Time	Wind Speed (m/s) [7]	VTG (°/C per 100m) [7]	L_{Aeq} Daytime Criterion dB [8]	Criterion Applies? [1,5]	MC L_{Aeq} dB [2,3]	Exceedance [4,6]
A1	27/07/10 09:24	1.0	-1.8	40	Y	NM	Nil
A2	27/07/10 07:52	1.1	3.0	40	N	NM	NA
A3	27/07/10 08:25	0.9	0.5	40	Y	23	Nil
A4	27/07/10 09:57	1.6	0.5	40	Y	28	Nil
A5	27/07/10 08:54	1.6	3.0	40	N	NM	NA

Notes:

1. *Noise emission limits apply for the following meteorological conditions:*
   - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
   - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2m/s at 10 metres above ground level;*
2. *These are results for Mangoola Coal in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable;*
7. *Wind speed and sigma theta data sourced from Mangoola Coal meteorological station. Sigma theta data used to calculate Vertical Temperature Gradient (VTG) in accordance with procedures detailed in the INP; and*
8. *NA in criterion column means there is no criterion for this location as there is an agreement in place or is owned by Mangoola Coal.*

Table 4.10 $L_{Aeq(15\ min)}$ GENERATED BY MANGOOLA COAL AGAINST LAND ACQUISITION CRITERIA – QUARTER 4 2010

Location	Date And Time	Wind Speed (m/s) [7]	VTG (°/C per 100m) [7]	L_{Aeq} Daytime Criterion dB [8]	Criterion Applies? [1,5]	MC L_{Aeq} dB [2,3]	Exceedance [4,6]
A1	14/10/10 07:52	1.6	0.5	40	Y	<20	Nil
A2	14/10/10 09:17	3.4	3.0	40	N	<25	NA
A3	14/10/10 08:46	1.9	-1.0	40	Y	35	Nil
A4	14/10/10 07:21	1.0	3.0	40	N	IA	NA
A5	14/10/10 08:20	2.6	0.5	40	N	32	NA

Notes:

1. *Noise emission limits apply for the following meteorological conditions:*
   - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
   - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2m/s at 10 metres above ground level;*
2. *These are results for Mangoola Coal in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable;*
7. *Wind speed and sigma theta data sourced from Mangoola Coal meteorological station. Sigma theta data used to calculate Vertical Temperature Gradient (VTG) in accordance with procedures detailed in the INP; and*
8. *NA in criterion column means there is no criterion for this location as there is an agreement in place or is owned by Mangoola Coal.*

Table 4.11 $L_{Aeq(15\ min)}$ GENERATED BY MANGOOLA COAL AGAINST LAND ACQUISITION CRITERIA – QUARTER 1 2011

Location	Date And Time	Wind Speed (m/s) [7]	VTG (°/C per 100m) [7]	L_{Aeq} Daytime Criterion dB [8]	Criterion Applies? [1,5]	MC L_{Aeq} dB [2,3]	Exceedance [4,6]
A1	25/01/11 08:24	1.6	0.5	40	Y	<20	Nil
A2	25/01/11 09:49	1.2	-1.9	40	Y	33	Nil
A3	25/01/11 09:19	1.9	-1.0	40	Y	33	Nil
A4	25/01/11 07:54	2.5	-1.0	40	Y	IA	Nil
A5	25/01/11 08:50	2.7	0.5	40	N	30	NA
A1	24/01/11 20:26	2.0	3.0	40	N	IA	NA
A2	24/01/11 21:47	1.3	3.0	40	N	28	NA
A3	24/01/11 21:16	1.4	3.0	40	N	29	NA
A4	24/01/11 19:56	2.5	0.5	40	N	IA	NA
A5	24/01/11 20:52	3.5	0.5	40	N	23	NA
A1	25/01/11 01:40	0.8	3.0	40	N	23	NA
A2	25/01/11 03:07	3.4	3.0	40	N	25	NA
A3	25/01/11 02:36	1.2	4.1	40	N	25	NA
A4	25/01/11 01:10	0.8	3.0	40	N	20	NA
A5	25/01/11 02:07	0.7	-1.0	40	Y	30	Nil

Notes:

1. *Noise emission limits apply for the following meteorological conditions:*
   - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
   - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2m/s at 10 metres above ground level;*
2. *These are results for Mangoola Coal in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable;*
7. *Wind speed and sigma theta data sourced from Mangoola Coal meteorological station. Sigma theta data used to calculate Vertical Temperature Gradient (VTG) in accordance with procedures detailed in the INP; and*
8. *NA in criterion column means there is no criterion for this location as there is an agreement in place or is owned by Mangoola Coal.*

Table 4.12 $L_{Aeq(15\ min)}$ GENERATED BY MANGOOLA COAL AGAINST LAND ACQUISITION CRITERIA – QUARTER 2 2011

Location	Date And Time	Wind Speed (m/s) [7]	VTG (°/C per 100m) [7]	L_{Aeq} Daytime Criterion dB [8]	Criterion Applies? [1,5]	MC L_{Aeq} dB [2,3]	Exceedance [4,6]
A1	20/04/11 08:04	2.0	-1.9	40	Y	32	Nil
A2	20/04/11 09:57	0.6	-1.9	40	Y	30	Nil
A3	20/04/11 09:14	1.2	-1.6	40	Y	28	Nil
A4	20/04/11 07:00	1.3	4.1	40	N	29	NA
A5	20/04/11 08:43	1.4	3.0	40	N	26	NA
A1	19/04/11 20:36	0.6	-1.0	40	Y	IA	Nil
A2	21/04/11 21:04	1.4	3.0	40	N	IA	NA
A3	19/04/11 21:36	1.1	3.0	40	N	<20	NA
A4	19/04/11 20:03	1.1	3.0	40	N	28	NA
A5	19/04/11 21:08	1.4	3.0	40	N	IA	NA
A1	20/04/11 01:58	0.3	0.5	40	Y	<20	Nil
A2	19/04/11 23:01	1.4	3.0	40	N	IA	NA
A3	19/04/11 23:49	0.6	0.5	40	Y	IA	Nil
A4	20/04/11 01:27	0.2	3.0	40	N	31	NA
A5	20/04/11 02:31	1.6	4.1	40	N	<20	NA

Notes:

1. *Noise emission limits apply for the following meteorological conditions:*
   - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
   - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2m/s at 10 metres above ground level;*
2. *These are results for Mangoola Coal in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable;*
7. *Wind speed and sigma theta data sourced from Mangoola Coal meteorological station. Sigma theta data used to calculate Vertical Temperature Gradient (VTG) in accordance with procedures detailed in the INP; and*
8. *NA in criterion column means there is no criterion for this location as there is an agreement in place or is owned by Mangoola Coal.*

Table 4.13 compares measured levels with $L_{A1(1min)}$ impact assessment criteria. Criteria are then applied if weather conditions are in accordance with the project approval.

Table 4.13 $L_{A1(1\ min)}$ GENERATED BY MANGOOLA COAL AGAINST IMPACT ASSESSMENT CRITERIA – 2011

Location	Date And Time	Wind Speed m/sec	VTG Degrees / 100 m	XMC LAeq Criterion[1]	Criterion Applies[5]	XMC LAeq dB[2,3]	Exceedance dB[3]
A1	25/01/11 01:40	0.8	3.0	45	N	28	NA
A2	25/01/11 03:07	3.4	3.0	45	N	28	NA
A3	25/01/11 02:36	1.2	4.1	45	N	29	NA
A4	25/01/11 01:10	0.8	3.0	45	N	32	NA
A5	25/01/11 02:07	0.7	-1.0	45	Y	35	Nil
A1	20/04/11 01:58	0.3	0.5	45	Y	<20	Nil
A2	19/04/11 23:01	1.4	3.0	45	N	IA	NA
A3	19/04/11 23:49	0.6	0.5	45	Y	IA	Nil
A4	20/04/11 01:27	0.2	3.0	45	N	36	NA
A5	20/04/11 02:31	1.6	4.1	45	N	<20	NA

Notes:

1. *Noise emission limits apply for the following meteorological conditions:*
   - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
   - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2m/s at 10 metres above ground level;*
2. *These are results for Mangoola Coal in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable;*
7. *Wind speed and sigma theta data sourced from Mangoola Coal meteorological station. Sigma theta data used to calculate Vertical Temperature Gradient (VTG) in accordance with procedures detailed in the INP; and*
8. *NA in criterion column means there is no criterion for this location as there is an agreement in place or is owned by Mangoola Coal.*

5 SUMMARY

5.1 SUMMARY

Noise surveys were conducted around Mangoola Coal during 2010/2011. The purpose of the survey was to quantify and describe the acoustic environment around the site and compare the results with development consent conditions for the operations.

Wind speed and/or estimated temperature inversion conditions resulted in development consent criteria not always being applicable, as indicated in Table 4.2, Table 4.3 and Table 4.4.

Mangoola Coal complied with the relevant day, evening and night consent $L_{Aeq(15\ minute)}$ and $L_{A1(1\ minute)}$ noise limits, where applicable, during 2010/2011.

Global Acoustics Pty Ltd

Appendix

A: Development Consent

NSW Department of Planning Project Approval 06-0014 applies to the Mangoola Coal operation. The noise section is reproduced below:

A.1 MANGOOLA COAL MINE PROJECT APPROVAL

Conditions 3 and 4 of Schedule 3 of the Mangoola project approval relate to impact assessment and land acquisition criteria and are reproduced below.

Impact Assessment Criteria

NOISE

Noise Impact Assessment Criteria

3. The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 1.

Table 1: Noise impact assessment criteria dB(A)

Day	Evening	Night		Land Number
$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{A1(1minute)}$	
40	40	40	45	66
40	40	39	45	138
40	40	38	45	45B
40	40	37	45	180
39	39	37	45	130, 148
39	38	37	45	59B
38	39	38	45	139
38	38	40	45	186A, 186B
38	38	36	45	110
37	37	39	45	184
37	37	38	45	199
37	37	37	45	171
37	37	36	45	128, 144, 205
36	37	39	45	164
36	36	40	45	193, 125D, 125E, 125F
36	36	39	45	192, 189
36	36	38	45	74, 104, 183C
36	36	37	45	191
36	36	36	45	200, 134A
36	36	35	45	116A, 116B, 116C, 116D, 116E, 116F, 116G, 134B

Day	Evening	Night		Land Number
$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{A1(1minute)}$	
36	35	38	45	125A
35	36	38	45	185
35	35	38	45	183A, 183B
35	35	37	45	187, 190, 251
35	35	36	45	294
35	34	39	45	111, 162
35	34	38	45	125C
35	34	37	45	241B
35	34	36	45	174A, 174B, 175, 241C
34	34	38	45	96B, 168
34	34	37	45	198, 241A
34	34	36	45	178, 201A, 201B, 201C, 227
34	33	38	45	96A
34	32	38	45	75A
33	33	36	45	182, 269B
33	32	37	45	125B
32	32	36	45	240
38	38	38	-	Anglican Church, Castlerock Road
37	37	37	-	Catholic Church, Wybong Road

However, if the Proponent has a written negotiated noise agreement with any landowner of the land listed in Table 1, and a copy of this agreement has been forwarded to the Department and DECC, then the Proponent may exceed the noise limits in Table 1 in accordance with the negotiated noise agreement.

Notes:

- *To determine compliance with the $L_{Aeq(15\ minute)}$ noise limits, noise from the project is to be measured at the most affected point or within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.*
- *To determine compliance with the $L_{A1(1\ minute)}$ noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).*
- *The noise emission limits identified in the above table apply under meteorological conditions of:*
  - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
  - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.*

Land Acquisition Criteria

4. If the noise generated by the project exceeds the criteria in Table 2, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 10-12 of schedule 4.

Table 2: Land acquisition criteria dB(A)

Day/Evening/Night $L_{Aeq(15\ minute)}$	Land
40	All privately owned land, excluding the land listed in the table to Appendix 5.

Note: Noise generated by the project is to be measured in accordance with the notes presented below Table 1.

Cumulative Noise Criteria

Conditions 5 and 6 of Schedule 3 of the Mangoola project approval relate to cumulative noise criteria and are reproduced below.

5. The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other mines does not exceed the following amenity criteria on any privately owned land, excluding the land listed in the table to Appendix 5, to the satisfaction of the Director-General:
   - $L_{Aeq(11\ hour)}$ 50 dB(A) – Day;
   - $L_{Aeq(4\ hour)}$ 45 dB(A) – Evening; and
   - $L_{Aeq(9\ hour)}$ 40 dB(A) – Night.

6. If the cumulative noise generated by the project combined with the noise generated by other mines exceeds the following amenity criteria on any privately owned land, excluding the land listed in the table to Appendix 5, then upon receiving a written request from the landowner, the Proponent shall take all reasonable and feasible measures to acquire the land on as equitable basis as possible with the relevant mines, in accordance with the procedures in conditions 10-12 of schedule 4, to the satisfaction of the Director-General:
   - $L_{Aeq(11\ hour)}$ 53 dB(A) – Day;
   - $L_{Aeq(4\ hour)}$ 48 dB(A) – Evening; and
   - $L_{Aeq(9\ hour)}$ 43 dB(A) – Night.

   Notes:
   - *For the purpose of this condition, the expression "Proponent" in conditions 10-12 of schedule 4 should be interpreted as the Proponent and any other relevant mine owners.*
   - *The cumulative noise generated by the project combined with the noise generated by other mines is to be measured in accordance with the relevant procedures in the NSW Industrial Noise Policy.*

Traffic Noise Criteria

Condition 7 of Schedule 3 of the Mangoola project approval relates to traffic noise and is reproduced below.

7. The Proponent shall take all reasonable and feasible measures to ensure that the traffic noise generated by the project (after commencement of mining operations) combined with the traffic noise generated by other mines does not exceed the traffic noise impact assessment criteria in Table 3:

Table 3: Traffic noise criteria dB(A)

Road	Day/Evening	Night
	$L_{Aeq(5\ hour)}$	$L_{Aeq(1\ hour)}$
Denman Road	60	55
Wybong Road, Bengalla Link Road	55	50

Note: Traffic noise generated by the project is to be measured in accordance with the relevant procedures in the DECC's Environmental Criteria for Road Traffic Noise.

Additional Noise Mitigation

Conditions 8 and 9 of Schedule 3 of the Mangoola project approval relate to additional noise mitigation measures and are reproduced below.

8. Upon receiving a written request from:
   - a landowner of the land listed in the table to Appendix 5 (unless the landowner has requested acquisition); or
   - a landowner of the land listed in Table 1 (except where a negotiated noise agreement is in place); or
   - the owner of any residence where subsequent operational noise monitoring shows the noise generated by the project is greater than, or equal to, $L_{Aeq(15\ minute)}$ 35 dB(A) (except where a negotiated noise agreement is in place); or
   - an owner of the 4 residences on Wybong Road where traffic noise levels are predicted in the EA to exceed the traffic noise criteria in Table 3 (ie. Residence numbers 168, 246, 249 and 96B); or
   - an owner of the 2 residences adjacent the Ulan to Muswellbrook rail line where rail noise levels are predicted in the EA to cause additional exceedances of the applicable rail noise criteria,

   the Proponent shall implement additional noise mitigation measures such as double glazing, insulation, and/or air conditioning at any residence on the land in consultation with the landowner.

   These additional mitigation measures must be reasonable and feasible.

   If within 3 months of receiving this request from the landowner, the Proponent and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

   Within 3 months of this approval, the Proponent shall notify all applicable landowners that they are entitled to receive additional noise mitigation measures, to the satisfaction of the Director-General.

9. Prior to starting mining operations, the Proponent shall ensure that all development on site is carried out during the day, with the exception of:
   (a) development that is inaudible at residences on privately owned land;
   (b) the delivery of materials to the site as requested by Police or other authorities for safety reasons;
   (c) emergency work to avoid the loss of lives, property and/or to prevent environmental harm; or
   (d) development specifically approved in writing by the Director-General.

Monitoring

Condition 11 of Schedule 3 of the Mangoola Coal project approval relates to monitoring and is reproduced below.

Monitoring

11. The Proponent shall prepare and implement a detailed Noise Monitoring Program for the project to the satisfaction of the Director-General. This program must:
   (a) be prepared in consultation with DECC;
   (b) be submitted to the Director-General for approval prior to carrying out any development on site; and
   (c) include:
      - a combination of real-time and supplementary attended monitoring measures; and
      - noise monitoring protocol for evaluating compliance with the noise impact assessment and land acquisition criteria in this approval.

A.2 MANGOOLA COAL MINE ENVIRONMENT PROTECTION LICENCE NO. 12894

L6 Noise Limits

L6.1 Noise generated from the premises must not exceed the noise impact assessment criteria in the following table.

Day	Evening	Night		Land Number
$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{A1(1\ minute)}$	
40	40	40	45	66
40	40	39	45	138
40	40	38	45	45B
40	40	37	45	180
39	39	37	45	130, 148
39	38	37	45	59B
38	39	38	45	139
38	38	40	45	186A, 186B
38	38	36	45	110
37	37	39	45	184
37	37	38	45	199
37	37	37	45	171
37	37	36	45	128, 144, 205
36	37	39	45	164
36	36	40	45	193, 125D, 125E, 125F
36	36	39	45	192, 189
36	36	38	45	74, 104, 183C
36	36	37	45	191
36	36	36	45	200, 134A
36	36	35	45	116A, 116B, 116C, 116D, 116E, 116F, 116G, 134B
36	35	38	45	125A
35	36	38	45	185
35	35	38	45	183A, 183B
35	35	37	45	187, 190, 251
35	35	36	45	294
35	34	39	45	111, 162
35	34	38	45	125C
35	34	37	45	241B
35	34	36	45	174A, 174B, 175, 241C
34	34	38	45	96B, 168
34	34	37	45	198, 241A
34	34	36	45	178, 201A, 201B, 201C, 227
34	33	38	45	96A
34	32	38	45	75A
33	33	36	45	182, 269B
33	32	37	45	125B
32	32	36	45	240
38	38	38	-	Anglican Church, Castlerock Road.
37	37	37	-	Catholic Church, Wybong Road.

L_{Aeq} means the equivalent continuous noise level – the level equivalent to the energy average of noise levels occurring over a measurement period.

Notes:

- **Day** is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays.
- **Evening** is defined as the period of 6pm to 10pm.
- **Night** is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8 am on Sundays and Public Holidays.
- These limits do not apply if the Licensee has an approved written agreement with the relevant owner/s of these residences to generate higher noise levels.
- Land identification numbers refer to *Anvil Hill Project – Environmental Assessment, Centennial Hunter Pty Limited, June 2006.*

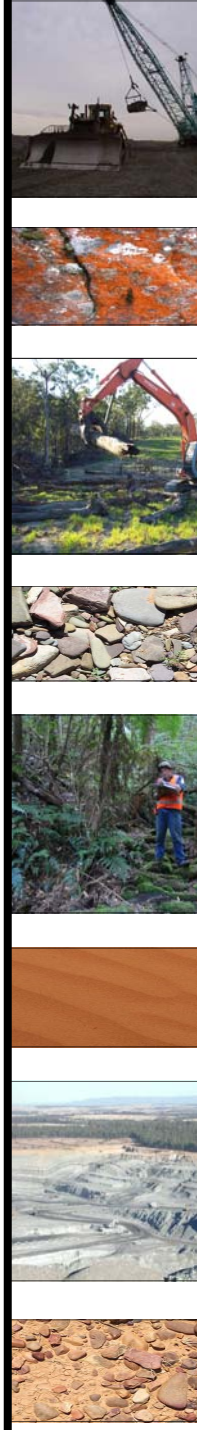
L6.2 To determine compliance with the $L_{Aeq(15\ minutes)}$ conditions L6.1 noise from the premises must be measured at, or computed for, the most affected point on or within the residential boundary, or at the most affected point within 30m of the dwelling (rural situations) where the dwelling is more than 30m from the boundary.
Where it can be demonstrated that direct measurement of noise from the premises is impractical, the EPA may accept alternative means of determining compliance. See Chapter 11 of the NSW Industrial Noise Policy.
The modification factors presented in Section 4 of the NSW Industrial Noise Policy shall be applied to the measured noise levels where applicable.

L6.3 To determine compliance with $L_{A1(1minute)}$ conditions L6.1 noise from the premises is to be measured at 1m from the dwelling façade.
Where it can be demonstrated that direct measurement of noise from the premises is impractical, the EPA may accept alternative means of determining compliance. See Chapter 11 of the NSW Industrial Noise Policy.

L6.4 The noise emission limits identified in conditions L6.1 apply under meteorological conditions of:
- Wind speed up to 3m/s at 10 metres above ground level; or
- Temperature inversion conditions of up to 4°C/100m and wind speed up to 2m/s at 10 metres above the ground.

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Blast Vibration Monitoring Data



APPENDIX J

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Mangoola Coal 2010-11 AEMR
Blasting Vibration Data

Date	Time of Blast	Blast Number	Location of blast	The Book			Rockshelters						Nearest Transgrid Pylon								
				Monitor Used	Overpressure (dBL)	Vibration (mm/s)	Tailings Pit Rockshelter	Overpressure (dBL)	Vibration (mm/s)	North Pit Rockshelter (transgrid)	Overpressure (dBL)	Vibration (mm/s)	Monitor Used	Overpressure (dBL)	Vibration (mm/s)	Location	Monitor Used	Vibration (mm/s)	Location	Monitor Used	Vibration (mm/s)
7/07/2010	14:00		Rail Loop																		
9/07/2010	14:00		Borrow Pit 4										Instantel permanent monitor	114.64	6.78						
22/07/2010	14:00		Rail Loop																		
23/07/2010	14:00		Borrow Pit 4										Instantel permanent monitor	129.35	11.87						
20/08/2010	13:45		Borrow Pit 2										Instantel permanent monitor	118.84	0.74						
2/09/2010	14:10		Tailings Pit										Instantel permanent monitor	104.78	0.71						
8/09/2010	14:18		Tailings Pit										Instantel permanent monitor	119.37	0.34						
14/09/2010	12:35		Tailings Pit										Instantel permanent monitor	105.68	1.04						
19/09/2010	12:29		Tailings Pit	Instantel permanent monitor	106.64	0.97							Instantel permanent monitor	110.49	0.66						
21/09/2010	11:28		Tailings Pit	Instantel permanent monitor	110.51	0.78							Instantel permanent monitor	113.08	0.67						
23/09/2010	12:27		Tailings Pit	Instantel permanent monitor	110.14	0.79	Instantel permanent monitor	110.04	1.11				Instantel permanent monitor	104.11	0.49						
24/09/2010	12:06		Tailings Pit	Instantel permanent monitor	110.33	0.53	Instantel permanent monitor	115.8	2.02				Instantel permanent monitor	111.69	0.94						
28/09/2010	12:10		Tailings Pit	Instantel permanent monitor	101.24	0.37	Instantel permanent monitor	110.54	1.24				Instantel permanent monitor	112.75	0.7						
1/10/2010	12:04		Tailings Pit	Instantel permanent monitor	112.2	0.45	Instantel permanent monitor	117.3	1.57				Instantel permanent monitor	109.4	0.75						
8/10/2010	12:06		Tailings Pit	Instantel permanent monitor	116.51	1.63	Instantel permanent monitor	125.03	5.97				Instantel permanent monitor	116.1	1.72						
12/10/2010	12:37		Tailings Pit	Instantel permanent monitor	108.73	0.68	Instantel permanent monitor	108.93	1.85				Instantel permanent monitor	104.42	0.4						
12/10/2010	12:39		Tailings Pit	Instantel permanent monitor	109.46	0.46	Instantel permanent monitor	115.39	1.08				Instantel permanent monitor	112.93	0.59						
14/10/2010	12:16		Tailings Pit	Instantel permanent monitor	105.82	0.49	Instantel permanent monitor	116.34	2.26				Instantel permanent monitor	112.15	0.46						
19/10/2010	12:03		Tailings Pit	Instantel permanent monitor	117.27	2.35	Instantel permanent monitor	119.95	3.69				Instantel permanent monitor	112.96	1.41						
22/10/2010	12:05		Tailings Pit	Instantel permanent monitor	107.47	0.96	Instantel permanent monitor	120.43	4.66				Instantel permanent monitor	117.26	1.53						
22/10/2010	12:05		Tailings Pit	Instantel permanent monitor	105.77	1.46	Instantel permanent monitor	107.61	1.9				Instantel permanent monitor	105.16	0.43						
27/10/2010	12:09		Tailings Pit	Instantel permanent monitor	111.07	1.41	Instantel permanent monitor	116.41	2.57				Instantel permanent monitor	113.6	0.79						
29/10/2010	12:17		Tailings Pit	Instantel permanent monitor	116.3	0.41	Instantel permanent monitor	116.85	1.28				Instantel permanent monitor	113.12	1.69						
5/11/2010	12:22		Tailings Pit	Instantel permanent monitor	112.72	0.38	Instantel permanent monitor	120.28	1.45				Instantel permanent monitor	122.73	1.85						
10/11/2010	12:09		Tailings Pit	Instantel permanent monitor	107.88	0.59	Instantel permanent monitor	119.26	2.52				Instantel permanent monitor	124.96	4.47						
12/11/2010	12:03		Tailings Pit	Instantel permanent monitor	112.28	0.4	Instantel permanent monitor	119.33	2.13				Instantel permanent monitor	122.4	4.36						
16/11/2010	12:02		Tailings Pit	Instantel permanent monitor	105.38	0.23	Instantel permanent monitor	113.97	1.47				Instantel permanent monitor	116.63	1.58						
22/11/2010	12:05		Tailings Pit	Instantel permanent monitor	113.89	0.63	Instantel permanent monitor	125.69	2.88				Instantel permanent monitor	132.3	27.61						
24/11/2010	12:03		Tailings Pit	Instantel permanent monitor	112.24	0.56	Instantel permanent monitor	112.93	1.17				Instantel permanent monitor	103.56	0.34						
29/11/2010	12:05		Tailings Pit	Instantel permanent monitor	111.52	0.55	Instantel permanent monitor	116.95	1.63				Instantel permanent monitor	125.15	Monitor Fault- Refer to Pylon Monitor Data							
1/12/2010	12:03		Tailings Pit	Instantel permanent monitor	103.83	0.54	Instantel permanent monitor	110.99	2.43				Instantel permanent monitor	120.1	36.15	Adjacent to TPL	BVE002	24.7	Transgrid Pylon Footing	BVE003	17.6
6/12/2010			Tailings Pit	Instantel permanent monitor	104.37	0.55	Instantel permanent monitor	110.95	2.08				Instantel permanent monitor	122.63	Monitor Fault- Refer to Pylon Monitor Data	Adjacent to TPL	BVE002	47.2	Transgrid Pylon Footing	BVE003	
8/12/2010	12:06		Tailings Pit	Instantel permanent monitor	99.68	0.39	Instantel permanent monitor	108.8	1.42				Instantel permanent monitor	121.15	32.94	Adjacent to TPL	BVE002	**59**	Transgrid Pylon Footing	BVE003	15.8
10/12/2010	13:01		Tailings Pit	Instantel permanent monitor	106.93	0.52	Instantel permanent monitor	113.04	1.25				Instantel permanent monitor	129.88	9.51	Adjacent to TPL	BVE002	9.6	Transgrid Pylon Footing	BVE003	7.54
16/12/2010	12:35		Tailings Pit	Instantel permanent monitor	95.84	0.42	Instantel permanent monitor	108.04	0.88				Instantel permanent monitor	123.14	Monitor Fault- Refer to Pylon Monitor Data	Adjacent to TPL	BVE002	14.4	Transgrid Pylon Footing	BVE003	30.6
16/12/2010	12:37		Tailings Pit	Instantel permanent monitor	107.34	0.47	Instantel permanent monitor	111.37	1.11				Instantel permanent monitor	123	21.61	Adjacent to TPL	BVE002	33.1	Transgrid Pylon Footing	BVE003	17.8
21/12/2010	12:12		Tailings Pit	Instantel permanent monitor	102.21	0.46	Instantel permanent monitor	106.61	1.45				Instantel permanent monitor	123.28	Monitor Fault- Refer to Pylon Monitor Data	Adjacent to TPL	BVE002	41.1	Transgrid Pylon Footing	BVE003	30.1
23/12/2010	12:03		Tailings Pit	Instantel permanent monitor	99.95	0.39	Instantel permanent monitor	105.48	0.59				Instantel permanent monitor			Transgrid Pylon #2 Footing	BVE002	38.3	Transgrid Pylon #3 Footing	BVE003	10.5
24/12/2010	12:04		Tailings Pit	Instantel permanent monitor	103.34	0.4	Instantel permanent monitor	110.69	1.55				Instantel permanent monitor			Transgrid Pylon #2 Footing	BVE002	14	Transgrid Pylon #3 Footing	BVE003	26.1
31/12/2010	12:01		Tailings Pit	Instantel permanent monitor	103.49	0.47	Instantel permanent monitor	112.37	0.73				Instantel permanent monitor	105.68	0.36	Transgrid Pylon #2 Footing	BVE002	Did not trigger < 1.5	Transgrid Pylon #3 Footing	BVE003	Did not trigger < 1.5
31/12/2010	12:03		Tailings Pit	Instantel permanent monitor	101.4	0.37	Instantel permanent monitor	106.1	2.21				Instantel permanent monitor	124.46	Monitor Fault- Refer to Pylon Monitor Data	Transgrid Pylon #2 Footing	BVE002	26.2	Transgrid Pylon #3 Footing	BVE003	26
5/01/2011	14:45	49	Tailings Pit	Instantel permanent monitor	107.41	0.38	Instantel permanent monitor	111.01	1.27				Instantel permanent monitor	125.31	Monitor Fault- Refer to Pylon Monitor Data	Transgrid Pylon #2 Footing	BVE002	**52.5**	Transgrid Pylon #3 Footing	BVE003	42.1
7/01/2011	12:34	33	Tailings Pit	Instantel permanent monitor	110.64	0.58	Instantel permanent monitor	114.62	1.66				Instantel permanent monitor	123.4	22.17	Transgrid Pylon #2 Footing	BVE002	**52.5**	Transgrid Pylon #3 Footing	BVE003	16.1

Date	Time of Blast	Blast Number	Location of blast	The Book			Rockshelters						Nearest Transgrid Pylon							
				Monitor Used	Overpressure (dBL)	Vibration (mm/s)	Tailings Pit Rockshelter	Overpressure (dBL)	Vibration (mm/s)	North Pit Rockshelter (transgrid)	Overpressure (dBL)	Vibration (mm/s)	Monitor Used	Overpressure (dBL)	Vibration (mm/s)	Location	Monitor Used	Vibration (mm/s)	Location	Monitor Used	Vibration (mm/s)
12/01/2011	12:09	50	Tailings Pit	Instantel permanent monitor	109.99	0.48	Instantel permanent monitor	122.21	2.16				Instantel permanent monitor	124.92	7.71	Transgrid Pylon #2 Footing	BVE002	2.88	Transgrid Pylon #3 Footing	BVE003	3.49
14/01/2011	12:11	28a	Tailings Pit	Instantel permanent monitor	113.15	0.034	Instantel permanent monitor	122.66	1.03				Instantel permanent monitor	131.04	8.87	Transgrid Pylon #2 Footing	BVE002	2.74	Transgrid Pylon #3 Footing	BVE003	2.29
18/01/2011	12:00	51	Tailings Pit	Instantel permanent monitor	104.77	0.24	Instantel permanent monitor	111.84	0.57				Instantel permanent monitor	121.36	4.16	Transgrid Pylon #2 Footing	BVE002	3.11	Transgrid Pylon #3 Footing	BVE003	2.5
21/01/2011	12:06	39/44	Tailings Pit	Instantel permanent monitor	103.29	0.58	Instantel permanent monitor	109.13	1.34				Instantel permanent monitor	129.33	Monitor Fault- Refer to Pylon Monitor Data	Transgrid Pylon #2 Footing	BVE002	21.6	Transgrid Pylon #3 Footing	BVE003	43.9
25/01/2011	9:02	53	Tailings Pit	Instantel permanent monitor	102.65	0.3	Instantel permanent monitor	106.7	0.48				Instantel permanent monitor	110.86	5.64	Transgrid Pylon #2 Footing	BVE001	16.1	Transgrid Pylon #3 Footing	BVE003	7.6
27/01/2011	12:03	41 + 45	Tailings Pit	Instantel permanent monitor	99.82	0.58	Instantel permanent monitor	107.5	2.33				Instantel permanent monitor	129.14	Monitor Fault- Refer to Pylon Monitor Data	Transgrid Pylon #2 Footing	BVE002	28.9	Transgrid Pylon #3 Footing	BVE003	**53.7**
28/01/2011	14:51	48	Tailings Pit	Instantel permanent monitor	109.3	0.54	Instantel permanent monitor	111.25	0.69				Instantel permanent monitor	119.51	13.11	Transgrid Pylon #1 Footing	BVE002	16.5	Transgrid Pylon #2 Footing	BVE003	**52.1**
31/01/2011	14.52	38	Tailings Pit	Instantel permanent monitor	104.66	0.55	Instantel permanent monitor	115.02	1.77				Instantel permanent monitor	138.12	Monitor Fault- Refer to Pylon Monitor Data	Transgrid Pylon #2 Footing	BVE002	34.1	Transgrid Pylon #3 Footing	BVE003	**77.2**
4/02/2011	9:10	18a	Tailings Pit	Instantel permanent monitor	98.35	0.07	Instantel permanent monitor	102.61	0.28				Instantel permanent monitor	101.21	0.11	Transgrid Pylon #2 Footing	BVE002	Did not trigger < 1.5	Transgrid Pylon #3 Footing	BVE003	Did not trigger < 1.5
4/02/2011	9:13	42/46	Tailings Pit	Instantel permanent monitor	101.04	0.38	Instantel permanent monitor	110.62	1.28				Instantel permanent monitor	129.19	Monitor Fault- Refer to Pylon Monitor Data	Transgrid Pylon #2 Footing	BVE002	35.6	Transgrid Pylon #3 Footing	BVE003	**80**
8/02/2011	12:02	54	Tailings Pit	Instantel permanent monitor	105.27	0.33	Instantel permanent monitor	109.75	0.87				Instantel permanent monitor	116.58	14.33	Transgrid Pylon #2 Footing	BVE002	11.5	Transgrid Pylon #3 Footing	BVE003	43.6
11/02/2011	12:08	62	Tailings Pit	Instantel permanent monitor	102.58	0.53	Instantel permanent monitor	112.87	1.77				Instantel permanent monitor	122.32	13.24	Transgrid Pylon #2 Footing	BVE002	27.2	Transgrid Pylon #3 Footing	BVE003	13.3
15/02/2011	12:05	55 &64	Tailings Pit	Instantel permanent monitor	103.97	0.52	Instantel permanent monitor	108.46	0.87				Instantel permanent monitor	116.62	15.96	Transgrid Pylon #2 Footing	BVE002	**61.6**	Transgrid Pylon #1 Footing	BVE003	11.1
18/02/2011	12:08	64	Tailings Pit	Instantel permanent monitor	101.81	0.25	Instantel permanent monitor	109.97	0.5				Instantel permanent monitor	115.16	1.85	Transgrid Pylon #2 Footing	BVE002	6.07	Transgrid Pylon #1 Footing	BVE003	2.98
18/02/2011	12:26	47+57	Tailings Pit	Instantel permanent monitor	110.62	0.61	Instantel permanent monitor	116.5	1.35				Instantel permanent monitor	133.3	23.85	Transgrid Pylon #2 Footing	BVE002	**103**	Transgrid Pylon #1 Footing	BVE003	13.8
22/02/2011	12:06	51B	Tailings Pit	Instantel permanent monitor	109.24	0.36	Instantel permanent monitor	111.61	0.71				Instantel permanent monitor	121.75	4.95	Transgrid Pylon #2 Footing	BVE002	4.19	Transgrid Pylon #3 Footing	BVE003	2.53
25/02/2011	12:06	58	Tailings Pit	Instantel permanent monitor	104.39	0.31	Instantel permanent monitor	111.13	1.06				Instantel permanent monitor	122.11	22.44	Transgrid Pylon #2 Footing	BVE002	**108**	Transgrid Pylon #3 Footing	BVE003	20
25/02/2011	12:08	65	Tailings Pit	Instantel permanent monitor	96.82	0.2	Instantel permanent monitor	102.06	0.49				Instantel permanent monitor	120.88	Monitor Fault- Refer to Pylon Monitor Data	Transgrid Pylon #2 Footing	BVE002	**89.39**	Transgrid Pylon #3 Footing	BVE003	29.9
2/03/2011	1:05	56	Tailings Pit	Instantel permanent monitor	102.34	0.35	Instantel permanent monitor	107.22	0.94				Instantel permanent monitor	113.38	10.89	Transgrid Pylon #1 Footing	BVE002	11.2	Transgrid Pylon #2 Footing	BVE003	49.1
2/03/2011	1:07	59	Tailings Pit	Instantel permanent monitor	106.47	0.21	Instantel permanent monitor	109.35	0.61				Instantel permanent monitor	26.55	18.02	Transgrid Pylon #1 Footing	BVE002	3.82	Transgrid Pylon #2 Footing	BVE003	38.8
3/03/2011	12:06	61	Tailings Pit	Instantel permanent monitor	98.03	0.2	Instantel permanent monitor	109.9	0.42				Instantel permanent monitor	129.21	28.01	Transgrid Pylon #2 Footing	BVE002	**56.5**	Transgrid Pylon #3 Footing	BVE003	16.1
3/03/2011	12:09	50B	Tailings Pit	Instantel permanent monitor	95.5	0.1	Instantel permanent monitor	102.57	0.29				Instantel permanent monitor	121.95	1.43	Transgrid Pylon #2 Footing	BVE002	1.28	Transgrid Pylon #3 Footing	BVE003	Did not trigger < 1.5
4/03/2011	11:35	65B	Tailings Pit	Instantel permanent monitor	97.79	0.13	Instantel permanent monitor	102.19	0.35	Instantel permanent monitor	102.2	0.32				Transgrid Pylon #1 Footing	BVE002	1.32	Transgrid Pylon #2 Footing	BVE003	**81.8**
4/03/2011	13:00	76	North Pit	Instantel permanent monitor	98.23	0.32	Instantel permanent monitor	102.59	0.43	Instantel permanent monitor	109.5	0.83				Transgrid Pylon #72 Footing	BVE002	22.1			
9/03/2011	12:05	58B	Tailings Pit	Instantel permanent monitor	105.93	0.12	Instantel permanent monitor	110.84	0.3	Instantel permanent monitor	105.59	0.3				Transgrid Pylon #2 Footing	BVE002	22.9	Transgrid Pylon #3 Footing	BVE003	4.54
9/03/2011	12:08	60	Tailings Pit	Instantel permanent monitor	98.31	0.13	Instantel permanent monitor	105.8	0.31	Instantel permanent monitor	102	0.35				Transgrid Pylon #2 Footing	BVE002	28.5	Transgrid Pylon #3 Footing	BVE003	11.3
10/03/2011	14:55	77	North Pit	Instantel permanent monitor	93.53	0.26	Instantel permanent monitor	99.47	0.37	Instantel permanent monitor	109.49	0.59				Transgrid Pylon #72 Footing	BVE002	9.77	Transgrid Pylon #71 Footing	BVE001	8.52
11/03/2011	12:06	59B	Tailings Pit	Instantel permanent monitor	104.77	0.17	Instantel permanent monitor	111.03	0.51	Instantel permanent monitor	106.2	0.3				Transgrid Pylon # 1 Footing	BVE002	3.97	Transgrid Pylon # 2 Footing	BVE003	43
15/03/2011	10:05	60B	Tailings Pit	Instantel permanent monitor	106.53	0.2	Instantel permanent monitor	111.88	0.49	Instantel permanent monitor	108.98	0.33				Transgrid Pylon #1 Footing	BVE002	5.87	Transgrid Pylon #2 Footing	BVE003	45.5
16/03/2011	11:59	60C	Tailings Pit	Instantel permanent monitor	100.07	0.12	Instantel permanent monitor	107.59	0.29	Instantel permanent monitor	102.19	0.29				Transgrid Pylon # 1 Footing	BVE002	**53.1**	Transgrid Pylon # 2 Footing	BVE003	
16/03/2011	13:00	78	North Pit	Instantel permanent monitor	94.55	0.17	Instantel permanent monitor	101.27	0.31	Instantel permanent monitor	107.39	0.44				Transgrid Pylon #72 Footing	BVE002	6.13	Transgrid Pylon #71 Footing	BVE003	5.69
18/03/2011	12:06	61B	Tailings Pit	Instantel permanent monitor	99.41	0.14	Instantel permanent monitor	103.67	0.27	Instantel permanent monitor	102.85	0.3				Transgrid Pylon #2 Footing	BVE002	**93**	Transgrid Pylon #2 Footing	BVE003	**72.5**
23/03/2011	12:22	79	North Pit	Instantel permanent monitor	97.7	0.29	Instantel permanent monitor	105.08	0.36	Instantel permanent monitor	108.65	0.64				Transgrid Pylon #72 Footing	BVE002	4.49	Transgrid Pylon #71 Footing	BVE003	6.46
25/03/2011	12:10	66	Tailings Pit	Instantel permanent monitor	90.37	0.29	Instantel permanent monitor	98.03	0.94	Instantel permanent monitor	91.05	0.57				Transgrid Pylon #2 Footing	BVE002	32.1	Transgrid Pylon #3 Footing	BVE003	18.2
29/03/2011	12:02	67	Tailings Pit	Instantel permanent monitor	95.79	0.17	Instantel permanent monitor	102.88	0.69	Instantel permanent monitor	99.93	0.46				Transgrid Pylon #2 Footing	BVE002	31.6	Transgrid Pylon #3 Footing	BVE003	
29/03/2011	12:16	70	Tailings Pit	Instantel permanent monitor	100.54	0.26	Instantel permanent monitor	106.47	0.84	Instantel permanent monitor	102.7	0.77				Transgrid Pylon #2 Footing	BVE002	36	Transgrid Pylon #3 Footing	BVE003	
31/03/2011	11:37	68	Tailings Pit	Instantel permanent monitor	102.96	0.24	Instantel permanent monitor	109.02	0.88	Instantel permanent monitor	104.27	0.61				Transgrid Pylon #2 Footing	BVE002	30.1	Transgrid Pylon #3 Footing	BVE003	23.6
31/03/2011	12:40	80	North Pit	Instantel permanent monitor	96.39	0.41	Instantel permanent monitor	95.05	0.68	Instantel permanent monitor	107.4	0.77				Transgrid Pylon #72 Footing	BVE002	4.69	Transgrid Pylon #71 Footing	BVE003	6.84
1/04/2011	14:41	69 and 46b	Tailings Pit	Instantel permanent monitor	100.11	0.17	Instantel permanent monitor	105.26	0.67	Instantel permanent monitor	105	0.7				Transgrid Pylon #2 Footing	BVE002	**54.7**	Transgrid Pylon #3 Footing	BVE003	32.6
1/04/2011	14:43	53b	Tailings Pit	Instantel permanent monitor	96.14	0.01	Instantel permanent monitor	102.42	0.02	Instantel permanent monitor	98.92	0.01				Transgrid Pylon #2 Footing	BVE002	Did not trigger < 1.5	Transgrid Pylon #3 Footing	BVE003	Did not trigger < 1.5
6/04/2011	14:05	75	North Pit	Instantel permanent monitor	95.89	0.22	Instantel permanent monitor	96.54	0.29	Instantel permanent monitor	107.84	0.5				Transgrid Pylon #72 Footing	BVE002	30.7	Transgrid Pylon #71 Footing	BVE001	3.35
8/04/2011	12:05	71	Tailings Pit	Instantel permanent monitor	103.51	0.25	Instantel permanent monitor	108.45	0.87	Instantel permanent monitor	107.18	0.56				Transgrid Pylon #2 Footing	BVE002	43.5	Transgrid Pylon #3 Footing	BVE003	11
11/04/2011	12:04	90	Tailings Pit	Instantel permanent monitor	93.18	0.2	Instantel permanent monitor	99.33	0.67	Instantel permanent monitor	92.93	0.43				Transgrid Pylon #2 Footing	BVE002	**59.6**	Transgrid Pylon #3 Footing	BVE003	10.7

Mangoola Coal 2010-11 AEMR
Blasting Vibration Data

Date	Time of Blast	Blast Number	Location of blast	The Book			Rockshelters						Nearest Transgrid Pylon								
				Monitor Used	Overpressure (dBL)	Vibration (mm/s)	Tailings Pit Rockshelter	Overpressure (dBL)	Vibration (mm/s)	North Pit Rockshelter (transgrid)	Overpressure (dBL)	Vibration (mm/s)	Monitor Used	Overpressure (dBL)	Vibration (mm/s)	Location	Monitor Used	Vibration (mm/s)	Location	Monitor Used	Vibration (mm/s)
12/04/2011	13:57	63	Tailings Pit	Instantel permanent monitor	98.69	0.28	Instantel permanent monitor	108.2	1.57	Instantel permanent monitor	93.53	1.09				Transgrid Pylon #3 Footing	BVE002	5.38	Transgrid Pylon #2 Footing	BVE003	5.77
12/04/2011	13:59	52	Tailings Pit	Instantel permanent monitor	96.82	0.17	Instantel permanent monitor	100.98	0.31	Instantel permanent monitor	90.1	0.15				Transgrid Pylon #3 Footing	BVE002	Did not trigger < 1.5	Transgrid Pylon #2 Footing	BVE003	2.23
13/04/2011	12:10	72	Tailings Pit	Instantel permanent monitor	97.27	0.26	Instantel permanent monitor	99.47	0.93	Instantel permanent monitor	98.88	0.72				Transgrid Pylon #2 Footing	BVE002	45.7	Transgrid Pylon #3 Footing	BVE003	8.77
14/04/2011	12:11	73	Tailings Pit	Instantel permanent monitor	93.46	0.25	Instantel permanent monitor	85.21	0.51	Instantel permanent monitor	89.6	0.7				Transgrid Pylon #2 Footing	BVE002	36.9	Transgrid Pylon #3 Footing	BVE003	10.5
15/04/2011	12:12	74	Tailings Pit	Instantel permanent monitor	100.42	0.17	Instantel permanent monitor	102.66	0.54	Instantel permanent monitor	100.81	0.43				Transgrid Pylon #2 Footing	BVE002	**61.8**	Transgrid Pylon #3 Footing	BVE003	10.5
20/04/2011	12:04	82	North Pit	Instantel permanent monitor	100.07	0.37	Instantel permanent monitor	102.01	0.64	Instantel permanent monitor	112.03	0.71				Transgrid Pylon #71 Footing	BVE002	5.47			
21/04/2011	12:03	44B	Tailings Pit	Instantel permanent monitor	97.87	0.22	Instantel permanent monitor	104.17	0.98	Instantel permanent monitor	100.75	0.59				Transgrid Pylon #2 Footing	BVE002	8.46	Transgrid Pylon #3 Footing	BVE003	4.72
29/04/2011	12:04	81A	North Pit	Instantel permanent monitor	91.64	0.09	Instantel permanent monitor	92.72	0.17	Instantel permanent monitor	99.14	0.4				Transgrid Pylon #71 Footing	BVE002	1.94			
29/04/2011	12:16	81B	North Pit	Instantel permanent monitor	101.43	0.34	Instantel permanent monitor	103.99	0.61	Instantel permanent monitor	111.2	0.77				Transgrid Pylon #71 Footing	BVE002	3.92			
3/05/2011	12:10	83	North Pit	Instantel permanent monitor	101.73	0.34	Instantel permanent monitor	106.14	0.7	Instantel permanent monitor	114.58	0.72				Transgrid Pylon #70 Footing	BVE002	4.68			
5/05/2011	12:10	86	North Pit	Instantel permanent monitor	98.27	0.51	Instantel permanent monitor	98.15	1.04	Instantel permanent monitor	113.61	1.53				Transgrid Pylon #71 Footing	BVE002	6.77			
6/05/2011	12:05	63B	Tailings Pit	Instantel permanent monitor	102.91	0.21	Instantel permanent monitor	108.62	0.72	Instantel permanent monitor	101.67	0.39				Transgrid Pylon #2 Footing	BVE002	4.49	Transgrid Pylon #3 Footing	BVE003	4.1
7/05/2011	11:04	92B	Tailings Pit	Instantel permanent monitor	100.11	0.21	Instantel permanent monitor	106.36	0.41	Instantel permanent monitor	103.14	0.18				Transgrid Pylon #2 Footing	BVE002	3.38	Transgrid Pylon #3 Footing	BVE003	1.67
10/05/2011	12:12	92A	Tailings Pit	Instantel permanent monitor	98.62	0.22	Instantel permanent monitor	107.56	0.45	Instantel permanent monitor	100.53	0.55				Transgrid Pylon #2 Footing	BVE002	5.81	Transgrid Pylon #3 Footing	BVE003	3.43
12/05/2011	12:09	93	Tailings Pit	Instantel permanent monitor	96.58	0.17	Instantel permanent monitor	Monitor Malfunction	Monitor Malfunction	Instantel permanent monitor	87.29	0.32				Transgrid Pylon #2 Footing	BVE002	10.4	Transgrid Pylon #3 Footing	BVE003	5.02
13/05/2011	12:08	84	North Pit	Instantel permanent monitor	100.63	0.26	Instantel permanent monitor	**58.74**	0	Instantel permanent monitor	106.87	0.53				Transgrid Pylon #70 Footing	BVE002	6.14	Transgrid Pylon #71 Footing	BVE003	2.05
16/05/2011	12:06	94	Tailings Pit	Instantel permanent monitor	98.47	0.14	BVE002	DNT, <1.0 mm/s		Instantel permanent monitor	101.33	0.35							Transgrid Pylon #3 Footing	BVE003	9.99
18/05/2011	12:06	96	Tailings Pit	Instantel permanent monitor	111.86	0.16	Instantel permanent monitor	120.85	0.46	Instantel permanent monitor	115.61	0.39				Transgrid Pylon #2 Footing	BVE002	6.14	Transgrid Pylon #3 Footing	BVE003	3.96
20/05/2011	12:10	100	North Pit	Instantel permanent monitor	102.06	0.37	Instantel permanent monitor	108.18	0.51	Instantel permanent monitor	114.85	0.89				Transgrid Pylon #70 Footing	BVE002	7.39	Transgrid Pylon #71 Footing	BVE003	2.8
20/05/2011	12:12	85	North Pit	Instantel permanent monitor	100.14	0.38	Instantel permanent monitor	105.49	0.74	Instantel permanent monitor	110.7	0.72				Transgrid Pylon #70 Footing	BVE002	4.02	Transgrid Pylon #71 Footing	BVE003	2.68
25/05/2011	10:06	87	North Pit	Instantel permanent monitor	105.24	0.47	Instantel permanent monitor	113.48	1.38	Instantel permanent monitor	114.98	1.25				Transgrid Pylon #70 Footing	BVE002	5.38	Transgrid Pylon #71 Footing	BVE003	3.96
26/05/2011	12:12	95	Tailings Pit	Instantel permanent monitor	122.31	0.3	Instantel permanent monitor	134.28	1.25	Instantel permanent monitor	129.2	1.08							Transgrid Pylon #3 Footing	BVE003	13
27/05/2011	12:11	99	North Pit	Instantel permanent monitor	96.63	0.71	Instantel permanent monitor	107.63	0.99	Instantel permanent monitor	109.29	1.16				Transgrid Pylon #70 Footing	BVE003	18.8	Transgrid Pylon #69 Footing	BVE001	5.77
2/06/2011	12:07	89	North Pit	Instantel permanent monitor	99.17	0.97	Instantel permanent monitor	104.68	0.98	Instantel permanent monitor	108.99	1.07				Transgrid Pylon #70 Footing	BVE002	5.85			
3/06/2011	12:14	97	Tailings Pit	Instantel permanent monitor	95.41	0.18	Instantel permanent monitor	106.57	0.67	Instantel permanent monitor	97.81	0.65				Transgrid Pylon #3 Footing	BVE002	3.04			
7/06/2011	12:18	89B	North Pit	Instantel permanent monitor	98.69	0.8	Instantel permanent monitor	106.82	0.63	Instantel permanent monitor	104.44	0.73				Transgrid Pylon #70 Footing	BVE003	4.85			
9/06/2011	12:16	90	North Pit	Instantel permanent monitor	95.52	1.1	Instantel permanent monitor	105.87	1.3	Instantel permanent monitor	103.33	1.08				Transgrid Pylon #70 Footing	BVE001	10.8	Transgrid Pylon #69 Footing	BVE003	6.57
10/06/2011	13:34	98	North Pit	Instantel permanent monitor	105.12	1.12	Instantel permanent monitor	112.63	1.43	Instantel permanent monitor	117.12	1.33				Transgrid Pylon #70 Footing	BVE001	16	Transgrid Pylon #69 Footing	BVE003	11.6
22/06/2011	10:02	88	North Pit	Instantel permanent monitor	97.83	0.37	Instantel permanent monitor	105.87	0.46	Instantel permanent monitor	105.8	0.67				Transgrid Pylon #72 Footing	BVE003	1.46	Transgrid Pylon #70 Footing	BVE002	1.32
22/06/2011	10:04	110	North Pit	Instantel permanent monitor	91.03	0.16	Instantel permanent monitor	100.41	0.14	Instantel permanent monitor	103.5	0.22				Transgrid Pylon #72 Footing	BVE003	3.35	Transgrid Pylon #70 Footing	BVE002	Did not trigger < 1.5
23/06/2011	12:14	102	North Pit	Instantel permanent monitor	100.48	1.28	Instantel permanent monitor	115.92	1.49	Instantel permanent monitor	105.9	1.83				Transgrid Pylon #70 Footing	BVE003	24.1	Transgrid Pylon #69 Footing	BVE002	19.9
27/06/2011	14:48	113	Tailings Pit	Instantel permanent monitor	105.13	0.34	Instantel permanent monitor	113.88	0.45	Instantel permanent monitor	109.6	0.4				Transgrid Pylon #2 Footing	BVE001	7.77			
27/06/2011	14:50	101	North Pit	Instantel permanent monitor	106	0.86	Instantel permanent monitor	112.69	1.43	Instantel permanent monitor	114.28	1.56				Transgrid Pylon #70 Footing	BVE003	44.3	Transgrid Pylon #69 Footing	BVE002	10.7

Mangoola Coal 2010-11 AEMR
Blasting Vibration Data

Date	Time of Blast	Blast Number	Location of blast	Castle Hill Slab			Nearest Private Residence								Dam Wall						
				Monitor Used	Overpressure (dBL)	Vibration (mm/s)	Withers (Tailings Pit)	Monitor	Overpressure (dBL)	Vibration (mm/s)	Comment	Phelps (North Pit)	Monitor	Overpressure (dBL)	Vibration (mm/s)	North Abutment Monitor used	Overpressure (dBL)	Vibration (mm/s)	Top of Wall Monitor used	Vibration (mm/s)	Bottom of Wall	Vibrations (mm/s)
7/07/2010	14:00		Rail Loop	BVE001	79.26	0.01	BV04 - Cole Residence	BVE003	100	0.199												
9/07/2010	14:00		Borrow Pit 4	BVE001	94	0.151	BV02 - Withers Residence	BVE003	91.5	0.247												
22/07/2010	14:00		Rail Loop		83.87	0.01	BV04 - Cole Residence	BVE003	100	0.294												
23/07/2010	14:00		Borrow Pit 4	Instantel permanent monitor	101.75	0.04	BV02 - Withers Residence		100.7	0.05												
20/08/2010	13:45		Borrow Pit 2	Instantel permanent monitor	94.3	0.11	BV02 - Withers Residence	Instantel permanent monitor	110.05	0.17												
2/09/2010	14:10		Tailings Pit	Instantel permanent monitor	101.75	0.13	BV02 - Withers Residence	Instantel permanent monitor	101.43	0.17												
8/09/2010	14:18		Tailings Pit	Instantel permanent monitor	103.21	0.05	BV02 - Withers Residence	Instantel permanent monitor	96.16	0.13												
14/09/2010	12:35		Tailings Pit	Instantel permanent monitor	93.72	0.17	BV02 - Withers Residence	Instantel permanent monitor	89.87	0.31												
19/09/2010	12:29		Tailings Pit	Instantel permanent monitor	92.42	0.12	BV02 - Withers Residence	Instantel permanent monitor	100.38	0.27												
21/09/2010	11:28		Tailings Pit	Instantel permanent monitor	96.64	0.14	BV02 - Withers Residence	Instantel permanent monitor	102.31	0.29												
23/09/2010	12:27		Tailings Pit	Instantel permanent monitor	92.59	0.09	BV02 - Withers Residence	Instantel permanent monitor	88.73	0.3												
24/09/2010	12:06		Tailings Pit	Instantel permanent monitor	93.09	0.12	BV02 - Withers Residence	Instantel permanent monitor	101.91	0.44												
28/09/2010	12:10		Tailings Pit	Instantel permanent monitor	103.94	0.09	BV02 - Withers Residence	Instantel permanent monitor	104.3	0.19												
1/10/2010	12:04		Tailings Pit	Instantel permanent monitor	97.9	0.16	BV02 - Withers Residence	Instantel permanent monitor	97.9	0.16						BVE001		4.28	BVE002	3.86	BVE003	7.92
8/10/2010	12:06		Tailings Pit	Instantel permanent monitor	100.29	0.16	BV02 - Withers Residence	Instantel permanent monitor	97.42	0.31						BVE001		14.9	BVE002	11.1	BVE003	6.39
12/10/2010	12:37		Tailings Pit	Instantel permanent monitor	93.09	0.08	BV02 - Withers Residence	Instantel permanent monitor	100.18	0.14						BVE003		12	BVE001	11.1	BVE002	5.65
12/10/2010	12:39		Tailings Pit	Instantel permanent monitor	94.91	0.05	BV02 - Withers Residence	Instantel permanent monitor	97.59	0.27						BVE003		23.3	BVE001	5.1	BVE002	2.82
14/10/2010	12:16		Tailings Pit	Instantel permanent monitor	93.25	0.07	BV02 - Withers Residence	Instantel permanent monitor	104.84	0.18						BVE002		10.5	BVE003	5.39	BVE001	2.07
19/10/2010	12:03		Tailings Pit	Instantel permanent monitor	103.13	0.23	BV02 - Withers Residence	Instantel permanent monitor	95.34	0.58						BVE002		16	BVE003	24		
22/10/2010	12:05		Tailings Pit	Instantel permanent monitor	90.67	0.17	BV02 - Withers Residence	Instantel permanent monitor	101.43	0.23						BVE002		16.1	BVE003	5.4		
22/10/2010	12:05		Tailings Pit	Instantel permanent monitor	90.67	0.1	BV02 - Withers Residence	Instantel permanent monitor	99.14	0.17						BVE002		3.91	BVE003	3.82		
27/10/2010	12:09		Tailings Pit	Instantel permanent monitor	93.01	0.16	BV02 - Withers Residence	Instantel permanent monitor	101.36	0.18						BVE001		9.42	BVE003	6.13		
29/10/2010	12:17		Tailings Pit	Instantel permanent monitor	100.03	0.06	BV02 - Withers Residence	Instantel permanent monitor	97.02	0.19						BVE001		13.4	BVE003	6.74		
5/11/2010	12:22		Tailings Pit	Instantel permanent monitor	98.03	0.09	BV02 - Withers Residence	Instantel permanent monitor	94.2	0.27						BVE003		11.6	BVE001	3.99		
10/11/2010	12:09		Tailings Pit	Instantel permanent monitor	95.25	0.14	BV02 - Withers Residence	Instantel permanent monitor	99.85	0.2						BVE003		4.52	BVE001	6.06		
12/11/2010	12:03		Tailings Pit	Instantel permanent monitor	92.42	0.1	BV02 - Withers Residence	Instantel permanent monitor	101.26	0.14						BVE003		6.08	BVE001	Did not trigger		
16/11/2010	12:02		Tailings Pit	Instantel permanent monitor	89.89	0.05	BV02 - Withers Residence	Instantel permanent monitor	97.02	0.14						BVE001		5.27	BVE003	3.4		
22/11/2010	12:05		Tailings Pit	Instantel permanent monitor	101.32	0.21	BV02 - Withers Residence	Instantel permanent monitor	97.64	0.26						BVE001		7.03				
24/11/2010	12:03		Tailings Pit	Instantel permanent monitor	95.97	0.13	BV02 - Withers Residence	Instantel permanent monitor	96.72	0.13						BVE001		9.44	BVE003	5.64	BVE002	3.61
29/11/2010	12:05		Tailings Pit	Instantel permanent monitor	94.78	0.15	BV02 - Withers Residence	Instantel permanent monitor	97.95	0.22						BVE002		10.9				
1/12/2010	12:03		Tailings Pit	Instantel permanent monitor	88.89	0.16	BV02 - Withers Residence	Instantel permanent monitor	86.87	0.17						BVE001		3.44				
6/12/2010			Tailings Pit	Instantel permanent monitor	86.82	0.18	BV02 - Withers Residence	Instantel permanent monitor	90.88	0.13						BVE001		3.23				
8/12/2010	12:06		Tailings Pit	Instantel permanent monitor	85.94	0.12	BV02 - Withers Residence	Instantel permanent monitor	91.23	0.16						BVE001		2.39				
10/12/2010	13:01		Tailings Pit	Instantel permanent monitor	90.67	0.1	BV02 - Withers Residence	Instantel permanent monitor	102.01	0.17						BVE001		6.74				
16/12/2010	12:35		Tailings Pit	Instantel permanent monitor	93.87	0.15	BV02 - Withers Residence	Instantel permanent monitor	94.36	0.11						BVE001		5				
16/12/2010	12:37		Tailings Pit	Instantel permanent monitor	95.61	0.12	BV02 - Withers Residence	Instantel permanent monitor	107.8	0.2						BVE001		7.5				
21/12/2010	12:12		Tailings Pit	Instantel permanent monitor	89.77	0.16	BV02 - Withers Residence	Instantel permanent monitor	99.59	0.13						BVE001		5.07				
23/12/2010	12:03		Tailings Pit	Instantel permanent monitor	84.76	0.09	BV02 - Withers Residence	Instantel permanent monitor	97.81	0.13						BVE001		5.32				
24/12/2010	12:04		Tailings Pit	Instantel permanent monitor	101.23	0.12	BV02 - Withers Residence	Instantel permanent monitor	98.12	0.14						BVE001		2.78				
31/12/2010	12:01		Tailings Pit	Instantel permanent monitor	87.92	0.14	BV02 - Withers Residence	Instantel permanent monitor	90.64	0.18						BVE001		did not trigger				
31/12/2010	12:03		Tailings Pit	Instantel permanent monitor	84.1	0.15	BV02 - Withers Residence	Instantel permanent monitor	90.01	0.1						BVE001		did not trigger				
5/01/2011	14:45	49	Tailings Pit	Instantel permanent monitor	92.15	0.09	BV02 - Withers Residence	Instantel permanent monitor	94.68	0.15						BVE001	112	4.68	CO15	4.48	CO19	2.12
7/01/2011	12:34	33	Tailings Pit	Instantel permanent monitor	106.92	0.12	BV02 - Withers Residence	Instantel permanent monitor	**116.01**	0.21	116.01 (recorded after blast)					BVE001	115.6	5.69	CO15	4.78	CO19	2.32

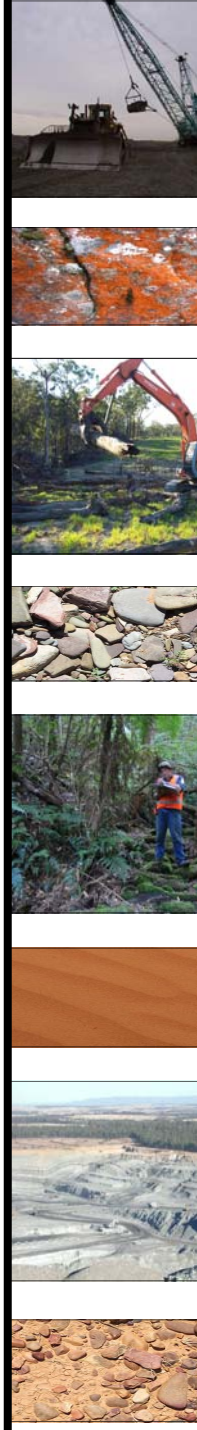
Mangoola Coal 2010-11 AEMR
Blasting Vibration Data

Date	Time of Blast	Blast Number	Location of blast	Castle Hill Slab			Nearest Private Residence									Dam Wall						
				Monitor Used	Overpressure (dBL)	Vibration (mm/s)	Withers (Tailings Pit)	Monitor	Overpressure (dBL)	Vibration (mm/s)	Comment	Phelps (North Pit)	Monitor	Overpressure (dBL)	Vibration (mm/s)	North Abutment Monitor used	Overpressure (dBL)	Vibration (mm/s)	Top of Wall Monitor used	Vibration (mm/s)	Bottom of Wall	Vibrations (mm/s)
12/01/2011	12:09	50	Tailings Pit	Instantel permanent monitor	93.41	0.14	BV02 - Withers Residence	Instantel permanent monitor	98.22	0.15						BVE001	115.2	3.67	CO15	6.77	CO19	2.48
14/01/2011	12:11	28a	Tailings Pit	Instantel permanent monitor	92.93	0.09	BV02 - Withers Residence	Instantel permanent monitor	111.53	0.011						BVE001	124.4	1.036	CO15	3.48	CO19	1.66
18/01/2011	12:00	51	Tailings Pit	Instantel permanent monitor	91.49	0.06	BV02 - Withers Residence	Instantel permanent monitor	90.64	0.06						BVE001	109.5	4.89	CO15	2.52	CO19	0.94
21/01/2011	12:06	39/44	Tailings Pit	Instantel permanent monitor	92.59	0.17	BV02 - Withers Residence	Instantel permanent monitor	89.03	0.14						BVE001	107.5	3.95	CO15	3.43	CO19	1.58
25/01/2011	9:02	53	Tailings Pit	Instantel permanent monitor	88.63	0.08	BV02 - Withers Residence	Instantel permanent monitor	95.76	0.08						BVE002 Monitor Fault - Refer to dam wall monitors			CO15	5.11	CO19	2.95
27/01/2011	12:03	41 + 45	Tailings Pit	Instantel permanent monitor	86.65	0.16	BV02 - Withers Residence	Instantel permanent monitor	95.05	0.13						BVE001	111.8	3.789	CO15	4.24	CO19	1.95
28/01/2011	14:51	48	Tailings Pit	Instantel permanent monitor	113.3	0.19	BV02 - Withers Residence	Instantel permanent monitor	108.89	0.15						BVE001	118.3	3.74	CO15	4.52	CO19	2.24
31/01/2011	14.52	38	Tailings Pit	Instantel permanent monitor	87.47	0.16	BV02 - Withers Residence	Instantel permanent monitor	91.49	0.13						BVE001	114.6	4.93	CO15	3.38	CO19	1.49
4/02/2011	9:10	18a	Tailings Pit	Instantel permanent monitor	81.45	0.01	BV02 - Withers Residence	Instantel permanent monitor	83.86	0.04						BVE001	114.4	4.24	CO15	0.61	CO19	0.49
4/02/2011	9:13	42/46	Tailings Pit	Instantel permanent monitor	87.47	0.14	BV02 - Withers Residence	Instantel permanent monitor	90.15	0.12						BVE001	109.2	3.71	CO15	3.88	CO19	1.75
8/02/2011	12:02	54	Tailings Pit	Instantel permanent monitor	102.41	0.08	BV02 - Withers Residence	Instantel permanent monitor	93.22	0.16						BVE001	111.8	3.85	CO15	3.04	CO19	1.61
11/02/2011	12:08	62	Tailings Pit	Instantel permanent monitor	92.93	0.16	BV02 - Withers Residence	Instantel permanent monitor	99.86	0.11						BVE001	88	7.7	CO15	6.4	CO19	2.29
15/02/2011	12:05	55 &64	Tailings Pit	Instantel permanent monitor	96.75	0.09	BV02 - Withers Residence	Instantel permanent monitor	100.57	0.12						BVE001	112	2.82	CO15	2.79	CO19	1.36
18/02/2011	12:08	64	Tailings Pit	Instantel permanent monitor	89.77	0.08	BV02 - Withers Residence	Instantel permanent monitor	88.08	0.08						BVE001	n/a	3.08	CO15	3.12	CO19	1.4
18/02/2011	12:26	47+57	Tailings Pit	Instantel permanent monitor	97.75	0.18	BV02 - Withers Residence	Instantel permanent monitor	87.74	0.2						BVE001	n/a	6.48	CO15	3.73	CO19	1.89
22/02/2011	12:06	51B	Tailings Pit	Instantel permanent monitor	98.91	0.07	BV02 - Withers Residence	Instantel permanent monitor	91.49	0.05						BVE001	n/a	2.74	CO15	3.24	CO19	1.28
25/02/2011	12:06	58	Tailings Pit	Instantel permanent monitor	90.35	0.09	BV02 - Withers Residence	Instantel permanent monitor	97.78	0.14						BVE001	n/a	2.64	CO15	2.2	CO19	1.19
25/02/2011	12:08	65	Tailings Pit	Instantel permanent monitor	84.97	0.05	BV02 - Withers Residence	Instantel permanent monitor	88.08	0.06						BVE001	n/a	2.06	CO15	1.48	CO19	0.58
2/03/2011	1:05	56	Tailings Pit	Instantel permanent monitor	97.51	0.01	BV02 - Withers Residence	Instantel permanent monitor	90.9	0.11		Wybong PO	Instantel permanent monitor	100.8	0.05	BVE001	112.6	3.27	CO15	2.6	CO19	1.21
2/03/2011	1:07	59	Tailings Pit	Instantel permanent monitor	92.06	0.06	BV02 - Withers Residence	Instantel permanent monitor	97.89	0.05		Wybong PO	Instantel permanent monitor	100.57	0.04	BVE001	114.4	1.74	CO15	1.47	CO19	0.73
3/03/2011	12:06	61	Tailings Pit	Instantel permanent monitor	82.33	0.03	BV02 - Withers Residence	Instantel permanent monitor	94.01	0.06		Wybong PO	Instantel permanent monitor	84.51	0.02	BVE001	115.9	1.67	CO15	1.67	CO19	0.83
3/03/2011	12:09	50B	Tailings Pit	Instantel permanent monitor	85	0.03	BV02 - Withers Residence	Instantel permanent monitor	91.6	0.04		Wybong PO	Instantel permanent monitor	83.56	0.01	BVE001	108	1.5	CO15	1.36	CO19	0.52
4/03/2011	11:35	65B	Tailings Pit	Instantel permanent monitor	85.37	0.05	BV02 - Withers Residence	Instantel permanent monitor	87.2	0.04		Wybong PO	Instantel permanent monitor	90.02	0.04	BVE001	109.9	3.17	CO15	1.14	CO19	0.6
4/03/2011	13:00	76	North Pit	Instantel permanent monitor	93.41	0.15	BV02 - Withers Residence	Instantel permanent monitor	85.58	0.09		Wybong PO	Instantel permanent monitor	102.57	0.17							
9/03/2011	12:05	58B	Tailings Pit	Instantel permanent monitor	89.89	0.04	BV02 - Withers Residence	Instantel permanent monitor	98.05	0.04		Wybong PO	Instantel permanent monitor	89.67	0.02	BVE001	Did not trigger, memory full due to nearby dozer		CO15	1.5	CO19	0.47
9/03/2011	12:08	60	Tailings Pit	Instantel permanent monitor	89.53	0.03	BV02 - Withers Residence	Instantel permanent monitor	89.17	0.04		Wybong PO	Instantel permanent monitor	84	0.02	BVE001	Did not trigger, memory full due to nearby dozer		CO15	1.8	CO19	0.66
10/03/2011	14:55	77	North Pit	Instantel permanent monitor	92.93	0.09	BV02 - Withers Residence	Instantel permanent monitor	94.42	0.07		Wybong PO	Instantel permanent monitor	91.61	0.14							
11/03/2011	12:06	59B	Tailings Pit	Instantel permanent monitor	92.06	0.05	BV02 - Withers Residence	Instantel permanent monitor	91.49	0.05		Wybong PO	Instantel permanent monitor	95.41	0.03	BVE001	112	1.67	CO15	1.73	CO19	0.78
15/03/2011	10:05	60B	Tailings Pit	Instantel permanent monitor	92.06	0.04	BV02 - Withers Residence	Instantel permanent monitor	88.72	0.06		Wybong PO	Instantel permanent monitor	96.3	0.03	BVE001	112.8	2.31	CO15	2.54	CO19	0.76
16/03/2011	11:59	60C	Tailings Pit	Instantel permanent monitor	88.21	0.04	BV02 - Withers Residence	Instantel permanent monitor	90.66	0.05		Wybong PO	Instantel permanent monitor	91.16	0.02	BVE001	Did not trigger, < 1.5 mm/s		CO15	1.68	CO19	0.82
16/03/2011	13:00	78	North Pit	Instantel permanent monitor	85.76	0.05	BV02 - Withers Residence	Instantel permanent monitor	94.42	0.09		Wybong PO	Instantel permanent monitor	95.69	0.07							
18/03/2011	12:06	61B	Tailings Pit	Instantel permanent monitor	86.48	0.04	BV02 - Withers Residence	Instantel permanent monitor	87.56	0.04		Wybong PO	Instantel permanent monitor	92.88	0.02	BVE001	Did not trigger, < 1.5		CO15	1.31	CO19	0.45
23/03/2011	12:22	79	North Pit	Instantel permanent monitor	101.48	0.05	BV02 - Withers Residence	Instantel permanent monitor	97.39	0.05		Wybong PO	Instantel permanent monitor	106.47	0.06							
25/03/2011	12:10	66	Tailings Pit	Instantel permanent monitor	99.03	0.08	BV02 - Withers Residence	Instantel permanent monitor	90.9	0.07		Wybong PO	Instantel permanent monitor	99.45	0.03	BVE001	n/a	2.3	CO15	2.4	CO19	0.85
29/03/2011	12:02	67	Tailings Pit	Instantel permanent monitor	99.78	0.07	BV02 - Withers Residence	Instantel permanent monitor	88.08	0.04		Wybong PO	Instantel permanent monitor	90.02	0.02	BVE001	Did not trigger, < 1.5 mm/s		CO15	1.58	CO19	0.82
29/03/2011	12:16	70	Tailings Pit	Instantel permanent monitor	86.65	0.07	BV02 - Withers Residence	Instantel permanent monitor	89.88	0.06		Wybong PO	Instantel permanent monitor	95.46	0.04	BVE001	n/a	2.2	CO15	1.66	CO19	1.19
31/03/2011	11:37	68	Tailings Pit	Instantel permanent monitor	98.86	0.08	BV02 - Withers Residence	Instantel permanent monitor	99.1	0.08		Wybong PO	Instantel permanent monitor	93.37	0.04	BVE001	106.5	2.26	CO15	1.92	CO19	1.16
31/03/2011	12:40	80	North Pit	Instantel permanent monitor	103.58	0.09	BV02 - Withers Residence	Instantel permanent monitor	92.45	0.08		Wybong PO	Instantel permanent monitor	104.02	0.07			-				
1/04/2011	14:41	69 and 46b	Tailings Pit	Instantel permanent monitor	87.92	0.07	BV02 - Withers Residence	Instantel permanent monitor	89.02	0.07		Wybong PO	Instantel permanent monitor	99.68	0.03	BVE001	108	2.07	CO15	1.62	CO19	0.63
1/04/2011	14:43	53b	Tailings Pit	Instantel permanent monitor	90.78	0	BV02 - Withers Residence	Instantel permanent monitor	84.64	0.01		Wybong PO	Instantel permanent monitor	94.1	0	BVE001	Did not trigger, < 1.0 mm/s		CO15	DNT	CO19	DNT
6/04/2011	14:05	75	North Pit	Instantel permanent monitor	105.01	0.1	BV02 - Withers Residence	Instantel permanent monitor	100.76	0.07		Wybong PO	Instantel permanent monitor	110.52	0.1							
8/04/2011	12:05	71	Tailings Pit	Instantel permanent monitor	100.32	0.08	BV02 - Withers Residence	Instantel permanent monitor	95.05	0.1		Wybong PO	Instantel permanent monitor	96.17	0.04	BVE001	n/a	1.69	CO15	2.43	CO19	1.04
11/04/2011	12:04	90	Tailings Pit	Instantel permanent monitor	95.24	0.07	BV02 - Withers Residence	Instantel permanent monitor	89.6	0.09		Wybong PO	Instantel permanent monitor	92.76	0.04	BVE001	104.9	2.4	CO15	2.51	CO19	0.88

Mangoola Coal 2010-11 AEMR
Blasting Vibration Data

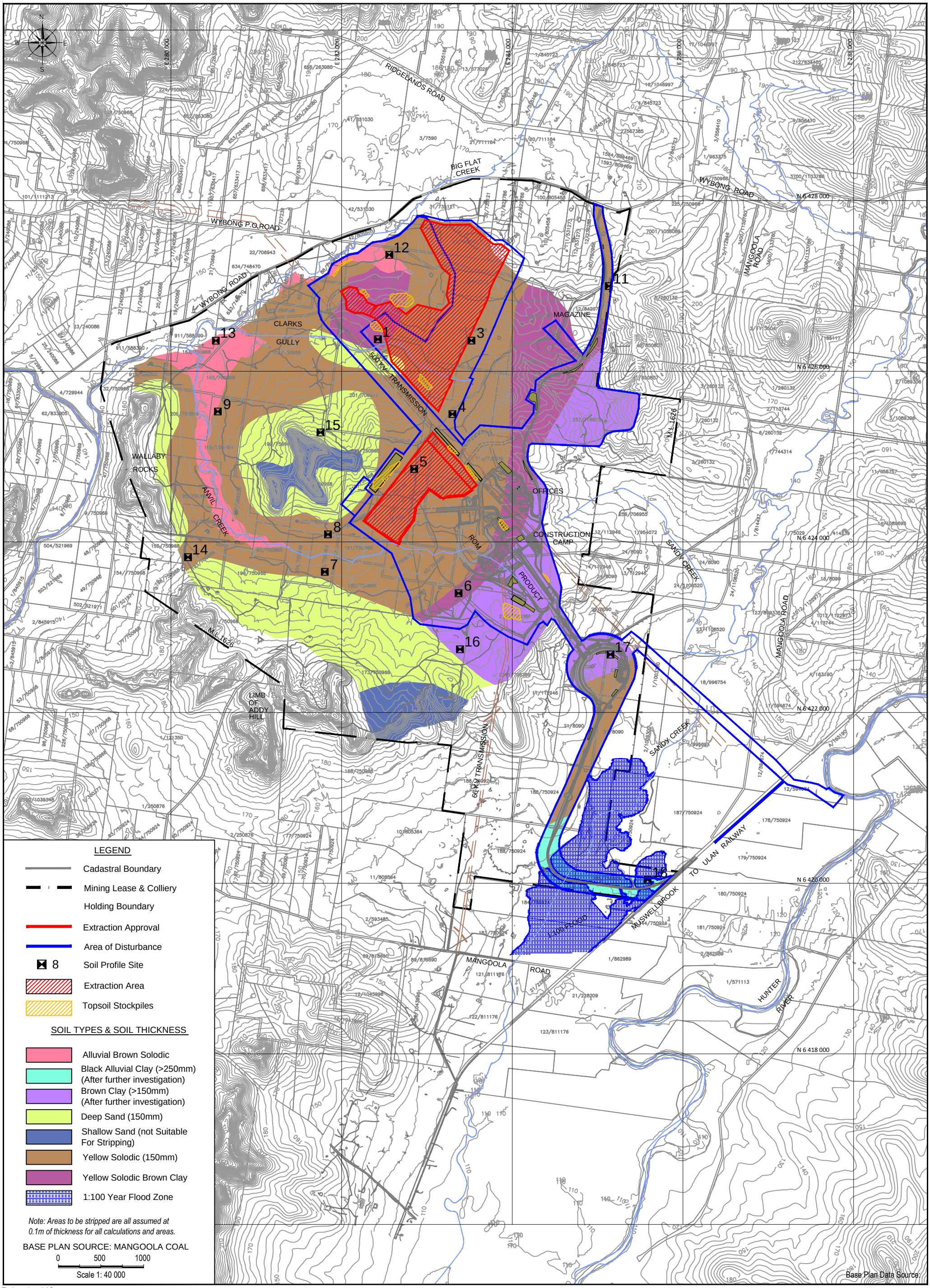
Date	Time of Blast	Blast Number	Location of blast	Castle Hill Slab			Nearest Private Residence									Dam Wall						
				Monitor Used	Overpressure (dBL)	Vibration (mm/s)	Withers (Tailings Pit)	Monitor	Overpressure (dBL)	Vibration (mm/s)	Comment	Phelps (North Pit)	Monitor	Overpressure (dBL)	Vibration (mm/s)	North Abutment Monitor used	Overpressure (dBL)	Vibration (mm/s)	Top of Wall Monitor used	Vibration (mm/s)	Bottom of Wall	Vibrations (mm/s)
12/04/2011	13:57	63	Tailings Pit	Instantel permanent monitor	97.89	0.08	BV02 - Withers Residence	Instantel permanent monitor	96	0.12		Wybong PO	Instantel permanent monitor	102	0.03	BVE001	111.2	4.6	CO15	3.9	CO19	1.54
12/04/2011	13:59	52	Tailings Pit	Instantel permanent monitor	99.39	0.04	BV02 - Withers Residence	Instantel permanent monitor	98.76	0.05		Wybong PO	Instantel permanent monitor	109.59	0.01	BVE001	112.6	1.53	CO15	1.53	CO19	0.57
13/04/2011	12:10	72	Tailings Pit	Instantel permanent monitor	104.43	0.1	BV02 - Withers Residence	Instantel permanent monitor	101.68	0.1		Wybong PO	Instantel permanent monitor	104.73	0.04	BVE001	111.2	2.04	CO15	2.03	CO19	1.14
14/04/2011	12:11	73	Tailings Pit	Instantel permanent monitor	105.85	0.09	BV02 - Withers Residence	Instantel permanent monitor	95.48	0.08		Wybong PO	Instantel permanent monitor	104.7	0.04	BVE001	n/a	2.02	CO15	1.56	CO19	0.66
15/04/2011	12:12	74	Tailings Pit	Instantel permanent monitor	94.98	0.07	BV02 - Withers Residence	Instantel permanent monitor	84.88	0.06		Wybong PO	Instantel permanent monitor	99.91	0.02	BVE001	108.4	1.46	CO15	1.1	CO19	0.59
20/04/2011	12:04	82	North Pit	Instantel permanent monitor	88.49	0.08	BV02 - Withers Residence	Instantel permanent monitor	93.13	0.06		Wybong PO	Instantel permanent monitor	97.07	0.07							
21/04/2011	12:03	44B	Tailings Pit	Instantel permanent monitor	96.85	0.09	BV02 - Withers Residence	Instantel permanent monitor	96.17	0.08		Wybong PO	Instantel permanent monitor	95.5	0.04	BVE001	110.6	3.5	CO15	3.55	CO19	1.38
29/04/2011	12:04	81A	North Pit	Instantel permanent monitor	83.63	0.02	BV02 - Withers Residence	Instantel permanent monitor	84.64	0.04		Wybong PO	Instantel permanent monitor	93.43	0.03							
29/04/2011	12:16	81B	North Pit	Instantel permanent monitor	96.02	0.1	BV02 - Withers Residence	Instantel permanent monitor	89.17	0.08		Wybong PO	Instantel permanent monitor	101.17	0.07							
3/05/2011	12:10	83	North Pit	Instantel permanent monitor	95.43	0.08	BV02 - Withers Residence	Instantel permanent monitor	90.78	0.06		Wybong PO	Instantel permanent monitor	103.35	0.07							
5/05/2011	12:10	86	North Pit	Instantel permanent monitor	98.57	0.16	BV02 - Withers Residence	Instantel permanent monitor	91.71	0.17		Wybong PO	Instantel permanent monitor	104	0.1							
6/05/2011	12:05	63B	Tailings Pit	Instantel permanent monitor	92.67	0.05	BV02 - Withers Residence	Instantel permanent monitor	87.2	0.06		Wybong PO	Instantel permanent monitor	94.27	0.02	BVE001	110.9	2.27	CO15	1.93	CO19	0.8
7/05/2011	11:04	92B	Tailings Pit	Instantel permanent monitor	89.89	0.05	BV02 - Withers Residence	Instantel permanent monitor	89.02	0.04		Wybong PO	Instantel permanent monitor	92.17	0.02	BVE001	110.9	1.68	CO15	DNT	CO19	0.42
10/05/2011	12:12	92A	Tailings Pit	Instantel permanent monitor	96.96	0.06	BV02 - Withers Residence	Instantel permanent monitor	88.24	0.08		Wybong PO	Instantel permanent monitor	91.96	0.03	BVE001	107	3.01	CO15	3.05	CO19	1.24
12/05/2011	12:09	93	Tailings Pit	Instantel permanent monitor	93.49	0.05	BV02 - Withers Residence	Instantel permanent monitor	95.34	0.08		Wybong PO	Instantel permanent monitor	93.31	0.07	BVE001	127.5	1.67	CO15	1.19	CO19	0.47
13/05/2011	12:08	84	North Pit	Instantel permanent monitor	94.98	0.06	BV02 - Withers Residence	Instantel permanent monitor	103.75	0.05		Wybong PO	Instantel permanent monitor	98.68	0.04							
16/05/2011	12:06	94	Tailings Pit	Instantel permanent monitor	84.97	0.06	BV02 - Withers Residence	Instantel permanent monitor	98.26	0.05		Wybong PO	Instantel permanent monitor	83.09	0.02	BVE001	Did not trigger, < 1.0 mm/s		CO15	0.9	CO19	0.43
18/05/2011	12:06	96	Tailings Pit	Instantel permanent monitor	94.16	0.05	BV02 - Withers Residence	Instantel permanent monitor	97.16	0.06		Wybong PO	Instantel permanent monitor	103.52	0.02	BVE001	118.8	1.86	CO15	1.32	CO19	0.55
20/05/2011	12:10	100	North Pit	Instantel permanent monitor	95.91	0.09	BV02 - Withers Residence	Instantel permanent monitor	93.4	0.08		Wybong PO	Instantel permanent monitor	101.89	0.07							
20/05/2011	12:12	85	North Pit	Instantel permanent monitor	91.1	0.11	BV02 - Withers Residence	Instantel permanent monitor	90.28	0.08		Wybong PO	Instantel permanent monitor	101.5	0.06							
25/05/2011	10:06	87	North Pit	Instantel permanent monitor	94.98	0.11	BV02 - Withers Residence	Instantel permanent monitor	87.38	0.12		Wybong PO	Instantel permanent monitor	104.57	0.09							
26/05/2011	12:12	95	Tailings Pit	Instantel permanent monitor	100.9	0.17	BV02 - Withers Residence	Instantel permanent monitor	101.96	0.12		Wybong PO	Instantel permanent monitor	**115.78**	0.04	BVE001	2.47	NA	CO15	2.46	CO19	1.13
27/05/2011	12:11	99	North Pit	Instantel permanent monitor	88.07	0.12	BV02 - Withers Residence	Instantel permanent monitor	94.51	0.14		Wybong PO	Instantel permanent monitor	100.75	0.1							
2/06/2011	12:07	89	North Pit	Instantel permanent monitor	93.64	0.19	BV02 - Withers Residence	Instantel permanent monitor	87.01	0.12		Wybong PO	Instantel permanent monitor	107.51	0.12							
3/06/2011	12:14	97	Tailings Pit	Instantel permanent monitor	86.48	0.06	BV02 - Withers Residence	Instantel permanent monitor	91.37	0.06		Wybong PO	Instantel permanent monitor	95.87	0.02	BVE001	1.16	NA	CO15	DNT	CO19	0.5
7/06/2011	12:18	89B	North Pit	Instantel permanent monitor	108.48	0.19	BV02 - Withers Residence	Instantel permanent monitor	101.85	0.09		Wybong PO	Instantel permanent monitor	97.88	0.09							
9/06/2011	12:16	90	North Pit	Instantel permanent monitor	100.21	0.23	BV02 - Withers Residence	Instantel permanent monitor	98.16	0.13		Wybong PO	Instantel permanent monitor	102.36	0.1							
10/06/2011	13:34	98	North Pit	Instantel permanent monitor	93.25	0.22	BV02 - Withers Residence	Instantel permanent monitor	99.86	0.18		Wybong PO	Instantel permanent monitor	96.99	0.13							
22/06/2011	10:02	88	North Pit	Instantel permanent monitor	109.39	0.11	BV02 - Withers Residence	Instantel permanent monitor	94.1	0.07		Wybong PO	Instantel permanent monitor	105.42	0.08							
22/06/2011	10:04	110	North Pit	Instantel permanent monitor	106.24	0.05	BV02 - Withers Residence	Instantel permanent monitor	86.62	0.02		Wybong PO	Instantel permanent monitor	103.77	0.04							
23/06/2011	12:14	102	North Pit	Instantel permanent monitor	108.61	0.26	BV02 - Withers Residence	Instantel permanent monitor	99.6	0.23		Wybong PO	Instantel permanent monitor	100.68	0.2							
27/06/2011	14:48	113	Tailings Pit	Instantel permanent monitor	92.76	0.09	BV02 - Withers Residence	Instantel permanent monitor	90.66	0.06		Wybong PO	Instantel permanent monitor	97.81	0.02	CO19	1.12	NA	CO15	0.84		
27/06/2011	14:50	101	North Pit	Instantel permanent monitor	100.87	0.21	BV02 - Withers Residence	Instantel permanent monitor	91.6	0.19		Wybong PO	Instantel permanent monitor	102.55	0.14							

AEMR Plans



APPENDIX K

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LEGEND

- Cadastral Boundary
- Mining Lease & Colliery Holding Boundary
- Extraction Approval
- Area of Disturbance
- 8 Soil Profile Site
- Extraction Area
- Topsoil Stockpiles

SOIL TYPES & SOIL THICKNESS

- Alluvial Brown Solodic
- Black Alluvial Clay (>250mm) (After further investigation)
- Brown Clay (>150mm) (After further investigation)
- Deep Sand (150mm)
- Shallow Sand (not Suitable For Stripping)
- Yellow Solodic (150mm)
- Yellow Solodic Brown Clay
- 1:100 Year Flood Zone

Note: Areas to be stripped are all assumed at 0.1m of thickness for all calculations and areas.

BASE PLAN SOURCE: MANGOOLA COAL

0 500 1000

Scale 1: 40 000

Base Plan Data Source:

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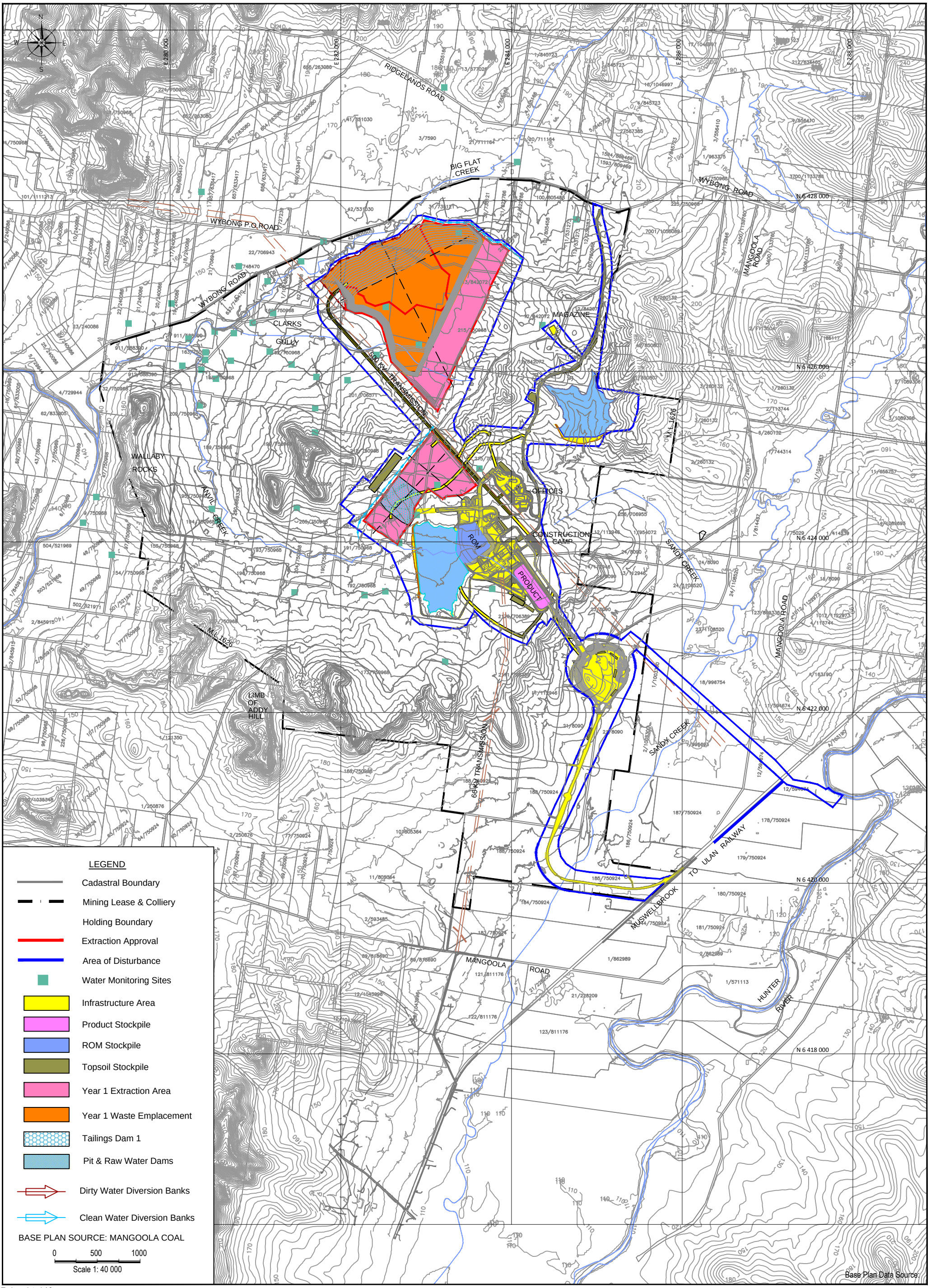
GSS ENVIRONMENTAL
Environmental, Land and Project Management Consultants

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LAND PREPARATION - 30 JUNE 2011

(EQUIVALENT TO MOP PLAN 3)

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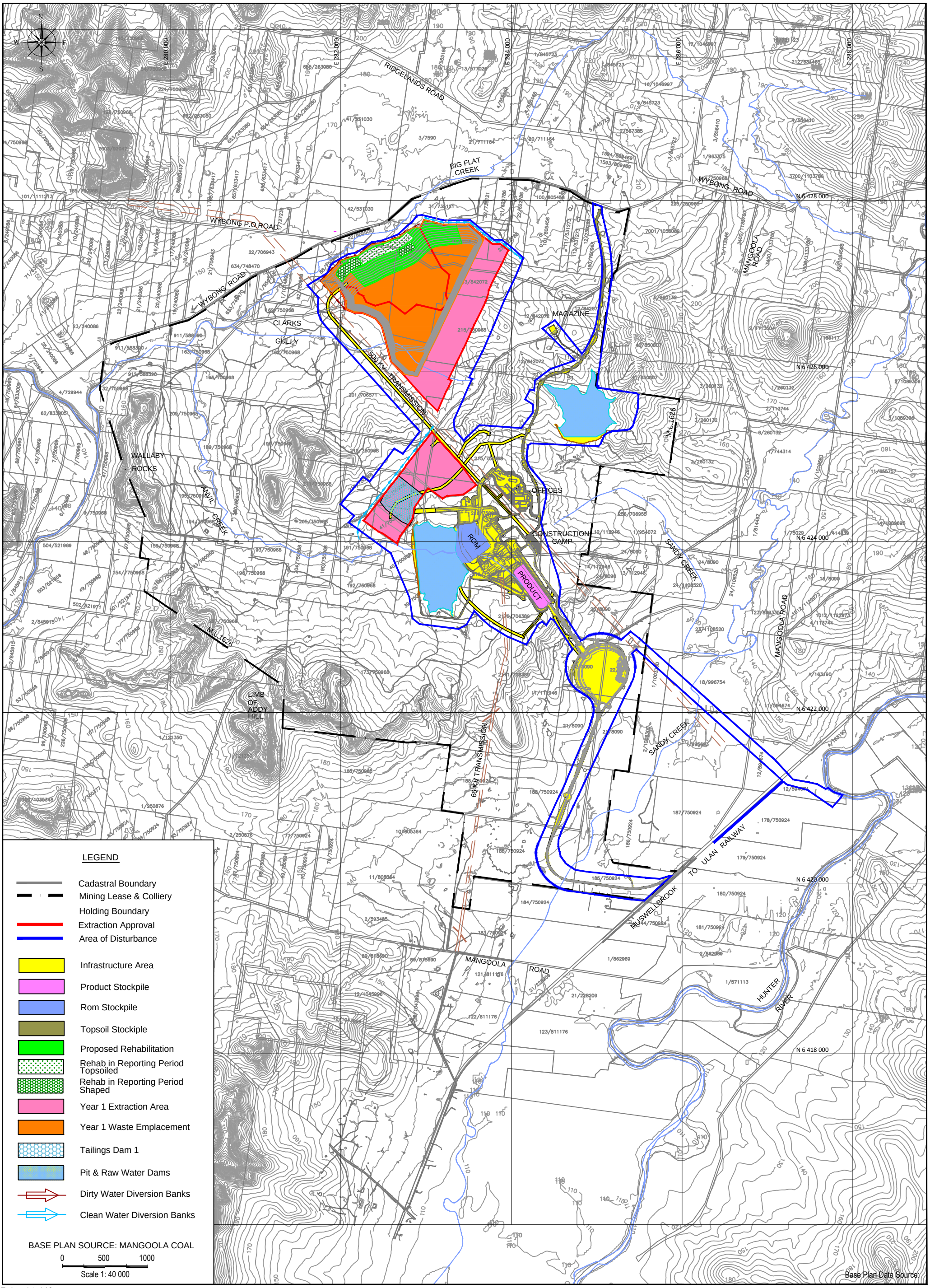
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MINING ACTIVITIES - 30 JUNE 2011

(EQUIVALENT TO MOP PLAN 4)

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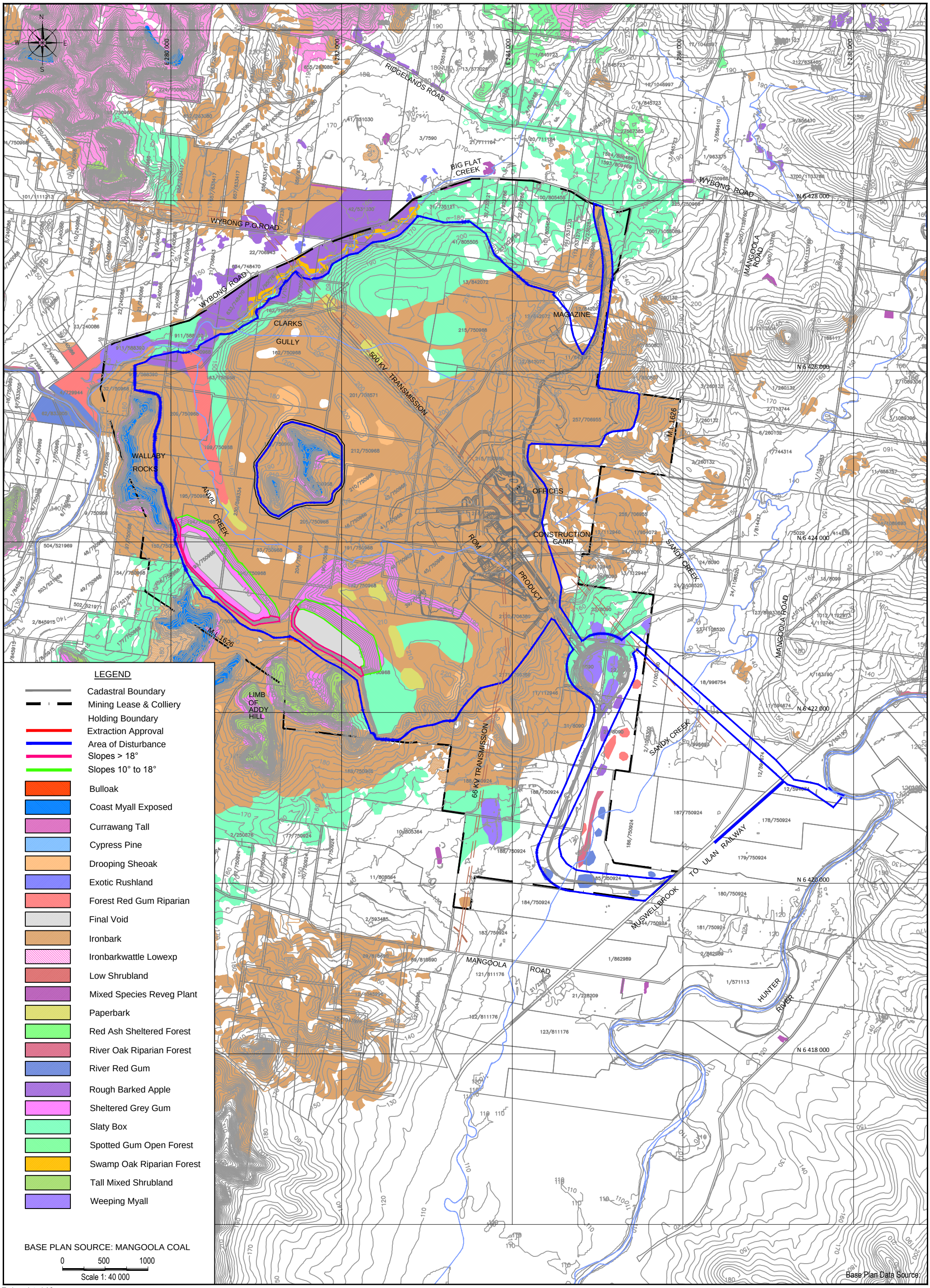
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REHABILITATION - 30 JUNE 2011

(EQUIVALENT TO MOP PLAN 5)

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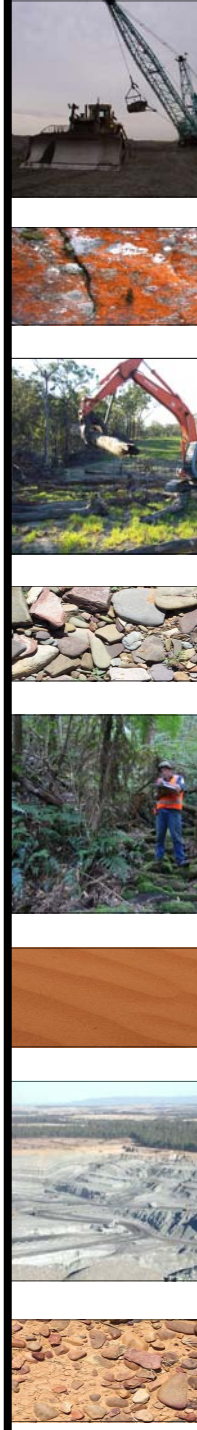
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FINAL REHABILITATION FOR LEASE RELINQUISHMENT

(EQUIVALENT TO MOP PLAN 6)

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Summary of Recommendations form the URS Independent Audit



APPENDIX L

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Summary of conditions / requirements assessed as non compliant or indeterminate and recommendations

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
Project Approval Condition (PAC) 2/1	The Proponent shall implement all practicable measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the project.	Mangoola Coal has developed a Sustainable Development Management System (SDMS) in accordance with Xstrata Coal NSW (XCN) Management Standards. The SDMS incorporates the Plans, procedures, etc in place to prevent an/or minimise harm to the environment from Mangoola Coal operations. Other than where issues have been identified, in general the site appeared to be implementing its management system. A detailed assessment of the implementation of the various monitoring plans was conducted and is presented in relevant sections of this compliance table. Several non compliances have been recorded in relation to an environmental incident which occurred in February 2010 and was being investigated by the DECCW at the time of the audit. This is discussed in the main section of the report. Apart from this incident no other incidents were recorded with the potential for environmental harm.	Non Compliant **Recommendation:** As per specific recommendations made throughout the report.	SD system being implemented as per XCN Sustainable Development Framework. Management Plans are currently being reviewed as part of transition into mining operations.	**Completed**
PAC 2/9	The Proponent shall ensure that all new buildings and structures, and any alterations or additions to existing buildings and structures, are constructed in accordance with the relevant requirements of the BCA.	A Construction Certificate (CN080200) was issued by BCA Certifiers dated 11.12.09 for the CHPP and MCC structures - stage 1 site works and footing systems. A Construction Certificate (CC 09 593) was issued by AcroCert on the 28.09.09 for mining infrastructure, site works only. Mangoola Coal were in the process of obtaining certificates for the temporary site buildings (e.g. demountables) at the time of the audit.	Non Compliant **Recommendation:** Continue process of obtaining certificates for temporary site buildings.	Certificate sought and approved for temporary workshop. Remaining buildings in progress.	**Completed**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
PAC 3/30 a)	The Proponent shall (a) not discharge any dirty water from the site, except as may be expressly provided by a DECC Environment Protection Licence; and	There has been one incident recorded where dirty water was discharged from the site. Refer to Section 3.1 of the main report for discussion of this incident.	Non Compliant	DECCW Investigating. **Actions completed by Mangoola:** Independent incident investigation completed. Discharge/overflow and significant rainfall event monitoring program developed. Engagement of specialist erosion and sediment control advice and training across Mangoola site by Mr R. Good from Soil Conservation Service. Update of ground disturbance permit requirements with checklist to confirm E&SC in place. Flocculation of dams undertaken where practical Revised and update role/responsibilities, training, inspection and reporting. Developed and implemented internal approval process transfer/release of water. **Actions ongoing:** 3rd party review and update of site E&SC plans	**Ongoing**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
PAC 3/31	The Proponent shall prepare and implement a Site Water Management Plan for the project to the satisfaction of the Director-General. This plan must: (a) be prepared in consultation with DECC and DWE by suitably qualified expert/s whose appointment/s have been approved by the Director-General; (b) be submitted to the Director-General for approval prior to carrying out any development on site; and (c) include a Site Water Balance; an Erosion and Sediment Control Plan; a Surface Water Monitoring Plan; a Ground Water Monitoring Program; and a Surface and Ground Water Response Plan.	A Site Water Management Plan was prepared by GSS Environmental and ATC who were approved by the DoP as suitably qualified experts by letter dated 10.07.07. The Plan was provided to the DWE and comments provided by letter dated 24.12.2008. The DoP approved the Plan by letter dated 05.01.09. The DWE's comments relating to the Surface and Groundwater Response Plan were yet to be addressed at the time of the audit. The Plan included a Site Water Balance, Erosion and Sediment Control Plan, Surface Water Monitoring Plan, Groundwater Monitoring Plan and Surface and Groundwater Response Plan. Implementation of the Plans is discussed in later sections of this Table.	Non Compliant **Recommendation:** Revise Surface and Groundwater Response Plan to incorporate DWE comments relating to trigger levels for groundwater impacts or drawdown. Refer to recommendations elsewhere regarding implementation of the Plan	WMP submitted August 2010.including DWE comments Minor changes required after DoP review regarding renaming of trigger levels to “impact assessment criterion”.	**Completed**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
PAC 3/32	The Site Water Balance must a) include details of: - sources and security of water supply; - water use on site; - water management on site; - off-site water transfers; - reporting procedures; and b) investigate and describe measures to minimise water use by the project.	The Site Water Balance (Revision G dated 11.09.09) was reviewed and the following noted: Water sources are discussed in Section 2.0 Water security is discussed in Section 4.0 Water use on site is discussed in Section 3.0 however is very limited. Water management is discussed in Section 3.0 Offsite water transfers is not discussed. Reporting requirements are referred to the SWMP. It is noted the SWMP does not discuss reporting requirements specific to the Site Water Balance. Whilst Section 3, Water Management, discusses some opportunities for water re-use (e.g. decant water from the tailings dam will be pumped back to the pit water dam for re-use), measures to minimise water use by the project are not specifically discussed.	Non Compliant **Recommendation:** Expand water-use section in the next revision of the SWB to include further details of process water and wash water demands. Include details of reporting requirements specific to the Site Water Balance either in the SWB or the SWMP. For example the reporting of water usage, water management, water minimisation etc in the AEMR. Include measures to minimise water use by the project in the next revision of the SWB.	**Complete** Refer Section 4.0 WMP August 2010 Further information required by DoP as per review comments supplied Oct10. **Complete** Refer Section 2.8 AEMR 2009-2010	**31 Jan 2011**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
PAC 3/36	The Surface and Ground Water Response Plan must include: (a) a protocol for the investigation, notification and mitigation of any exceedances of the surface water, stream health and groundwater impact assessment criteria; (b) measures to mitigate and/or compensate potentially affected landowners with privately owned groundwater bores within the predicted drawdown impact zone identified in the EA, including provision of alternative supply of water to the affected landowner that is equivalent to the loss attributed to the project; (c) measures to mitigate and/or compensate potentially affected landowners for the loss of surface water flows in Sandy Creek, Big Flat Creek and Wybong Creek downstream of the project; (d) measures to minimise, prevent or offset groundwater leakage from the Big Flat Creek alluvial aquifer; (e) measures to mitigate any direct hydraulic connection between the backfilled open cuts and the Big Flat Creek alluvium if the potential for adverse impacts is detected;	The Surface and Groundwater Response Plan (Revision 1 dated 02.11.08) was reviewed and the following noted: (a) Impact assessment criteria are outlined in the Surface Water Monitoring Program and Groundwater Monitoring Program and are not reproduced in this Plan. Investigation of exceedances is discussed in Section 2.0. Notification is discussed in Section 5.0. Mitigation is discussed in general terms in Section 3.0. (b) Measures to mitigate potentially affected landowners is discussed in Section 3.0 (c) Measures to mitigate potentially affected landowners for the loss of surface water flows in Sandy Creek, Big Flat Creek and Wybong Creek are not specifically discussed. (d) Section 3.0 of the Plan states that the Plan will be revised prior to mining to include further detail on the contingency measures associated with the protection of Big Flat Creek alluvium and others referred to in the EA. (e) As per (d) above. (f) As per (d) above. (g) Contingency procedures are directed towards exceedances. Response procedures for impacts on groundwater drawdown are not specifically discussed.	Non Compliant **Recommendation:** Include specific discussion of measures to mitigate potentially affected landowners for the loss of surface water flows in Sandy Creek, Big Flat Creek and Wybong Creek in the next revision of the SGRP. Ensure the updated Plan for the mining phase addresses DWE comments specifically relating to trigger levels for groundwater impacts or drawdown (refer to Condition PAC 3/31).	Refer Section 8.0 WMP August 2010-11-08 Refer Section 4.0 Groundwater Trigger Levels GWMP July 2010. Minor update required following DoP review of plan.	**Completed**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
PAC 3/36 (cont)	(f) a contingency plan for isolating the Big Flat Creek alluvium from Anvil Creek alluvium and mining areas in the event that it is required; and (g) the procedures that would be followed if any unforeseen impacts are detected during the project.			Refer Surface Water and Groundwater Response Plan July 2010. Minor update required following DoP review of plan.	**Ongoing - Budget Price Received**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
PAC 3/37	The Proponent shall progressively rehabilitate the site to the satisfaction of the Director-General and I&I NSW, in a manner that is generally consistent with the final landform in the EA (shown conceptually in Appendix 6). However, the Proponent must endeavour to incorporate at least 700 hectares of native grassland in the final rehabilitated landscape.	Given the timing of this audit, no mining had commenced, hence the term rehabilitation (for the purposes of this audit) is interpreted in relation to the soil stabilisation/rehabilitation of soils and vegetation around the built infrastructure. At the time of the audit progressive soil stabilisation activities such as seeding/revegetation were underway by both key construction phase contractors, Daracon and Robson, however, a number of issues were identified where improvements could be made. Some work areas had been left exposed for too long and have been rehabilitated using exotic seed mixes. There was a lot of inconsistency between contractors as to what the seed mix for progressive rehabilitation (hydro mulching/hand seeding) should be, which highlighted a need for the Draft Rehabilitation and Offset Management Plan (ROMP) to streamline current documents and outline the guide for progressive rehabilitation and the requirement for native seed usage to enhance the Native Grassland community. The Draft ROMP was observed to be consistent with the EA at this stage for Native Grassland allocations.	Non Compliant **Recommendations:** It is recommended that a range of appropriate native seeds be used (as soon as possible) by contractors undertaking revegetation (hydro mulching or hand seeding) with seed to be either collected from site and stored appropriately before use or alternatively bought in from local suppliers. There are approximately 50 native grass species as part of the threatened Native Grassland community occurring onsite that should be utilised for progressive rehabilitation to enhance this community. Appropriate native seed collection information (grass species, collection methods and time framing) is readily available from Mangoola Coal's Seed Collection Strategy - Mangoola Operations (ENSR Australia Pty Ltd 2008). Mangoola Coal's environment team reported that it plans to investigate engaging a grass seed harvester. It is recommended that this action is expedited and a program developed for collection, storage and supply to hydro mulching companies.	Revised seed mix distributed with Ground Disturbance permits Mangoola LOM rehab plan contains provisions for achieving the target amount of grassland within the disturbance area and offsets. These provisions will be detailed in the revised version of the ROMP incorporating recent DoP review comments. Rehab to date has been confined to disturbance areas associated with construction of infrastructure facilities. Total rehab to date 57.5 ha.	**Completed**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
PAC 5/11 b)	During the project, the Proponent shall update these results on a regular basis (at least every 3 months).	The auditors accessed the website in May and June 2010 and observed that monitoring reports were available up until February 2010. It was reported that the March and April 2010 reports had been sent by the Environmental Coordinator to Xstrata's website manager in Switzerland for uploading. The March 2010 report should have been available in June 2010.	Non Compliant **Recommendation:** Investigate measures to speed up the process of uploading reports onto the Mangoola Coal website. The March 2010 report is now overdue.	Mangoola now has ownership of the website. A consultant will be engaged to assist in the ongoing development and maintenance of the website. Reports to be uploaded.	**Periodically updated**
Statement of Commitment (SOC) 6.10.4	Mangoola will complete a detailed archival recording of the Castle Hill homestead to the standard of local heritage significance.	Refer also to PAC 3/47. Archival recording of Castle Hill homestead had not been undertaken during the audit period as Mangoola Coal has not been able to obtain access to the property. A letter was sighted from Mangoola Coal to the owners of the property dated 2.06.09 requesting access to undertake the archival recording.	Non Compliant **Recommendation:** Continue to work with the landowner to resolve access issues so as to enable the archival recording to be undertaken.	Access not granted from the landholder to assess Castle Hill homestead. Access negotiations to continue.	**Ongoing negotiations**
SOC 6.5.8	Techniques to minimise blast impacts will be employed as necessary to ensure compliance with relevant criteria. This may include blast initiation using electronic detonation techniques, limiting blast MIC, consideration of wind speed and direction prior to blasting, use of adequate stemming, implementing a delay detonation system, and careful drilling and hole loading to ensure that the required blast design is implemented.	Mangoola Coal's Blast Monitoring Program does not outline techniques to minimise blast impacts. Mangoola Coal's blasting contractor, Addrill, had prepared a Blast Management Plan dated February 2010 which included a description of measures to protect the safety of people, property and public infrastructure however the plan focuses on safety precautions and is not aimed at minimising environmental impacts associated with blasting.	Non Compliant **Recommendation:** Include a description of techniques to minimise blast impacts within the Blast Monitoring Program.	Refer BMP Section 3.3.8 July 2010 -Procedures developed and continuing to be refined regarding techniques and checks to reduce blast impacts including assessment of meteorological conditions to avoid firing during adverse conditions, reduced MIC and the refinement of blast criteria of time. Further aspects are to be addressed as per comments supplied during recent DoP review of management plan.	**Now included in BMP**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
SOC 6.12.2	In addition to these initiatives, Mangoola will review various emission trading schemes and abatement initiatives available and assess the suitability of these for the Project (for example, the NSW Greenhouse Gas Abatement Scheme). The objective of these measures is to seek further opportunities to reduce or offset GHG emissions from the Project.	It was reported that Mangoola Coal has not reviewed various abatement initiatives and assessed the suitability of these for the Project. It was reported that this will be conducted as part of the development of the Energy Savings Action Plan.	Non Compliant **Recommendation:** Include a review of the various abatement initiatives and assess their suitability for the Project. Document within the Energy Savings Plan which is currently being prepared.	Mangoola's participation in abatement initiatives such as the Energy Savings Scheme and any future CPRS will be assessed as part of Xstrata Coal's abatement activities. There is limited opportunity for further abatement given that an energy review of the Mangoola Project was undertaken prior to construction commencing. Assessment of geological data will occur to determine the method 2 emission factor for Mangoola O/C with reference to the NGERS Act/Regulations. ESAP being revised as per comments supplied during recent DoP review.	**ESAP review Meeting found no new initiatives as this is a new mine with energy efficiencies incorporated into the as built plans.**
SOC 6.5.15	Blast management procedures will be periodically reviewed to evaluate performance and identify corrective action, if required.	A Blast Management Procedure has not been prepared by Mangoola Coal. Blasting was managed under the Blast Monitoring Plan, Addrill Blast Management Plan and pre and post blast checklists. It is recommended that the BMP is revised to include general measures for blast management and mitigation and a requirement for a formal periodic review to assess performance.	Non Compliant **Recommendation:** Revise the Blast Monitoring Program to include general measures for blast management and mitigation and include requirements for a formal periodic review to assess performance.	See Blast Management Procedure 25/10/10 MAN MIN PRO 0017. Drill & Blast Planning, Design & Record Keeping	**Completed**
EPL-L1.1	Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the	Refer to PAC 3/30	Non Compliant	DECCW investigating. See comments above from condition PAC 3/30 a)	**Completed**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
	Environment Operations Act 1997.				
EPL-L6.2	Monitoring measured at, or computed for, the most affected point on or within the residential boundary, or at them most affected point within 30 m from the boundary.	EPL Condition M 8.1 requires monitoring in accordance with L6.2 to determine compliance with the noise limits specified in L6.1 every six months. Mangoola Coal undertakes attended noise monitoring on a quarterly basis for the purpose of meeting M8.1. The auditor reviewed the attended noise monitoring reports prepared by Global Acoustics which indicated that all of the attended monitoring was conducted at the most affected point within 30 m from the dwelling. The attended monitoring report stated that there were occasions where noise from Mangoola Coal activities was not measurable or was inaudible due to high background noise related to traffic and other sources. Chapter 11 of the INP provides alternative methods to estimate the noise of concern under these circumstances e.g. monitor the noise closer to the source and calculate / compute noise levels back to receptor location.	Compliant- **Recommendation**: Consider adopting the NSW Chap 11 method (see Notes to Table 1 in the Project Approval) in addition to the current attended monitoring program.	For review and advice from Acoustics consultant.	**Ongoing routine monitoring**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
EPL-R4.1	The Licensee must supply with each Annual return, a Blast Monitoring Report.	A Blast Monitoring Report was not provided with the Annual Return for the period 07.07.08 to 06.07.09. During the Annual Return reporting period two blasts were undertaken (on the 13.03.09 and 27.03.09) and no monitoring results were recorded as the blasts did not trigger the monitoring equipment. A report was required to have been submitted to the DECCW outlining: - the date and time of the blast; - the location of the blast on the premises - the blast monitoring results at each monitoring location; and - an explanation of any missing blast monitoring results.	Non Compliant **Recommendation:** Ensure Blast Monitoring Report is submitted with each Annual Return as required by Condition R4.1.	09/10 Annual Return received by DECCW 3/9/10.	**Complete**
EPL-R1.5	The Annual Return must be supplied by registered post not later than 60 days after the end of each reporting period.	The Annual Return for the period 07.07.08 to 06.07.09 was sent to the EPA by registered post on the 8.09.09 (64 days after the end of the reporting period). The auditors sighted the registered post delivery confirmation - advice receipt.	Non Compliant **Recommendation:** Ensure future Annual Returns are submitted no later than 60 days after the end of the reporting period.	09/10 Annual Return received by DECCW 3/9/10.	**Complete**
EPL-O6.1	Soil and water management controls must be employed to minimise soil erosion and the discharge of sediment and other pollutants to lands and/or waters during construction activities in accordance with the requirements outlined in the *Managing Urban Stormwater: Soils and Construction* (available from the Department of Housing).	Mangoola Coal received complaints relating to discharge of turbid water in February 2010. In response to a notice from DoP, Mangoola Coal commissioned Umwelt to conduct an investigation into the discharge (Umwelt March 2010). This investigation was detailed and identified a number of issues with regard to erosion and sediment controls. Section 3.1 of the main report details recommendations made by Umwelt and URS have assessed the status of implementation of those actions. A number of recommendations remain outstanding. Further discussion of erosion and sediment management and recommendations is	Non Compliant Refer to recommendations on erosion and sediment controls made throughout the Report.	Refresher training conducted for engineering and operational personnel. Ongoing assistance from Richard Good (Soil Conservation Service) has been occurring. Site controls being routinely monitored. Satisfactory improvement – ongoing inspections and refinements/adjustments as necessary.	**Complete**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
		provided in the assessment of implementation of the Erosion and Sediment Control Plan.			
ML-15 c)	c) Notification Contact is to be made with Forests NSW, Macquarie Region during the fire danger period.	The Pre-Blasting Checklist did not include this requirement as a check item. The Blasting Notification Register does not include Forest NSW, Macquarie Region.	Non Compliant **Recommendation:** Include requirement to notify Forests NSW, Macquarie Region during fire danger period as a check item on the Pre-Blasting Checklist. Update Blasting Notification Register to include Forests NSW, Macquarie Region.	This condition is not listed in Mangoola EL 1626 conditions.	**Not for Action**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
ML-18	Operations must be carried out in a manner that does not cause or aggravate air pollution, water pollution (including sedimentation) or soil contamination or erosion, unless otherwise authorised by a relevant approval, and in accordance with an accepted Mining Operations Plan. For the purpose of this condition, water shall be taken to include any watercourse, waterbody or groundwaters. The lease holder must observe and perform any instructions given by the Director-General in this regard.	Mangoola Coal was observed to generally conduct operations in a manner that would prevent or minimise air pollution, water pollution (including sedimentation) or soil contamination or erosion. Extensive discussion of these issues is found elsewhere in this report commenting on compliance with the EPL and PAC. One key non-compliance to this requirement was the discharge of sediment laden water as discussed in Section 3.1 of the main report. . No additional direction has been served on the Mine Manager by the Director-General (I&I NSW).	Non Compliant (in respect to discharge event in February 2010)	DECCW investigating. See comments above from condition PAC 3/30 a)	**Not for Action**
Noise Management Plan-13	Summary of noise monitoring results to be made available on the Mangoola Coal website and to the CCC. These are to be updated every three months.	The auditors accessed the website in May and June 2010 and observed that monitoring reports were available up until February 2010. It was reported that the March and April 2010 reports had been sent by the Environmental Coordinator to Xstrata's website manager in Switzerland for uploading. The March 2010 report should have been available in June 2010. The Monthly Monitoring Reports were sighted and noted to include a summary of the attended noise monitoring results on a quarterly basis.	Non Compliant **Recommendation:** Investigate measures to speed up the process of uploading reports onto the Mangoola Coal website. The March 2010 report is now overdue.	Mangoola now has ownership of the website. A consultant will be engaged to assist in the ongoing development and maintenance of the website. Reports to be uploaded.	**Periodically updated**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
Blast Management Plan-5	A pre-blast checklist will be completed to ensure that the nearest private resident is appropriately monitored.	The auditor sighted completed pre-blast checklists (15.04.10, 2.06.10 and 4.06.10) which detailed the blasting location, hours allowed for blasting, clearance from Wybong Road and private residence, consultation with the affected landowners, and monitoring requirements. The checklists dated 02.06.10 and 04.06.10 indicated that the blasts would take place within 500 metres of a private residence (R34) and stated that monitoring would be undertaken at that residence. A review of the monitoring data for these days indicated that on the 2.06.10 monitoring was undertaken at R34 however no results were recorded. On the 4.06.10 monitoring was not undertaken at R34.	Non Compliant **Recommendation:** Ensure monitoring is undertaken at the nearest potentially affected residence during all blast events.	Results are available for the 4/6/10. Residences monitored for remainder of June and July, with results available. Permanent monitor installed at closest residence on 20/8/10 to coincide with the one blast undertaken that month. Monitor to be relocated or further monitors installed at other residences as mine develops.	**Complete**
BMP-7	A post-blast checklist will be completed to ensure that the project approval and BVMP conditions are adhered to.	The auditor sighted completed Addrill Blast Reports (22.04.10, 2.06.10 and 4.06.10) which detailed the blasting location, number of holes used, measured vibration and overpressure levels, maximum instantaneous charge used and weather conditions. On some blast reports the time was not filled in. In addition the auditor sighted completed examples of Mangoola Coal's Post Blast Checklist (GEN-HSE-FRM-0102). This form does not specify the time of the blast or the monitoring location.	Non Compliant **Recommendation:** Ensure the post blast checklist or report is completed in its entirety. Revise the Mangoola Coal Post Blast Checklist (GEN-HSE-FRM-0102) to include the time of the blast and the monitoring location.	Checklist form to be updated. Forms to be completed by Drill and Blast for each blast.	**Completed**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
BMP-10	Summary of blasting and vibration monitoring results to be made available on the Mangoola Coal website. These are to be updated every three months.	The auditors accessed the website in May and June 2010 and observed that monitoring reports were available up until February 2010. It was reported that the March and April 2010 reports had been sent by the Environmental Coordinator to Xstrata's website manager in Switzerland for uploading. The March 2010 report should have been available in June 2010. The Monthly Monitoring Reports were sighted and noted to include a summary of the blasting and vibration results.	Non Compliant **Recommendation:** Investigate measures to speed up the process of uploading reports onto the Mangoola Coal website. The March 2010 report is now overdue.	Mangoola now has ownership of the website. A consultant will be engaged to assist in the ongoing development and maintenance of the website. Reports to be uploaded.	**28 Feb 2011**
Construction Traffic Management Plan-8	f) Provide Council with an updated program of works that ensures the work will be practically complete by April 2010.	The work was not practically completed in April 2010 due to wet weather delays and at the time of the audit site inspection was still in progress. Council is provided with a progress update at the weekly Wybong Road East meeting. The auditors sighted minutes of meetings held on the 4.5.10, 11.05.10 and 25.05.10 and noted that the works program was discussed.	Non Compliant **Recommendation:** Continue to work towards achieving practical completion and providing MSC with an updated program of works.	**Complete**	**Complete**
CTMP-20	Temporary signage will be put in place to advise transport operators on how and where they should access the site.	Whilst a number of traffic related signs were observed during the audit site inspection, temporary signage specifically advising transport operators on how and where they should access the site was not observed during the audit site inspection.	Non Compliant **Recommendation** Ensure signage is installed advising transport operators on how and where they should access the site.	**Complete**	**Complete**
CTMP-21	Other signage containing contact details for reporting issues or complaints associated with construction will be installed at the access to the project site.	Whilst a number of traffic related signs were observed during the audit site inspection, a sign containing contact details for reporting issues or complaints was not observed at the entrance to the project site during the audit site inspection.	Non Compliant **Recommendation:** Ensure sign containing contact details for reporting issues or complaints is located at the entrance to the project site.	**Complete**	**Complete**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
CTMP-22	Mangoola Coal will erect an informative sign to indicate the project duration, which sections of road is under construction and the estimated delay to be expected.	A sign was observed during the audit site inspection (June 2010) informing Wybong Road upgrade works were in progress, with a planned completion date of April 2010 and to expect delays. It was reported that this sign was in the process of being replaced to reflect the revised project duration.	Non Compliant **Recommendation:** Ensure that informative signs are replaced / modified to indicate the revised project duration.	**Complete**	**Complete**
Erosion Sediment Control Plan-5	Sediment dams have been generally designed in accordance with the principles of Managing Urban Stormwater (Landcom 2004) ('the Blue Book').	Table 2, Section 3.2.3 defines sediment dam capacities for various dams across the site. The table has not been updated since the last review of the document and was out of date at the time of the site inspection. Mangoola did not conduct a review of erosion and sediment control plans including a review of calculations regarding size of sediment dams. Following the sediment laden water discharge in February 2010, a review was conducted by Umwelt. It found that capacities of sediment dams was not sufficient. The main report discusses the response to the incident and makes recommendations for improvement. Refer to Section 3.2 of the report for further discussion of the issue and recommendations.	Non Compliant See Section 3.1 of the report for recommendations.	**Complete** Controls now in place and routinely monitored.	**Complete**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
ESCP-6	Any overflows from the dams within the MIA will flow to the Pit Water Dam where they will be contained and managed accordingly. The Rail Loop dam capacities will be managed at minimum levels through a pumping arrangement that will deliver water from the dam to the Pit Water Dam. To minimise the potential for sediment laden water entering Sandy Creek, sediment dams will be managed to maintain a low level, near empty level.	At the time of the audit site inspection, sediment dam over flows in most areas would have reported to the Pit Water Dam which had sufficient capacity (130 ML) due to having been partially constructed. Once fully constructed, the capacity of the dam will provide significant capacity for the mine to manage rainfall events. At the time of the discharge event in February 2010, the Pit Water Dam was not constructed and did not provide secondary containment to discharges. As such, this requirement was not complied with in February 2010. Rail Loop dams were relatively low during the site inspections.	Non Compliant in February 2010. Compliant at time of site inspection in June 2010.	**Complete**	**Complete**
ESCP-16	Native grass species will also be used where practicable. Species Rate (kg/ha) Cereal Crop (Oats in autumn/winter and Japanese Millet in spring/summer) 20-30 Hulled Couch 6-8 Lucerne 3-5 Pioneer Rhodes Grass 10 Wimmera Ryegrass 8-10 Haifa White Clover 4-5	It was noted that various seed mixes were used and that some seed mixes did not include any native seeds. On some occasions invasive species such as Rhodes grass had been used. It was acknowledged that there is no apparent current use of Rhodes grass and management were aware of issues with using it and did not approve of its use. Refer to PAC 3/37 for recommendations regarding native seed use and Draft SOC 7.7.3 for recommendations regarding weed management.	Non Compliant **Recommendation:** Seed mixes should include native grasses and a focus on success of the establishment of these grasses should be fostered. Invasive species such as Rhodes grass should not be used and the Erosion and Sediment Control Plan adjusted to reflect this.	**Complete** Revised seed mix containing native grasses distributed with ground disturbance permits.	**Complete**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
ESCP-17	Topsoil stripping within the disturbed area would as far as practicable be undertaken, when the soil is in a slightly moist condition thus reducing damage to soil structure, however, this may not always be achievable due to seasonal variations. Wherever possible, stripped soil would be transported to completed sections of the final landform for immediate spreading if operational sequences, equipment scheduling and weather conditions permit. Where this is not the case, topsoil will generally be transferred to stockpiles within the perimeter of the dirty water management system and seeded depending on stockpile life.	Stripped soil is reused directly where possible, however this appeared to be largely impractical, and hence most topsoils are stockpiled first. There was limited evidence of effective seeding of topsoil stockpiles to prevent weed invasion of stockpiles. Many stockpiles, particularly in the Rail Loop area were observed to be completely covered by weeds.	Non-Compliant (on basis of effective seeding not observed) **Recommendation:** Topsoil stockpiles should be seeded to prevent weed growth. It is recommended that some system of topsoil volume is introduced to ensure topsoil is used efficiently and so site can demonstrate that topsoil will be available for rehabilitation activities for life of mine.	**Complete** Topsoil stockpiles surveyed as required by mine surveyor and data supplied to E&C Dept for accurate inventory. Revised seed mix containing native grasses distributed with ground disturbance permits.	**Complete**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
ESCP-24	The drawings will contain detailed erosion and sediment control information for each construction stage/area, and may include (but not limited to): (a) Features of the site including contours and drainage paths; (b) Different stages of construction (i.e. initial clearing, grubbing, topsoil stripping and stockpiling with revision for bulk earthworks); (c) Relevant construction details of all erosion and sedimentation control structures; (d) All permanent and temporary erosion and sedimentation control measures, including the control measures to be implemented in advance of, or conjunction with, clearing and grubbing operations; (e) An order of works based upon stabilisation of all areas of high erosion hazard at the earliest practical stage; (f) Proposed time schedules for construction of structures and implementation of measures to control erosion and sedimentation; (g) Reference to monitoring and maintenance procedures, including details of any water quality testing required; and (h) Site stabilisation methods.	There was no evidence sighted of a formal check by Mangoola Coal or a delegate to confirm that all ESCPs contain the information required as listed. In order to assess this requirement, it was not possible to assess all ESCPs. As such, the ESCP by Robson dated October 2009 was selected as an example. The ESCP was prepared by TREES P/L. a) there is one contour plan to cover the whole CHPP area. The detail is not considered sufficient for effective implementation of all controls. b) there is a discussion section on various stages, however, only one plan exists to cover all stages of works. The Plan indicates it is to be revised as necessary. Few revisions were sighted. c) relevant construction details as examples are provided in photos and schematics. d and e) Not able to be fully assessed as was not on site to evidence. There were no third party audits of earlier works to independently assess implementation of controls. This is covered in other sections in more detail. The GDP process does require this. It appears from site observations that erosion and sediment controls are regularly put in place prior to construction activities. f) no time schedules were included in the ESCP reviewed g) there is a reference to monitoring and maintenance requirements. h) site stabilisation methods are referred to in the text.	Non Compliant **Recommendations:** The Plan should be more detailed to allow more understanding of detail of erosion and sediment control requirements at each location. It is considered more plans should be included in the ESCP to cover the various work stages. Details of how the plans are to be reviewed and what triggers this review needs to be included in the ESCPs. The review of the ESCPs as recommended above should include the requirements as listed for this line item.	**Complete** Refer to: ESCP July 2010-11-08 S3.2 Construction Principles S3.4 Site Specific Control Measures S3.5 ESC Programs S4.0 Inspections & Maintenance	**Complete**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
ESCP-24 (cont)		The requirement is deemed not compliant on the basis that the plan reviewed was not considered sufficiently detailed to address the requirements of the condition, it did not define various plans for various stages of the construction process, and an ESCP review process was not well defined or followed. Notwithstanding this, many of the requirements had been addressed.		**Complete** See above	**Complete**
ESCP-25	Sediment and erosion control structures will be inspected on a weekly basis, and following significant rainfall events. Where controls are observed to not be functioning correctly the controls will be restored to meet the required Blue Book standard.	Mangoola Coal conduct environmental inspections using a checklist that includes assessment of erosion and sediment controls. The checklist is generic and does not require assessment against the requirements of the ESCP. A number of checklists were observed, however, the checks done on any one area are irregular. A total of 32 inspections were evident in the summary from the database Xstrasafe, with these inspections mainly occurring over a selected area of the site - not covering the whole site. The Robson ESCP requires that monitoring would be conducted through weekly inspections and inspections prior to and after wet weather. A number of inspections by Robsons were reviewed. With respect to the checklist, one question related to erosion and sediment controls and that was "Have all sediment and erosion controls been inspected within 24 hours of all rainfall events greater than 10 mm and the after rain checklist completed?" This form did not appear to address all requirements of the management of erosion and sediment controls. E.g. the process did not require a check of implementation of the ESCP, and did not provide specific guidance on what was being checked.	Non Compliant **Recommendations:** The form for assessment of erosion and sediment controls used by Mangoola Coal and its contractors should be more specific to the requirements of the relevant the ESCP. Inspections by Mangoola personnel should be more consistent in terms of timing and area of coverage, so as to ensure all areas are covered regularly. It is recommended that formal independent inspections by an expert are conducted regularly, that are documented, have corrective actions listed and assess implemented actions. These should include a review of implementation of the requirements of ESCP Plans.	**Complete** Gen-HSE-FRM Erosion and Sediment Control Checklist revised as part of recent revision of ESCMP. See below Detailed in revised ESCMP recently reviewed by DoP. No further comments were provided in this review. Mr Richard Good of LPMA/SCS, senior Environmentalist engaged. Conducted several inspections in company with different staff officers, prepared reports and held several extensive training workshops.	**Complete**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
ESCP-27	Water quality testing of the water management structures will also be undertaken and pumping will be monitored to record/estimate quantities transferred. This information will be used to manage water internally, and can be analysed in conjunction with monitoring under the SWMP.	The sediment discharge event in February 2010 was an example where this was not conducted and hence Mangoola Coal are deemed non compliant with this requirement. After the discharge event in February 2010, a new procedure was established to ensure that sediment ponds were not pumped out at any location on site without a check by environmental personnel. One water sample was noted to be taken on 6.03.10 during an inspection of the Pit Water Dam after a rain event.	Non Compliant **Recommendation:** Ensure water quality testing of water structures is undertaken and that they are monitored to record / estimate quantities transferred.	**Complete** GEN-HSE-FRM-0118 Mangoola Coal Water Discharge Approval Form developed, including these recommendations.	**Complete**
ESCP-31	Construction Manager (or their delegate) will keep a record of entries at least weekly and immediately before forecast rain and after rainfall. Entries will include: (a) The amount of rainfall and the rainfall duration; (b) The condition of any soil and water management work; (c) The condition of vegetation and any need irrigate; (d) The need for erosion/sedimentation prevention strategies; and (e) Any remedial works to be undertaken. The records will be kept on-site and made available to any authorised person on request. It will be given to the environmental manager at the conclusion of the works.	Records were not sighted that addressed all of these requirements in one central location. Rainfall records are obtained from weather stations and kept. No information was sighted on the condition of soil and water management work; the condition of vegetation and the need to irrigate; the need for erosion/sedimentation prevention strategies or remedial work to be undertaken.	Non Compliant **Recommendation:** Site should consider the requirement and how it will be relevant to ongoing construction work and implement actions as appropriate.	**Complete** ESCP revision dated Jul 2010 and submitted to DoP for review. No further comments or alterations were advised.	**Complete**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
ESCP-32	This will include reporting on: • construction, monitoring and maintenance of erosion and sediment control structures; and • proposed improvements to erosion and sediment control systems when monitoring indicates the need.	No specific reporting was observed to address this requirement outside of inspection sheets. Mangoola Coal has organised for a soil conservation expert to visit the site on a few occasions to: • review sediment controls; • train selected management personnel on sediment and erosion controls; • conduct a site tour with management to discuss sediment controls. At the time of the audit site inspection the outcomes of this work had not been documented. As such the extent of the works was difficult to assess.	Non Compliant **Recommendation** It is recommended that formal independent inspections (or audits) by an expert are conducted regularly, that are documented, have corrective actions listed and assess implemented actions. The reports produced should describe erosion and sediment control works conducted before and after each review by the expert.	**Complete** Mr Richard Good of LPMA/SCS, Senior Environmentalist engaged. Conducted several inspections in company with different staff officers, prepared reports and held several extensive training workshops.	**Complete**
Groundwater Management Plan-1	The groundwater monitoring program consists of manual sampling which are carried out at various times as set out below: All piezometers are sampled for standing water level, EC and pH (on average) every two months. Eight selected piezometers are also sampled for additional analytes annually. Site Monitoring Frequency Parameters All existing and new piezometers designed for water quality sampling Two-monthly Water level pH, EC Eight (8) selected representative piezometers Annual	<u>All existing and new piezometers</u> Mangoola Coal commissioned Carbon Based Environmental to conduct its groundwater monitoring program. The auditors sighted the monthly monitoring reports and summary spreadsheet (Mangoola Groundwaters Update March 2010) provided by Carbon Based Environmental. It was observed that during the audit period all piezometers (46 in total) were monitored for standing water level, pH and electrical conductivity on a quarterly basis rather than two monthly as specified in the Plan. It is believed this oversight was due to the requirement in the EPL for quarterly reporting. Mangoola Coal reported that it intends to monitor groundwater on a quarterly basis during the operational phase of the project and that this will be documented in the Operational Groundwater Monitoring Plan to be approved by the DoP.	Non Compliant **Recommendation:** Ensure groundwater monitoring of standing water level, pH an electrical conductivity is undertaken at the frequency specified within the Groundwater Monitoring Program or the Program is amended and approved accordingly. Ensure vibrating wire piezometers are installed and pore pressure data is collected and analysed.	**Complete** In progress - Installation of additional vibrating wire piezometers awaiting advice from ground water consultant (Col Mackie) prior to finalising AFE. GDP plans prepared –still require ecological and archaeological	**Complete**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
	(may be carried out more regularly if required) Total dissolved solids (TDS) Major ions: Ca, Mg, Na, K, CO_3, HCO_3, Cl, SO_4 (or S). Elements/metals: Al. As, B, Ba, Fe (soluble), Li, Mn, Rb, P, Se, Si, Sr, Zn Vibrating wire piezometers Continuous (4 hourly intervals) Pore pressure at multiple elevations All In-pit sump dewatering As required Volume of water transferred & pumping hours	<u>Eight selected representative piezometers</u> The auditors sighted the groundwater chemistry results for March 2009. Seven piezometers were analysed for a suite of parameters. These differed to those specified in the Plan for example the following parameters were not monitored: CO_3, As, Li, Rb, P and Se however the following parameters were monitored which were not specified in the Plan: Br, F and PO_4. The results for March 2010 were not available. <u>Vibrating wire piezometers</u> The vibrating wire piezometers were not installed at the time of the audit and therefore pore pressure data was not available for the audit period. It was reported that the vibrating wire piezometers were in the process of being purchased. <u>In-pit dewatering</u> This requirement was not triggered during the audit period as mining was yet to commence.		inspection/clearance. Aboriginal groups informed of proposed drilling programme at most recent 6 monthly Consultation meeting Currently being installed in VW3. Holes VW1 and VW2 still to be drilled during current AEMR reporting period.	
GMP-2	Depressurisation will be assessed by regular measurement of prevailing groundwater levels in the rock strata and alluvial aquifers, which will be compared with pre-mining levels.	It was reported that depressurisation would be assessed using pore pressure data following the installation of the vibrating wire piezometers. This was still to be conducted.	Non Compliant **Recommendation:** Assess depressurisation through regular measurement of prevailing groundwater levels in the rock strata and alluvial aquifers and compare with pre-mining levels.	On-going. Consultant Colin Mackie engaged, and work order issued.	**31 Dec 2011** **11 of 12 holes drilled**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
GMP-3	Changes to groundwater hydrochemistry (induced by changes to groundwater flow pattern) will be identified by regular sampling of groundwater from piezometers and wells, with field and laboratory determination of a suite of analytes.	The auditors sighted the groundwater chemistry results for March 2009. Seven piezometers were analysed for a suite of parameters. The results for March 2010 were not available. It was not evident if an analysis of the results including comparison with previous year's results was being undertaken. The AEMR does not include a discussion of the groundwater chemistry results and a discussion of trends.	Non Compliant **Recommendation:** Ensure the groundwater chemistry monitoring for 2010 is undertaken. Undertake an analysis of the groundwater chemistry results which includes comparison to previous years / baseline data. Include a discussion of the groundwater chemistry results and the analysis / interpretation of the data in the AEMR.	**Complete** 8 representative sites selected and annual full speciation analysis conducted in September 2010	**Complete**
GMP-5	Delineation of Big Flat Creek alluvial aquifer in the vicinity of the confluence with Clarks Gully and Anvil Creek (where the mine pit will intercept the alluvium), will be conducted in increased detail by drilling numerous transects to determine the base of the alluvium and the hydraulic conductivity of the alluvial materials. Permanent piezometers will also be installed in a number of transect drill holes for the purpose of water table monitoring. Geophysical methods may be used prior to transect drilling to optimise transect locations	It was reported that additional piezometers are planned to be installed along Big Flat Creek in consultation with the DWE. The auditors sighted Mangoola Coal's Annual Plan for 2010 which indicated the installation of additional piezometers as an action during 2010. The auditors also sighted an email from Mangoola Coal to the DWE dated 4.05.10 asking for confirmation of the location of one additional piezometer.	Non Compliant **Recommendation:** Continue working towards installing additional piezometers and delineation of the Big Flat Creek alluvial aquifer.	As per comments for GMP-1. Developing installation program. Licences for proposed sites almost complete. Further consultation with NSW Office of Water will be required.	**All licences obtained, working budget prepared – scheduled late 2011-Q2 2012.**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
GMP-6	Groundwater Dependant Ecosystems (GDE) and Riparian Vegetation will be assessed through the River Health monitoring that will be undertaken for Big Flat Creek, Wybong Creek and Sandy Creek. This monitoring will detect any measureable changes in river health, including those induced by changes to alluvial aquifers. This monitoring is described within the Surface Water Monitoring Program;	The following River Health Monitoring was undertaken during the reporting period and sighted by the auditors: - Spring 2007 by Robyn Tuft and Associates; - Autumn 2008 by Robyn Tuft and Associates; - Spring 2008 by Robyn Tuft and Associates; - Autumn 2009 by Biosis Research; and - Spring 2009 by Biosis Research. The River Health Monitoring included monitoring at six sites across the three main tributaries which traverse the site (Sandy Creek, Wybong Creek and Big Flat Creek). The monitoring program assessed macroinvertebrate community structures, as well as water quality and catchment-riparian health. It was noted that the program did not specifically look at Groundwater Dependant Ecosystems and assess impacts due to changes to alluvial aquifers.	Non Compliant **Recommendation:** Revise the River Health Monitoring Program to include an assessment of the health of Groundwater Dependant Ecosystems. Ensure changes to river health induced by changes to alluvial aquifers are assessed.	**Complete.** Refer SWMP July 2010 Section 3.6 and Section 4.1. Some further changes to SWMP are required form recent DoP review.	**Complete.**
GMP-7	Groundwater Dependant Ecosystems (GDE) and Riparian Vegetation will be assessed through Floristic monitoring that will be undertaken in Big Flat Creek and Anvil Creek as a part of the Rehabilitation and Offset Management Plan; and	During the audit period quarterly ecological monitoring was undertaken by Forest Fauna Surveys and Eastcoast Flora Survey. The auditors sighted the report for Autumn 2009. The monitoring program included floristic monitoring however did not specifically include Groundwater Dependent Ecosystems and Riparian Vegetation along Big Flat Creek and Anvil Creek.	Non Compliant **Recommendation:** Include floristic monitoring of Groundwater Dependant Ecosystems and Riparian Vegetation along Big Flat Creek and Anvil Creek within the ecological monitoring program. Include reference to this monitoring within the ROMP.	**Complete** Refer GWMP Section 3.5 July 2010. Some further changes to GWMP are required form recent DoP review.	**Complete.**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
GMP-8	Groundwater Dependant Ecosystems (GDE) and Riparian Vegetation will be assessed through Identified groundwater sources associated with GDE's using both the existing piezometer network and the strategic installation of new piezometers designed to measure the water table of the connected groundwater aquifer(s) at shallow depths.	Water levels are monitored through the existing piezometer network. Additional piezometers had not been installed during the audit period for the purpose of monitoring impacts on Groundwater Dependant Ecosystems. An analysis of the relationship between water levels and Groundwater Dependant Ecosystem and Riparian Vegetation health was not undertaken during the audit period.	Non Compliant **Recommendation:** Install piezometers adjacent to Groundwater Dependant Ecosystems along Big Flat Creek as required by requirement GWMP-12. Regularly assess the relationship between water levels and Groundwater Dependant Ecosystem and Riparian Vegetation health.	As per comments for GMP-1	**3 transects proposed for late 2011 – Q2 2012**
GMP-10	Construction of a shallow piezometer along the Sandy Creek Floodplain to monitor the alluvial water levels, pH and EC (at a minimum) every two months	Mangoola Coal submitted an application for a groundwater licence under Part 5 of the Water Act to the DWE on the 22.02.08. The application was for the installation of a shallow piezometer in the vicinity of Sandy Creek. It was reported that this piezometer has since been installed. A review of the monitoring data did not indicate any new piezometers being monitored post February 2008.	Non Compliant **Recommendation:** Ensure shallow piezometer along the Sandy Creek flood plain is installed and monitored every two months.	This requirement to be reviewed against consent conditions and GWP to be amended accordingly in consultation with NOW and DoP. Not in Dec 2010 WMP.	**30 June 2011**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
GMP-11	The proposed activities during construction will expand the baseline monitoring program to include construction of additional standpipe and pore pressure (vibrating wire) piezometers to enhance measurement of strata depressurisation in areas surrounding the mine pits. Locations for these piezometers would be subject to consultation and agreement with DWE and will be located such there is minimal (or no) impact on the archaeological and ecological values of the area. Permeability testing will be completed at new piezometer locations prior commissioning;	Additional vibrating wire piezometers had not been installed during the audit period. It was reported that this is planned to take place in 2010 and 2011.	Non Compliant **Recommendation:** Install additional vibrating wire piezometers in locations decided in consultation with DWE.	As per comments for GMP-1. Planning in progress – Drilling in 2011.	**31 Dec 2011**
GMP-12	The proposed activities during construction will expand the baseline monitoring program to include construction of shallow piezometers at strategic locations adjacent to GDE's identified along Big Flat. Locations for these piezometers would be subject to consultation and agreement with DNR. Permeability testing will be completed at new piezometer locations prior commissioning.	It was reported during the audit site inspection that the construction of new shallow piezometers adjacent to GDE's along Big Flat Creek was planned to take place in 2010. The auditors sighted Mangoola Coal's Annual Plan for 2010 which indicated the installation of additional piezometers as an action during 2010. The auditors also sighted an email from Mangoola Coal to the DWE dated 4.05.10 asking for confirmation of the location of one additional piezometer	Non Compliant **Recommendation:** Install additional piezometers adjacent to Groundwater Dependant Ecosystems along Big Flat Creek and implement monitoring.	As per comments for GMP-1	**31 Dec 2011**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
GMP-13	Assessment of data trends and impact analyses will include: • Two-monthly data assessment for departures from identified monitoring or predicted data trends. If consecutive data over a period of six (6) months (minimum of three consecutive readings) exhibit an increasing divergence towards a negative (adverse) impact from the established or predicted trend, then such departures will initiate further action. That is, a greater than predicted change in groundwater levels or deteriorating water quality would serve as a trigger for further investigations	The monitoring reports provided by Carbon Based Environmental include graphs of each monitoring bore plotting historical data for water level, pH and EC. The reports however do not analyse or discuss in detail departures from monitoring or predicted data trends. A more thorough analysis and discussion is provided within the AEMR. It is not expected that there would have been any impacts to groundwater during the audit period as mining was yet to commence.	Non Compliant **Recommendation:** Undertake data assessment for departure from groundwater monitoring or predicted data trends upon receipt of monitoring results rather than annually as part of the AEMR.	**Complete** Agree with recommendation, and will adopt as monitoring database expands.	**Complete**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
Site Water Balance-6	Base data will be collected from a range of field monitoring devices being flow meters, water level gauges, stream flow gauges and water quality at applicable locations, specifically: - Flow meters installed on all transfer pumps; - Level recorders installed in each of the major storages (level information used in unison with geometric data to estimate storage volumes); - Stream flow gauges installed at spillways of all sediment basins (typical v-notch weir arrangement with supplementary large flow spillway should be sufficient); - Stream flow gauges at mine water system overflow points to both the Anvil Creek and Clarks Gully waterways (could be similar to that suggested for sediment basin spillways, or permanently installed Acoustic Doppler Current Profiler); and - Salinity (EC) and Total Suspended Solids (TSS) measurements will be taken at critical points.	Not all of the water storages had been completed during the audit period. It was reported that sediment dams have meter boards installed but that they are not routinely surveyed. Water usage from sediment dams is estimated based on a visual inspection. It was reported that a flow meter had been installed on the Hunter River pipeline to enable monitoring of the quantity of the water extracted from the Hunter River.	Non Compliant **Recommendation:** Ensure that flow meters, water gauges and stream flow gauges are installed at all locations outlined within the Site Water Balance to enable calibration and modelling of the SWB.	Flow meters are currently installed on the following pumps which will link into the site Scada system: 1) Hunter river pumps 2) Booster station pumps 3) Rail loop pond pump 4) Dirty water pump to Pit water dam 5) MIA transfer pump from Raw water dam to MIA 6) MIA raw water to potable treatment. 7) Raw water to pit water transfer pump 8) CHPP in and outflows. Pressure transducers are to be installed to both the Raw water and Pit Water dam.	**30 Jun 2011**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
SWB-9	It is recommended that the stream flow gauges at mine water system discharge points to the Anvil Creek and Clarks Gully waterways be commenced as early as possible to establish a solid baseline condition.	It was reported that flow gauges were in the process of being commissioned at the time of the audit site inspection.	Non Compliant **Recommendation:** Commission flow gauges and commence collecting data on flows from Anvil Creek and Clarks Gully waterways.	Pit Water Dam overflow to have appropriate metering installed.	**Complete**
Surface Water Management Plan-4	The SWMP will also be reviewed if there is a significant variation to the mine plan and/or surface activities and/or change to legislative requirements.	The SWMP was not revised during the audit period as a result of significant changes to surface activities or legislative requirements. The SWMP should have been reviewed at the time the EPL was issued to specify monitoring requirements required by the EPL. Whilst the monitoring outlined in the plan was not inconsistent with that required by the EPL there were no direct references to the EPL.	Non Compliant **Recommendation:** Ensure future plans are revised following any applicable changes to the EPL.	**Complete** As required.	**Complete**
Surface Water and Groundwater Response Plan -4	Following an exceedance, downstream water quality monitoring will be carried out on a daily basis until water quality parameters are back within impact assessment criteria.	Downstream water quality monitoring was undertaken following the water discharge incident which occurred on the 8.04.10. Monitoring was also taken on the 13.04.10. The results indicated that TSS levels in the pit water dam both upstream and downstream increased between the two monitoring events. Further monitoring was not undertaken. As stated above, as the impact criteria are not well defined within the Surface Water Monitoring Plan this requirement (to monitor daily until water quality parameters are back within impact assessment criteria) is difficult to implement.	Non Compliant **Recommendation:** The impact assessment criteria within the Surface Water Monitoring Plan need to be revised to include specific indicators so the site can clearly determine if they are exceeding the criteria.	Refer to SWMP Section 3.7 On site Water Monitoring Section 5.1 Site WMP – protocol developed for rainfall response Section 3.8 Discharge of Water Appendix D Surface Water Monitoring Summary of the SWMP Further updates to be effected as per recent DoP review comments.	**Complete**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
SWMP-1	The “Blue Book” recommends that treated discharge waters should not contain more than 50 milligrams per litre of suspended solids in the design rainfall event	During the audit period there was one incident where sediment laden water was discharged from the site. This event is discussed in Section 3.1 of the main report and other sections of this assessment.	Non Compliant Refer to recommendations in the Main Report and in other sections of this table.	Previously captured action.	**Complete**
SWMP-5	Water Quality in surrounding watercourses including Sandy Creek, tributary of Sandy Creek, Hunter River, Anvil Creek, Big Flat Creek, Wybong Creek, Reedy Creek and Goulburn River. (W1 to W17). Site W17 is a new site to collect additional data in the Hunter River Monthly TSS, TDS, EC and pH Annually All parameters (see below) As required in response to an Environmental Incident or after significant rain event. As required, depending on the nature of the event/incident	Mangoola Coal engaged Carbon Based Environmental to undertake its surface water monitoring. The auditors sighted the monthly monitoring reports and summary spreadsheet (Appendix 7 Surface Water Monitoring Data 2002 to 2009) provided by Carbon Based Environmental. The spreadsheet contained results up until February 2010 which indicated that monitoring was being undertaken monthly at Sites W1 to W16 for TSS, TDS, EC and pH. Site W17 was reported to be the pump station for monitoring water quality following commissioning of the Hunter River pipeline. At the time of the audit monitoring was yet to be conducted at W17. The auditors sighted an internal email dated 17.06.10 requesting that W17 is added to the surface water quality monitoring program. Refer to SWMP-4 above for discussion of monitoring following an environmental incident.	Non Compliant **Recommendation:** Undertake monitoring at Site W17 as per Surface Water Monitoring Plan.	**Complete.** First sample taken June 2010	**Complete**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
SWMP-6	"All Parameters", will include: • flow (by way of observation), • pH, • Electrical conductivity (EC), • Total Dissolved Solids (TDS), • Total Suspended Solids (TSS), • Calcium (Ca), • Magnesium (Mg), • Sodium (Na), • Potassium (K), • Bicarbonate as $CaCO_3$, • Sulphate (SO_4-), • Chloride (Cl-), • Iron (Fe), • Silver (Ag), • Arsenic (As), • Boron (B), • Barium (Ba), • Cadmium (Cd), • Copper (Cu), • Manganese (Mn), • Lead (Pb), • Selenium (Se), • Zinc (Zn), • Mercury (Hg), • Fluoride (Fl-), • Nitrite and nitrate as N, • Total Kjeldahl Nitrogen (TKN), • Total nitrogen (Total N), • Total phosphorus (Total P), • Total cations; and • Total anions.	The results of the annual monitoring of all parameters were not available at the time of the audit. It was reported that the 2010 analysis had been conducted and that Mangoola Coal were awaiting the report from its consultants. A summary of these results was not provided in the 2007-08 or 2008-09 AEMRs.	Non Compliant **Recommendation:** Ensure annual surface water quality chemistry analysis is undertaken and results reported in the AEMR.	**Complete.** All annual analysis will be included in future AEMRs commencing 09/10 report.	**Complete**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
SWMP-9	Flows downstream of Anvil Hill in Wybong creek and flows upstream and downstream in Big Flat Creek	It was reported that flow gauges were in the process of being commissioned at the time of the audit site inspection. Flow data downstream of Anvil Hill in Wybong Creek and upstream and downstream in Big Flat Creek was not obtained during the audit period.	Non Compliant **Recommendation:** Ensure that flow monitoring is undertaken in accordance with the Surface Water Monitoring Plan. Report results of flow monitoring within the AEMR.	Installed in Wybong Ck and downstream Big Flat Ck. Operating August 2010. First quarterly reports received 5 Nov2010. Suitable upstream location for BFC to be determined.	**Not being done**
SWMP-14	This will include reporting on: • Water Quality in all surrounding watercourses; • The river health assessment for Big Flat Creek, Wybong Creek and Sandy Creek; and • Channel stability within Big Flat Creek and Sandy Creek.	Water quality reporting is included within the AEMR. The 2008-09 AEMR was reviewed and noted to include discussion of the monthly surface water quality results. Annual water chemistry monitoring results were not discussed neither were flows. River health is discussed briefly within the Threatened Flora and Fauna Section of the Report. Channel Stability is not discussed.	Non Compliant **Recommendation:** The AEMR should report on the following: - results of annual water chemistry monitoring and discussion of compliance with impact assessment criteria; - results of the channel stability monitoring program; and - further details of the results of the river health assessment.	Required information to be included in future AEMRs commencing 09/10 report.	**31 Dec 2010**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
PAC 3/12	The Proponent shall ensure that the airblast overpressure level from blasting at the project does not exceed the criteria in Table 3 at any residence on privately owned land.	Mangoola Coal had conducted 8 blasts in 2009 and 16 blasts up until the 9.06.10. Blasting is undertaken by blast contractor Addrill. Addrill provide Mangoola Coal with Blast Reports which include details such as the date, time, explosives used as well as records of any monitoring conducted (peak particle velocity and airblast overpressure level). In addition monitoring reports are provided by Instantel which also include the date, time and a more detailed analysis of the of the velocity and frequency of the blast. Blast monitoring results are summarised by the Environmental Coordinator into a Blasting and Vibration Results Excel spreadsheet. The auditor sighted a selection of Addrill reports and Instantel reports and reviewed the Blasting and Vibration Results spreadsheet. A review of the results indicated the following: - There were three incidents were no blast monitoring results were recorded in 2009 and three incidents were no blast monitoring results were recorded in 2010. In 5 of the 6 instances it was noted that the monitor did not trigger. - In 2010 there were two blasts where the airblast overpressure level of 115dB(Lin Peak) was exceeded at the nearest residence (4.02.10 and 09.06.10). At the current ratio (2 / 16) this would represent an exceedance of the 5% exceedance allowance over a 12 month period. It is therefore recommended that Mangoola Coal track blast monitoring results diligently so as to be aware of the exceedance ratio and employ techniques to minimise blast impacts to ensure compliance with the criteria.	Indeterminate **Recommendation:** Ensure blast monitoring results are diligently tracked so that Mangoola Coal is aware of the current exceedance ratio for 2010 and employ techniques to minimise blast impacts to ensure compliance with the criteria. Levels above the airblast overpressure and peak particle velocity criteria should be recorded as incidents (even though they theoretically may not represent exceedances of the criteria over a 12 month period) so as to formalise and record the investigation and corrective and preventative action process.	Compliant. No exceedances. Results tracked to monitor compliance.	**Complete**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
PAC 3/24	The Proponent shall ensure that the dust emissions generated by the project do not cause additional exceedances of the air quality impact assessment criteria listed in Tables 5, 6, and 7 at any residence on privately owned land, or on more than 25 percent of any privately owned land (excluding the dust affected properties listed in the table to Appendix 5).	A detailed discussion of compliance with the air quality criteria is provided in Appendix B.	Compliant (TSP, PM10 & Max deposited dust) Indeterminate incremental deposited dust) Refer to Recommendations in Appendix B and summarised in Section 6 of the main report.	**Not for action.** Current management and maintenance programs to continue	**Not for action.**
PAC 3/42	The Rehabilitation and Offset Management Plan must include: (Refer to Condition for details)	The Draft ROMP was not reviewed in detail as it was yet to be finalised at the time of the audit.	Indeterminate	ROMP finalised and submitted. DoP review comments to be incorporated into final document.	**31 Jan 2011**
PAC 3/43	The Final Void Management Plan must: (Refer to Condition for details)	The Final Void Management Plan included within the Draft ROMP was not reviewed in detail as it was yet to be finalised at the time of the audit.	Indeterminate	As above	**31 Jan 2011**
PAC 3/44	The Mine Closure Plan must: (Refer to Condition for details)	The Mine Closure Plan included within the Draft ROMP was not reviewed in detail as it was yet to be finalised at the time of the audit.	Indeterminate	As above	**31 Jan 2011**
PAC 3/56	The Proponent shall minimise the visual impacts of the project to the satisfaction of the Director-General.	Refer to later sections of this Table for discussion of the implementation of the recommendations from the Visual Impact Mitigation Report (prepared to satisfy PAC 3/53). This report was prepared to the satisfaction of the Director General. A number of recommendations were yet to be implemented at the time of the audit as infrastructure and lighting was yet to be installed.	Indeterminate **Recommendation:** Continue to work towards implementing the recommendations of the Visual Impact Mitigation Report and completion of the visual screening required by PAC 3 / 55A. Upon completion of these works seek DG satisfaction of visual impact minimisation.	Tree screen planting completed to date and reported in 09/10 AEMR: Mangoola Rd (2.5km), and one private residence. Planned planting: one private residence, sections of Wybong Rd, section of Limb of Addy, Rail Loop Noise Wall, further private residence requests.	**Ongoing works during 2011 and 2012.**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
				Ongoing plus maintenance	
PAC 3/57	The Proponent shall: (a) take all practicable measures to mitigate off-site lighting impacts from the project; and (b) ensure that all external lighting associated with the project complies with Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting, to the satisfaction of the Director-General.	As 24-hour operations were yet to commence, permanent lighting had not been installed on site at the time of the audit. However lighting impacts were being considered by Downer Engineering during the design phase of the CHPP. Refer to later sections of this Table for implementation of Visual Impact Mitigation Report and SOC 6.13.5.	Indeterminate **Recommendation:** Continue to work towards implementing measures to reduce off-site lighting impacts from the project. Upon completion of these works seek Director General satisfaction of off-site lighting impact minimisation.	**Complete** Site will actively plan operations to minimise offsite lighting impact.	**Complete**
SOC 6.6.5	Water carts will be used on active haul roads and unsealed working areas. Surface moisture levels on all haul roads will be maintained at suitably elevated levels and/or chemical treatments will be applied to achieve 90% dust suppression.	The environmental assessment included an air quality impact assessment which was used to estimate compliance with air quality standards at sensitive receptor sites. This included the generation of an inventory of dust emitting activities, the use of emission factors to estimate dust emissions (kg/hr) from each of these activities, and dispersion modelling to estimate the resulting dust concentrations (µg/m3) at sensitive receptors. The emissions inventory included the assumption that haul road emissions would be controlled by 90% beyond uncontrolled haul road emissions. This assumption progressed into the statement of commitments as: "Surface moisture levels on all haul roads will be maintained at suitably elevated levels and/or chemical treatments will be applied to achieve 90% dust suppression"	Indeterminate **Recommendation:** Investigate the haul road watering requirements required to achieve 90% dust suppression in order to attempt to confirm whether this commitment has, and is being satisfied. This investigation could also extend to the Dustbloc trial, with evaluation of the product using a comparison to an untreated section of haul road.	Implementing RST Haul Road Management System dust suppressant additive. Planned implementation of portable dosing system December 2010, with installation of permanent system to be commissioned with the main site water fill point. Trials continuing – improving results. Extending to hardstand areas	**Trials Continuing**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
		During the audit period there wasn't evidence that haul road watering is implemented to this commitment, although work is currently being undertaken in this area. Mangoola Coal has made reasonable endeavours to investigate the specific requirements to achieve the condition, and may be satisfying this condition with water cart usage. The auditor sighted correspondence between Mangoola Coal and the consulting firm that performed the air quality impact assessment, requesting the watering requirements for a 90% reduction, however the response did not include a watering requirement. The auditor also sighted vendor material on a chemical dust suppressant "Dustbloc", as well as a purchase order for the Dustbloc trial which is to be implemented in the near future. It is recommended that Mangoola Coal investigate the haul road watering requirements required to achieve 90% dust suppression in order to attempt to confirm whether this commitment has, and is being satisfied. This investigation could also extend to the Dustbloc trial, with evaluation of the product using a comparison to an untreated section of haul road.			
SOC 6.6.9	Blasting design and operation will be managed to achieve optimum material breakage and movement to facilitate efficient mining while minimising the explosives used to achieve this outcome. This includes consideration of material and explosives characteristics, excavating equipment specifications, hole	Blasting is undertaken by blast contractors, Addrill. Addrill is responsible for designing the blast so as to facilitate mining while minimising the explosives used. Addrill has developed a Blast Management Plan which details the field procedures for blasting. The Plan does not include details on designing the blast so as to minimise dust generation. Refer also to PAC 3/17.	Indeterminate **Recommendation:** Although the scope of the Blast Monitoring Program as specified by PAC 3/23 does not include a description of management / mitigation measures it is recommended that these are documented within the Program. These should include best	Refer BMP July 2010 Section 3.3 Blast Impact Evaluation & Compliance Assessment. Review comments from DoP on revised plan. Development of Blast Management Procedure 25/10/10 MAN MIN PRO	**Completed**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
	spacing and stemming material specification, accurate placement and drilling of holes, accurate explosives loading and well-managed stemming of blast holes. These measures will assist with minimising dust generation in the blasting process.		practice to protect the safety of people, property, public infrastructure, significant rock shelters and formations of Aboriginal and non-indigenous cultural heritage as well as measures to minimise the dust and fume emissions from blasting including blast design and operation. The revised Program should be submitted to the DoP for approval and implemented.	0017. Drill & Blast Planning, Design & Record Keeping	
EPL-R2.1	The licensee or its employees must notify the EPA of incidents causing or threatening material harm to the environment as soon as practicable after the person becomes aware of the incident.	During the audit period Mangoola Coal was notified on the 11 February 2010 by the DECCW of a complaint relating to a water quality incident. DOP visited the site on 18 February 2010. Mangoola Coal became aware that there was a discharge event on 22 February 2010 and reported the event to the DECCW Pollution Hotline on 23 February 2010 (report number 119158). On 24 February 2010, DoP issued Mangoola Coal with a Notice to furnish information or records under section 122Q of the Environmental Planning and Assessment Act 1979. The Notice indicated that the information was required by 10 March 2010. Mangoola Coal commissioned Umwelt to prepare an investigation into the discharge (March 2010). This was submitted to DoP on 10 March 2010 and to the DECCW on 11 March 2010. Refer to Section 3.1 of the main report for further details of this incident. Mangoola Coal reported that there have been no other incidents causing or threatening to cause material harm to the environment.	Indeterminate with respect to the discharge event in February 2010 - this is subject of an investigation by DECCW. Otherwise Compliant	DECCW investigating. See comments above from condition PAC 3/30 a)	**Investigation completed.**

Condition Requirement No.	Summary of Condition / Requirement	Comment	Compliance Status and Recommendation	Status	Target Completion
SWB-2	All monitoring bores, groundwater extraction bores and the mine pit will be licensed under Part 5 of the Water Act 1912.	The majority of the monitoring bores were installed prior to when Mangoola Coal acquired the mine. The monitoring bores and their licence numbers are not listed in the Groundwater Monitoring Program. Centennial Hunter submitted an application for a groundwater licence under Part 5 of the Water Act to the DWE on the 22.02.08. The application was for the installation of a shallow piezometer in the vicinity of Sandy Creek. This is not included in the latest SWMP (Dec 10)	Indeterminate **Recommendation:** Ensure all monitoring bores and the mine pit are licensed. The Groundwater Monitoring Plan should be revised to list all licensed monitoring bores, extraction bores and the mine pit.	Letter to NOW 1/9/10 c/w application & cheque to dewater 700ML /year from Open Cut. Next suite of piezometer LOM monitoring holes (11) all licensed approximately August 2010. Email to NOW 25/10/10 – application referred to Major Projects Branch for the inclusion of special conditions.	**31 Mar 2011** **11 of 12 holes completed**