THE WALLERAWANG COLLIERIES LIMITED

2011 ANNUAL ENVIRONMENTAL

MANAGEMENT REPORT

Name of mine		Baal Bone Colliery	
Titles/Mining Leases		CCL 749, MPL 261, CL 391, ML 1302, ML 1382, ML 1607	
MOP Commencement Date	10/07/2009	**MOP Completion Date**	10/07/2016
AEMR Commencement Date	01/01/2011	**AEMR End Date**	31/12/2011
Name of leaseholder		The Wallerawang Collieries Limited	
Name of mine operator (if different)		Baal Bone Colliery	
Reporting Officer		Elizabeth Wood	
Title		Environment and Community Officer	
Signature		……	
Date			

Managed by xstrata coal

Table of Contents

SECTION 1.0: INTRODUCTION

1.1 Overview

This Annual Environmental Management Report (AEMR) for Baal Bone Mine is prepared annually by Baal Bone Colliery (Baal Bone), to fulfil the reporting requirements of various regulatory departments. Baal Bone is operated by The Wallerawang Collieries Limited (TWCL). The reporting period for this AEMR is 1 January 2011 to 31 December 2011.

On 14 January 2011, TWCL received Project Approval (PA 09_0178) for the continuation of mining activities at Baal Bone via Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Project Approval granted approval for the continuation of mining operations at Baal Bone until 14 December 2014, and included:

- continuation of underground mining of Longwalls (LW) 29-31 in accordance with the approved Subsidence Management Plan (SMP) and Mining Operations Plan (MOP);
- continued operation of associated surface infrastructure;
- saleable coal production of 2.0 Mtpa (equating to 2.8 Mtpa run of mine (ROM) coal);
- continued transport of prepared saleable coal to markets by rail, and up to 900,000 tonnes per annum (tpa) by road; and
- mining of other isolated Remnant Areas within existing workings.

Underground mining at Baal Bone ceased during the reporting period on 3 September 2011, and underground mining operations have now entered into care and maintenance. A 'Suspension of Operations' notice was provided to the NSW Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) on 30 August 2011. Coal washing operations were completed in December 2011, with transport of product coal by train expected to continue until approximately April 2012. A new MOP is currently being prepared for the suspension of operations for the period 2012 to 2015.

Investigations for future land uses and mining operations at Baal Bone are currently being undertaken. Any future mining operations not approved under PA 09_0178 will require the preparation of the relevant approval applications (e.g. development approvals, mining leases, SMP and MOP) prior to commencement. A review period will occur prior to the end of the new MOP period in 2015, whereby TWCL will undertake a review of opportunities for continued operations, or the progression of mine closure. In the event that future operations are not feasible, Baal Bone will commence with mine closure activities following the submission of a mine closure plan to DTIRIS.

1.2 Scope of this AEMR

The layout of this AEMR has been aligned to the *Guidelines and Format for Preparations of an Annual Environmental Management Report* (Version 3, January 2006).

This AEMR has also been prepared to address the requirements of Schedule 5, Condition 3 of Baal Bone's Project Approval (PA 09_0178). Schedule 5, Condition 3 of the project approval requires a report to be submitted to the NSW Department of Planning and Infrastructure (DP&I) reviewing the annual environmental performance of the project. The requirements of

Schedule 5, Condition 3 of the Project Approval and where these are addressed in the AEMR are listed in **Table 1.1**. References to the environmental assessment (EA) in **Table 1.1** and throughout this report refer to the document titled *Baal Bone Colliery Environmental Assessment* dated March 2010 (AECOM, 2010).

Table 1.1.Requirements of Schedule 5, Condition 3 of Project Approval 09_0178

Schedule 5, Condition 3 requirement	AEMR Section
a) describe the works that were carried out in the previous calendar year, and the works that are proposed to be carried out over the current calendar year.	Section 2.0 and Section 6.0
b) include a comprehensive review of the monitoring results and complaints records of the project over the previous calendar year, which includes a comparison of these results against: • the relevant statutory requirements, limits or performance measures/criteria; • the monitoring results of previous years; and • the relevant predictions in the EA.	Section 3.0
c) identify any non-compliance over the previous calendar year, and describe what actions were (or are being) taken to ensure compliance;	Section 3.0
d) identify any trends in the monitoring data over the life of the project;	Section 3.0
e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and	Section 3.0
f) describe what measures will be implemented over the current calendar year to improve the environmental performance of the project.	Section 3.0

The AEMR will be submitted to the following authorities:

- DTIRIS;
- DP&I;
- Forests NSW;
- Lithgow City Council (LCC);
- NSW Office of Water (NOW);
- Office of Environment and Heritage (OEH); and
- Sydney Catchment Authority (SCA).

The reporting period for this AEMR is 1 January 2011 to 31 December 2011.

It should be noted that this AEMR does not necessarily provide a comprehensive description of each individual operation or environmental control that is currently employed at Baal Bone; this level of detail is available in the MOP and SMP for Baal Bone's Underground Operations (July 2009). Rather, this AEMR focuses on providing a succinct review of the significant

operational and environmental activities undertaken throughout the year. It also examines the performance of key site operations and environmental controls throughout the 2011 reporting period.

Included is a summary of monitored data (as applicable), a discussion regarding the level of compliance achieved, together with an overview of initiatives proposed and actions planned for the 2012 reporting period.

1.2 Consents, Leases and Licences

1.2.1 Current Consents, Leases and Licences

A list of all current consents, leases, licences and approvals are included below in **Table 1.2**. It is noted that development consents will be surrendered in accordance with Schedule 2, Condition 9 of PA 09_0178 in early 2012 (outside this AEMR reporting period); however these are noted in **Table 1.2**.

Table 1.2. Consents, Leases, Licences and Approvals.

Type	Regulatory Authority	Approval Number	Holder	Issue Date	Expiry/ Review Date	Scope
Project Approval	DP&I	09_0178	The Wallerarang Collieries Ltd	14/01/2011	31/12/2014	Part 3A Project Approval for continued operations at Baal Bone Colliery. Will supersede all prior development consents (except for Ventilation Shaft and Transmission line – PA 07_0035) as previous consents are relinquished in 2012.
	DP&I	07_0035	The Wallerawang Collieries Ltd	24/10/2007	Perpetuity	Part 3A Project Approval for the Ventilation Shaft and Power Line Project
Development Consent	DP&I	Nil	Coalex Pty Ltd	13/09/1982	14/01/2012 in accordance with Project Approval 09_0178	Original development consent for Baal Bone Colliery – coal for export.
			Coalex Pty Ltd	31/12/1992	14/01/2012 in accordance with Project Approval 09_0178	Section 102 EP&A Act modification of original Development Consent (13/09/1982) to include road haulage of 150,000 tonnes of coal per annum for industrial purposes
	DP&I	164/98	The Wallerawang Collieries	19/08/1999	30/12/2000	Road haulage of 1.5 million tonnes of coal per annum for

Type	Regulatory Authority	Approval Number	Holder	Issue Date	Expiry/ Review Date	Scope
			Ltd			domestic market.
			The Wallerawang Collieries Ltd	25/08/2000	31/12/2003	Modification to DA 164/98 for the extension of coal haulage time for 900,000 tonnes of coal on the haulage road from Baal Bone Colliery by public road.
			The Wallerawang Collieries Ltd	23/12/2003	31/12/2015	Modification to DA 164/98 for the extension of the duration of the haulage road from Baal Bone Colliery to Mt Piper and Wallerawang Power Stations.
	Greater Lithgow Council	186/95	The Wallerawang Collieries Ltd	27/02/1996	14/01/2012 in accordance with Project Approval 09_0178	Development consent for open cut mining and associated development of Boxcut as part of the Northern Extension
Environment Protection Licence	OEH	765	The Wallerawang Collieries Ltd	17/11/2009	10/09/2014	Premises and Scheduled Activity (Coal Mining/ Washery) Licence
Mining Operations Plan	DTIRIS	09/2520	The Wallerawang Collieries Ltd	10/07/2009	10/07/2016	MOP for Baal Bone Colliery LW 29-31.
Mining Leases	DTIRIS	CCL 749	The Wallerawang Collieries Ltd	05/04/1990	23/03/2021	Mining Entitlement (Consolidates MPL 209, CL 246, CL 329, CL 330, CL331 and CL332) Various depths
	DTIRIS	MPL 261 (Act 1973)	The Wallerawang Collieries Ltd	22/08/1990	22/08/2011	Mining Entitlement (Southern mine dewatering bores) Parish: Ben Bullen, Depth: Surface - 10m
	DTIRIS	CL 391 (Act 1973)	The Wallerawang Collieries Ltd	24/02/1992	24/02/2013	Mining Entitlement Parish: Ben Bullen Depth: > 20m
	DTIRIS	ML 1302 (Act 1992)	The Wallerawang Collieries Ltd	29/09/1992	29/09/2013	Mining Entitlement Parish: Ben Bullen Depth: >20m
	DTIRIS	ML 1389 (Act 1992)	The Wallerawang Collieries	09/05/1996	09/05/2017	Mining Entitlement Parish: Ben Bullen Depth: Surface –

Type	Regulatory Authority	Approval Number	Holder	Issue Date	Expiry/ Review Date	Scope
			Ltd			unlimited Surface - 20m
	DTIRIS	ML1607	The Wallerawang Collieries Ltd	08/01/08	08/01/18	Mining Lease (Purposes) Parish: Cox Depth: Surface – 10m
S126(1) Approval	DTIRIS	317524306001	Baal Bone Colliery	14/11/2005	Perpetuity	Section 126(1) of the CMRA (1982) for the construction and operation REA 5
S100(1) Approval	DTIRIS	317551291001	Baal Bone Colliery	12/02/08	Perpetuity	Section 100(1) of the CMH&SA (2002) for the construction and operation of REA 6
Clause 88(1) Approval	DTIRIS	OUT09/1983	Baal Bone Colliery	16/02/2009	01/03/2012	Approval to longwall mine LW 29 and 30 within the Lithgow seam.
Subsidence Management Plan	DTIRIS	06/7570	Baal Bone Colliery	07/12/2007	01/12/2014	SMP for Extraction of LW 29-31, Lithgow Seam
Occupation Permit	Forests NSW	14719	Baal Bone Colliery	05/03/1991	Perpetuity	Occupation permit relevant to the power line route from the company's freehold land to Mining Purposes Lease (MPL) 261 (LW 1 mine dewatering bore); includes various subsequent extensions (LW 19 dewatering bore).
		14161	Baal Bone Colliery	08/03/1991	Perpetuity	Occupation Permit for the powerline that supplies power to the railway loop on the western edge of Ben Bullen State Forest.
S22H(1)(a) Approval	NOW	N/A	Baal Bone Colliery	27/07/1991	Perpetuity	Section 22H(1)(a) of the Rivers and Foreshores Act (1948) exemption. Permission to undertake activities on streams and drainage lines within the Baal Bone Mining Leases.
Bore Licences	NOW	80BL136703	The Wallerawang Collieries	14/01/2008	13/01/2013	Section 115 of the Water Act 1912. Bore – (under UC1

Type	Regulatory Authority	Approval Number	Holder	Issue Date	Expiry/ Review Date	Scope
			Ltd			and UC2). Main washery water make-up bore near UC1
	NOW	80BL135509	The Wallerawang Collieries Ltd	09/06/2007	08/06/2012	Section 115 of the Water Act 1912. Borehole No. 6 near Rail Loop; washery make-up and dust suppression.
	NOW	80BL236132	The Wallerawang Collieries Ltd	18/01/1995	Perpetuity	Section 115 of the Water Act 1912. Bore – Mine dewatering LW 1 (South Bore 1)
	NOW	80BL236134	The Wallerawang Collieries Ltd	18/01/1995	Perpetuity	Section 115 of the Water Act 1912. Bore – Mine dewatering LW 1 (South Bore 2)
	NOW	80BL239077	The Wallerawang Collieries Ltd	19/06/2006	18/06/2016	Section 115 of the Water Act 1912. Bore – Mine dewatering LW 19. North Bore.
	NOW	10BL601877	The Wallerawang Collieries Ltd	08/06/2007	Perpetuity	BBN175; LW29-31 groundwater monitoring piezo
	NOW	10BL601816	The Wallerawang Collieries Ltd	08/06/2007	Perpetuity	BBN176; LW29-31 groundwater monitoring piezo
	NOW	10BL601817	The Wallerawang Collieries Ltd	08/06/2007	Perpetuity	BBN177; LW29-31 groundwater monitoring piezo
	NOW	10BL601970	The Wallerawang Collieries Ltd	05/09/2007	Perpetuity	BBN 179; LW29-31 groundwater monitoring piezo
Water Licences	NOW	80SL046064	The Wallerawang Collieries Ltd	17/07/2007	17/07/2012	Section 12 of the Water Act 1912. Diversion works, 2 pumps, overshot and block dams, bywash dam.
Acknowledgement of Dangerous Goods on Premises	Work Cover Authority	35/023231	The Wallerawang Collieries Ltd	05/04/2009	22/07/2011	Dangerous Goods Licence.
Radiation Gauge	OEH	29207	The Wallerawang Collieries Ltd	20/12/2007	16/01/11	To sell and possess – Radiation Control Act 1990. Coal quality sensing device
	OEH	1123	The	16/09/2009	15/09/2011	Registration

Type	Regulatory Authority	Approval Number	Holder	Issue Date	Expiry/ Review Date	Scope
			Wallerawang Collieries Ltd			Certificate – Radiation Control Act 1990; fixed radiation gauge.

Abbreviations:

CCL – Consolidated Coal Lease
CL – Coal Lease
CMRA – Coal Mines Regulation Act 1982
DA – Development Application
DP&I – Department of Planning and Infrastructure
OEH – Office of Environment and Heritage
DTIRIS – Department of Trade and Investment, Regional Infrastructure and Services
EPL – Environment Protection Licence
ML – Mining Lease
MOP – Mining Operations Plan
MPL – Mining Purposes Lease
NOW – NSW Office of Water
REA - Reject Emplacement Area

1.2.2 Amendments During the Reporting Period

Project Approval (09_0178) was granted on 14 January 2011 for continuation of mining activities at Baal Bone during the reporting period under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

There were no amendments to Baal Bone's MOP during the 2011 reporting period.

1.3 Mine Contacts

Baal Bone Colliery can be contacted via telephone on (02) 6350 6900 and fax (02) 6359 0530. The postal and street addresses are as follows:

Postal: Baal Bone Colliery
PO Box 13
Lithgow NSW 2790

Street: Baal Bone Colliery
Off Castlereagh Highway
Cullen Bullen NSW 2790

Personnel responsible for environmental issues at Baal Bone Colliery are shown in **Table 1.3**. The current organisation chart is shown in **Figure 1.1**.

Table 1.3. Mine Personnel Contact Details

Contact Person	Position	Contact Details
Lawrie Ireland	Operations Manager	Ph: (02) 6350 6928 Email: lireland@xstratacoal.com.au Fax: (02) 6359 0596
Gary Linford	Technical Services Manager	Ph: (02) 6350 6945 Email: glinford@xstratacoal.com.au Fax: (02) 6359 0530

Contact Person	Position	Contact Details
Elizabeth Wood	Environment and Community Officer	Ph: (02) 6350 6920 Email: ewood@xstratacoal.com.au Fax: (02) 6359 0530

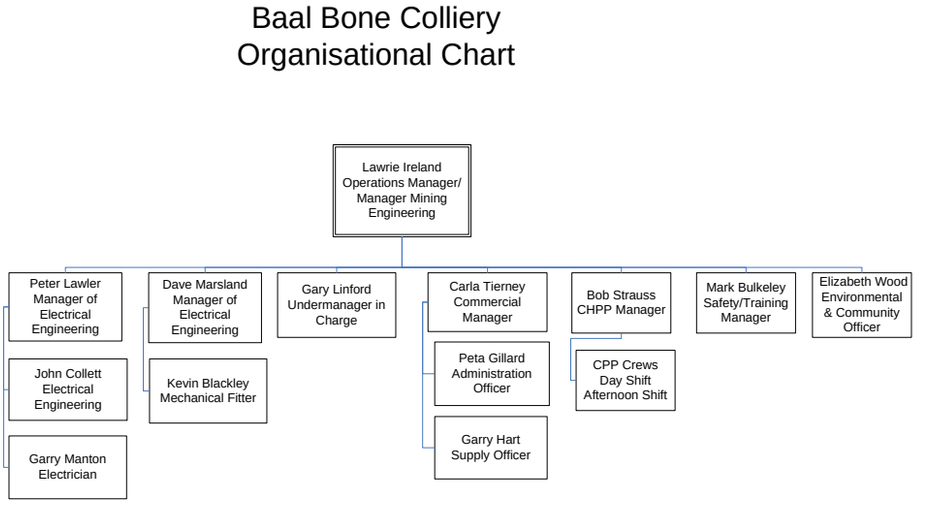


Figure 1.1. Baal Bone Organisational Chart

1.4 Actions Required at Previous AEMR Review and Site Inspection

Representatives from DTIRIS, OEH, NOW, LCC and Forests NSW attended an AEMR review meeting and site inspection at Baal Bone on 26 May 2011. The purpose of the meeting was to review progress of site operations and to discuss issues relating to environmental management and performance for the 2010 AEMR reporting period.

Based on the site inspection, DTIRIS reported that the environmental management at Baal Bone was satisfactory. DTIRIS (Greg Kininmonth) identified some deficiencies with the 2010 AEMR, outlined in its letter dated 3 June 2011. DTIRIS requested that additional information be provided, including results from contamination assessment and annual groundwater monitoring, annual monitoring of rehabilitation, and results of monitoring subsidence impacts to watercourses above Longwalls 29 and 30. Additional information was provided to DTIRIS regarding these matters in June 2011.

Baal Bone's AEMR was formally accepted by DTIRIS in its letter dated 13 July 2011, which confirmed that the deficiencies identified had been satisfied through the provision of the requested supplementary information.

DTIRIS (Greg Kininmonth) confirmed in its letter dated 4 August 2011 that it was satisfied with the rehabilitation works undertaken to subsidence induced cracking above Longwall 30. Forests NSW (Rebecca Pagan) also provided correspondence dated 1 August 2011 which confirmed that the rehabilitation works were in accordance with agreed remediation measures outlined in the 2010 AEMR.

1.5 Employment Status and Demographics

Employment details for staff based at Baal Bone Colliery are found in **Tables 1.4 – 1.6** below:

Table 1.4 Employment Type

Employment Type	Number of persons in reporting period	
	During underground mining	Following completion of underground mining
Permanent	118	11
Contractor	20	20

Table 1.5 Male/Female Breakdown of Workforce

Gender	Number of persons in reporting period	
	During underground mining	Following completion of underground mining
Male	133	28
Female	5	3

All employees resided in the Lithgow Shire during the reporting period.

1.6 Environmental and Community Vision and Policy

Baal Bone Colliery has developed an Environment and Community Vision and Policy. These policies have the commitment and support of Baal Bone Management and have been developed with the Xstrata Coal NSW (XCN) Environment and Community Vision and Policy. They are displayed in prominent locations accessed by the workforce, contractors and visitors, as well as being provided on the intranet for the awareness of all staff. The Environment and Community Vision and Policy confirms Baal Bone's commitment to being a recognised leader in environmental management and a valued operator within the community.

1.7 Enduring Value – The Australian Mineral Industry Framework for Sustainable Development

Xstrata Coal is a signatory to "Enduring Value – The Australian Minerals Industry Framework for Sustainable Development". As Baal Bone Colliery is owned and managed by Xstrata Coal Pty Ltd (Xstrata Coal), it is obliged to operate within the guidelines for environmental management as outlined in the Enduring Value framework.

1.8 National Pollution Inventory

In December 1997, the NSW Parliament passed a number of new legislation that saw the start of the National Pollution Inventory (NPI) reporting process. The NPI is an internet database designed to provide the community, industry and the government with information on the types and amounts of certain substances being emitted to the environment.

Baal Bone Colliery submitted an NPI report in August 2011 for the period of 1 July 2010 to 30 June 2011. The report detailed emissions of listed substances from Baal Bone Colliery to air, water and land requiring collation, analysis and interpretation of site-specific data. Results can be obtained from the NPI website www.npi.gov.au.

SECTION 2.0: OPERATIONS DURING THE REPORTING PERIOD

2.1 Exploration

There was no exploration activity conducted during the reporting period.

2.2 Land Preparation

No land clearing, vegetation removal or soil removing activities were undertaken during the reporting period.

2.3 Construction

No construction activities were undertaken during the reporting period. The existing administration, amenities, workshops and coal handling infrastructure associated with the Baal Bone Colliery remained unchanged. Surface facilities and infrastructure are shown on **PLAN 1**.

2.4 Mining

Underground mining extraction at Baal Bone ceased in September 2011, and operations have now entered into care and maintenance. Coal washing operations are complete, with transport of product coal by train expected to continue until approximately April 2012. Further detail is provided in the following sections.

2.4.1 Longwall Mining

Underground mining operations in the Lithgow Seam were undertaken using longwall mining methods during the reporting period, until September 2011.

Extraction of Longwall 30 was completed during the reporting period, on 2 February 2011. Extraction of Longwall 31 subsequently commenced on 7 April 2011, and was completed on 3 September 2011.

Baal Bone has approval to mine remnant coal mining areas via bord and pillar extraction method under PA 09_0178. However due to economic viability and other feasibility constraints, the completion of Longwall 31 has exhausted the economically recoverable underground reserves at this time within the currently approved mining areas of the lease. Accordingly, mining of the remnant areas is not proposed in the 2012 reporting period.

Following the completion of mining of Longwall 31, underground mining operations have been suspended. A notice of the suspension of operations was provided to DTIRIS on 30 August 2011. Recognition from the Department regarding Baal Bone's application for the suspension of operations was received on 16 September 2011. A new MOP is currently being prepared for the suspension of operations for the period 2012 to 2015.

Investigations for future land uses and mining operations at Baal Bone are currently being undertaken. Any future mining operations not approved under PA 09_0178 will require the

preparation of the relevant approval applications (e.g. development approvals, mining leases, SMP and MOP) prior to commencement. A review period will occur prior to the end of the new MOP period in 2015, whereby TWCL will undertake a review of opportunities for continued operations, or the progression of mine closure. In the event that future operations are not feasible, Baal Bone will commence with mine closure activities following the submission of a mine closure plan to DTIRIS.

2.4.2 Open Cut Mining

Open cut extraction of coal at Baal Bone was completed in July 2007. No open cut extraction occurred during the reporting period. **PLAN 1** and **PLAN 2** show the current mine layout and lease areas for both the open cut rehabilitation areas, reject emplacement areas, underground operations and associated surface facilities.

2.4.3 Production

The total ROM coal production for the 2011 reporting period was approximately 1.75 million tonnes (Mt). **Table 2.1** shows the production record for 2006-2011 for both ROM coal and saleable product coal.

Table 2.1 Saleable and ROM Coal Production Record 2006 -2011 for Baal Bone Colliery (,000 tonnes)

Product	2006	2007	2008	2009	2010	2011
Domestic	629	0	0	0	0	0
PCI	159	147	30	0	0	0
Premium	0	0	0	0	0	0
Thermal	1,770	1,410	1,211	1,413	1,277	1,258
Total Saleable Coal (,000 tonnes)	**2,558***	**1,557**	**1,241**	**1,413**	**1,277**	**1,258**
Total ROM Coal (,000 tonnes)	1,840 (UG) 648 (OC)	1,614 (UG) 411 (OC)	1,683 (UG)	2,140 (UG)	1,942 (UG)	1,752 (UG)

* total coal sold in 2006 exceeds ROM production due to a significant stockpile carry over from 2005

UG – underground extraction
OC- open cut extraction

Extraction of ROM coal ceased in September 2011 at the completion of mining of Longwall 31. Processing of ROM coal through the coal handling and preparation plant (CHPP) continued throughout the reporting period. The last ROM coal was processed through the CHPP in December 2011, with product coal stockpiled.

Saleable product coal continued to be transported from product stockpiles via the existing rail load-out facility. Transport of the remaining stockpiled saleable coal is expected to continue until approximately April 2012.

2.4.4 Resource Utilisation

Mining at Baal Bone targeted the Lithgow Seam of the Illawarra Measures. This is the only seam in the area of sufficient thickness and quality that warranted economic recovery. Other seams in the Baal Bone area do not justify mining operations at this time.

The Lithgow Seam in the underground workings ranged from 2.25-2.5m in thickness and the full seam height was typically extracted.

2.4.5 Changes in Mining Equipment or Method

There were no changes to the mining method during the reporting period. The major mining equipment fleet utilised during 2011 is outlined in **Tables 2.2a** and **b** below.

Table 2.2a. Washery Equipment

Equipment Type	Number of Units
Caterpillar Dump Truck (773)	1
Dozers (Michigan W 380, CAT D11)	2
Caterpillar Front End Loader (966F)	1
Bobcat Skid Steer Loader (753)	1
Washery Water Cart	1
Toyota Landcruiser Utility	1
Gradall Forklift	1

Table 2.2b Underground Mining Equipment

Equipment Type	Number of Units
Bobcat Skid Steer Loader	1
913 Eimco	4
912 Eimco	1
915 Eimco	1
130 Eimco	2
Forklift	2
Domino Road Grader	1
PJB Man transports	8

2.5 Mineral Processing

2.5.1 Production, Processing and Waste Summary

Baal Bone produced three grades of washed coal, principally for the export market; these being 9%, 14% and 18% ash coal. During the 2011 reporting period, 1.75 Mt ROM coal was washed, compared with 1.94 Mt and 1.99 Mt washed during the 2010 and 2009 reporting periods, respectively.

There were no changes or additions to the process or facilities during the reporting period. **Table 2.3** shows production and waste for the reporting period.

Table 2.3 Production, Processing and Waste Summary

	Start of 2010 (cumulative)	2010 Total	2011 Total	Total (cumulative)
Topsoil (freedig) stripped (m^3)	1,020,092	Nil	Nil	1,020,092
Topsoil (freedig) used/spread (m^3)	461,540	Nil	Nil	461,540
Waste Rock (open cut) (m^3)	5,810,526	Nil	Nil	5,810,526
ROM coal (,000 tonnes)	57,774	1,942	1,752	61,468
Processing Waste (CHPP) (,000 tonnes)	12,950	1,878	1,416	16,244
Product (,000 tonnes)	44,621	1,277	1,258	47,156

2.5.2 Product Destination and Transportation

There were no changes to the product transportation process during the reporting period. The total quantity of saleable product coal dispatched from Baal Bone during the reporting period was 1,258,873 tonnes, which was transported by rail to Port Kembla for export.

The Project Approval permits transport of up to 900,000 tonnes per annum (tpa) of saleable coal by public road to the Mount Piper and Wallerawang Power Stations. No product coal was transported by road during the reporting period.

2.6 Waste Management

2.6.1 CHPP Waste and Reject Emplacement

CHPP waste comprises a mixture of high ash coal and non-coal materials, such as sedimentary rock and clay. These materials occur both within the coal seam and as floor or roof materials extracted during the mining operation. They are rejected during the beneficiation process on a specific gravity basis. CHPP waste is managed through disposal in an on-site reject emplacement areas (REA).

During the reporting period, course reject was disposed in the southern REA, located in the void of the former southern open cut area. Coarse reject was trucked from the CHPP via an internal haul road. Fine reject (tailings) was disposed in REA 6, also located in the void of the former southern open cut area. REA 6 contains two cells, Cell 1 and Cell 2, separated by an embankment. Cell 1 (tailings dam) is used for the emplacement of tailings, while Cell 2 is used to collect leachate generated by the tailings in Cell 1. REA 6 has a total volume of approximately 454,000m^3 in its two cells. Tailings were pumped as a 20 to 25% w/w slurry to REA 6.

Former REAs historically used at Baal Bone have been fully rehabilitated and capped, with the exception of REA 5 (refer **PLAN 1**), located in the western portion of the void of the former southern open cut workings, which was decommissioned in 2008. REA 5 will be capped and rehabilitated during the care and maintenance period, while REA 6 will be bunded for safety and security.

2.6.2 Coarse Reject

Coarse reject at Baal Bone has a particle size ranging from 100 millimetres (mm) to 100 micron (µm) and comprises approximately 22% of washery feed. Analysis of the coarse reject material has previously confirmed that it is generally non-saline, and pH is near neutral with negligible acid producing capacity. It has been shown to exhibit poor physical characteristics with a coarse texture and low water holding capacity.

Even though it is chemically benign, this material is not suitable for use as a growth medium. All reshaped areas are therefore covered with a minimum of 300 mm of soil (freedig) material to provide a covering layer in which a sustainable and protective vegetative cover is established.

During the reporting period 498,093 tonnes of coarse reject material was strategically placed around in REA 6. REA 6 has 3 Mt of coarse reject capacity remaining.

2.6.3 Fine Reject (Tailings)

Fine reject is generally smaller than 100 µm in diameter and comprises around 7% of CHPP washery feed. Fine reject is pumped as 20–25 % w/w slurry to Cell 1 within REA 6. During the reporting period 141,575 m^3 of tailings was pumped to REA 6.

Leachate generated by Cell 1 in REA 6 is initially collected in Cell 2. It is then returned to the process water circuit for reuse by the CHPP.

REA 6 has 300 m^3 within cell 2 of fine reject capacity remaining.

2.6.4 Open Cut Waste Rock

No open cut mining was undertaken during the reporting period; accordingly there was no open cut waste rock placed during the reporting period.

2.7 Ore and Product Stockpiles

The maximum working capacity of the Baal Bone coal stockpiles (both ROM and product) is approximately 1,000,000 tonnes.

During 2011 the maximum tonnage of stockpiled ROM coal reached 556,000 tonnes in September 2011 and the maximum tonnage of stockpiled washed coal peaked at 285,000 tonnes in December 2011.

2.8 Water Management

2.8.1 Process Water Circuit

Baal Bone Colliery has a cyclic Process Water Management System. That is, all site runoff is directed into and is reticulated around the Process Water Circuit for use in general site operations and the CHPP. Some water is discharged into Baal Bone Creek through two discharge points licensed under EPL 765; LDP3 and LDP6.

EPL 765 imposes a volumetric limit of 12 ML per day on discharges from discharge point LDP6. During the reporting period an average of 3.45 ML/day was discharged with a maximum discharge of 4.35 ML on 7 October 2011. A total of approximately 1,260 ML was discharged through this discharge point during the 2011 reporting period.

As at 31 December 2011, approximately 91 ML of water was held within the process water circuit, see **Table 2.5**. Water is typically used by the CHPP at a rate of 2.5 ML/day.

Tailings slurry from the CHPP is pumped to the REA 6 tailings dam (Cell 1) at an average rate of 150 m^3/hr. From the tailings dam, leachate is gravity fed through a filter embankment to the leachate collection dam, from where water can be pumped back into the Dirty Water Dam. Some leachate is also returned via seepage into the Box Cut sump. Approximately 112.9 ML of leachate water was recycled from the Leachate Dam and/or Box Cut sump into the process water circuit in 2011.

Water from the Dirty Water Dam is subsequently pumped into the Process Water Dam prior to redistribution to the CHPP and to the underground operations for wash down, dust suppression and fire fighting purposes.

2.8.2 Potable Water

Potable water is purchased from State Water and is supplied through a connection into the Fish River Water Supply Pipeline. This connection services the administration centres and bathhouses, and is also used underground in a solcenic emulsion for the longwall hydraulic roof support system. Drinking water is also taken underground in containers.

Potable water usage for the reporting period was 20.928 ML. As a result of various water savings initiatives during 2009 and 2010, consumption of potable water on site has been further reduced by 7.979 ML compared to the 2008 reporting period, prior to implementation of these initiatives. A total potable water reduction of 31.967 ML has been achieved over the past four years at Baal Bone.

Table 2.5 Stored Water at Baal Bone Colliery

	Volume Held			
	Start of Reporting Period	**End of Reporting Period**	**Volume lost/gained**	**Maximum Storage Capacity**
Dirty Water Dam	37 ML	30 ML	-7 ML	37 ML
Process Water Dam	55 ML	57 ML	+7 ML	57 ML
Box Cut Sump	6.9 ML	3.5 ML	-3.4 ML	6.9 ML
Controlled Discharge Water (Salinity Trading Schemes)	Nil	Nil	Nil	Nil
Contaminated Water	Nil	Nil	Nil	Nil

2.8.3 Sewage Treatment and Disposal

Sewage and grey water effluent from site facilities, including the administration building, bathhouse, CHPP and amenities are collected in a sump and directed through macerator pumps to an on-site sewage treatment plant (STP). The waste is treated by an activated sludge treatment process then is discharged into two maturation ponds, with a total residence time of approximately 20 days.

Following treatment and maturation the overflow from the second pond discharges onto a well vegetated transpiration bed; this is an EPL discharge location and monitoring point. The location of the STP and maturation ponds is shown on **PLAN 1**.

2.8.4 Changes to the Water Management System During 2011

There were no changes to the water management system at Baal Bone during the reporting period.

2.9 Hazardous Material Management

2.9.1 Status of Licence

Baal Bone holds an *Acknowledgement of Notification of Dangerous Goods on Premises* (35/023231). In order to be granted a licence to store explosives, in accordance with the Explosives Regulation (2005), Baal Bone has nominated suitable persons to hold an Unsupervised Handling Licence following appropriate state and federal security background check. Accordingly the Explosive and Detonator Magazine was also included in the Acknowledgement.

Details of hazardous materials stored on-site during the reporting period are provided in **Table 2.6.** Location of the storage of hazardous goods can be found on **PLAN 1**.

Table 2.6 Hazardous Materials Stored On Site

Hazardous Material	Dangerous Goods Classification	Maximum Quantity Stored	Storage Type
Explosives; blasting, Type A	Class 1.1D	480 kg	Surface Explosive Magazine
Detonator, non-electric and electric	Class 1.1B	1000 kg	Surface Explosives Magazine
Petroleum gases, liquefied	Class 2.1	45,500 L	Above Ground Tanks (Pit-top and CHPP)
Diesel	Class C1	50,000 L	UST (Pit-top)
Diesel	Class C1	47,000 L	AST (CHPP)

2.9.2 Material Safety Data Sheets

Under Baal Bone's Environmental Management System (EMS) there is a Hazardous Substance Standard (HSEC STD 5.03 – Hazardous Substances), which deals with the safe storage, handling and disposal of chemicals and other hazardous substances. Materials Safety Data Sheets (MSDS) are made available to all employees at the store facility.

Baal Bone also has a comprehensive online "Chemalert" database, which provides all employees easy access to information on all chemicals held on site. Information includes but is not limited to: the safe handling of products, Personal Protective Equipment (PPE) requirements, storage, use and disposal of the materials and spill response procedures. Chemalert is available on most PCs including the one for general employee use in the lamp room.

2.9.3 Hazardous Materials Audit and Risk Assessment

A hazardous materials audit and risk assessment was undertaken in 2010 by AECOM as a requirement following notification to OEH under "Duty to Report Contamination under the *Contaminated Land Management Act 1997*".

The hazardous materials audit and risk assessment found a number of minor non-compliances, mainly due to the factor in consideration not being As Low As Reasonably Practicable. Most of these minor non-compliances were within the CHPP.

A review of mine documentation, required as part of the NSW *Occupational Health and Safety (Dangerous Goods Amendment) Regulation 2005* and documents required under the Xstrata standard (HSEC Standard 3.08), indicated that all documents complied with the regulations and standard.

2.10 Other Infrastructure Management

The location of existing infrastructure is shown on **PLAN 1**. During the 2011 reporting period there were no significant alterations or additions to processes or infrastructure.

2.11 Site Security

A number of safety measures have been adopted on site to ensure employee and public safety throughout all aspects of operations at Baal Bone. These security measures include:

- licensed security contractor with regular patrols during hours of non-operation;
- change of security locks;
- CCTV surveillance of key areas of site;
- lockable gates across all portals;
- perimeter fencing;
- compulsory surface and underground inductions for those working on site; and
- all visitors must be signed in and out and must be accompanied around the site by authorised personnel.

2.12 Activities During Suspension of Mining.

Subsequent to the completion of Longwall 31, Baal Bone has suspended mining operations. A new MOP is currently being prepared for suspension of operations for the period 2012 to 2015.

A summary of the activities associated with the suspension of operations activities which were undertaken during the reporting period is provided in the sections below.

2.12.1 Salvage of Selected Underground Equipment

During preparation leading up to suspension of mine workings, there was a period whereby selected materials and equipment were salvaged from the underground. This included equipment which contained contaminants such as transformers containing Polychlorinated biphenyl (PCB). Where salvage was not feasible, materials and equipment were left underground in an environmentally safe manner.

Plant and equipment that was salvaged from the mine was cleaned and is being stored temporarily on the pit top or cut throughs close to the mine entrance prior to removal off site. Where appropriate, equipment that has been salvaged may be sold within the Xstrata Group. Salvaged equipment that has no residual value may be scrapped and/or recycled.

2.12.2 Maintenance of Services

Baal Bone proposes to continue operation of two main ventilation fans, the South East ventilation fan and pit top ventilation fan (Adit 1) throughout the suspension of operations period (2012 to 2015). The box cut fan (North) has been switched off and it is not anticipated operate again during the 2012 to 2015 period, but may be activated if necessary. The South East ventilation fan operational output has been turned down to approx 70% capacity, while the pit top fan will continue to operate at 100% capacity.

Electricity, water, compressed air and communications services to the underground mine will continue to operate and be maintained. Services to the buildings, and pit top infrastructure will be retained until the completion of pre-feasibility assessments and a decision on future mining operations is made.

Pumping of the boreholes will continue as required throughout the suspension of operations. Pumping may be reduced should decisions be made regarding closing sections of the mine. Should Baal Bone decide to seal any borehole, detailed sealing designs will be submitted to DTIRIS for approval prior to the commencement of works.

SECTION 3.0: ENVIRONMENTAL MANAGEMENT AND PERFORMANCE

Baal Bone maintains and operates an Environmental Management System (EMS), which has been prepared to reflect industry best practice and to specifically address Development Consent conditions, approvals, licence and other statutory requirements. Baal Bone's EMS also includes the LW29-31 Subsidence Management Plan (SMP).

Detailed Plans of Management and Performance Standards for a wide range of environmental elements have subsequently been developed. These Plans and Standards detail relevant control measures, management strategies, monitoring requirements, reporting procedures and performance expectations/criteria.

It should be noted that this section of the AEMR does not necessarily provide a comprehensive description of each individual environmental control mechanism that is currently employed at Baal Bone; this level of detail is available in the MOP for Baal Bone's Underground Operations (July 2009).

Rather, this section will focus on providing a succinct review of the performance and/or modification of key control measures throughout the 2011 reporting period. Also included is a review of significant activities undertaken or actions completed throughout the year, a summary of monitored data (as applicable), a discussion regarding the level of compliance achieved; together with an overview of initiatives proposed and actions planned for the 2012 reporting period.

3.1 Air Pollution

3.1.1 Wind speed and direction

The Ben Bullen Range (and State Forest) provides Baal Bone with reasonable shelter from winds with the exception of those from the north-west which have a clear fetch of approximately 12 km upwind of the site. However, strong winds from the southwest and southeast may funnel through the gaps in the Ben Bullen Range and along the valleys towards the site.

Wind speed and direction at Baal Bone is comparable to the wind conditions from the Lithgow (Birdwood Street) Weather Station approximately 25km south-east of the site. Historic seasonal wind roses for this weather station are found in **Figure 3.1**.

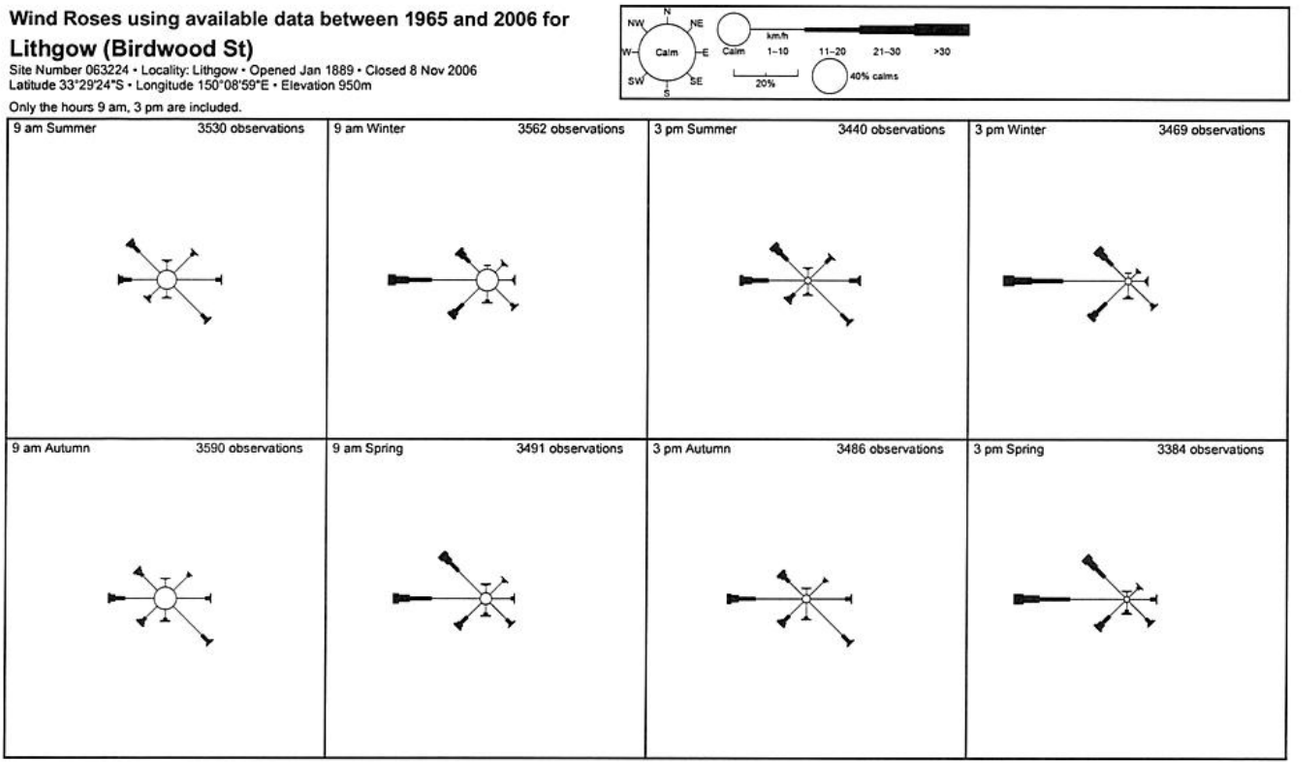


Figure 3.1 Historic Wind Roses for the Lithgow Weather Station (Birdwood Street)

3.1.2 Dust Monitoring and Sample Locations

Monthly dust fall-out monitoring is carried out in accordance with Australian Standard AS3580.10.1 and EPL requirements. Baal Bone has engaged ALS Group Environmental Division Mudgee, a NATA Accredited laboratory, to undertake monthly sampling, monitoring and analysis.

Baal Bone maintains a network of five dust deposition gauges to monitor dust levels around site and in the vicinity of the nearest neighbour, these are:

- Sample location DM1 (EPL monitoring point No. 7);
- Sample location DM2 (EPL monitoring point No. 13);
- Sample location DM3 (EPL monitoring point No. 14); and
- Sample location DM4 (EPL monitoring point No. 15).
- Sample location DM5 – installed 8 September 2011 (EPL monitoring point No. 16).

Particulate matter less than 10 µm in size (PM_{10}) and high volume air sampler total suspended particulate (TSP) monitors were installed 23 October 2011 and 29 October 2011 respectively in accordance with a revised Air Quality Management Plan which was approved by DP&I in

accordance with PA 09_0178. The location of the TSP and PM_{10} monitors are situated at the same location as DM2.

Locations of all air quality monitoring gauges are shown in **Drawing 1**.

3.1.3 Review and interpretation of dust monitoring results

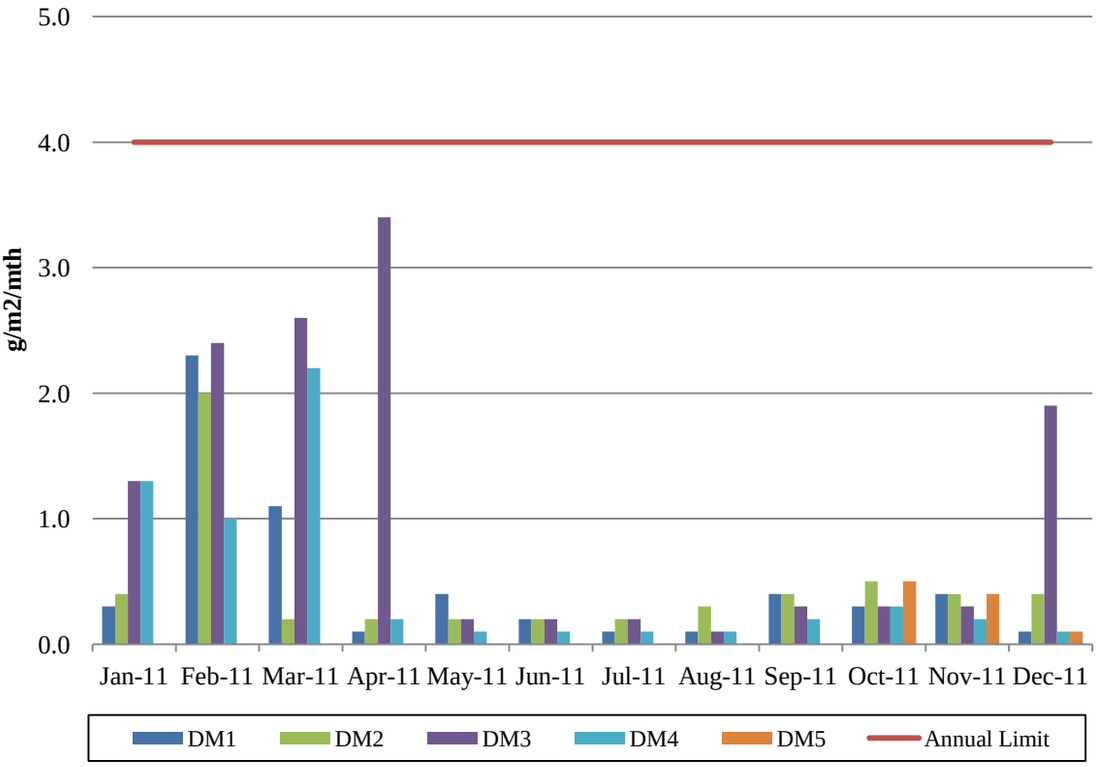
Schedule 3, Condition 10 of PA 09_0178 includes air quality impact assessment criteria for the project which are summarised in **Table 3.1** below. The pollutants to be monitored include deposited dust, TSP and PM_{10}.

Table 3.1. Baal Bone air quality impact assessment criteria

Pollutant	Averaging period	Criterion	
Deposited dust	Annual	Maximum increase	Maximum total
		2 g/m^2/month	4 g/m^2/month
TSP	Annual	90 $\mu g/m^3$	
PM_{10}	24 hour	30 $\mu g/m^3$	
	Annual	50 $\mu g/m^3$	

Levels of deposited dust were monitored in accordance with the air quality impact assessment criteria. Results of deposited dust monitoring conducted during the 2011 reporting period are illustrated graphically in **Figure 3.2** below.

Figure 3.2 - 2011 Deposited Dust Results



All levels of deposited dust were below the 4g/m^2/month criterion. Further, the maximum increase criterion of 2g/m^2/month (refer to **Table 3.1**) was not exceeded, with the maximum increase recorded of no more than 2g/m^2/month at DM1 between January and February 2011.

As stated earlier, TSP and PM_{10} monitoring commenced in October 2011. Results of monitoring conducted during the 2011 reporting period (November and December) are illustrated graphically below in **Figure 3.3** for TSP and **Figure 3.4** for PM_{10} below. There were a number of invalid readings during October and November that were caused by power outages at the mine affecting the monitors. Note, recorded values of 0µg/m3 indicate an invalid reading.

Figure 3.3 - 2011 TSP results

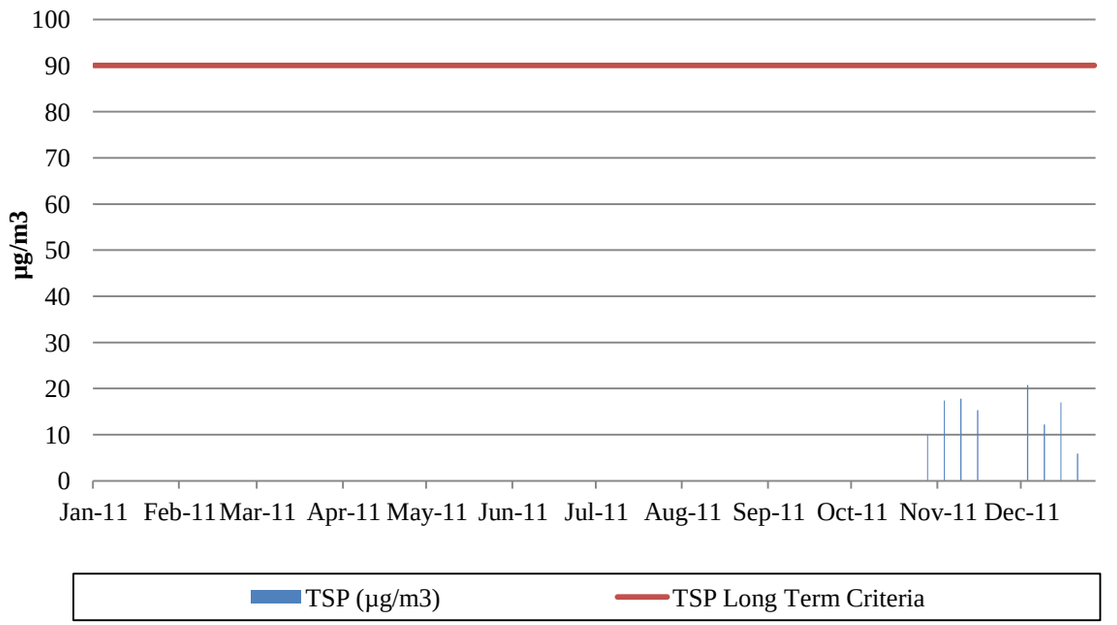
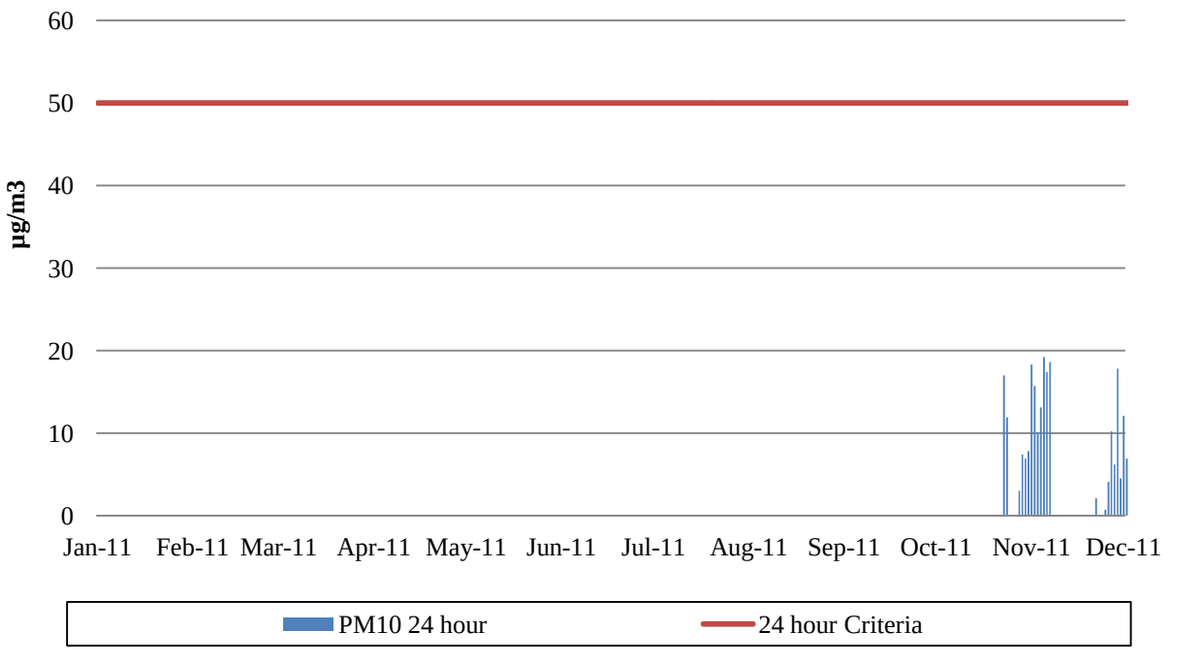


Figure 3.4 - 2011 PM_{10} 24 hour average results



Levels of TSP and PM_{10} were below the relevant criteria in 2011. As the monitors for TSP and PM_{10} were installed in October 2011, the annual rolling average is not available for this monitoring period and will be available in October 2012 and reported in the 2012 AEMR.

3.1.4 Comparison against EA

Levels of air quality pollutants as predicted under the EA are presented in **Table 3.2** below. **Table 3.2** shows the predicted cumulative pollutant concentration (which includes the predicted concentration from Baal Bone plus the background concentration). Deposited dust criteria are expressed as deposition rates and not concentrations. The predicted levels were all below the specified criteria.

Predicted odour levels are presented in **Table 3.2** below, and were assessed in the EA (AECOM 2010). Odour is not monitored as part of site operations, however no odour complaints were received during the reporting period.

Table 3.2 Maximum predicted pollutant results at the discrete sensitive receptors

Receptor Number	**TSP (ug/m^3)**		**PM_{10} (ug/m^3)**			**Deposited Dust (g/m^2/month)**		**Odour (OU)**
	Annual	Annual cumulative*	Annual	Annual cumulative*	24 hour	Annual	Annual cumulative*	One Second
1	13.5	58.5	5.0	23.0	36.2	0.76	3.3	2.6
2	7.4	52.4	2.6	20.6	23.2	0.4	3.0	1.8
4	3.3	48.3	1.2	19.2	12.5	0.2	2.8	1.0
5	4.2	49.2	1.5	19.5	16.1	0.2	2.8	0.9
6	4.5	49.5	1.7	19.7	13.2	0.2	2.8	2.1
7	2.5	47.5	0.9	18.9	13.6	0.2	2.8	1.3
8	2.6	47.6	1.0	19.0	16.4	0.2	2.8	1.8
9	5.2	50.2	1.7	19.7	26.5	0.4	3.0	1.1
10	5.4	50.4	1.8	19.8	19.4	0.4	3.0	2.5
11	3.8	48.8	1.3	19.3	13.0	0.2	2.8	0.7
12	3.3	48.3	1.1	19.1	18.5	0.2	2.8	1.5
13	2.8	47.8	0.8	18.8	10.6	0.2	2.8	0.7
Criteria	**90 ug/m^3**		**30 ug/m^3**		**50 ug/m^3**	**4 g/m^2/month**		**5 OU**

** Includes the predicted concentration from Baal Bone plus ambient background concentrations*

The monitoring results at DM2 for all pollutants are likely to be representative of predicted pollutant results at receptor number 2 listed in **Table 3.2**. The dust monitoring results for all pollutants at DM2 during the reporting period, presented in Section 3.1.3, are consistently lower than the maximum predicted pollutant levels within the EA, as well as below the relevant criteria.

Therefore, the air quality impacts associated with Baal Bone's operations are consistent with the predicted impacts in the EA.

3.2 Erosion and Sediment Control

In non-active areas of the mining lease, there have been negligible levels of erosion and sedimentation. Agisted livestock were removed in 2007 to ensure the maintenance of a satisfactory level of ground cover. Timely spring and early summer rains in 2008 subsequently

resulted in a very good level of ground cover, and livestock were again reintroduced in April 2009.

Excellent rain during 2010, coupled with average levels of rainfall in 2011, ensured more than adequate pasture cover over all agisted areas, with no evidence of land degradation or erosion.

All active surface mining and rehabilitation areas fall within Baal Bone's Water Management System which is subdivided into 'clean water' and 'dirty water' systems. Features of the 'clean water' system includes upslope diversion banks, levee banks, lined channels and drains and reed beds within the Ben Bullen Creek; features of the 'dirty water' system include graded contour banks, containment bunds, primary arrestor/grit traps, sediment dams, water treatment plant and settlement dams.

The dirty water system is incorporated into Baal Bone's process water circuit. This is essentially a closed circuit which provides water for the CHPP, in addition to water for dust suppression, fire fighting and general underground operations. Water from this circuit is reused and is only discharged from site through a licensed discharge point during high intensity rainfall events.

An Erosion and Sediment Control Audit was undertaken by GSS Environmental (GSSE) in April 2011. The audit included an assessment of key water storage and sediment dam capacities against the risk they pose for uncontrolled discharges into downstream waterways. The audit observed that there is substantial mixing of clean, dirty and mine water throughout the pit top facilities and general site area. In particular, whilst Ben Bullen Creek Diversion Channel is classified as a clean water system, it was observed to being receiving a range of flows including clean, dirty and mine water. However, historical water quality data indicates that discharge water from the Ben Bullen Creek Diversion Channel has generally been compliant with EPL 765. The audit included a number of recommendations to improve the current water management system in accordance with best management practices. Most of the recommendations were implemented in 2011, except for the finalisation of the Water Management Plan which will be completed early 2012.

The Overshot Dam is located on the Colliery's northern boundary and is the final point of containment / retention for the clean water system. It also provides an additional opportunity for settlement and/or other treatment if required. The discharge from the Overshot Dam is Licenced Discharge Point No. LDP1 within EPL 765 (monitoring point No. 11).

LDP1 discharged water off-site during all months of the reporting period.

3.3 Surface Water

Baal Bone has engaged ALS Group Environmental Division Mudgee, a NATA Accredited laboratory, to undertake monthly sampling, monitoring and analysis of a range of surface and subsurface waters.

Baal Bone maintains a network of five licensed discharge and monitoring points in accordance with EPL 765 (viz. LD2, LD3, LD6, LDP1 and WMP1) (**DRAWING 1** and **DRAWING 2**). In addition to the licensed discharge points, another 24 monitoring points are located throughout the site and the data obtained is used to assist internal management and planning decisions.

A description of discharge and monitoring sites, analyses conducted, frequency of sampling and concentration limits (where applicable) are shown in **Table 3.1** below.

Table 3.1. Baal Bone Colliery water monitoring locations and monthly analysis

Sample Name	Sample Location	Frequency	Pollutants Analysed	EPL Limits Apply
BBLD2	EPL Monitoring Pt No.2. In sump at discharge from STP maturation pond to transpiration bed area	Monthly during discharge	Oil & grease, TSS, pH, BOD, faecal coliforms, nitrogen, phosphorus	Not specified
BBLD3	EPL Monitoring Pt No. 3. In stilling pond at pipe outlet of south mine dewatering bores	Monthly during discharge	EC, oil & grease, sulphate, iron, TSS, pH, MBAS, Pseudomonas, flow rate	Oil & grease, pH, TSS
BBLD6	EPL Monitoring Pt No. 6. In stilling pond at pipe outlet of north mine dewatering bore	Monthly during discharge	EC, oil & grease, sulphate, iron, TSS, pH, MBAS, Pseudomonas, flow rate	Oil & grease, pH, total iron, TSS and daily volume limit
BBLDP1	EPL Monitoring Pt No.11 Immediately below the pipe outlet or in stilling pool below spillway of overshoot dam	Monthly during discharge	EC, oil & grease, sulphate, iron, TSS, pH, flow rate, hardness, MBAS, nitrogen, phosphorus	Oil & grease, pH, total iron, TSS
BBWMP1	EPL Monitoring Pt No. 12 Pool within Ben Bullen creek upstream of active surface mining area	Monthly (during flow)	EC, oil & grease, sulphate, iron, TSS, pH, flow rate, hardness, nitrogen, phosphorus	Not specified
BBPOT	Potable water from main kitchen in Administration	Monthly	pH, EC, Hardness, heterotrophic standard plate count, total coliforms, E coli, Pseudomonas	N/A
BBCHPP MEAL ROOM	Potable water from kitchen in Washery.	Monthly	pH, EC, Hardness, heterotrophic standard plate count, total coliforms, E coli, Pseudomonas	N/A
BBLR	Leachate pond on western side of REA 5	Monthly	EC, oil & grease, sulphate, iron, TSS, pH, flow rate, hardness	N/A
BBREAS	Spring on Ben Bullen Creek	Monthly (during flow)	EC, iron, oil & grease, pH, sulphate, hardness, nitrogen, phosphorous, and TSS	
BBMW No.5	Mine water discharge pipeline adjacent to No. 5 Adit	Monthly (only if discharging)	Flow rate, pH, EC, TSS, iron, sulphates, oil & grease, MBAS, heterotrophic standard plate count, faecal coliforms, pseudomonas	N/A
BBMW No.3	Mine water discharge pipeline adjacent to No. 3 Adit	Monthly (only if discharging)	Flow rate, pH, EC, TSS, iron, sulphates, oil & grease, MBAS, heterotrophic standard plate count, faecal coliforms, pseudomonas	N/A
BBPit 1	Pit-top grit trap/oil	Monthly	pH, oil & grease, MBAS	N/A

Sample Name	Sample Location	Frequency	Pollutants Analysed	EPL Limits Apply
	separator (eastern)	(only if discharging)		
BBPit 2	Pit-top grit trap/oil separator (western)	Monthly (only if discharging)	pH, oil & grease, MBAS	N/A
BBPit 3	Washery grit trap/oil separator	Monthly (only if discharging)	pH, oil & grease, MBAS	N/A
BBDW	Dirty water dam	Monthly	EC, Iron, oil & grease, pH, Sulphate, TSS, Hardness, MBAS	N/A
BBDWD	Dirty water dam discharge	Monthly (only if discharging)	EC, Iron, oil & grease, pH, Sulphate, TSS, Hardness, MBAS	N/A
BBPRW	Process water dam	Monthly	EC, Iron, oil & grease, pH, Sulphate, TSS, Hardness, MBAS, heterotrophic standard plate count, pseudomonas	N/A
BBPRWD	Process water dam discharge	Monthly (only if discharging)	EC, Iron, oil & grease, pH, Sulphate, TSS, Hardness, MBAS, pseudomonas	N/A
BBSTP1	STP Maturation Pond No 1	Monthly	pH, BOD, Faecal coliforms, nitrogen, phosphorus	N/A
BBSTP2	STP Maturation Pond No 2	Monthly	pH, BOD, Faecal coliforms, nitrogen, phosphorus	N/A
BBBC	Box cut sump	Monthly	pH, EC, iron, sulphates	N/A
BBBBC Mid	Ben Bullen Creek mid-way through site	Monthly (during flow)	Flow rate, pH, EC, TSS, iron, sulphates, hardness, oil & grease, nitrogen, phosphorus	N/A
BBBBC End	Ben Bullen Creek upstream of the Overshot Dam	Monthly	pH, EC, TSS, iron, sulphates, hardness, oil & grease, nitrogen, phosphorus	N/A
BBLT	'Lake Tegan'	Monthly	EC, iron, oil & grease, pH, sulphate, hardness, nitrogen, phosphorous, and TSS	N/A
BBJ	Jews Creek junction with discharge channel from Overshot Dam (downstream of all mining operations and dewatering bore discharges)	Monthly (during flow)	Flow rate, pH, EC, TSS, iron, sulphates, hardness, oil & grease, nitrogen, phosphorus	N/A
BBJC2	Jews Creek upstream of mining operations, but below dewatering bore discharges	Monthly (during flow)	Flow rate, pH, EC, TSS, iron, sulphates, hardness, oil & grease, nitrogen, phosphorus	N/A
BBJC3	Jews Creek at confluence with un-named flowline from	Monthly (during flow)	Flow rate, pH, EC, TSS, iron, sulphates, hardness, oil & grease, nitrogen, phosphorus	N/A

Sample Name	Sample Location	Frequency	Pollutants Analysed	EPL Limits Apply
	mine dewatering bore discharge			
BBJCH	Jews Creek headwaters upstream of all mining operations and mine dewatering discharges	Monthly (during flow)	Flow rate, pH, EC, TSS, iron, sulphates, hardness, oil & grease, nitrogen, phosphorus	N/A
BBLW19 Sed Dam	North bore settlement dam	Monthly	EC, Iron, oil & grease, pH, Sulphate, TSS, hardness, MBAS, pseudomonas	N/A

EPL Monitoring Points are highlighted in yellow.

BOD – Biochemical Oxygen Demand
COD – Chemical Oxygen Demand
EC – Electrical Conductivity
MBAS – Metheleyne Blue Active Substances
TSS – Total Suspended Solids

3.3.1 Interpretation and Review of Monitoring Results

Monitoring results for Baal Bone's five licensed discharge and monitoring points as required by EPL 765 are discussed below. Where available, samples were taken monthly during discharge in accordance with the EPL. **Table 3.2** summarises the locations and months during which samples from the licensed discharge and monitoring points were collected.

Results of these samples are tabulated below in **Table 3.3;** graphic interpretation of these results where the licensed discharge and monitoring points have concentration limits is included in **Figures 3.8 - 3.11**.

Table 3.2. Baal Bone's licensed discharge and monitoring points – samples available for collection in 2011

EPL Point	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
LD2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	×
LD3	✓	✓	✓	✓	✓	✓	✓	✓	×	×	×	✓
LD6	×	✓	✓	✓	×	✓	✓	✓	×	✓	✓	✓
LDP1	×	×	×	✓	×	✓	✓	×	✓	×	✓	✓
WMP1	×	×	×	×	×	×	×	×	×	×	×	×

Table 3.3. Summary of available concentration levels recorded for OEH licensed discharge points as required by EPL 765

EPL Point	Month	EC uS/cm	Oil & Grease mg/L	Sulphate mg/L	Iron mg/L	TSS mg/L	pH	BOD mg/L	Faecal Coliforms cos/100mls	Nitrogen mg/L	Phosphorus mg/L
LD2	Jan	-	2	-	-	296	6.9	216	<10	31.1	8.28
	Feb	-	<2	-	-	240	8.0	60	60	4.4	4.22
	Mar	-	<2	-	-	200	7.3	90	70	5.4	4.04
	Apr	-	42	-	-	158	6.6	78	10	3.2	3.24
	May	-	<2	-	-	54	8.8	30	50	6.1	3.38
	June	-	<2	-	-	93	8.6	37	190	7.1	3.79
	July	-	<2	-	-	72	7.5	46	215	6	4.7
	Aug	-	7	-	-	77	7.5	40	120	5.7	4.53
	Sept	-	<2	-	-	228	7.5	600	<5	12.1	5.33
	Oct	-	8	-	-	15	7.6	14	1	13.3	5.33
LD3	Jan	1260	<2	244	3.5	10	6.9	-	-	-	-
	Feb	1290	<2	237	2.6	9	7.0	-	-	-	-
	Mar	1440	<2	257	4.2	10	6.9	-	-	-	-
	Apr	1510	<2	312	4	12	7.0	-	-	-	-
	May	1480	<2	306	5	7	7.1	-	-	-	-
	Jun	1560	2	314	2.5	4	7.0	-	-	-	-
	Jul	1550	<2	326	3	2	6.8	-	-	-	-
	Aug	1530	<2	360	2.9	4	7.0	-	-	-	-
	Dec	1650	<2	374	5.1	6	6.9	-	-	-	-
LD6	Feb	1450	<2	398	0.2	5	7.2	-	-	-	-
	Mar	1570	<2	437	0.31	5	7.0	-	-	-	-
	Apr	1600	<2	428	1.2	<2	7.1	-	-	-	-
	Jun	1650	<2	455	0.66	3	7.0	-	-	-	-
	Jul	1730	<2	520	0.63	<2	6.9	-	-	-	-
	Aug	1710	<2	571	0.95	<2	7.0	-	-	-	-
	Oct	1530	<2	454	1.2	2	7.6	-	-	-	-
	Nov	1690	<2	475	0.39	<2	7.0	-	-	-	-
	Dec	1470	<2	320	0.14	3	6.9	-	-	-	-
LDP1	Apr	1220	<2	438	0.52	6	7.8	-	-	<0.1	0.04
	Jun	1230	2	482	3	2	8.1	-	-	0.1	<0.01
	Jul	1290	<2	507	0.42	<2	7.3	-	-	0.2	<0.01
	Sep	1300	<2	480	0.34	<2	8.1	-	-	0.3	<0.01
	Nov	1280	<2	445	0.64	4	7.8	-	-	<0.1	<0.01
	Dec	1150	<2	374	0.28	3	7.6	-	-	0.3	<0.01

Figure 3.8. Total Iron Levels of Samples Recorded in Relation to EPL Concentration Limit of 1.0 mg/L

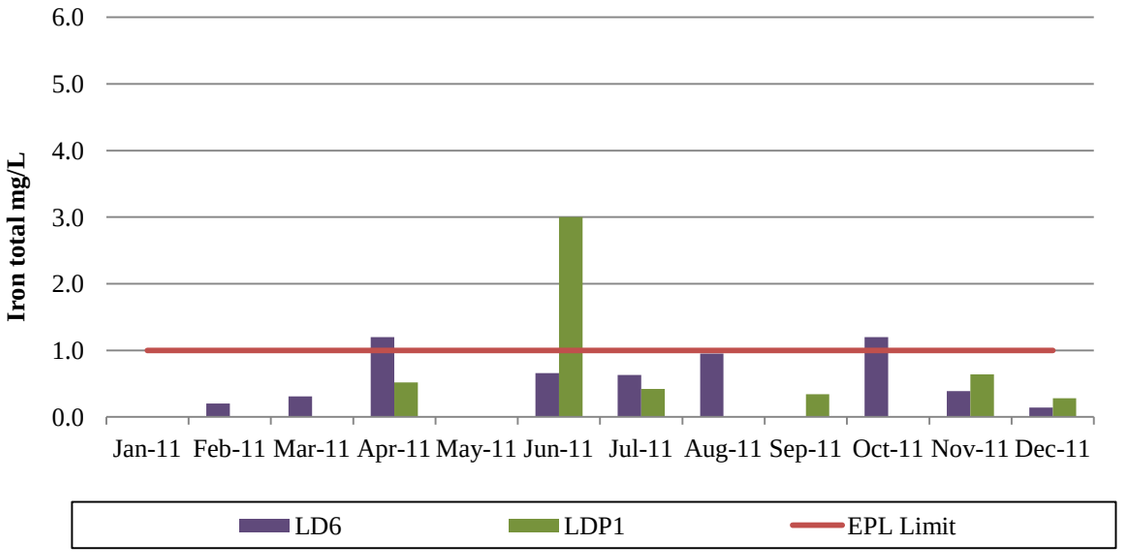
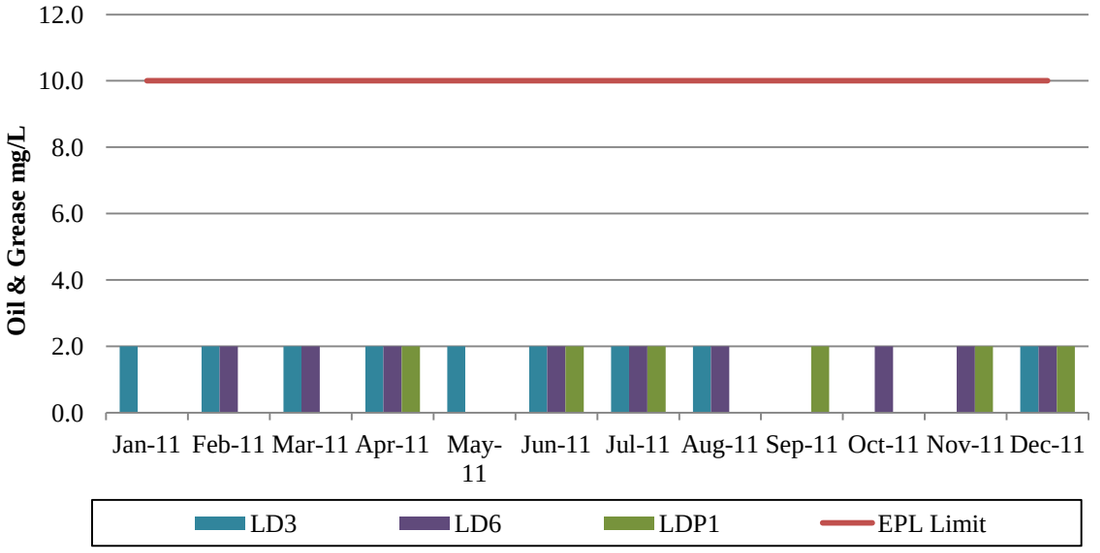


Figure 3.9. Oil and Grease Levels of Samples Recorded in Relation to EPL Concentration Limit of 10 mg/L



Note: some values shown as 2 were reported as being <2.

Figure 3.10. pH Levels of Samples Recorded in Relation to EPL Range of 6.5-8.5.

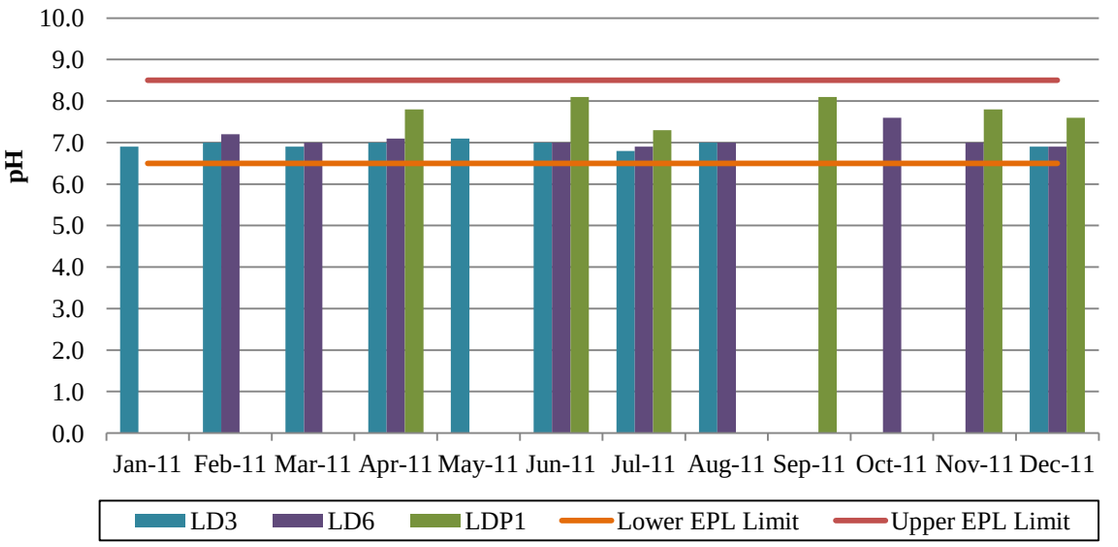
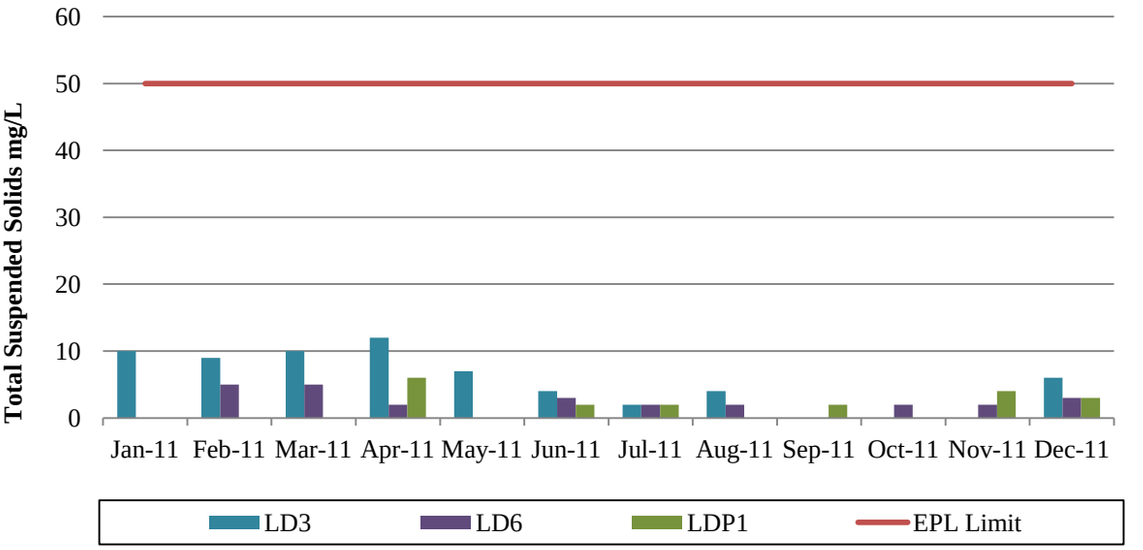


Figure 3.11. TSS Levels of Samples Recorded in Relation to EPL Concentration Limit of 50mg/L



All samples recorded were within EPL concentration limits except for iron levels at LD6 measurement of iron in April and October 2011 and at LDP1 in June 2011.

A summary of monitoring results for EPL discharge and monitoring points (those with specified concentration limits) can be found below:

- All samples for TSS returned levels of 12 mg/L or less which is well below the EPL specified concentration limits of 50mg/L.
- All samples for total iron were within EPL specified concentration limits of 1.0mg/L, except for levels at LD6 in April and October and LDP1 in June.

- All samples returned oil and grease concentration levels of 2mg/L or lower, which is well below the EPL concentration limit of 10mg/L.
- All samples returned pH results that were within the upper and lower EPL limits (8.5 and 6.5 respectively).

Initial investigations into iron levels at LDP1 and LD6 were unable to determine a cause for the non-compliance. As such a follow-up investigation will be conducted, including weekly surface water testing at LDP1 for a period of eight weeks to determine if any trends are discernible with increased monitoring frequency. Appropriate actions arising from the investigation will be implemented. Furthermore a new system for tracking monitoring results is scheduled to be deployed on-site during 2012, with the aim of improving the identification of trends.

3.3.2 Comparison against EA

The EA reported that, based on past monitoring results for EPL discharge and monitoring points, that water quality was expected to continue to be within the EPL limits during extraction of Longwalls 29-31. This prediction is supported by the results presented in this and past AEMRs. A summary of water quality results from previous AEMRs is provided below at **Table 3.4**.

Table 3.4 Water quality results 2006 - 2011

AEMR Year	Iron	Oil and Grease	pH	TSS
2006	One minor exceedance at LDP1.	Compliant	Compliant	Compliant
2007	One erroneous exceedance at LDP1 of 5.4mg/L in August 2007 – retesting showed compliant level of 0.9mg/L	Compliant	Compliant	One erroneous exceedance at LDP1 of 266mg/L in August 2007 – retesting showed compliant level of 25mg/L
2008	Compliant	Compliant	Compliant	Compliant
2009	Compliant	Compliant	Compliant	Compliant
2010	1 exceedance at LDP1 of 2mg/L in February 2010.	Compliant	Compliant	Compliant
2011	2 exceedances at LD6 in April and October and 1 exceedance at LDP1 in June 2010 of 1.2, 1.2 and 3mg/L respectively.	Compliant	Compliant	Compliant

Occasional exceedances of iron have been recorded in 2006, 2010 and 2011, and following further investigations, no apparent relation to mining operations was identified. In response to an iron exceedence at LDP1 during 2011, weekly water monitoring at LDP1 will occur for a period of eight weeks during 2012 to determine if any trends in iron levels are discernible with more frequent monitoring. If any trends are identified, Baal Bone will design and implement a response plan. All other pollutant levels have complied with the EPL limits.

3.4 Groundwater and Pollution

Baal Bone Colliery currently has nine bores, four with piezometers, licensed with NOW, summarised in **Table 3.5**.

*Table 3.5 Licensed bores and piezometers**

Licence Number	Expiry Date	Location / Use
80BL136703	13/01/2013	CHPP water make-up bore near UC1 (not used during reporting period)
80BL135509	08/06/2012	Borehole No. 6 near Rail Loop; previously used for dust suppression (low yielding; no longer used)
80BL236132	Perpetuity	Mine dewatering Longwall 1 (South Bore 1)
80BL236134	Perpetuity	Mine dewatering Longwall 1 (South Bore 2)
80BL239077	18/06/2016	Mine dewatering Longwall 19 (North Bore)
10BL601877	Perpetuity	BBN175; LW 29-31 groundwater monitoring piezometer. This piezometer is known as BBPB1, and monitors the sandstone aquifer north of the Coxs River Swamp.
10BL601816	Perpetuity	BBN176; LW 29-31 groundwater monitoring piezometer This piezometer is known as BBPB2, and monitors the sandstone aquifer north of the Coxs River Swamp
10BL601817	Perpetuity	BBN177; LW 29-31 groundwater monitoring piezometer This piezometer is known as BBPB3, and monitors the sandstone aquifer on the eastern side of the Coxs River Swamp
10BL601970	Perpetuity	BBN 179; LW 29-31 groundwater monitoring piezometer This piezometer is known as BBPB4, and monitors the sandstone aquifer on the western side of the Coxs River Swamp

* In addition to the four piezometers licensed with NOW (BBPB1-4), Baal Bone has two other monitoring piezometers (BBPB5-6) which due to the shallowness of the bores do not require licence with NOW.

The six groundwater monitoring piezometers were installed and equipped with data loggers in 2007 to gather background data and to monitor subsidence effects on local groundwater regimes as part of the SMP for Longwalls 29-31.

Data loggers in the piezometers are monitored on a regular basis to gather data regarding groundwater level fluctuations in the vicinity of the Coxs River Swamp due to the progression of mining of Longwalls 29-31. Baseline data obtained prior to commencement of mining confirms a strong correlation between groundwater levels and prevailing climatic conditions, in particular a strong relationship to rainfall which is a major source of recharge.

Monitoring data in the six piezometers (four aquifer and two swamp) are presented in **Figures 3.12 to 3.18**. Piezometers BBPB1-BBPB4 monitor groundwater levels and chemistry in the deeper sandstone aquifer, while piezometers BBPB5 and BBPB6 monitor groundwater levels and chemistry in the shallower Coxs River Swamp.

Baal Bone's Surface and Groundwater Response Strategy includes a Trigger, Action, Response Plan (TARP), which includes triggers for assessing changes to groundwater levels. Additionally, there is a Determination of Groundwater Quality TARP Trigger Values document prepared by Aurecon in May 2009 for the Longwall 29-31 area which presents trigger levels for a number of water chemistry parameters. The TARPs are used as a measure of impacts to groundwater levels and quality in both the deep sandstone and shallower swamp groundwater aquifers. The TARP trigger levels are presented in **Table 3.6** below. Response and rehabilitation methodologies have also been included.

Table 3.6 Combined groundwater TARP trigger levels for groundwater and water quality

Groundwater Level Triggers, Actions and Management Response		
NIL or MINOR IMPACT - **Ongoing monitoring – normal hydrogeological conditions –no additional response required**	**MODERATE IMPACT -** **Abnormal or anomalous condition – management options**	**MAJOR IMPACT -** **Continuing or worsening anomalous condition – management and/or engineering options**
Aquifer Groundwater		
No significant change in groundwater level/quality (g'water level change <2 metre) or measured variation is within the normal range and shows normal response to climatic conditions.	Groundwater level/quality shows anomalous trend (g'water level change >2 metre over a period of 6 months) or is not in line with the normal range or expected response to climatic conditions	Anomalous trend continues or worsens (g'water level change >10 metres over a period of 6 months) and is well outside the normal level range or not in line with the expected response to climatic conditions
	Management response	Engineering response
	Field inspection, additional and/or more frequent monitoring, review by hydrogeologist and other expert consultants as required. Notification under Condition 18 of SMP Approval.	Engineering solutions only required if anomalous trends are noted in the swamp as well*.
Swamp Groundwater		
No significant change in groundwater level/quality (g'water level change 0.5 metre) or measured variation is within the normal range and shows normal response to climatic conditions.	Groundwater level/quality shows anomalous trend (g'water level change >0.5 metre over a period of 6 months) or is not in line with the normal range or expected response to climatic conditions	Anomalous trend continues or worsens (g'water level change >2 metres over a period of 6 months) and is well outside the normal level range or not in line with the expected response to climatic conditions, loss of some swamp vegetation.
	Management response	Engineering response
	Field inspection, additional and/or more frequent monitoring, review by hydrogeologist and other expert consultants as required. Notification under Condition 18 of SMP Approval.	Water diversion into swamp, consider other engineering solutions if condition is due to unexpected subsidence damage*.

Groundwater Quality Minor Changes or Impacts		
Element	**Long-term changes 50th percentile ≤ baseline 80th**	**Minor Change Criteria (>95th Percentile)**
pH*	decrease of 0.35 from 5.9 units	< 4.6 for ≤ 2 consecutive months
Conductivity	increase of 230 from 300 uS/cm*	>300 uS/cm for ≤ 2 consecutive months
Copper	increase of 0.011 from 0.013mg/L	>0.041 mg/L for ≤ 2 consecutive months
Iron	increase of 6.6 from 12 mg/L	>15.25 mg/L for ≤ 2 consecutive months
Zinc	increase of 0.054 from 0.089 mg/L	>0.143 mg/L for ≤ 2 consecutive months

Groundwater Quality Moderate Changes or Impacts	
Element	**Moderate Change Criteria**
pH*	pH < 4.4 for > 2 consecutive months
Conductivity	Ec > 300 µS/cm for > 2 consecutive months
Copper	Cu > 0.151 mg/L for > 2 consecutive months
Iron	Fe > 19.05 mg/L for > 2 consecutive months
Zinc	Zn > 0.141 mg/L for > 2 consecutive months

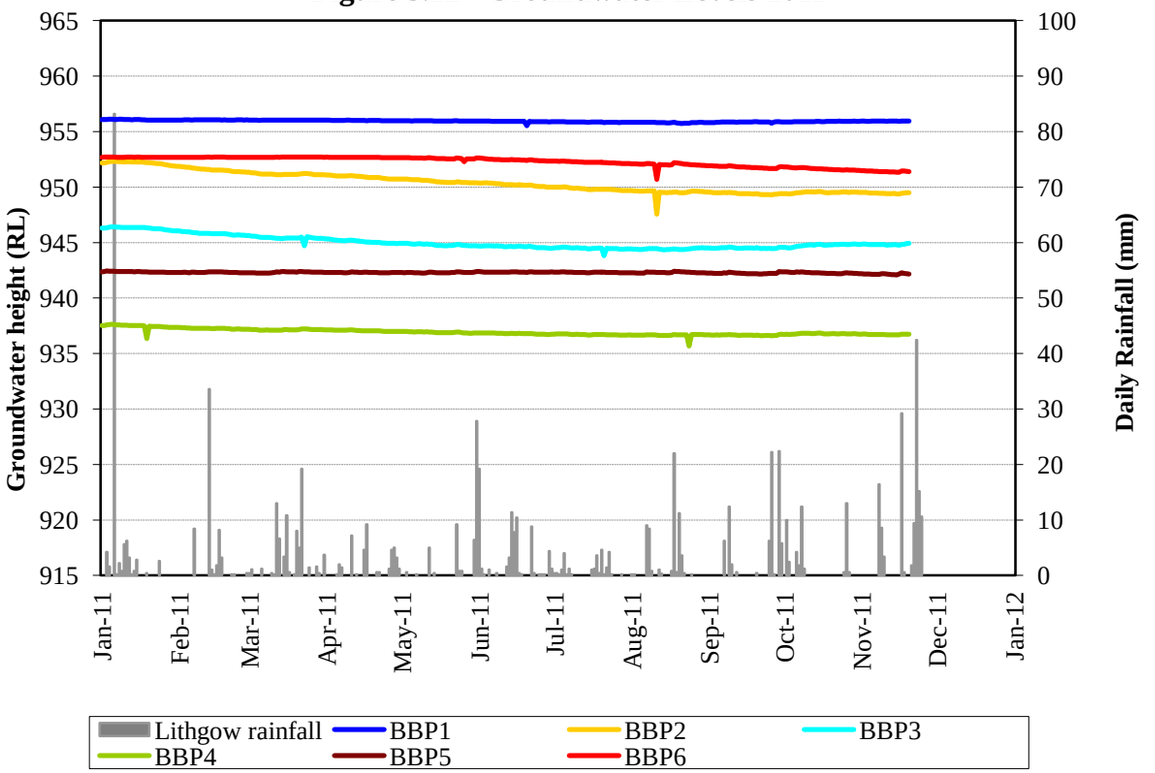
Groundwater Quality Major Changes or Impacts				
Element	**Pre-mining Maximum**	**Major Change Criteria (80th Percentile Baseline + 2 standard deviations)**	**All Bore 80th percentile baseline**	**BBP4 80th Baseline**
pH*	4.6 (minimum)	< 4.2 for > 2 consecutive months	5.1*	5.9*
Conductivity	45 uS/cm	>300 uS/cm for > 2 consecutive months	100	90
Copper	0.061 mg/L	>0.043 mg/L for > 2 consecutive months	0.013	0.002
Iron	20.0 mg/L	>24.28 mg/L for > 2 consecutive months	12.0	12.0
Zinc	0.150 mg/L	>0.175 mg/L for > 2 consecutive months	0.089	0.026

* See discussion on investigation and implementation of engineering responses in the Surface and Groundwater Response Strategy.

3.4.1 Groundwater levels

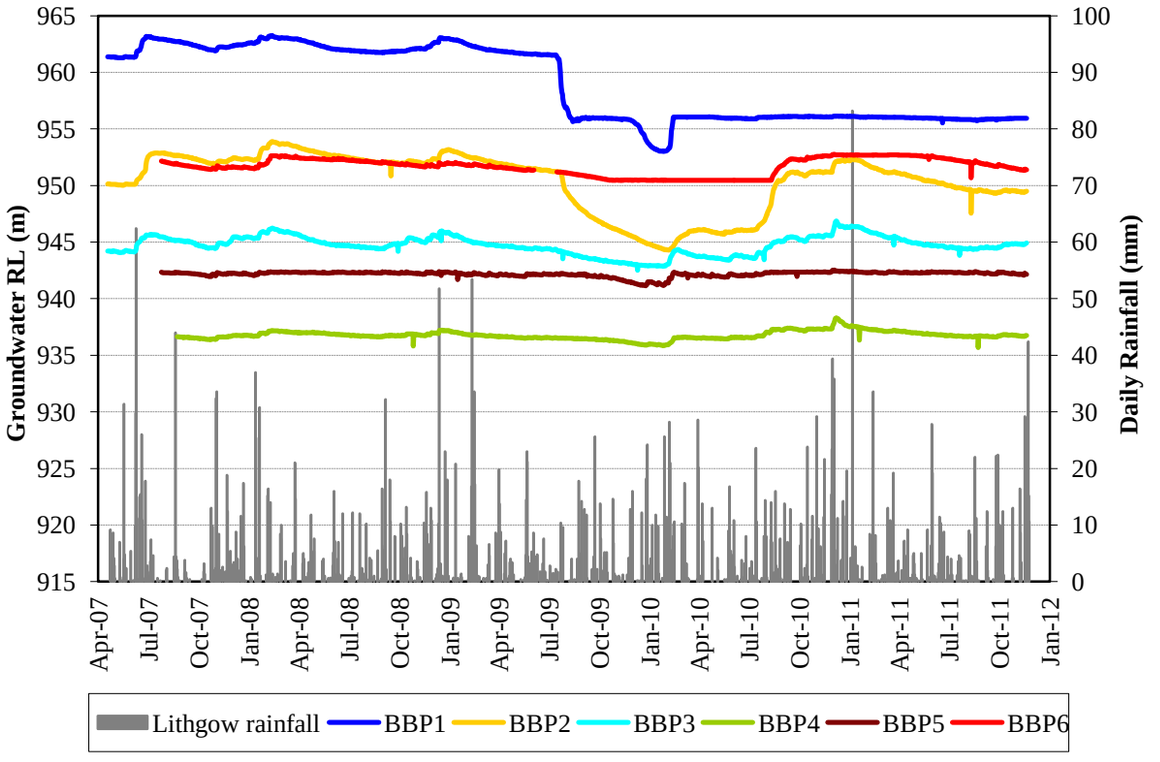
Groundwater levels in the six groundwater monitoring piezometers during 2011 are presented in **Figure 3.12**. Long term trends of groundwater levels are shown in **Figure 3.13**.

Figure 3.12 - Groundwater Levels 2011



The moderate impact TARP trigger for changes to groundwater level occurs when groundwater levels show an anomalous trend which is outside the normal level range or not in line with the expected response to climatic conditions. When observed against previous year's data, as shown in **Figure 3.13**, groundwater levels in 2011 are within the normal level range, and no anomalous trends are considered to have occurred in 2011.

Figure 3.13 - Groundwater Levels 2007 – 2011



3.4.2 Groundwater chemistry

Impacts on groundwater chemistry are determined through monitoring of pH, electrical conductivity, copper, zinc and iron. TARP triggers have been identified for 'minor impact', 'moderate impact' and 'major impact', as shown in **Table 3.6**.

The TARP provides a graded series of management actions for the various levels of exceedance of the trigger values (shown in **Table 3.6**):

- **Minor**: continue monitoring – variation is within the normal range in response to climatic conditions.
- **Moderate**: targeted investigation of the causes and possible remedial action.
- **Major**: if the cause is mining related, and not due to natural causes undertake remedial actions.

During 2011, TARP minor impact values were exceeded for pH at BBPB6; and iron and zinc at BBPB3. Major impact values were exceeded in 2011 for iron at BBPB3, and copper at BBPB4 (the background bore).

As a result of these exceedences, Aurecon (who originally set the TARP trigger levels) were commissioned to review all relevant groundwater quality data against TARP trigger levels, investigate and report on any trigger level exceedences, and review issues relevant to any water quality changes.

Groundwater chemistry monitoring results for the reporting period are provide in **Figures 3.14 to 3.18** below. Further detail and results from the Aurecon report: *Groundwater Level and*

Water Quality Changes compared to TARP Trigger Values in and around the Coxs River Swamp from 2009 to 2011 for SMP Area LW29-31 can be found in the relevant sections below.

.

Figure 3.14 Groundwater - pH 2011

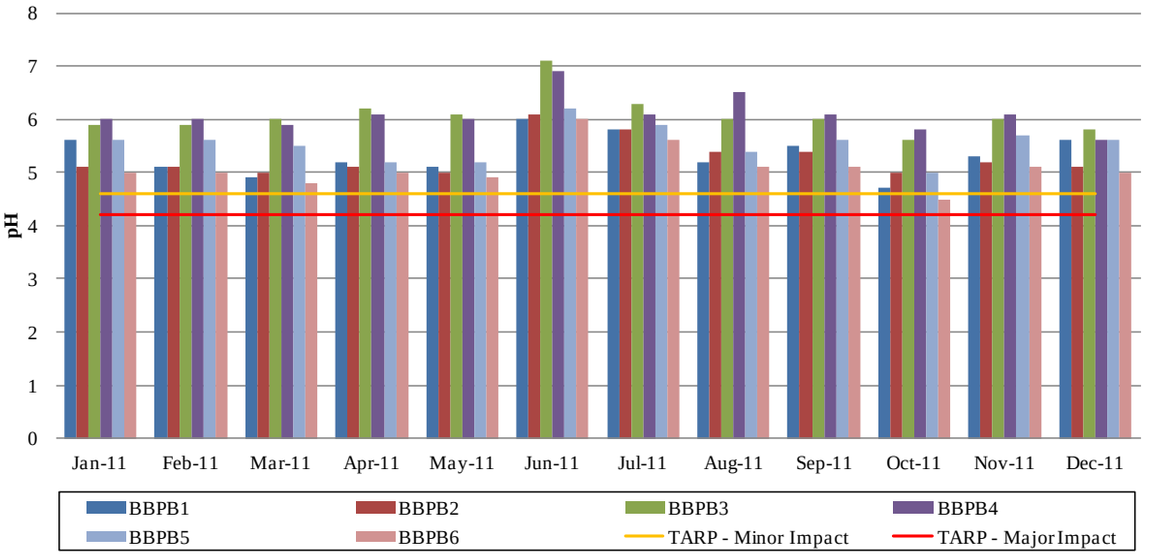


Figure 3.14 shows that the pH levels for all piezometers were above the minor and major impact trigger levels for 2011 except for BBPB6. In October 2011, BBPB6 fell marginally below the minor impact trigger level of 4.6 for a single month when a pH level of 4.5 was recorded.

Figure 3.15 Groundwater - Electrical Conductivity 2011

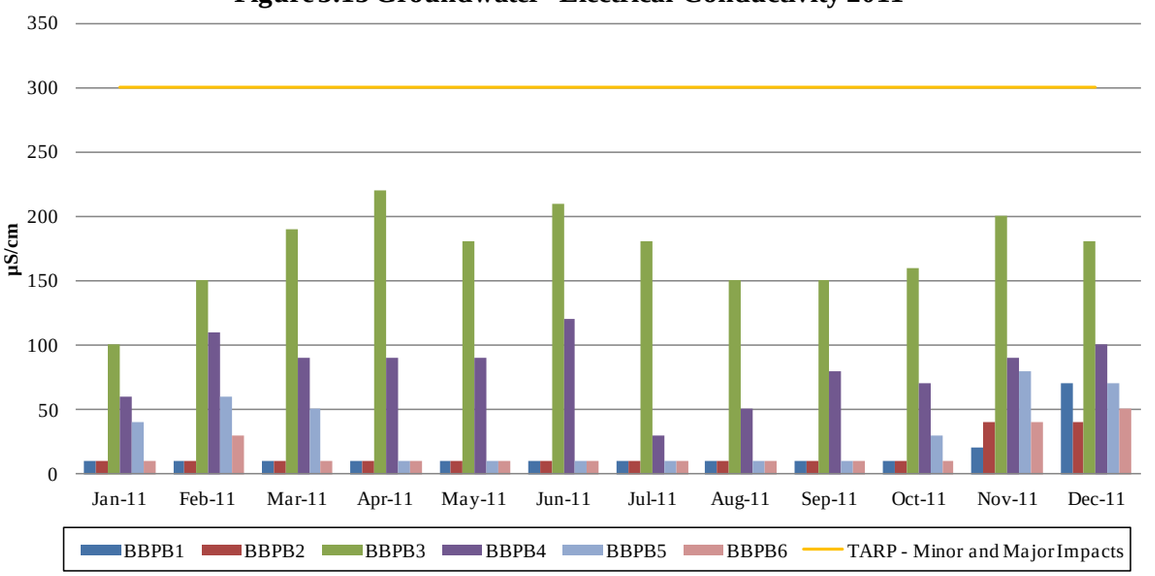


Figure 3.15 shows that electrical conductivity levels at all piezometers were below the TARP trigger levels during the reporting period.

Figure 3.16 Groundwater - Copper 2011

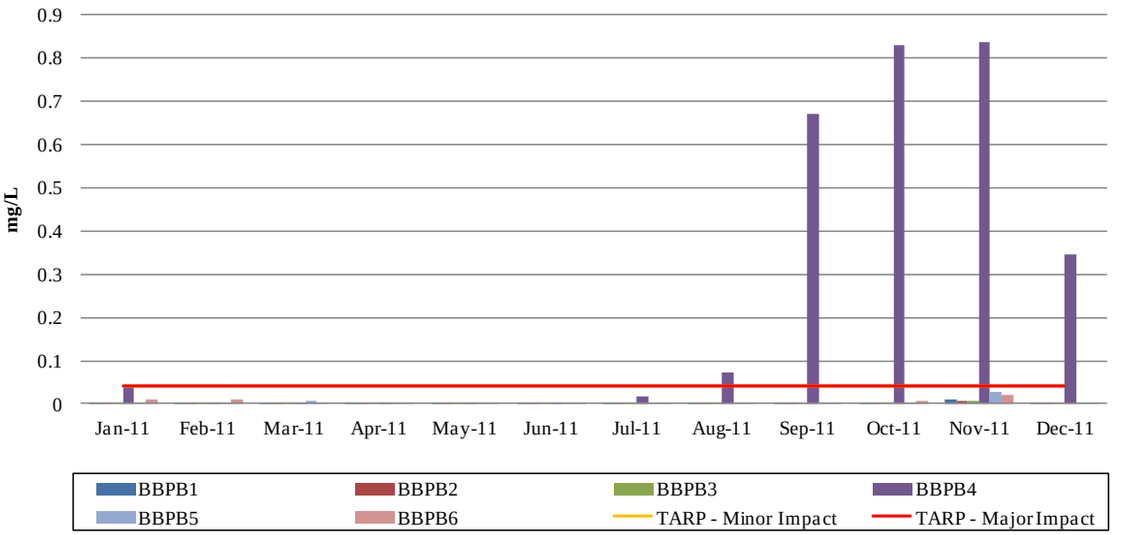


Figure 3.16 shows that copper levels in 2011 exceeded the major impact trigger level for five consecutive months at BBPB4, which measures groundwater quality in the deeper sandstone aquifer.

BBPB4 is a background bore and its purpose is to provide a benchmark for comparison with bores BBPB1 to 3, and BBPB 5 and 6. BBPB4 is located down-gradient of the Coxs River Swamp and is recharged by water from the swamp and the Coxs River, which flows through the swamp.

The exceedence in copper levels at BBPB4 was investigated by Aurecon (2012) and it was found that copper levels increased during spring each year (2009 – 2011), suggesting a biological process. Aurecon found that:

> "The release of trace metals from wetland soils to the local groundwater is known to occur as a result of biological degradation of organic matter. The decaying organic matter releases carbon dioxide, which forms carbonic acid in the groundwater. The acid conditions reduce the alkalinity such that the water is poorly buffered and the trace metals are released (Schaller et.al. 2011 and Maltby 2009)."

All other piezometers were well below the TARP trigger levels for copper.

Figure 3.17 Groundwater - Iron 2011

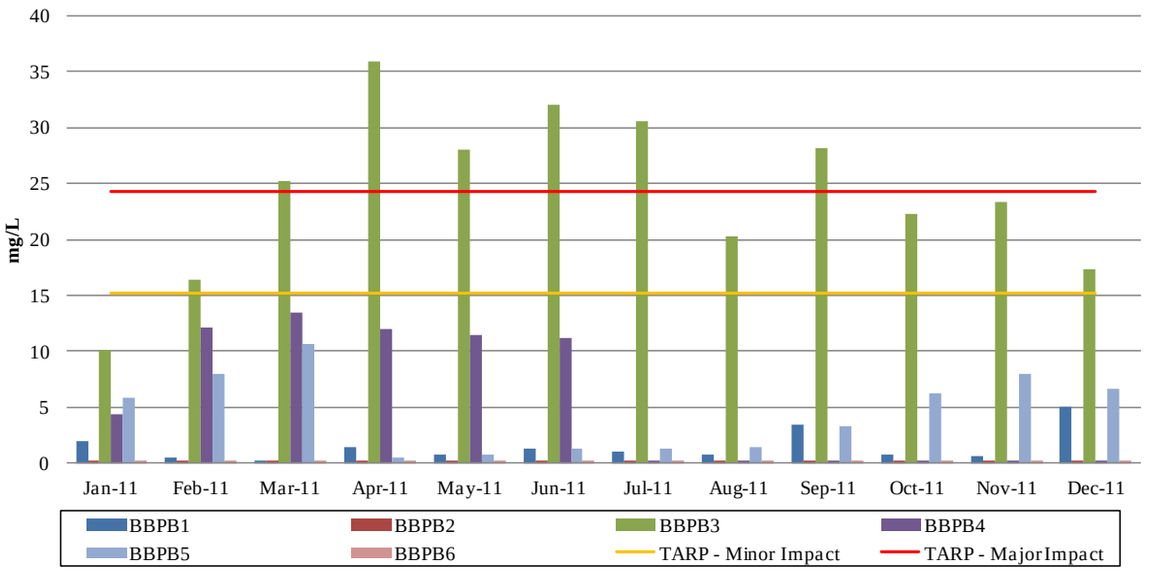


Figure 3.17 shows that iron levels at BBPB3 exceeded the minor impact trigger level in February 2011, and a major exceedence of the trigger level occurred from March to July 2011. This major event was also followed by a moderate level of exceedence from October to December 2011. A notification has been submitted to DPI in accordance with condition 18 of Baal Bone's SMP conditions regarding the exceedances at BBPB3.

The exceedence in iron levels at BBPB3 was investigated by Aurecon (2012) and it was found that the major increase in dissolved iron concentrations at bore BBPB3 corresponded with the rise in groundwater levels (decrease in depth) after the drought broke in December 2010 and also corresponded with an increase in pH to 6.0 or above. This suggests that the previously dry soil, exposed during the drought, became wet again, due to the rising water level, which oxidised water soluble forms of iron in the soil and caused it to enter the groundwater.

All other piezometers were below the TARP trigger levels for iron.

Figure 3.18 Groundwater - Zinc 2011

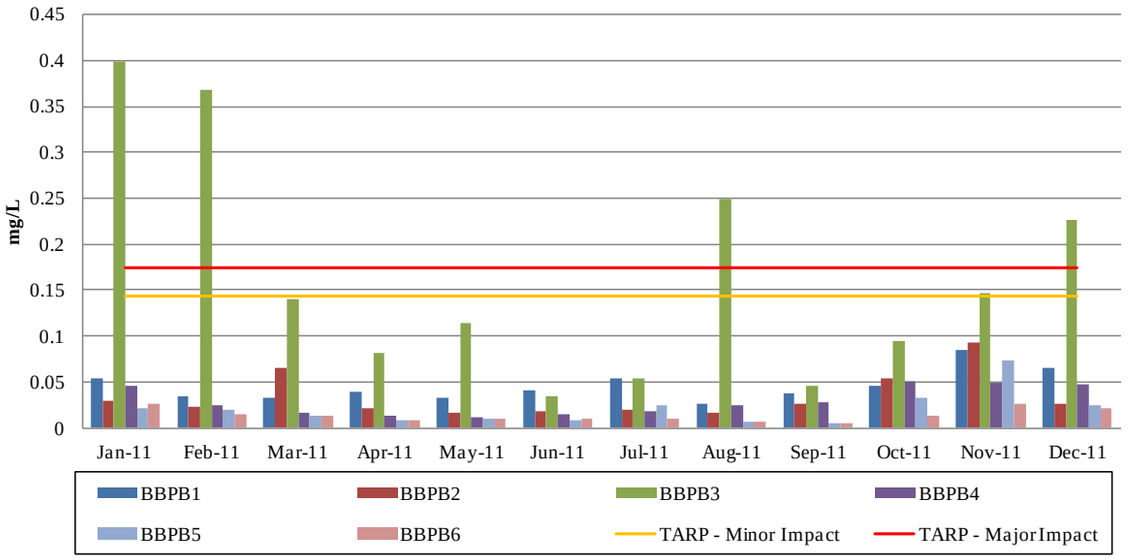


Figure 3.18 shows that zinc levels at BBPB3 exceeded the minor and major impact TARP trigger levels for no more than two consecutive months. Therefore, the minor impact trigger events for zinc occurred in January to February 2011, August 2011, and from November to December 2011. A notification has been submitted to DPI regarding the exceedances at BBPB3.

The Aurecon (2012) investigation into groundwater quality found no obvious reasons for the short-term increases in zinc at BBPB3, other than natural variability, and that the largest zinc increase (in January/February 2011) corresponded with the peak in rainfall recovery after the drought broke in December 2010.

All other piezometers were below the TARP trigger levels.

3.4.3 Groundwater Extraction

Bore licences 80BL136703 and 80BL135509, as issued by NOW, impose a maximum total extraction limit of 750 ML/year. As stated previously, the yield from Bore 80BL135509 has proven to be unreliable and its use has since been discontinued. There was no water extracted from Bore 80BL136703 during the reporting period.

Bore licence 80BL239077 authorises the north dewatering bore and a daily volumetric discharge limit of 12 ML is imposed by Environment Protection Licence 765 at LD6. During the reporting period, the discharges from the north bore did not exceed the daily limit, with the average daily discharge at LD6 of 3.45 ML/day. A total of 1,260 ML was discharged during 2011. **Figure 3.19** shows daily discharges from the north mine dewatering bore over the 2011 reporting period.

Bore licences 80BL236132 and 80BL236134 authorise Baal Bone's south mine dewatering bores and do not have extraction limits. During 2011, the south bores discharged a total of 989ML. **Figure 3.20** shows daily discharges from the south mine dewatering bores over the 2011 reporting period.

Figure 5.19 North Dewatering Bore Discharges (LD6)

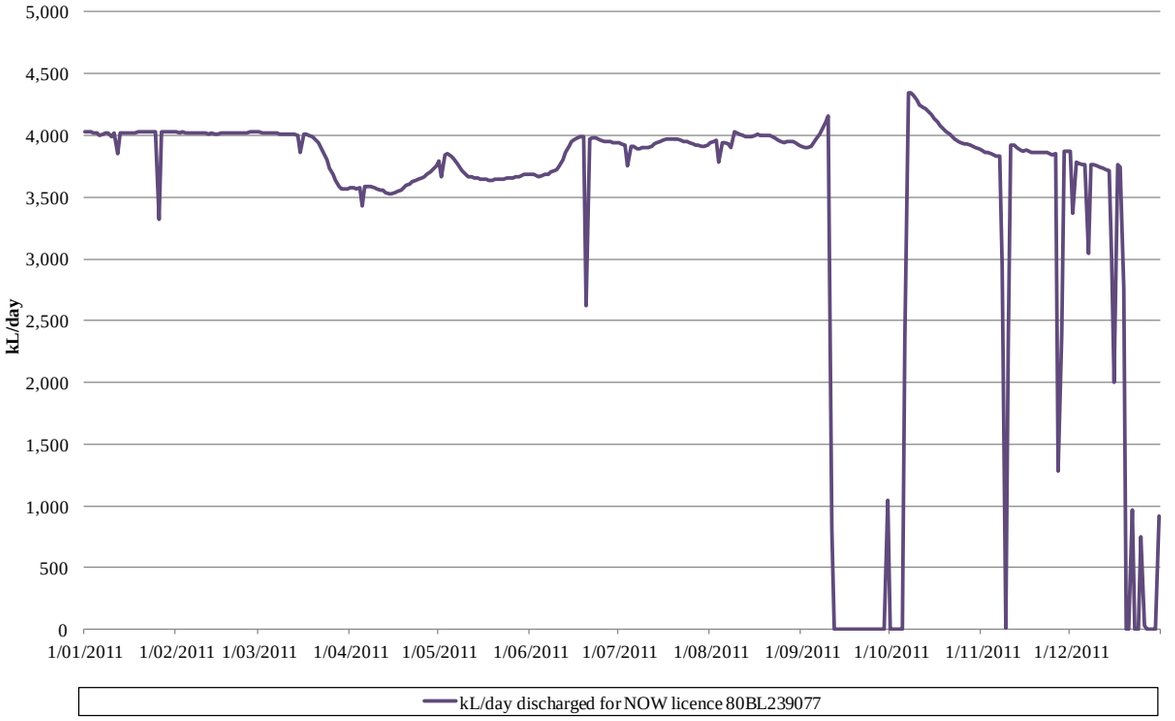
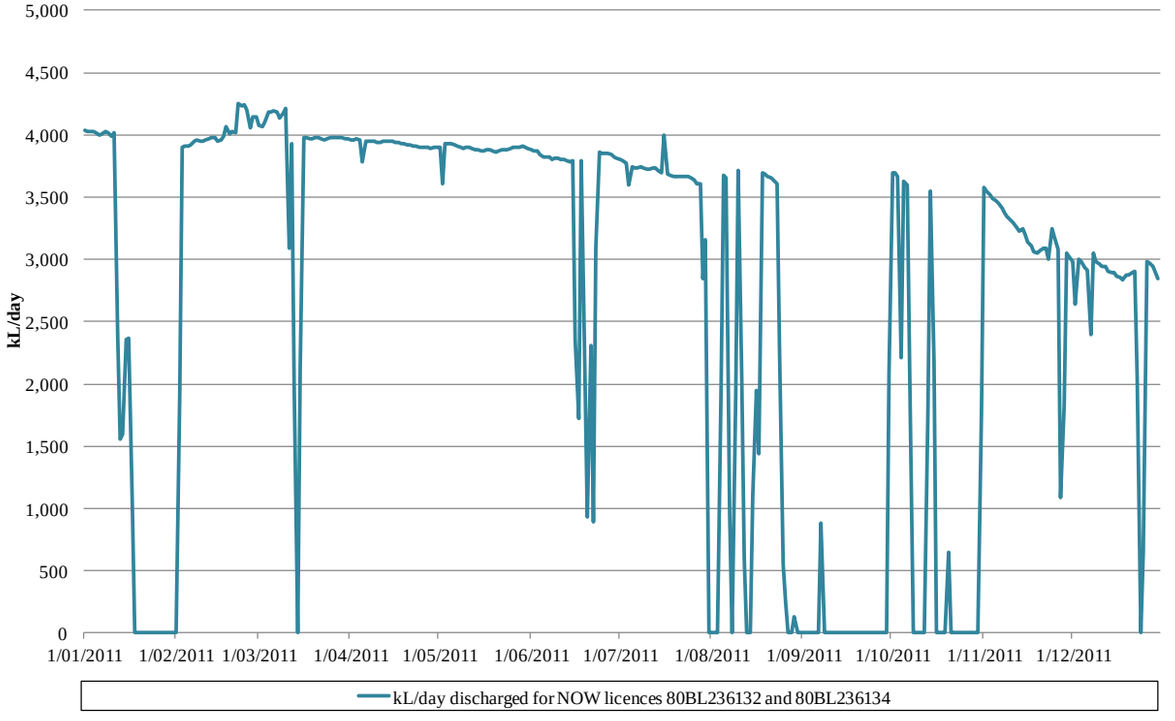


Figure 3.20 - South Dewatering Bore Discharges (LD3)



3.4.4 Comparison against EA

The EA concluded that the likelihood of extraction of Longwalls 29-31 resulting in a significant impact on the Coxs River Swamp is considered extremely low.
In terms of groundwater levels, monitoring has shown that there has been little to no impact from mining. Recent above average rainfall in 2010 has produced rising groundwater levels in all of the bores except BBPB1, which has shown a stable groundwater level since February 2010. There is obviously still some influence from the fault zone at this site as the groundwater level is below pre-mining levels. The fault zone lies between the BBPB1 and the swamp, so there is unlikely to be any hydraulic connection between the zone of depleted groundwater and the swamp. The groundwater level at BBPB1 is still higher than the groundwater level in the swamp so that even if there is a connection across the fault, groundwater flow would still be towards the swamp.

The groundwater level in BBPB2 has recovered significantly since February 2010 and is now at the same level as it was just before mining commenced. Above average rainfall in August 2010 has raised the groundwater level more than would be normally expected, which indicates that the excess infiltration appears to have replaced the groundwater drained. More importantly the pattern of groundwater response to rainfall is still normal and any remaining deficiency in the groundwater caused by the activity on the fault will be replaced by excess infiltration from future rainfall events. The groundwater level behaviour also indicates that clearly that there has been negligible drainage of groundwater into the goaf. If a connection between the goaf and the aquifer was responsible for the initial drop in groundwater level there would have been no recovery in the groundwater level in this bore.

BBPB3 showed a groundwater level that is above its pre-mining level and responded to rainfall event in an identical fashion to that displayed before mining. There is no evidence of any mining impacts at this site. BBP4 is well downstream and was not impacted by mining. It continues to show normal groundwater behaviour.

Both of the bores in the swamp (BBPB5 and BBPB6) now have groundwater levels that are higher than previously measured, and are responding normally to the climatic conditions. This is due to the consistent rainfall conditions in 2010 and 2011. The monitoring data confirms that there has been no measurable impact from mining on the swamp.

In terms of groundwater quality, monitoring and analysis have shown that mining did not affect water quality or trace metals in the Coxs River Swamp. Although minor and major changes have been noted for pH and trace metals at some bores, electrical conductivity has not exceeded its trigger level of 300 µS/cm. This indicates that the local groundwater has a very low salinity and is consistent with the local background of only 100 µS/cm.

With the exception of the major changes for copper and iron, noted in **Section 3.4.2**, the other changes to groundwater quality were minor in terms of duration above the trigger levels. The Aurecon (2012) report on groundwater quality concludes that minor changes to groundwater quality can occur by chance in the variable conditions of rainfall and the resulting groundwater level changes.

In regards to the major changes for copper and iron, the Aurecon investigation and subsequent report found that:

- It is likely that the major changes in copper noted in the background bore BBPB4 were due to the release of the metal into the groundwater from the nearby wetland by natural processes.
- The pre-mining 80th percentile baseline of 12 mg/L for all the bores indicates that iron is abundant in the groundwater of the area. The water level changes, caused by drought conditions just before and during mining, did not occur during the pre-mining period of 2008/09, which was used to establish the baseline conditions and the trigger levels. The bore BBP3 exceedance of even the major level of 24.27 mg/L by the increase to 36 mg/L, during the change from dry to wet conditions, shows how naturally abundant iron is in the area.

3.5 Contaminated Land

Known contaminated or polluted lands at Baal Bone are limited to those affected by hydrocarbons. Hydrocarbon contamination is discussed in **Section 3.17**.

There were no environmental incidents recorded or additional areas of contaminated land identified during the reporting period.

3.6 Flora

Gingra Ecological Surveys (Gingra) submitted their annual monitoring report in August 2011 which summarises the LW 29-31 SMP area monitoring completed during Autumn 2011.

The results show that levels of species diversity recorded in 2011 were at the higher end or above the previously recorded range at each site. At the woodlands sites BB05, BB06 and BB07, species diversity in autumn 2011 was higher than at any other sampling over the monitoring period.

The total number of species records in summer 2007 was 113 and in autumn 2008 it was 161 records. For the spring samplings there were 119 records in 2007, 141 records in 2008, 147 records in 2009 and 128 in 2010. The total number of species recorded in the 2011 autumn sampling was 187.

Table 3.7 Plant Species Diversity for LW29-31 SMP Area

Site	Species Count								
	Summer 2007	Spring 2007	Autumn 2008	Spring 2008	Autumn 2009	August 2009*	Autumn 2010	Spring 2010	Autumn 2011
BB05	28	26	33	33	41	NS	46	44	51
BB06	22	24	29	26	31	NS	31	30	35
BB07	18	19	29	23	26	NS	29	30	32
BB08	22	24	33	27	29	NS	35	37	32
BB09	14	14	23	20	19	16	21	25	24
BB10	9	12	14	12	10	10	14	13	13

*Additional requested survey

From the floral surveys undertaken to date there have been no endangered species found, however two vulnerable species and one species of regional significance have been identified in the area around Baal Bone. These include Capertee Stringybark *(Eucalyptus cannonnii)*,

Clandulla Geebung *(Persoonia marginata)* and Blue Devil *(Eryngium vesiculosum)* respectively.

Potential habitat for both *E. cannonnii* and *P. marginata* are isolated to areas north of the current lease area and they have not been affected by mining activities on site. Baal Bone has developed a Biodiversity and Land Management Plan to ensure that site operations (in particular vegetation clearing and ground disturbing activities) do not potentially impact on these species.

Swamp vegetation is present along Baal Bone Creek and lower arms of its tributaries and at the Coxs River Swamp along the upper Coxs River. The vegetation is typically closed sedgeland with patches of closed scrub and emergent trees.

Trees present include Mountain Gum (*E. dalrympleana*) and Blackwood (*Acacia melanoxylon*). Shrub patches include the tea-trees, *Leptospermum continentale*, *Leptospermum obovatum* and *Leptospermum grandifolium*. The ground layer is dominated by *Carex gaudichaudiana* and Tussocky Poa (*Poa labillardieri*). Associated ground layer species include *Stellaria angustifolia*, *Epilobium gunnianum*, *Juncus sarophorus*, *Geranium homeanum* and Brooklime (*Gratiola latifolia*).

This vegetation type has a restricted distribution. It corresponds to the vegetation listed as Montane Peatlands and Swamps Endangered Ecological Community (EEC) under the NSW Threatened *Species Conservation Act*. It does not correspond to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* listed Temperate Highland Peat Swamps on Sandstone EEC.

3.6.1 Comparison against EA

Floral studies conducted by Gingra as part of Baal Bone Part 3A EA predicted that no significant modification of swamp vegetation would occur as a result of the current or proposed mining operations and that mining operations are not likely to increase the impact of any relevant key threatening process on this community. These predictions are consistent with the survey results presented above.

3.7 Fauna

Biodiversity Monitoring Services (BMS) completed a seasonal survey of the Longwalls 29-31 SMP area in June 2011. The results of this survey are reported as Autumn 2011 in the table and discussion below.

Measurements of habitat characteristics derived from trap site descriptions have been used to provide an index of habitat complexity that can be helpful in determining changes over time of the habitats surveyed in the SMP Area. One index system used is that developed by Catling and Burt (1995), called the Habitat Complexity Score. This system scores the following parameters: Tree cover, tall and short shrub cover, ground cover, logs/rocks and litter cover. The scores range from 0 to 3, hence the maximum score is 18. The Habitat Complexity Scores for each site are given in the table below, together with the mean woodland results from Autumn 2007 to 2011 and Spring 2005 to 2010.

Table 3.7 Habitat Complexity Scores for LW 29-31 SMP Area – Autumn

	Autumn 2007	Autumn 2008	Autumn 2009	Autumn 2010	Autumn 2011
Woodland1	15	16	16	16	16
Woodland2	16	16	17	15	16
Mean Woodland	15.5	16	16.5	15.5	16
Creek	16	16	16	16	15
Swamp	-	13	17*	15	15
Overall	15.6	15.2	16.5	15.5	15.5

* *The swamp site was changed slightly in 2009 to better represent this environment.*

Table 3.8 Habitat Complexity Scores for LW 29-31 SMP Area – Spring

	Spring 2005	Summer 2006	Spring 2007*	Spring 2008	Spring 2009	Spring 2010
Woodland1	13	16	15	15	17	16
Woodland2	14	14	16	17	16	17
Mean Woodland	13.5	15	15.5	16	16.5	16.5
Creek	16	16	16	16	16	17
Swamp	-	-	-	13	17	16
Overall	14.3	15.3	15.6	15.2	16.5	16.5

** Only one survey was conducted in 2007 with the Autumn results presented for Spring.*

These scores indicate moderate to high habitat complexity, with a slight non-significant fall in 2010 and 2011, potentially due to differences in climatic conditions and to sampling variations. These scores also show that all sites provide good habitat for ground-dwelling mammals and woodland birds.

A total of nine native mammal (plus three introduced), 34 bird, and one amphibian species have been located within or near Longwall 29-31 SMP Area at Baal Bone during 2011.

The number of birds and native mammals located in 2011 was similar to or slightly higher than in earlier years, the number of amphibian species was lower and no reptile species were located. As expected with continued surveys, the number of species located within the SMP area has increased over the years. It is expected that the number of new species located each year will continue to increase and finally level out.

In 2011, the following threatened species were observed: Eastern Pygmy Possum, Gang-gang Cockatoo, Scarlet Robin, and Varied Sittella.

BMS concluded in their Autumn 2011 report that, due to the monitoring data set that has been accumulated over the past six seasons (2005 to 2011), it is now possible to assess any differences in the biodiversity and habitat condition of those sites that are subject to underground mining in the future. This comparison showed that there are no significant differences in the biodiversity and habitat complexity over the years. It is concluded that, at present, there are no discernable impacts from underground mining of Longwalls 29-31 at Baal Bone upon the fauna on the surface.

3.7.1 Comparison against EA

The results described above are consistent with the predictions in the EA which determined that potential impacts on fauna were largely limited to impacts on habitat as a result of subsidence.

Subsidence was not expected to result in significant impacts to fauna species as the levels predicted were similar to that which has previously occurred at Baal Bone.

3.8 Weeds

Exotic weeds were recorded at four sites in autumn 2011 by Gingra, with a total of three species, Dirty Dora (Cyperus eragrostis), Yorkshire Fog (Holcus lanatus) and Catsear (Hypochaeris radicata). The only weed at woodland sites was Catsear (Hypochaeris radicata). Yorkshire Fog declined in abundance at the two Long Swamp sites (BB09 & BB10). The decline from 2010 levels may be attributable to extended inundation within the swamp favouring species adapted to wetter conditions.

A full land management review of the Baal Bone site was undertaken by Land Asset Management Pty Limited in February 2010 (**Section 5.3.1**), which identified targeted species and their location. A comprehensive weed spraying program targeting Blackberry, St John's Wort and Biddy Bush *(Cassinia arcuata)* and isolated populations of Serrated Tussock (*Nassella trichotoma*) and Scotch Thistle (*Onopordum acanthium*) was undertaken in 2011 during March and April. Spraying commenced in November 2011 but was halted due to heavy rainfall. The spraying program recommenced in January and March 2012.

3.9 Blasting

No blasting was conducted at Baal Bone during the reporting period.

3.10 Operational Noise

During the reporting period there was one complaint received from a residence adjacent to Baal Bone in relation to noise generated by surface plant operations. The complaint coincided with an environmental compliance noise audit for Baal Bone in October 2011 – conducted by Atkins Acoustics. On-site attended noise monitoring was conducted on 4 October 2011 between 3.00 pm and 12.00 midnight at two locations: R1 – 'Muldoon' residence and R2/R3 – 'Speirs/Desch residence. The report found that during evening hours when the dozers were operating on the ROM stockpiles, the long term licence noise limits specified under Schedule 3, Condition 4 of the Development Consent were exceeded at R1 and R2/3. However, when the dozer was not operating on the ROM stockpiles the operations would comply with the long term licence noise limits.

To address noise exceedances associated with the use of the dozers on the ROM stockpiles, a rubber tyre dozer was trialled as an alternative to the tracked dozer. Orientation of plant equipment and coal stockpiles to shield noise generated by the dozer from sensitive receivers was also trialled. Orientation of the stockpiles was found to be more effective in reducing noise emissions than the use of a rubber tyre dozer. This measure was subsequently implemented. No further complaints have been received in relation to noise.

3.10.1 Comparison against EA

The EA predicted noise levels at residence location R1 with the dozer operating on the ROM stockpiles of 46 $L_{Aeq\ 15\ minute}$ dB(A) which is consistent with the attended monitoring undertaken

by Atkins Acoustics in October 2011. The EA recommended that surface operations operate in accordance with existing noise management practices, which aim to reduce noise impacts to feasible and reasonable levels for operations at the site. These primarily involve stockpile management practices including utilising existing stockpiles as barriers to minimise noise emissions from the dozer operating on the stockpile.

The October 2011 noise audit and subsequent implementation of these management practices has demonstrated that these measures are effective in managing noise impacts from the surface operations.

3.11 Visual, Stray Light

All lighting associated with the CHPP and the UC1 conveyor/ROM stockpile has been designed and constructed so as to minimise glare and stray light to sensitive receivers. No formal complaints have been received during the reporting period in this respect, although in response to comments received from a neighbour, a light near the box cut which was not required for night time operations was switched off.

A lighting assessment of the operations was undertaken by JP Environmental in 2011. This assessment was undertaken to determine compliance with Condition 29 of the Project Approval. A lighting survey was conducted on site in November 2011, where readings of illuminance (Lux) from eight different survey locations were recorded. All measurements of obtrusive light emitted from Baal Bone were below the relevant light intensity parameters. The recommendations of this assessment were that all lighting at the mine be directed below the horizontal at all times to minimise the potential for off-site light emissions. Any new lighting installations required onsite in the future will be fixed in accordance with the recommendations of this report to minimise the potential for obtrusive light. Further, the assessment recommended that consideration be given to monitoring light emissions from the mine on an ongoing basis to assess the obtrusiveness of mine lighting on surrounding external receptors over time. If mining recommences, Baal Bone will consider implementing the 2011 light assessment recommendations for existing lighting.

In addition to the recommendations of the lighting assessment, screening of mine ventilation shafts with trees or other materials was undertaken.

3.12 Aboriginal and European Heritage

3.12.1 Aboriginal Heritage

In early 2007, an Indigenous Heritage Assessment was undertaken in conjunction with preparation of the Longwalls 29-31 Subsidence Management Plan (SMP) application. This assessment identified a potential rock shelter site (BBC-RS1) located above Longwall 30 in the Ben Bullen State Forest. An Aboriginal Cultural Heritage Management Plan (ACHMP) for the potential rock shelter site BBC-RS1 was developed by OzArk Environmental & Heritage Management Pty Ltd in 2008, based on the findings of the Indigenous Heritage Assessment. The ACHMP was workshopped by the Registered Aboriginal Parties and representatives of the former Department of Environment, Climate Change and Water (now OEH).

Schedule 3, Condition_26 of the Project Approval granted in January 2011 required that the ACHMP be updated in accordance with the EA. The ACHMP was subsequently revised in July 2011 in accordance with Condition 26.

3.12.2 European Heritage

No European Heritage Sites have been identified within the Baal Bone mining lease.

3.12.3 Comparison against EA

The EA predicted that, while subsidence may occur, it is unlikely to impact currently undetected Aboriginal sites such as open sites. Potential impacts to Aboriginal heritage associated with the mining of Longwalls 29-31 have been assessed in previous surveys (OzArk 2007a; 2010). No significant impacts were predicted in this area, however, subsidence monitoring was to be undertaken during extraction. The rock shelter site BBC-RS1 was also required to be managed in accordance with an ACHMP.

Extraction of Longwall 30 beneath BBC-RS1 occurred in July 2010. During this time, Baal Bone inspected the site twice weekly. Following extraction beneath BBC-RS1, the area was resurveyed and movement vectors were calculated. Subsidence monitoring during the reporting period has confirmed the predictions in the EA. The data showed that the rock which forms the main shelter (overhang) moved 536mm in a westerly direction and subsided approximately 717mm (10mm accuracy). However, there was no visible damage caused to BBC-RS1 as a result of the extraction of Longwall 30.

3.13 Natural Heritage

No natural heritage sites have been identified within the Baal Bone mining lease. However, the Gardens of Stone National Park lies approximately 5km north-east of Baal Bone and the Greater Blue Mountains World Heritage Area is located approximately 80 km to the south-east of Baal Bone. These areas are not expected to be affected by the operations at Baal Bone.

The Ben Bullen State Forest covers much of the lease area.

3.14 Spontaneous Combustion

No spontaneous combustion events occurred in 2011.

Baal Bone has a Spontaneous Combustion TARP for the ROM stockpile. The TARP principally involves regulating the duration of ROM storage on the stockpile to reduce residence time and therefore potential oxidation, and monitoring of internal stockpile temperatures.

3.15 Bushfire Management

There were no bushfire events during the reporting period at Baal Bone. Controlled burn off events were conducted by Forests NSW within the adjacent State Forest, south-west of the site, in April 2011.

In the event of a bushfire within the adjacent State Forest, Forests NSW would assume responsibility for all fire fighting and emergency response activities. An agreement has been reached between Forests NSW and Baal Bone regarding use of the site's helipad, first aid room and process water dam in emergency situations.

In the event that a bushfire is ignited on company owned land or where bushfire poses a threat to the mining operations, the Baal Bone's Emergency Response Procedure will be activated.

In addition, site management will ensure that:

- all boundary roads around the land within the Colliery freehold area are maintained in a condition suitable for use as fire breaks and access tracks during an emergency situation;
- a water cart at the CHPP can assist in fire fighting activities;
- main access road and helipad are maintained suitable for use by emergency services;
- dams, voids and any other areas that may be utilised as watering points can be accessed by fire fighting equipment;
- portable radios are used at the time of emergency solely by the emergency response team who are trained and are provided with protective clothing;
- site earthmoving equipment can be utilised; and
- emergency phone, fire extinguishers and fire depots are located at strategic locations around the surface facilities.

Bushfire preparedness has also been included in Baal Bone's Biodiversity and Land Management Plan.

3.16 Mine Subsidence

3.16.1 Current Approvals

A SMP for development and extraction of Longwalls 29-31 was lodged with DTIRIS in June 2007. Approval was received from the Deputy Director General on 7 December 2007, with the approved period of mining to expire on 1 December 2014 (or at the expiry/cancellation of Baal Bone's Coal and Mining Leases).

Production in the first panel, Longwall 29, commenced on 6 July 2009. Extraction of Longwall 30 commenced on 9 June 2010 and was completed on 2 February 2011. Longwall 31 production commenced on 7th April 2011, and was completed on 3 September 2011.

3.16.2 Longwalls 29-31 Subsidence Development (Summary of Survey Results)

Surveys of various subsidence monitoring lines have been undertaken during mining of Longwalls 29-31. Maximum results of surveys conducted since 2009 are listed below in **Table 3.7**.

Table 3.9 LW 29-31 Subsidence Survey Data Summary

Parameter	Predicted Results	Maximum measured result

		2009	2010	2011
Vertical subsidence (mm)	1400 - 1600	1341	1538	1726
Horizontal movement (mm)	400	450	188	538
Strain (mm/m)	9 - 21	11.7	13.7	14.2
Tilt (mm/m) K=5.0	32 - 52	25.6	23.2	43.7

During the 2011 reporting period, mining was undertaken in Longwalls 30 and 31. Maximum results were within the predicted range with one minor exceedance of vertical subsidence by 38mm for Line E (a transect line along Longwalls 29-31).

Some tension cracking, as predicted, appeared in 2010 parallel to the gateroads and across the centre of Longwall 30, including one crack that exceeded predictions. Remediation works for the cracking were undertaken in 2011 and are discussed in **Section 3.16.5** below.

Routine scientific and survey monitoring of impacts on rock features, escarpments, and surface and groundwater regimes continued, as did seasonal monitoring of flora and fauna. Anomalous groundwater behaviour in several monitoring bores reported previously appears to have stabilised and is showing signs of normalising. All other monitoring results for the reporting period are within expected / predicted parameters. Routine and scheduled seasonal monitoring will continue.

There have been no subsidence impacts observed outside the nominated angle of draw.

3.16.3 Protection of the Wolgan Escarpment

Stress change monitoring instruments have been installed and commissioned in the vicinity of the two pinch points on Longwall 31. Stress changes in the rock strata were monitored during mining in the reporting period using a remote logger as Longwalls 30 and 31 were progressively extracted. Stress cells were logged on a twice daily cycle and information downloaded periodically for analysis by SCT Operations.

The strain gauges observed on BBO20 (southern pinch-point) and BBO23 (northern-pinch-point) since 1 March 2011 are considered to provide a strong indication of stress changes at the two sites. At BBO20 there is a good correlation between gauges on opposite sides of the borehole and axial (external) show little change consistent with expectation.

The correlation between independent gauges (0.965 on 6 degrees of freedom) is consistent with a meaningful point measurement of the stress gauges at the point of measurement. BBO20 indicates that the stresses parallel to the escarpment continue to decrease slowly over time and were at 0.91 Megapascals (Mpa) in August 2011.

BBO23 indicates that the major horizontal stress sub-parallel to the escarpment has increased to 0.44Mpa and is continuing to increase at a steady rate. The measured stress change (0.44Mpa) remains relatively small (19%) compared to the natural in-situ stress measured prior to the

commencement of mining in the area, and has exceeded the 0.21Mpa stress relief that occurred in this direction on 1 December 2010 during mining of Longwall 30.

The orientation of the principal stress change remains approximately aligned with the natural in-situ stress field measured prior to the start of the mine (330 degrees GN). Currently stress is aligned at 340 degrees GN.

The high resolution prism monitoring indicates a linear and steadily increasing compression parallel to the escarpment that is consistent in nature and magnitude with the stress changes observed at BBO23.

3.16.4 Longwall 31 Cracking

The only visible impacts associated with Longwall 31 observed during 2011 was some minor cracking, generally as predicted, parallel to the gate roads. Routine inspections of the surface above Longwall 31 first identified initial cracking around the LW 31 start area on 6 May 2011. At that time the width of the crack was within the predicted range. In subsequent weekly inspections the crack stayed within the predicted range and as it is relatively flat in the vicinity of the crack it was determined not to require follow up inspections other than the end of panel walkover.

The end of panel walkover, conducted on 19 January 2012, identified that the surface expression of the Longwall 31 cracks has increased in size (post mining) to the stage where notification has been provided. It is likely that continued wet weather during 2011 and 2012 has resulted in these isolated areas of increased surface crack expression.

A notification regarding the exceedences was submitted to DPI on 25 January 2012 in accordance with condition 18 of Baal Bone's SMP conditions.

In response to a request from DPI a full inspection of the surface above the entire Longwalls 29-31 area was completed in late February / early March to confirm the location of any additional surface cracking. A remediation program has been developed and this will be implemented following appropriate studies and approvals.

3.16.5 Longwall 30 Start Line Crack Update

Tension cracking around the start of Longwall 30 was identified during the 2010 reporting period. Following various meetings, site inspections and consultation, a remediation plan, including preparation of a Review of Environmental Factors, for the remediation works was developed and approved in conjunction with officers of DTIRIS and Forests NSW during the previous reporting period. These remediation works commenced on 9 February 2011 and completed on 24 February 2011. DTIRIS inspected the remediation works in 2011 and provided positive feedback on the outcomes of the remedial actions.

3.16.6 Surface and Drainage Depressions

To date there has been one unpredicted subsidence impact observed on surface drainage depressions within the SMP area, in Longwall 30, details of which were included in the 2010 AEMR**,** and an update provided above at **Section 3.16.5**. Apart from this incident some minor

fractures, within predicted ranges and below TARP trigger values, as outlined in the SMP Environmental Monitoring Program, have been identified.

Inspections of the area during or immediately following runoff producing rainfall events (ie. 25mm / 24 hour period) continued during the reporting period; there has been no observable change to pre-mining flow characteristics and/or stream morphology during this reporting period.

On 4 March 2011, Baal Bone received a letter from DTIRIS asking for details on repairs to the creek undertaken since the group inspection as part of the subsidence crack notification for LW 30.

Baal Bone responded stating that the company did not think repairs to the creek were necessary for the following reasons:

- Due to the ephemeral nature of the creek, it does not hold any significant ecosystems or endangered flora or fauna refuges.
- It is not currently proposed that it be rehabilitated, as over time it may self rehabilitate as it has a silty stream bed which may fill any underlying cracking that may have occurred during mining of Longwall 30.
- It was proposed that Baal Bone continue subsidence monitoring with additional photo points near the Longwall 30 crack area and upstream and downstream of the Longwall 29-31 area until Longwall 31 is complete and reassess any subsidence/upsidence impacts and/or required remediation on the stream at that stage.

3.17 Hydrocarbon Contamination

An annual review of the groundwater monitoring wells at Baal Bone was undertaken by AECOM during May 2011. The results of this monitoring program acknowledged that activities at the site, prior to 2011, have resulted in contamination of shallow groundwater. The contamination was localised and associated with known point sources such as fuel storage areas.

The results of the review indicated an improvement or reduction in groundwater contamination concentrations with petroleum concentrations across a majority of the site reporting a decrease from previous years. The review included recommendations that the groundwater monitoring program continue so that adverse impacts to shallow groundwater in the pit-top and CHPP vicinities can be readily identified and managed accordingly.

Some areas of the pit top were remediated in 2011 with some contaminated soils placed temporarily in the site's bioremediation area with full rehabilitation to be undertaken following mine closure. The soils that were placed in the area are regularly aerated to ensure that bioremediation occurs efficiently.

During the reporting period a minor oil spill occurred. The spill was not required to be reported to OEH and is discussed further in **Section 3.20.1.**

3.18 Methane Drainage and Ventilation

During the reporting period, monthly gas bag samples from the underground ventilation system were analysed by Coal Mines Technical Services, a NATA accredited company.

Results from the sampling completed throughout the reporting period confirm non-detectable levels of methane at Baal Bone (<0.01%). Consequently, methane drainage is not required at Baal Bone.

3.19 Public Safety

Fences are in place around the mining lease area, with all other boundary gates locked and maintained in correct working order. All access points onto the mine area are signposted to warn the public of Baal Bone Colliery's mining operations and of the risks involved. Warning signs have also been erected along public tracks in the Ben Bullen State Forest warning of mine subsidence and prohibiting entry to unauthorised persons.

All employees and contractors who enter the mining operations or workshop areas are inducted and must be suitably trained. All visitors must sign in and be accompanied by an employee or staff member of the mine if they have not been inducted by the Safety and Training Superintendent.

Security and safety measures were undertaken in 2011 to prepare for suspension of operations and included the employment of security staff and placing of gates on adits. Grills were placed on conveyors in 2011 and are to be put on the CHPP in 2012. A gate lock change also took place in 2011.

In 2010 there was a larger than expected subsidence crack at the beginning of Longwall 30 which posed a risk to public safety. Remediation works to the crack were completed in February 2011. This was discussed in detail in **Section 3.16.4.**

3.20 Other Issues and Risks

3.20.1 Reportable Incidents

Pursuant to Xstrata's categorisation of incidents, any incident that falls into the categories below must be reported to the Group Environment and Community Manager, the General Manager for Open Cut or Underground Operations (depending on the type of incident) and the Chief Operating Officer.

Category I: An incident that has caused negligible, reversible environmental impact, requiring very minor or no remediation. For example, exceeding EPL Limits or a hydrocarbon spill >20L.

Category II: An incident that has caused minor, reversible environmental impact, requiring minor remediation. For example, Hydrocarbon spill >20L but <205L AND contained on site.

Category III: An incident that has caused moderate, reversible environmental impact with short-term effect, requiring moderate remediation. For example, illegal discharge offsite that

causes local but reversible damage. Also, a hydrocarbon spill <205L that was not contained readily or a spill of any amount of hydrocarbon into public waterways.

Category IV: An incident that has cause serious environmental impact, with medium-term effect, requiring significant remediation. For example, an incident that requires a remediation program over 1-12 months.

Category V: An incident that has caused disastrous environmental impact, with long-term effect, requiring major remediation. For example, an incident that requires a long-term remediation program over 12 months.

In accordance with the definitions provided above, there were two reportable environmental incidents recorded by Baal Bone during the reporting period; this related to the noise complaint received from a neighbour previously discussed in **Section 3.10**. One minor oil spill occurred near the train loader in February when the hydraulic ram seal failed and released 100L of oil to the ground. The spill was contained and cleaned up using spill sorb and the hydraulic ram was repaired. This incidence was a Category 1 incident (i.e. a incident of negligible, reversible environmental impact, requiring very minor or no remediation) and, therefore, was not required to be reported to OEH.

There were no fines or penalties recorded during the reporting period

3.20.2 Audits Conducted During the Reporting Period

In an order to assess our environmental performance at Baal Bone and to plan and implement a process of continual improvement, the audits below were conducted during 2011.

- Erosion and Sediment Control Audit;
- Mine Closure Risk Review;
- Independent Environmental Audit;
- Noise assessment;
- Lighting assessment; and
- Routine audits on dust monitoring gauges.

The Erosion and Sediment Control Audit was discussed in **Section 3.2.**

A Mine Closure Risk Review was prepared for Baal Bone in June 2011 in accordance with the 2011 XCN Internal Audit Plan. The review covered the key systems, processes and controls identified by management for the management of Mine Closure Risk for XCN's Baal Bone operation, as identified in the relevant XCN Risk Registers. Based on the results of the review the overall control framework with regard to management of Mine Closure Risk at Baal Bone is classified as Acceptable in terms of the overall rating definitions. The review found the current key controls identified by XCN and site management were in place, being applied and to the extent currently possible were effective in the management and control of the Baal Bone Mine Closure Risk. Minor issues and improvement suggestions were also identified for Baal Bone's Mine Closure management plans.

An Independent Audit was undertaken by URS in December 2011 in accordance with Schedule 5, Condition 7 of the Project Approval.

The noise and lighting assessments were discussed previously in **Sections 3.10** and **3.11** respectively.

Audits on dust monitoring gauges are conducted annually, usually in January of each year. Due to the New Year holiday and the need to comply with the standard exposure periods for dust deposition gauges, the January 2011 audit was completed on 31 December 2010 in conjunction with the monthly dust deposition gauges bottle changeovers. This audit reported that all four dust deposition gauges were compliant with the Australian Standards (AS/NZS3580.1.1:2007 and AS/NZS3580.10.1:2003). On 8 September 2011, a fifth dust deposition gauge was installed and an audit for this gauge conducted. The audit reported that the fifth gauge was also compliant with the Australian Standards.

SECTION 4.0: COMMUNITY RELATIONS

4.1 Environmental Complaints

In accordance with Baal Bone Health, Safety, Environment and Community (HSEC) Procedure PRO 01.09.01.02.009 (Community Complaints Management), Baal Bone Colliery has a comprehensive system in place to document and respond to community complaints in a timely manner and to maintain a comprehensive complaints database.

Consistent with conditions of Baal Bone's EPL, Baal Bone maintains a 24 hour telephone complaints line and answering service for the purposes of receiving and responding to complaints from members of the public in relation to activities conducted at Baal Bone.

Upon receipt of a complaint, the following details are obtained from the complainant:

- Date of complaint;
- Notification method;
- Date of incident;
- Name of complainant;
- Contact details of complainant;
- Type of complaint;
- Actions taken;
- Persons notified; and
- Details of follow up actions taken, if required.

Following the receipt of a complaint, a thorough investigation of the complaint is undertaken and the complainant advised of the results of the investigation. Any action to be taken to prevent a recurrence is undertaken as soon as practicable.

During the 2011 reporting period there was one formal complaint received from a residence adjacent to Baal Bone, relating to noise generated by surface plant operations. The details of this complaint are discussed in **Section 3.10** of this AEMR.

4.2 Community Liaison

4.2.1 Community Initiatives

During 2011 the following community support initiatives were implemented, which included donations to:

- Capertee Public School;
- Portland School for school excursion bus hire;
- Cullen Bullen School for school excursion bus hire;
- Cullen Bullen School for Innovation Award prize money;
- Cullen Bullen Progress Association for upgrading Cullen Bullen Progress Hall;
- Portland Art Purchase Society Inc for 35th Anniversary of Portland Art Exhibition;

- Lithgow Show Society;
- Cullen Bullen Primary School for school excursion bus hire;
- Lithgow Private Hospital for purchase of sofa bed chair for children's room;
- Australian Rotary for Hat Day for Mental Health;
- Prostate Foundation; and
- Lithgow Volunteer Rescue Squad towards new truck.

Funding has been allocated for community involvement activities in the 2012 reporting period, which will be identified in early 2012.

4.2.2 Community Consultative Committee

The Baal Bone Colliery Community Consultative Committee (CCC) has been established to provide a formal conduit for exchange of information and views between the local community and Baal Bone's Management Team.

Membership of the 2011 Baal Bone CCC:

- Ray Blackley (Resident);
- Barbara Milne (Resident);
- David Speirs (Adjacent landholder);
- Representative from Lithgow City Council;
- Representative from Cullen Bullen Public School;
- Lawrie Ireland (Operations Manager);
- Diana Barnes (Senior Environment and Community Officer); and
- Mark Bulkeley (Safety and Training Superintendent).

CCC meetings were held at Baal Bone on 21 February, 21 June and 14 September 2011 during the reporting period. Regular agenda items included:

- Operations Manager's update;
- Health and Safety Manager's update;
- Environment Manager's update;
- Open Cut rehabilitation update; and
- General Business and any other issues of concern from the community.

The Baal Bone CCC is scheduled to meet again in March/April 2012.

4.2.3 Baal Bone Newsletter

Baal Bone Colliery circulates a periodic community newsletter, *The Baal Bone Community Newsletter,* to approximately 250 neighbouring residents, to selected locations in Lithgow, Wallerawang and Portland, in addition to all Baal Bone employees and contractors.

The newsletter provides topical information regarding the mine's operational progress, environment and safety performance, and other areas of general interest including site rehabilitation and mine closure.

No newsletters were distributed in the 2011 reporting period.

SECTION 5.0: REHABILITATION

5.1 Buildings

No buildings were rehabilitated or removed during the reporting period.

5.2 Rehabilitation of Disturbed Land

The current disturbed footprint of Baal Bone has been systematically and progressively reduced due to substantial rehabilitation carried out in conjunction with and following the recent open cut mining program which concluded in 2007. The current levels of disturbance at the site have been significantly reduced due to these recent rehabilitation works (refer to **PLAN 3**).

During the 2011 AEMR period, approximately 2.5 ha of land was rehabilitated. The newly rehabilitated area is on the north-west area of the site bordering an adjacent private property (Speirs residence) (**PLAN 3**) and was a former coal stockpile from the legacy mine in the 1950s. The works were undertaken by the NSW Soil Conservation Service and completed in late August 2011. Landform design included shaping of contour drains and reseeding to a pasture land which forms in with the surrounding pasture landscape.

A summary of rehabilitation works at the start of the MOP period (July 2009), an estimate for the end of the current MOP period (July 2016) and at mine closure are detailed in **Table 5.1**, together with actual rehabilitation completed during the 2010 and 2011 AEMR reporting periods.

Table 5.1 Summary of Rehabilitation Performance

	Area Affected/Rehabilitated (hectares)				
	Start of MOP (July 2009)	**End of 2010 AEMR Reporting Period**	**End of 2011 AEMR Reporting Period**	**End of MOP Period (July 2016)**	**At Mine Closure *(anticipated)***
A: MINE LEASE AREA					
A1 Mine Lease(s) Area	5002 ha				
B: DISTURBED AREAS					
B1 Infrastructure area (other disturbed areas to be rehabilitated at closure including facilities, roads)	70.54 ha	70.54 ha	70.54 ha	70.54 ha	Nil
B2: Active Surface Mining Area (excluding items B3 - B5 below)	Nil	Nil	Nil	Nil	Nil

B3 Waste emplacements (dozer push and dumps in N and S) (active/unshaped/in or out-of-pit)	44.36 ha	44.36 ha	41.86 ha	41.86 ha	Nil
B4 Tailings emplacements (REA 5, 6) (active/unshaped/uncapped)	9.88 ha	9.88 ha	9.88 ha	9.88 ha	Nil
B5 Shaped waste emplacement (awaits final vegetation)	5.60 ha	5.60 ha	5.60 ha	Nil	Nil
ALL DISTURBED AREAS	130.38 ha	130.38 ha	130.38 ha	Nil	Nil

C REHABILITATION PROGRESS (Cumulative)

C1 Total Rehabilitated area (excluding maintenance)	134.87 ha	134.87 ha	137.37 ha	137.37 ha	270.87 ha

D: REHABILITATION ON SLOPES (Cumulative)

D1 10 to 18 degrees	38.25 ha	38.25 ha	38.25 ha	38.25 ha	38.25 ha
D2 Greater than 18 degrees	2.5 ha	2.5 ha	2.5 ha	2.5 ha	2.5 ha

E: SURFACE OF REHABILITATED LAND (Cumulative)

E1 Pasture and grasses	59.99 ha	59.99 ha	62.49 ha	62.49 ha	89.39 ha
E2 Native forest/ecosystems	74.88 ha	74.88 ha	74.88 ha	74.88 ha	181.48 ha
E3 Plantations and crops	Nil	Nil	Nil	Nil	Nil
E4 Other (includes non-vegetative outcomes)	Nil	Nil	Nil	Nil	Nil

5.3 Rehabilitation Inspections and Monitoring

Three types of rehabilitation monitoring/inspections are undertaken at Baal Bone. These include;

- Ad hoc inspections by site personnel,
- An annual environmental rehabilitation walk around inspection as per XCN (HSEC STD 5.13, section 5.4.1), and
- Annual ecological rehabilitation monitoring which was implemented in 2009.

5.3.1 Annual Environmental Rehabilitation Inspection

The annual environmental rehabilitation inspection was conducted by Land Asset Management Pty Ltd on 14 February 2011. The 2011 inspection identified significant ongoing improvements in the results of the management of the land under Baal Bone control including:

- Progress in the vegetation on the rehabilitated parts of the mine land; grasses, herbage and tree species with the increase in rainfall during 2010,
- Very little evidence of soil erosion activity due to effective land drainage management measures, and
- Limited evidence of feral animals following a successful Blackberry control campaign in previous years eliminating rabbit harbour.

The rehabilitation inspection identified a lack of pasture growth in areas dominated by tree species (particularly Acacia's) and that continued vigilance will be required to control weeds onsite.

5.3.2 Annual Ecological Rehabilitation Monitoring

Annual ecological rehabilitation monitoring was conducted onsite by DnA Environmental from 16 – 24 August 2011. The methodology used for undertaking the monitoring was consistent with that used in 2009 and 2010, and monitors the results of six woodland and two pasture rehabilitation sites comparing their ecological progress since 2009 against relevant reference sites.

The monitoring program uses a combination of Landscape Function Analyses (LFA), comprehensive soil analyses and an assessment of ecosystem characteristics using an adaptation of methodologies derived by the Biometric Model used in the Property Vegetation Planning Process. The ecological assessment provides quantitative data that measures changes in:

- Floristic diversity including species area curves and growth forms;
- Ground cover diversity and abundance;
- Vegetation structure and habitat characteristics (including ground cover, cryptogams, logs, rocks, litter, projected foliage cover at various height increments);
- Understorey density and growth (including established shrubs, direct seeding and tubestock plantings and tree regeneration);
- Overstorey characteristics including tree density, health and survival; and
- Other habitat attributes such as the presence of hollows, mistletoe and the production of buds, flowers and fruit.

Recommendations arising from the 2011 annual ecological rehabilitation monitoring include:

- The application of vegetative material such as weed free pasture hay, scattered logs and branches, and over sowing with a sterile cover crop and native grass seed to improve ground cover, stabilise rehabilitation slopes and increase soil fertility.
- Future rehabilitation programs should refine (and reduce) seed mixes to species found naturally occurring within specific vegetation communities, including a broader range or higher density of ground cover species and in more similar proportions.
- Regular monitoring of feral / pest animals and noxious weeds, and the implementation of targeted control programs, as required, to maintain the current level of control.

5.4 Works Outstanding to Date

The areas which have not yet been rehabilitated are generally limited to the current surface infrastructure areas, including the pit-top area, CHPP, ventilation shaft and fan compounds, transmissions lines, pipelines, various water management structures and the southern REA,

including REA 5 and REA 6 and the Course Reject Emplacement Area (**PLAN 3**). These areas will be rehabilitated should Baal Bone decide to progress mine closure following the suspension of operations period (2012 to 2015). The rehabilitation of REA 5 will commence in the 2012 AEMR period (**PLAN 3**).

Survey has confirmed that approximately 331,000 m^3 of freedig (clay loam) material has been stockpiled for capping and covering these areas following mine decommissioning. Three dimensional modelling indicates that approximately 150,000 m^3 is required to provide a 500 mm cover over the former southern open cut area and approximately 127,500 m^3 will be required to provide a 300 mm cover over the remaining surface infrastructure area.

5.5 Ben Bullen Creek Rehabilitation Project

In 2010 Baal Bone completed the Ben Bullen Creek Rehabilitation project. This was as part of a larger Catchment Management Authority project in the Upper Jews Creek area.

The section rehabilitated was on an adjacent landholders property and not part of Baal Bone mine rehabilitation liability. The project was partially funded by Xstrata Coal NSW as part of their Corporate Social Involvement donations for 2010.

Stabilisation and restoration works have been completed along two sections of the Ben Bullen Creek including riparian vegetation (tube stock) planting in sections 1 and 3. These works have been specifically designed and constructed using the philosophy of natural channel design.

Under PA 09_0178, Baal Bone was required to review its water management systems which included a review of the Ben Bullen Creek Natural Channel Design and Restoration Plan, originally prepared in 2007. In late August 2011 Baal Bone engaged the services of a consultant to complete this review. Results from the review are currently pending.

5.6 Other Infrastructure

No other rehabilitation was undertaken during 2010 as a result of construction or decommissioning of site infrastructure.

5.7 Rehabilitation Trials and Research

There has not been any formal rehabilitation trials or research carried out at Baal Bone during the reporting period.

5.8 Finalisation of a Detailed Mine Closure Plan

5.8.1 Mine Closure Planning

In accordance with Xstrata Coal NSW Sustainable Development Annexure 0038, 10.1 Mine Closure, Baal Bone is in the final stages of the preparation of a Detailed Mine Closure Plan.

Activities completed and/or initiated include the following:

- Desktop Constraints and Opportunities Analysis for Mine Closure (Umwelt Australia);
- Final Landuse Options Workshop and Risk Register (GSSE Environmental);
- Preparation of draft closure objectives and completion criteria for final Landuse options;
- Phase 1 and Phase 2 Contamination Survey and Assessment (ENSR Australia);
- Hazardous Materials Survey and Sire Register (SP Solutions);
- Completion of a Demolition and Dismantlement Closure Study for the site (Liberty Industrial);
- Finalisation of Mine Seal Design (Burke Engineering Services);
- Indicative market valuation of final Landuse options and accompanying cost to benefit and economic analysis of Landuse options (Trevor Hudson and Associates);
- Mine Closure Social Impact Assessment (Coakes Consulting); and
- Development and progressive implementation of Mine Closure Consultation Strategy.

As a result of these activities, a decommissioning plan has been developed for each domain within the mine area. The plan is to be revised yearly in accordance with any changes that may occur with company goals, legislation and planning. The domain areas which require decommissioning activities are dominated by the current infrastructure areas associated with Domain 1 – Northern Void, Domain 3 – Infrastructure, Domain 4 – Central Pit Top Area, Domain 6 – Southern Void and Domain 7 – Subsidence areas. Decommissioning of current infrastructure is the first step to meet the Mine Closure criteria.

Activities completed and/or initiated during 2011 focussed on the following:

- Continuation of community consultation program;
- Implementation of recommendations in Social Impact Assessment regarding redundancies;
- Annual Phase 2 Contamination Review for soil and ground water (AECOM Australia);
- Continuation of annual review and monitoring program using the concept of Landscape Function Analysis; and
- Finalise Detailed Mine Closure Plan document and distribute to stakeholders.

5.8.2 Rehabilitation Liability Estimate

Baal Bone's rehabilitation liability estimate was calculated in 2011 at a total of $13,021,897, increasing from $9,722,852 at the end the 2010 reporting period.

SECTION 6.0: ACTIVTIES PROPOSED IN THE NEXT AEMR PERIOD

6.1 Operations and Systems

Projects and targets for the 2012 reporting period include the following:

- Continue to implement the Project Approval for the continued operations at Baal Bone;
- Pursuant to the Project Approval conditions, Baal Bone will prepare all required management plans and systems, plus install and establish all required monitoring equipment and programs;
- Submit the Suspension of Operations MOP for approval by DTIRIS;
- Submit the End of Panel report for Longwall 31;
- Annual review and update of Baal Bone's EMS and Environment and Community Risk Assessment; and
- Distribute a Detailed Mine Closure Plan.

6.2 Care and Maintenance Period (Temporary Closure)

Baal Bone has entered a care and maintenance period following the cessation of mining operations in 2011. During this period, infrastructure will remain intact and the site will continue to be managed and maintained for potential future mining or industrial land use.

The potential utilisation of the Baal Bone site for future mining activities including mining, mine training facility, use of the coal processing, rail loop or coal emplacement areas will be considered, however have not been confirmed as a future land use. Potential future use could involve quarantining of the pit-top area, rail loop, CHPP and voids during a care and maintenance period until a decision has been made on the future mining/industrial land use options.

Following completion of extraction from Longwall 31 in September 2011, the underground workforce was retrenched. The CHPP continued with sufficient labour for approximately three months until December 2011 to process and market the remaining ROM and coal stockpiles.

The underground sections have entered a care and maintenance period which will be primarily managed by contracted labour.

6.2 Pit-top Facilities

During the next AEMR period all infrastructure will be maintained to an operational standard. In the event that a full mine closure is decided, a rehabilitation strategy for pit top facilities is detailed in the Mine Closure Plan.

As the current future of mining operations at Baal Bone is uncertain, a suspension strategy has been adopted for the CHPP. This will allow the CHPP to be temporarily decommissioned, and then restarted in the future should investigations identify suitable and economically viable

reserves for extraction. Subsequently, Baal Bone has developed a CHPP Suspension Strategy which includes the following:

- A decommissioning strategy, which includes the required activities to decommission plant and equipment in a safe and effective manner.
- A preservation strategy which includes preservation, storage and ongoing maintenance activities

As a component of the decommissioning process, specific details were developed for each piece of equipment and plant identified within the CHPP. The strategy that has been adopted provides a safe and cost effective method of preserving the current CHPP in the event that mining operations are re-commenced at Baal Bone. After the CHPP has been decommissioned, the following activities around the CHPP will take place during the care and maintenance period:

- Coal stockpile area will be cleaned up;
- CHPP will be secured;
- All electricity supply to be maintained;
- Sediment traps will be maintained; and
- Reclaim tunnels and other infrastructure will be man-proofed.

6.3 ROM and Product Stockpiles

All stockpiles have been depleted leading up to the suspension of mining operations. Washery operations have ceased, and remaining saleable product coal is being dispatched from the site via rail. All saleable product coal is expected to be dispatched by April 2012. Following the suspension of operations, all stockpiles will be cleaned of carbonaceous material and left in a stable condition. In the event that a full mine closure is decided, rehabilitation strategy for coal stockpile infrastructure is detailed in the mine closure plan.

The approved capacity of the ROM coal stockpile is approximately 400,000 tonnes, and the saleable coal stockpile is approximately 600,000 tonnes. The stated stockpile capacity will not be altered as a result of operations proposed for 2012.

6.4 Mine Ingress/Egress

The main ingress to the underground operations is provided through the No.4 adit. The primary ingress to each previous longwall is provided through the maingate roadways. Secondary egress is provided through the tail gate of each longwall panel. Egress for Longwall panels 28, 29, 30 and 31 is provided through the 1 and/or 3 East returns.

All adits have been secured with steel gates and will be kept locked at all times throughout the next AEMR period. Access will only be available to approved underground operators for completion of routine underground maintenance, statutory inspections and possible training activities.

6.5 Voids

It is intended to retain and maintain REA 6 for future use should Baal Bone decide to continue operations in accordance with its Project Approval. Final rehabilitation of this area will occur concurrent with mine closure.

6.6 Other Infrastructure

Other infrastructure associated with Baal Bone or in the immediate vicinity includes powerlines, access tracks, monitoring sites and ventilation shafts. All powerlines to the site will remain to supply buildings and offices power during the care and maintenance phase of the mine. All mine related access tracks, monitoring sites and ventilation shaft sites present on Forest NSW land will be maintained during the care and maintenance phase of the mine.

6.7 Rehabilitation

The principal objective for the rehabilitation of mined land at Baal Bone is to return the site to a condition where its landforms, soils, hydrology, flora and fauna are self-sustaining, and compatible with the surrounding land fabric.

The proposed end land use for the site includes a combination of grazing and bushland/wildlife habitat. The stated land use combination is compatible with adjoining lands. The overriding principle is to create the most beneficial future use of rehabilitated land, which can be sustained in view of the range of limiting factors. The post-mining landscape will be dominated by Class IV (grazing – occasional cultivation) and Class VI (grazing – no cultivation) Rural Land Capability Classification. Drainage paths, contour drains, ridgelines, and emplacements are to be shaped in undulating informal profiles in keeping with natural landforms of the surrounding environment. The rehabilitation work completed to date is illustrated in **PLAN 3**.

The areas which have not yet been rehabilitated are generally limited to the current surface infrastructure areas; these include the pit-top area, CHPP, ventilation shaft and fan compounds, transmissions lines, pipelines, various water management structures and the southern reject emplacement area (**PLAN 3**). These areas will not be decommissioned and rehabilitated until after a decision to commence mine closure occurs.

Survey has confirmed that approximately 331,000 m^3 of freedig (clay loam) material has been stockpiled for capping and covering these areas following mine decommissioning. Three dimensional modelling indicates that approximately 150,000 m^3 is required to provide a 500 mm cover over the southern REA and approximately 127,500 m^3 will be required to provide a 300 mm cover over the remaining central infrastructure area.

It should also be noted that the southern REA including REA 6 will be maintained during the suspension of operations period. Whilst it may be progressively or temporarily rehabilitated if the opportunity arises, final rehabilitation will be completed concurrent with mine closure. Approximately 178,000 m3 of freedig (clay loam) covering material has been stockpiled in readiness. Species used in this rehabilitation will match the species composition that was used in the Southern Area. The box cut will remain open during the care and maintenance period for future mining purposes.

To ensure Baal Bone will be able to meet the final rehabilitation objectives, the preferred methodologies to be used include a combination Landscape Function Analyses (LFA), accredited soil analyses, and an annual rehabilitation walkover inspection. Baal Bone will undertake an annual rehabilitation walkover inspection over previously rehabilitated sites. This will be completed by a suitably qualified environmental officer and will ensure that any land management issues such as weeds and erosion are raised and addressed. Inspections from site personnel will also be undertaken on monthly basis for rehabilitation with pit top inspections occurring weekly.

6.8 Community Relations

Community relations projects for the 2012 AEMR reporting period include the following:

- hosting of 2 six-monthly CCC meetings; and
- distribution of 2 six-monthly newsletters.

REFERENCES:

AECOM (2010). Dangerous Good Review, Baal Bone Colliery. AECOM Australia Pty Ltd, Gordon.

Aurecon (2012). Groundwater Level and Water Quality Changes compared to TARP Trigger Values in and around the Coxs River Swamp from 2009 to 2011 for SMP Area LW29-31. Aurecon Australia Pty Ltd, Neutral Bay.

Baal Bone, (2009). MP01.09.01.02.007 Social Involvement Plan. Baal Bone Colliery, Cullen Bullen.

DnA Environmental (2011). Baal Bone Colliery Rehabilitation Monitoring 2011, DnA Environmental.

DPI-MR, (2006). Rehabilitation Security Deposit Requirements for Mining and Petroleum Titles. NSW Department of Primary Industries – Mineral Resources, Maitland.

ENSR-AECOM Australia (2010). Annual Groundwater Monitoring, Baal Bone Colliery (2009). ENSR Australia Pty Ltd, Pymble.

GSS Environmental, (2011). Baal Bone Close Now Rehabilitation Liability Estimate. GSS Environmental, Newcastle.

Land Asset Management (2010). Land Management Assessment, Baal Bone Colliery. Land Asset Management, Singleton.

Maltby,E (2009). The wetlands handbook. John Wiley and Sons.

nghenvironmental (2010). Environment and Community Risk Assessment, Baal Bone Colliery Lithgow, NSW. **ngh**environmental, Wagga Wagga.

Schaller, J, Brackhage, C, Mkandawire, M and Dudel, E G (2011). Metal/metalloid accumulation/remobilization during aquatic litter decomposition in freshwater: A review. Science of the Total Environment 409: 4891-4898

SCT Operations Pty Ltd, (2011). Review of subsidence and stress cell change monitoring adjacent to the Wolgan Escarpment at completion of longwalls 29 and 30, SCT Operations Pty. Ltd, Wollongong.

Xstrata Coal NSW Sustainable Development Annexure 0038, 10.1 Mine Closure (Version 2.0).