GLENCORE

BAAL BONE COLLIERY

ANNUAL ENVIRONMENT REVIEW

1st January 2014 – 31st December 2014

GLENCORE

Name of mine:	Baal Bone Colliery
Titles/Mining Leases:	CCL 749 MPL 261 CL 391 ML 1302 ML 1382 ML 1607
MOP Commencement Date:	29/02/2012
MOP Completion Date:	30/08/2015
AEMR Commencement Date:	01/01/2014
AEMR End Date:	31/12/2014
Name of Leaseholder:	Wallerawang Collieries Pty Ltd
Name of mine operator:	Baal Bone Colliery
Reporting Officer	Ben Anderson Environment and Community Coordinator
	Signature: 
	Date: 25/02/2015

Abbreviations:

ACMA – Australian Communications and Media Authority
CCL – Consolidated Coal Lease
CL – Coal Lease
CMRA – Coal Mines Regulation Act 1982
DP &E – Department of Planning & Environment
DRE -Department of Trade & Investment, Division of Resources & Energy
BOD –Biochemical Oxygen Demand
MBAS – Metheleyne Blue Active Substances
COD – Chemical Oxygen Demand
EPA – Environmental Protection Authority
EPL – Environment Protection Licence
ML – Mining Lease
MOP – Mining Operations Plan
MPL – Mining Purposes Lease
NOW – NSW Office of Water
REA - Refuse Emplacement Area
EC – Electrical Conductivity
TSS – Total Suspended Solids

GLENCORE

Table of Contents

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 Wallerawang Collieries Pty Ltd (TWCL). The reporting period for this AEMR is 1 January 2014 to 31 December 2014.

On 14 January 2011, Baal Bone 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 on 3 September 2011, and underground mining operations have entered into care and maintenance.

During 2012 and 2013 Baal Bone Colliery was utilised as a training facility for Glencore Xstrata employees. Underground workers completed a twelve week training course including classroom tutorials, and equipment familiarisation. The objective of the training program was to provide employees with experience and skills in an underground mining environment. Until the current down turn in the industry, Baal Bone had trained approximately 300 new industry entrants from Glencore's Ulan West Mine and Blakefield South Mine.

The management and administration of Glencore's NSW generic induction program has been managed from the Baal Bone site since June 2013. In 2013, over 3200 new employees and contractors have completed inductions at various training locations. In February 2014 Baal Bone also took over the management and administration of the QLD generic induction program.

In February 2015, DP&E approved amendment to the Project Approval to extend the life of mine for an additional three years until 31 December 2019 to allow the Remnant Areas to be mined. Mining methods would remain the same as that currently approved, namely, through use of continuous miner using bord and pillar/partial extraction mining methods. Apart from the extension in time that mining can occur, no other changes to the Project are being sought.

Ongoing Investigations for future land uses and mining operations at Baal Bone will be undertaken.

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 DP&E 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. References to the environmental assessment (EA) in Table 1 and throughout this report refer to the document titled *Baal Bone Colliery Environmental Assessment* dated March 2010 (AECOM, 2010).

Table 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:

- Department of Trade and Investment, Regional Infrastructure and Services (DTI);
- NSW Department of Planning and Environment (DP&E)
- Forests NSW;
- Lithgow City Council (LCC);
- NSW Office of Water (NOW);
- Environment Protection Authority (EPA); and
- Sydney Catchment Authority (SCA).

The reporting period for this AEMR is 1 January 2014 to 31 December 2014.

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. 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 2014 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 2015 reporting period.

1.3 Consents, Leases and Licences

1.3.1 Current Consents, Leases and Licences

A list of all current consents, leases, licences and approvals are included below in Table 2.

Table 2: Consents, Leases, Licences and Approvals.

Type	Regulatory Authority	Approval Number	Holder	Issue Date	Expiry/ Review Date	Scope
Project Approval	DP&E	09_0178	Wallerawang Collieries Pty Ltd	14/01/2011	31/12/2019 (Mining operations)	Part 3A Project Approval for continued operations at Baal Bone Colliery. DP&E has approved an amendment to the Project Approval to extend the life of mine for an additional three years until 31 December 2019.
	DP&E	07_0035	Wallerawang Collieries Pty Ltd	24/10/2007	Perpetuity	Part 3A Project Approval for the Ventilation Shaft and Power Line Project
Environment Protection Licence	EPA	765	Wallerawang Collieries Pty Ltd	1/08/2013	1/8/2018	Premises and Scheduled Activity (Coal Mining/ Washery) Licence
Mining Operations Plan	DRE	09/2520	Wallerawang Collieries Pty Ltd	29/02/2012	30/08/2015	MOP for Baal Bone Colliery Suspension of Mining Operations.
Mining Leases	DRE	CCL 749	Wallerawang Collieries Pty Ltd	05/04/1990	11/3/2030	Mining Entitlement (Consolidates MPL 209, CL 246, CL 329, CL 330, CL331 and CL332) Various depths
	DRE	MPL 261 (Act 1973)	Wallerawang Collieries Pty Ltd	22/08/1990	22/08/2032	Mining Entitlement (Southern mine dewatering

Type	Regulatory Authority	Approval Number	Holder	Issue Date	Expiry/ Review Date	Scope
						bores) Parish: Ben Bullen, Depth: Surface - 10m
	DRE	CL 391 (Act 1973)	Wallerawang Collieries Pty Ltd	24/02/1992	11/03/2030	Mining Entitlement Parish: Ben Bullen Depth: > 20m
	DRE	ML 1302 (Act 1992)	Wallerawang Collieries Pty Ltd	29/09/1992	11/03/2030	Mining Entitlement Parish: Ben Bullen Depth: >20m
	DRE	ML 1389 (Act 1992)	Wallerawang Collieries Pty Ltd	09/05/1996	08/05/2017	Mining Entitlement Parish: Ben Bullen Depth: Surface – unlimited Surface - 20m
	DRE	ML1607	Wallerawang Collieries Pty Ltd	08/01/2008	08/01/2018	Mining Lease (Purposes) Parish: Cox Depth: Surface – 10m
S126(1) Approval	DRE	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	DRE	317551291001	Baal Bone Colliery	12/02/2008	Perpetuity	Section 100(1) of the CMH&SA (2002) for the construction and operation of REA 6
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 - western edge of Ben Bullen SF.

Type	Regulatory Authority	Approval Number	Holder	Issue Date	Expiry/ Review Date	Scope
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 ML.
Water Access Licence	NOW	WAL27887	Wallerawang Collieries Pty Ltd	17/7/2007	17/7/2017	Water Access Licence (under water management Act 2000) replaces bore licences: 80BL135509(near rail loop) and 80BL136703 (near UC1)
Bore Licences	NOW	80BL236132	Wallerawang Collieries Pty Ltd	18/01/1995	Perpetuity	Section 115 of the Water Act 1912. Bore – Mine dewatering LW 1 (South Bore 1).
	NOW	80BL236134	Wallerawang Collieries Pty Ltd	18/01/1995	Perpetuity	Section 115 of the Water Act 1912. Bore – Mine dewatering LW 1 (South Bore 2).
	NOW	80BL239077	Wallerawang Collieries Pty Ltd	19/06/2006	18/06/2016	Section 115 of the Water Act 1912. Bore – Mine dewatering LW 19 (North Bore).
	NOW	10BL601877	Wallerawang Collieries Pty Ltd	08/06/2007	Perpetuity	BBN175; LW29-31 groundwater monitoring piezometer
	NOW	10BL601816	Wallerawang Collieries Pty Ltd	08/06/2007	Perpetuity	BBN176; LW29-31 groundwater monitoring piezometer
	NOW	10BL601817	Wallerawang Collieries Pty Ltd	08/06/2007	Perpetuity	BBN177; LW29-31 groundwater monitoring piezometer
	NOW	10BL601970	Wallerawang Collieries Pty Ltd	05/09/2007	Perpetuity	BBN 179; LW29-31 groundwater monitoring piezometer
Water Licences	NOW	80SL046064	Wallerawang Collieries Pty Ltd	17/07/2007	17/07/2017	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	NDG023231	Wallerawang Collieries Pty Ltd	27/09/2015	Renewed Annually	Dangerous Goods Licence.
Radiation Gauge	EPA	29207	Wallerawang Collieries Pty	27/7/2013	16/01/2017	To sell and possess – Radiation Control Act 1990.

Type	Regulatory Authority	Approval Number	Holder	Issue Date	Expiry/ Review Date	Scope
			Ltd			Coal quality sensing device
Apparatus Licence	ACMA	95441	Wallerawang Collieries Pty Ltd	04/08/2014	26/07/2015	Land Mobile (Two way Radio)- Radio communications Act 1992

1.3.2 Amendments during the Reporting Period

During 2014, mining lease renewals were sought for and granted for CL 391 and ML 1302. In addition, the NSW Department of Planning and Environment (DP&E) issued a draft recommended modification instrument for the extension of mine life until 31 December 2019 (this modification has been subsequently approved in February 2015).

1.4 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 management at Baal Bone Colliery are shown below:

Table 3: Mine Personnel Contact Details

Contact Person	Position	Contact Details
Mark Bulkeley	Operations Manager	Ph: (02) 6350 6943 Email: Mark.Bulkeley@Glencore.com.au Fax: (02) 6359 0530
Gary Linford	Technical Services Manager	Ph: (02) 6350 6945 Email: Gary. Linford@Glencore.com.au Fax: (02) 6359 0530
Ben Anderson	Environment and Community Coordinator	Ph: (02) 6350 6920 Email: Ben.anderson@Glencore.com.au Fax: (02) 6359 0530

1.4 Actions Required at Previous AEMR Review and Site Inspection

The AMER review meeting and site inspection was held on 10 September 2014 and was attended by representatives from The Environmental Protection Authority, Lithgow City Council and Department of Trade & Investment, division of Resources & Energy. Feedback from this inspection was that environmental managements appears generally satisfactory, however several issues were identified.

Table 4: Issues identified during AMER visit

Issues/Observation	Action	Status
Poor vegetation establishment on the "Thistle Hill" area of the mine site	Either conduct a rehabilitation trail in this area or utilise a suitable revegetation strategy to correct the potential soil hostilities and vegetation failure in this area.	Additional capping of up to 500mm is currently underway. This will be followed by treatment with soil ameliorants and fertiliser. The area will then be resown using the site Native seed mix
Capping of soil stockpiles were observed to occur in several locations across the site without obvious demarcation. There is a risk that soil stockpiles can be diluted or lost completly during operations if material is not adequately signposted.	Erect stockpile signs indicating the nature and end use of the material. Do Not Disturb/ Keep Off signs or similar should be considered	Identification signs have been installed.

Acceptance of the 2013 AEMR was received from the Department of Planning & Environment (DPE) via written correspondence on 2 October 2014. DPE was satisfied with the form and content of the report but had the following comments:

Table 5: AMER comments

Comments	Section in AEMR
Groundwater piezometer BBPB1 has been recording a reduced groundwater level of approximately 5 meters (compared to pre-mining) since 2009. Further discussions on this topic have confirmed that this impact was investigated in 2009 and flora monitoring in the area of Cox's Swamp between 2009 and 2011 has determined that there has been no deleterious impact on flora. However, the results of this investigation are not specially discussed in the AMER. The next AMER should summarise the results of the investigation for completeness and also because groundwater level impact is continuing.	3.4.4 Comparison against EA and previous AEMRs
Groundwater copper, iron and zinc levels were observed to exceed TARP trigger levels during the 2013 reporting period. It is noted that Baal Bone has informed the Department of these exceedances and has also commissioned a report by Aurecon to investigate the elevated copper and zine levels. The AMER indicates that the Aurecon report attributes elevated copper levels to biological processes and elevated zinc levels to variable rainfall/groundwater conditions. It is unclear from the AMER whether elevated iron levels have also been investigated properly. An explanation for elevated iron levels should be included in the next AMER	3.4.2 Groundwater chemistry

1.5 Employment Status and Demographics

Employment details for staff based at Baal Bone Colliery are found in Tables 6 and 7 below:

Table 6: Employment Type

Employment Type	Number of persons as at 31 December 2013
Permanent	8
Contractor	4

Table 7: Male/Female Breakdown of Workforce

Gender	Number of persons as at 31 December 2013
Male	10
Female	2

Eleven employees resided in the Lithgow Shire during the reporting period, with one employee residing in the Mid-Western Regional Shire.

1.6 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.

During 2014, Baal Bone Colliery did not meet the threshold required to participate in the NPI reporting Process.

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 appendices as Plan 1.

2.4 Mining

There was no underground mining extraction or transportation of coal product at Baal Bone during the reporting period.
Underground mining operations at Baal Bone ceased in September 2011, and underground mining operations entered care and maintenance. Coal washing operations were completed in December 2011. Transportation of coal product ceased in April 2012.

Following the completion of mining of Longwall 31 on 3 September 2011, underground mining operations were suspended. A notice of the suspension of operations was provided to DTI on 31 August 2011. Approval from the Department for the suspension of mining operation and labour/expenditure conditions of CCL 749, CL 391, ML 1302 and ML 1389 was received on 27 September 2012.

The equipment fleet utilised for car and maintenance during 2014 is outlined below.

Table 8: Pit top Equipment

Equipment Type	Number of Units
Toyota Landcruiser Utility/ Troop Carrier	3
Manitou Forklift	1
Bobcat Skid Steer Loader	1
130 Eimco	2
Domino Road Grader	1
PJB Man transports	2

2.5 Mineral Processing

2.5.1 Production, Processing and Waste Summary

Underground mining ceased in September 2011, and coal washing activities were completed in December 2011. When operational, Baal Bone produced three grades of washed coal, principally for the export market; these being 9%, 14% and 18% ash coal.

2.5.2 Product Destination and Transportation

The transport of saleable product coal off-site via rail was completed on 25 April 2012.

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.

2.5.3 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 the reporting period there was no stockpiled ROM coal.

2.6 Mineral Waste Management

Processing and washing of coal was completed in December 2011. As such, no mineral waste was produced during the reporting period.

2.6.1 CHPP Waste and Reject Emplacement

Historical CHPP waste comprised 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 area (REA).

Former REAs historically used at Baal Bone have been fully rehabilitated and capped, with the exception of REA 5 and REA 6 (refer **PLAN 1**). The capping of REA 5, cell 1 was completed in April 2012. A geotechnical study carried out in November 2013, indicated that REA 5, cell 2 is sufficiently dry and is able to be capped. It is anticipated that REA 5, cell 2 will be revegetated during the 2015 AEMR period.

It is intended to retain and maintain REA 6 for future use should Baal Bone decide to continue operations. Final rehabilitation of this area will occur concurrently with mine closure. As such REA 6 has been bunded for safety and security.

2.6.2 Reject Material

Coarse reject at Baal Bone has a particle size ranging from 100 millimetres (mm) to 100 micron (µm) and comprised 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.
REA 6 has 3 Mt of coarse reject capacity remaining.

Fine reject is generally smaller than 100 μm in diameter and comprised around 7% of CHPP washery feed. Historical fine reject was pumped as 20–25 % w/w slurry to Cell 1 within REA 6.
REA 6 has 300 m^3 within cell 2 of fine reject capacity remaining.

2.7 Water Management

2.7.1 Process Water Circuit

The process water system at Baal Bone Colliery consists of water that has had the potential to be in contact with coal or carbonaceous material, and therefore has the potential to be saline. Mine water is captured on site, and stored in water storages within the mine water management system before being discharged off-site. The system also allows for the reuse and recycling of water throughout the operation.

The 2014 process water system consists of:

- groundwater inflows and outflows;
- rainfall/runoff into mine pit;
- runoff from unsealed roads; and
- dirty water runoff from CHPP, pit top facilities, stockpiles and rail load out facilities.

A network of water transfer pipelines is used to transfer water across the Baal Bone Colliery site.

As at 31 December 2014, approximately 84.4 ML of water was held within the process water circuit, see Table 9.

Table 9: Stored Water at Baal Bone Colliery

	Volume Held			
Location	Start of Reporting Period	End of Reporting Period	Volume lost/gained	Maximum Storage Capacity
Dirty Water Dam	10 ML	25.9 ML	15.9ML	37 ML
Process Water Dam	55 ML	55 ML	Remained even	55 ML
Box Cut Sump	3.5 ML	3.5 ML	Remained even	6.9 ML
Controlled Discharge Water (Salinity Trading Schemes)	Nil	Nil	Nil	Nil
Contaminated Water	Nil	Nil	Nil	Nil

Water from both the north and south boreholes is piped back to the pit top's 'Dirty Water' management system. After discharge through an iron aeration system and retention in Lake Tegan, water overflows into the overshot dam and leaves site through LDP1. Alternatively this water can be discharged into the dirty water dam, after retention time the water is then pumped to the process water dam, overflows onto Ben Bullen Creek and then leaves site through LDP1 at the overshot dam. An over view of the current water management and monitoring system can be seen in Plan 1 and Drawing 1 and locations of the north and south de-watering bores in Drawing 2 (supplied as appendices to this report).

2.7.2 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. Drinking water is also taken underground in containers.

Potable water usage for the 2014 reporting period was 5.5 ML, an increase of ~30% compared to the 3.8 ML of potable water usage in 2013.

2.7.3 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 (LDP2) and monitoring point. The location of the STP and maturation ponds is shown on **PLAN 1**.

With the completion of mining at Baal Bone and the reduced number of employees on site, the discharge of LDP2 has been greatly reduced, with discharge only occurring during 2 months in 2014.

2.7.5 Water Balance

The net water discharge from site has historically been in the order of 1,500 ML/year (AECOM, 2010). The majority of this water is intercepted within the underground mine workings and goaf, which is then discharged through the north and south boreholes.

During mining operations all runoff from the pit top area, stockpile area and CHPP area was used within the mine as process water as required (AECOM, 2010). Process water was supplemented with water from mine Adit No. 5 and surface runoff and seepage collected from the Boxcut Sump as required (AECOM, 2010).

Approximately 50% of leachate from the Tailings Dam was returned to the process system (AECOM, 2010). Recycled process water used on site comprising leachate return water and wash down water from the CHPP, coal stockpile and pit top areas, historically contributed approximately 63% of all process water used (AECOM, 2010).

Potable water used on site has historically accounted for approximately 4% of all water used.

The annual site water balance takes into account the following:

- water sources (including rainfall, groundwater and potable water);
- demands and losses;
- the change in the inventory of water stored underground and in surface dams; and
- discharge of water off site

Major inputs for the 2014 reporting period were:

- 5.5 ML potable water from Fish River Water Supply;
- 39.95ML runoff from pit top and CHPP areas;
- 1545 ML mine dewatered from southern and northern underground mining areas; and
- 170.57 ML mine dewatering from Adits 2 and 5.

Major outputs of the 2014 reporting period were:

- 1545 ML groundwater dewatered via north and south boreholes (leaving site via overshot dam LDP1);
- 215 ML/year average site overflow from the Overshot Dam (not including southern and northern de-watering bores)

2.8 Hazardous Material Management

2.8.1 Status of Licence

Baal Bone holds an *Acknowledgement of Notification of Dangerous Goods on Premises* (NDG023231). 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 10. Location of the storage of hazardous goods can be found on **PLAN 1**.

Table 10: Hazardous Materials Stored On Site

Storage ID	Storage Type	Maximum Storage Capacity
1	Underground Tank: Diesel	50,000L
2	Above Ground Tank: LPG	37,750L
3	Above Ground Tank: LPG	37,750L
4	Above Ground Tank: LPG	5000L

2.8.2 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 Sheets (MSS) 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 Other Infrastructure Management

The location of existing infrastructure is shown on **PLAN 1**. During the 2014 reporting period there were no significant alterations or additions to processes or infrastructure.

2.10 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.

2.11 Activities during Suspension of Mining.

During 2012, a new MOP for the Suspension of Mining Operations (2012 – 2015) was submitted to DRE and approved on 25 June 2012.

On 18 November 2013 DRE approved amendments to the MOP including changes to the water management system at site, removal of the South East Ventilation fan and an update on the training mine status at site.

A summary of the activities associated with the suspension of operations activities is provided in the sections below.

2.12.1 Salvage of Selected Underground Equipment

Continuing during the reporting period, plant and equipment that was salvaged from the mine has been cleaned and stored temporarily on the pit top or in cut throughs close to the mine entrance prior to removal off site. Where appropriate, equipment that has been salvaged may be sold within Glencore. Salvaged equipment that has no residual value may be scrapped and recycled.

2.12.2 Maintenance of Services

Baal Bone is proposing to continue operation of the pit top (1 adit) ventilation fan throughout suspended operations. The box cut fan (North) has been switched off and it is not anticipated to operate again during the suspended operations period, but may be activated if necessary.

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 throughout the suspension of operations. Should Baal Bone decide to seal any borehole, detailed sealing designs will be submitted to DRE for approval prior to the commencement of works.

REA5 cell 1 was capped in April 2012 and REA5 cell 2 will be revegetated during 2015. REA6 will remain open and has been bunded for safety and security until further decisions are made about the future of the mine site.

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 Project Approval conditions, Environmental Protection Licence conditions and other statutory requirements.

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 Baal Bone MOP (Suspension of Mining Operations) 2012 to 2015.

Rather, this section will focus on providing a succinct review of the performance and/or modification of key control measures throughout the 2014 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 2014 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 1.

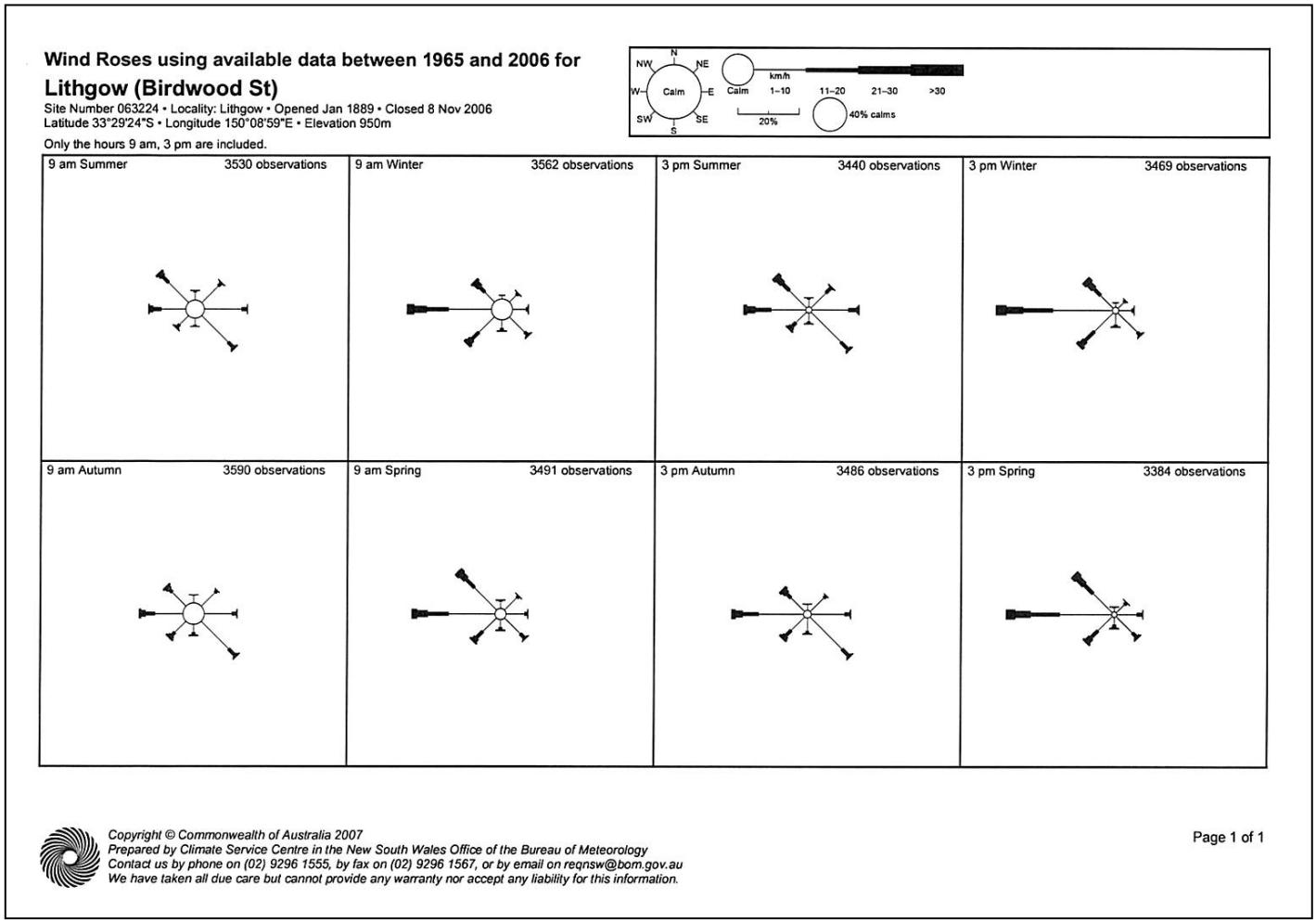


Figure 1: Historic Wind Roses for the Lithgow Weather Station (Birdwood Street)

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 (EPL monitoring point No. 16) was removed from the EPL in February 2014 following consultation with the EPA regarding site dust monitoring and risks.

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 below. The pollutants to be monitored include deposited dust, TSP and PM_{10}.

Table 11: Baal Bone air quality impact assessment criteria

Pollutant	Averaging period	Criterion	
Deposited dust	Annual	**Maximum increase** 2 g/m²/month	**Maximum total** 4 g/m²/month
		Maximum Total	
TSP	Annual (suspended)	90 µg/m³	
PM_{10}	24 hour (suspended)	50 µg/m³	
	Annual (suspended)	30 µg/m³	

Levels of deposited dust were monitored in accordance with the air quality impact assessment criteria. Results of deposited dust monitoring conducted during the 2014 reporting period provided below.

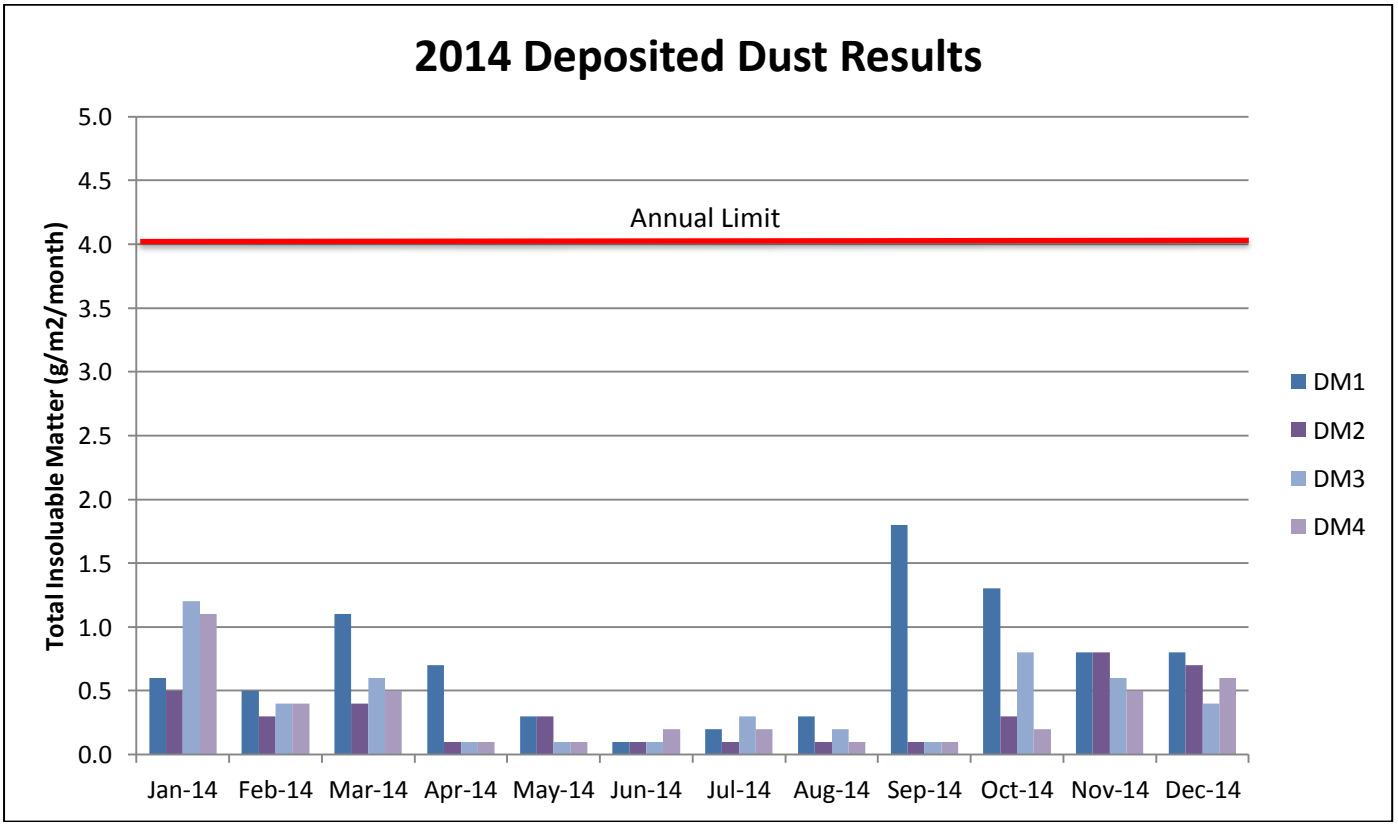


Figure 2: 2014 Deposition Dust Monitoring Results

All levels of deposited dust were below the 4 g/m²/month criterion (annual averaging period). The highest result during 2014 was at DM1 in September with a result of 1.8/m².

3.1.4 Comparison against previous AEMRs

As can be expected with the continuing of Baal Bone on care and maintenance, dust deposition results have continued to remain low across the site. Results of deposited dust monitoring conducted during the 2013 reporting period are provided below.

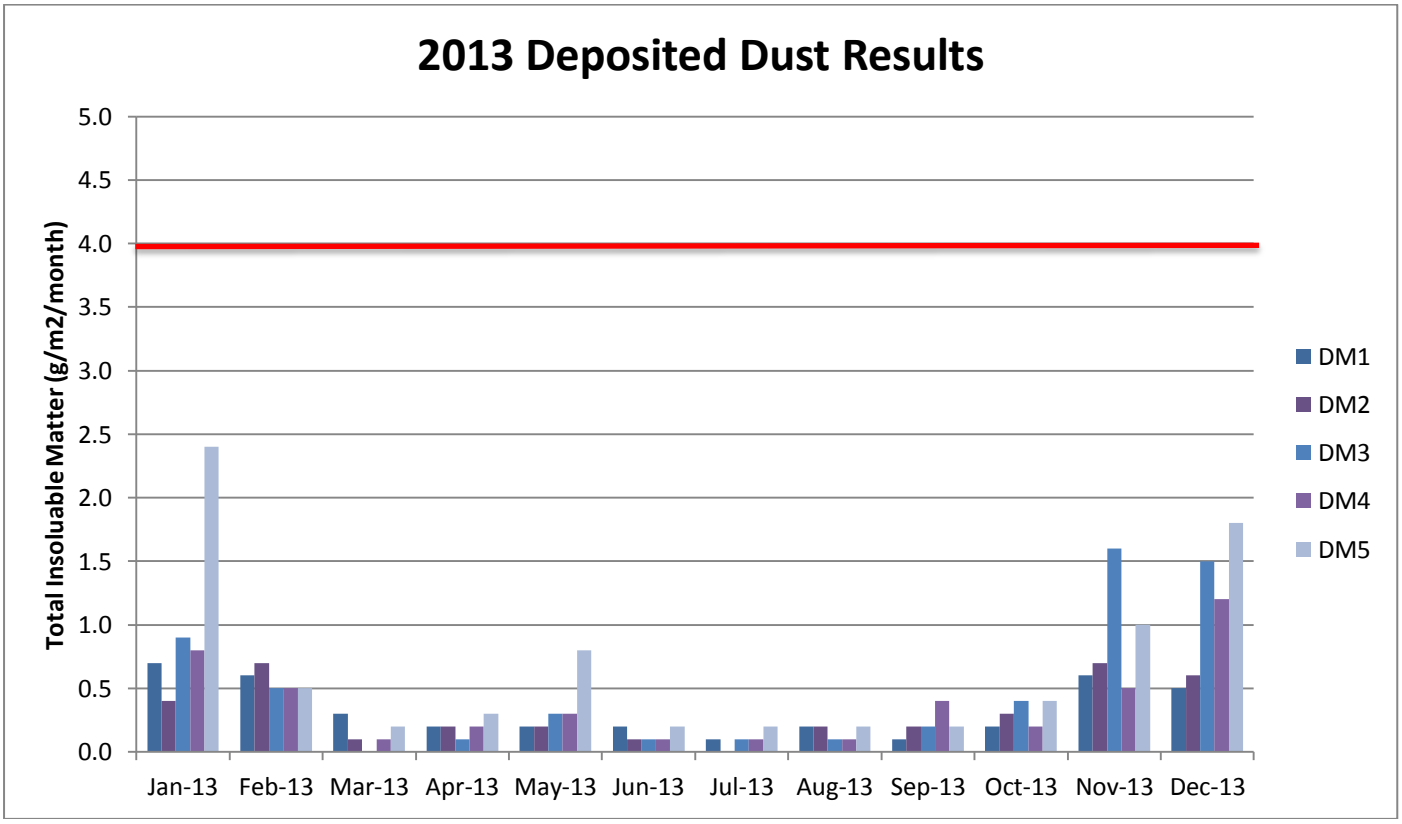


Figure 3: 2013 Deposition Dust Monitoring Results

3.1.4 Comparison against EA

Levels of air quality pollutants as predicted under the EA are presented in below. Table 12 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 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 12: 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 12. 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 2013 to ensure the maintenance of a satisfactory level of ground cover. Livestock reintroduced in late 2014, following sufficient rainfall to promote pasture growth.

In December 2014, Baal Bone engaged Umwelt Australia to conduct Channel Stability & Stream Health Monitoring across the site. A key recommendation of this monitoring was that the areas of active erosion are closely monitored and remedial actions undertaken to ensure further erosion does not occur, particularly within Ben Bullen Creek and Coxs River. Baal Bone will investigate management options during 2015.

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 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 LDP1 within EPL 765 (monitoring point 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.

EPL No. 765 currently contains three licensed monitoring points in relation to surface water and groundwater management The EPL licensed monitoring points are provided in the table below. The location of monitoring points can be seen in Drawing 1.

Table 13: EPL Licenced Monitoring Points

EPA Identification No.	Type of Monitoring Point	Description of Location
2	Discharge water quality monitoring	Sewage Transpiration Bed labelled as 'LD2'
11	Discharge to waters	Ben Bullen Creek downstream of active surface mining area, labelled as 'LDP1'
12	Upstream quality monitoring	Ben Bullen Creek upstream of active surface mining area, labelled as 'WMP1'

A copy of EPL 765 can be accessed here: www.epa.nsw.gov.au/prpoeoapp

A description of discharge and monitoring sites, analyses conducted, frequency of sampling and concentration limits (where applicable) are shown below. EPL Monitoring Points are highlighted in yellow.

Table 14: Baal Bone Colliery water monitoring locations and monthly analysis during 2014

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
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	Monthly	pH, EC, Hardness, heterotrophic	N/A

Sample Name	Sample Location	Frequency	Pollutants Analysed	EPL Limits Apply
	in Administration		standard plate count, total coliforms, E coli, Pseudomonas	
BBCHPP MEAL ROOM	Potable water from kitchen in Washery.	Monthly	pH, EC, Hardness, heterotrophic standard plate count, total coliforms, E coli, Pseudomonas	N/A
BBREAS	Spring on Ben Bullen Creek	Monthly (during flow)	EC, iron, oil & grease, pH, sulphate, nitrogen, phosphorous, and TSS	
BBDW	Dirty water dam	Monthly	EC, Iron, oil & grease, pH, Sulphate, TSS	N/A
BBPRW	Process water dam	Monthly	EC, Iron, oil & grease, pH, Sulphate, TSS	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, oil & grease, nitrogen, phosphorus	N/A
BBLT	'Lake Tegan'	Monthly	EC, iron, oil & grease, pH, sulphate, nitrogen, phosphorous, and TSS	N/A
BBJC2	Jews Creek upstream of mining operations, but below dewatering bore discharges	Monthly (during flow)	Flow rate, pH, EC, TSS, iron, sulphates, oil & grease, nitrogen, phosphorus	N/A
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

3.3.1 Interpretation and Review of Monitoring Results

Condition L2 of EPL 765 outlines water concentration limits for oil and grease, pH, total suspended solids and total iron. These limits are presented below:

Table 15: EPL concentration limits

Aspect	LD2	LDP1	WMP1
Oil and grease (mg/L)	-	10	-
pH	-	6.5-8.5	-
Total Suspended Solids (mg/L)	-	50	-
Total Iron (mg/L)	-	1.0	-

Monitoring results for Baal Bone's three monitoring points as required by EPL 765 are discussed in the following tables. Samples were taken monthly during discharge in accordance with the EPL.

Table 16: Summary of available concentration levels recorded for EPA licensed discharge points as required by EPL 765.

EPL Point	Month	Aspect									
		EC uS/cm	O&G mg/L	SO^{2-4} mg/L	Fe mg/L	TSS mg/L	pH	BOD mg/L	Faecal Coliforms cos/100ml	N mg/L	P mg/L
LD2	Jan	Sample not required	*Dry*	Sampling not required		*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Feb		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Mar		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Apr		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	May		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	June		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	July		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Aug		5			19	6.7	3	30	4.8	0.46
	Sep		5			67	7.2	34	2	6.5	3.65
	Oct		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Nov		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Dec		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
LDP1	Jan	1320	5	343	1.11	2	8	Sampling not required			
	Feb	1300	5	340	0.12	5	8.1				
	Mar	1320	5	336	0.21	3	8.2				
	Apr	1200	5	315	0.65	2	7.6				

	May	1350	5	386	0.26	2	8.1
	June	1340	5	326	0.32	2	7.8
	July	1310	5	322	0.25	2	8.0
	Aug	1270	5	340	0.22	2	7.9
	Sep	1200	5	335	0.25	2	7.9
	Oct	1220	1	326	0.05	2	8.1
	Nov	1160	1	352	0.12	2	8.1
	Dec	930	1	311	0.39	8	7.2
WMP 1	Jan	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Feb	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Mar	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Apr	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	May	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	June	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	July	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Aug	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Sep	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Oct	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Nov	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Dec	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*

Legend

BOD = Biological oxygen demand
EC = Electrical conductivity
Fe = Iron
N = Nitrogen
= Exceedance of EPL Limit

O & G = Oil and Grease
P = Phosphorus
SO^{2-} = Sulphate
TSS = Total suspended solids

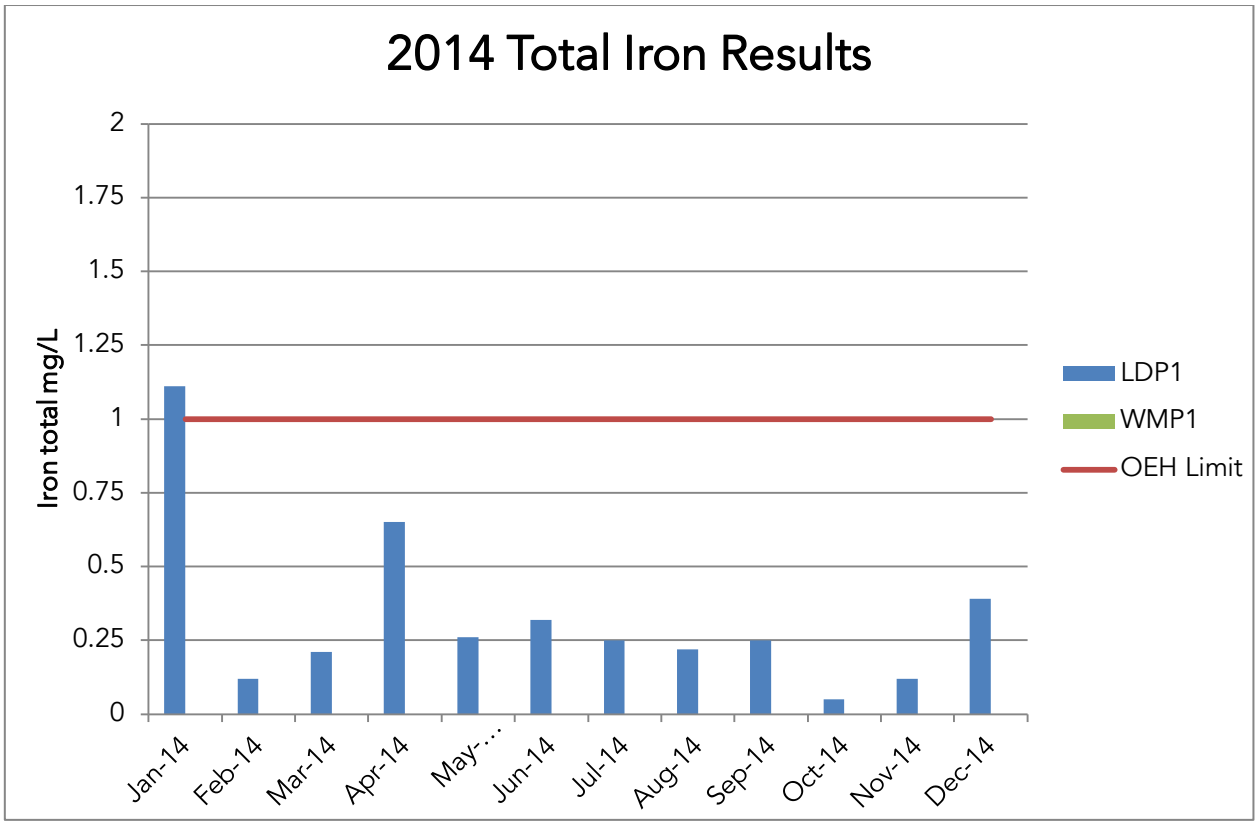


Figure 4: Total Iron

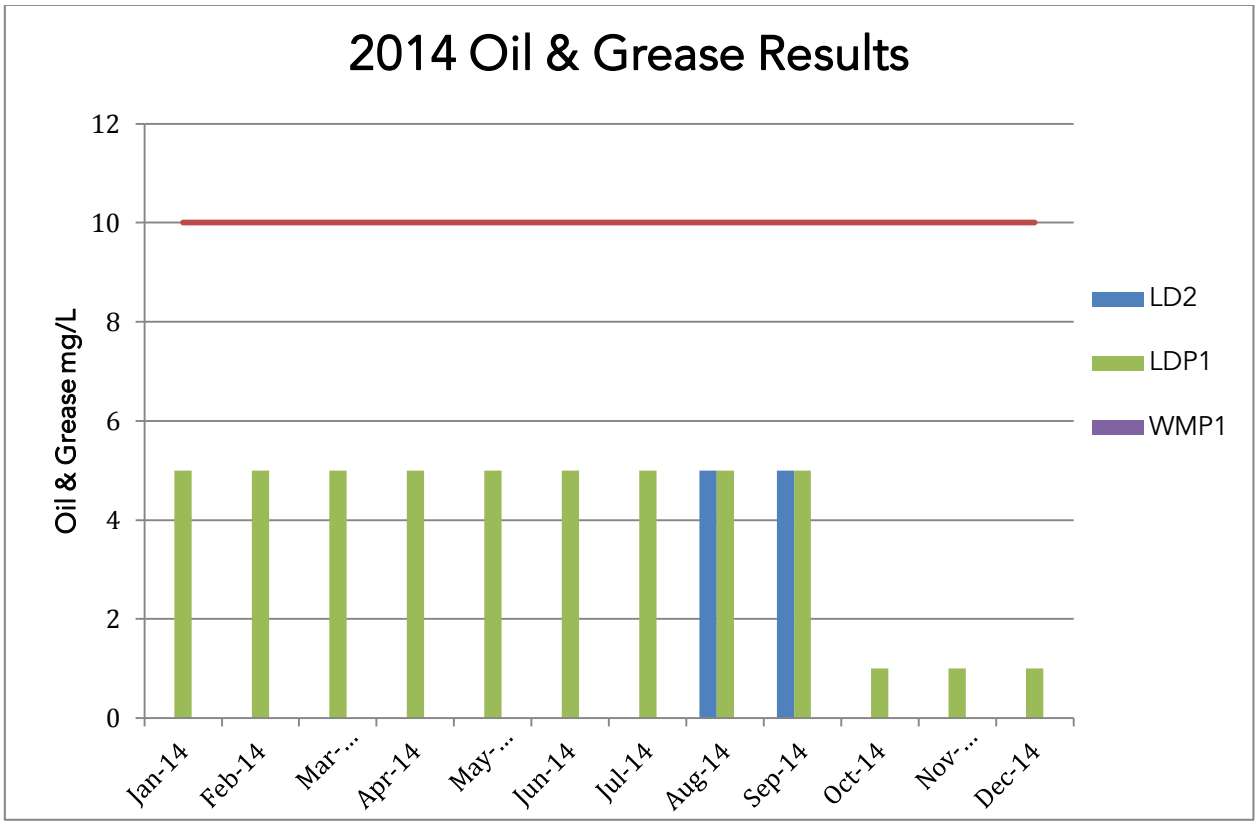


Figure 5: Oil & Grease

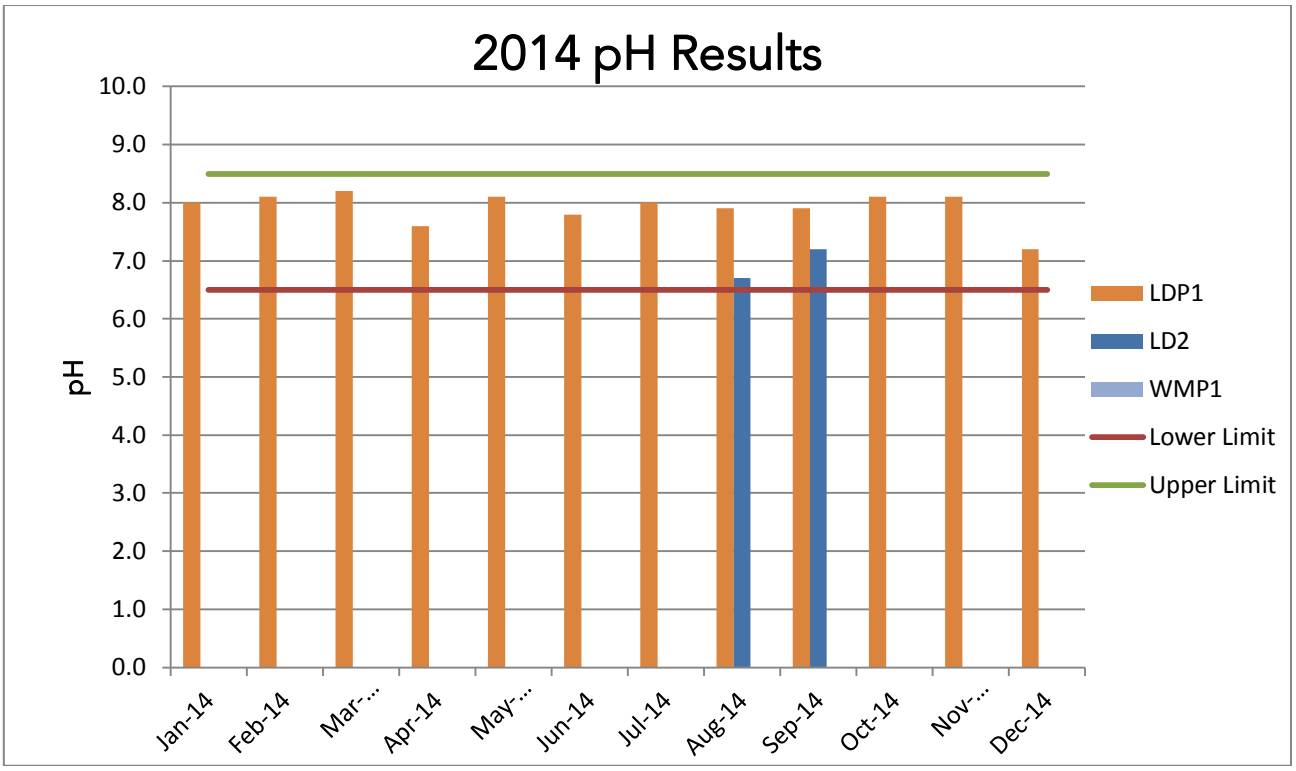


Figure 6: pH

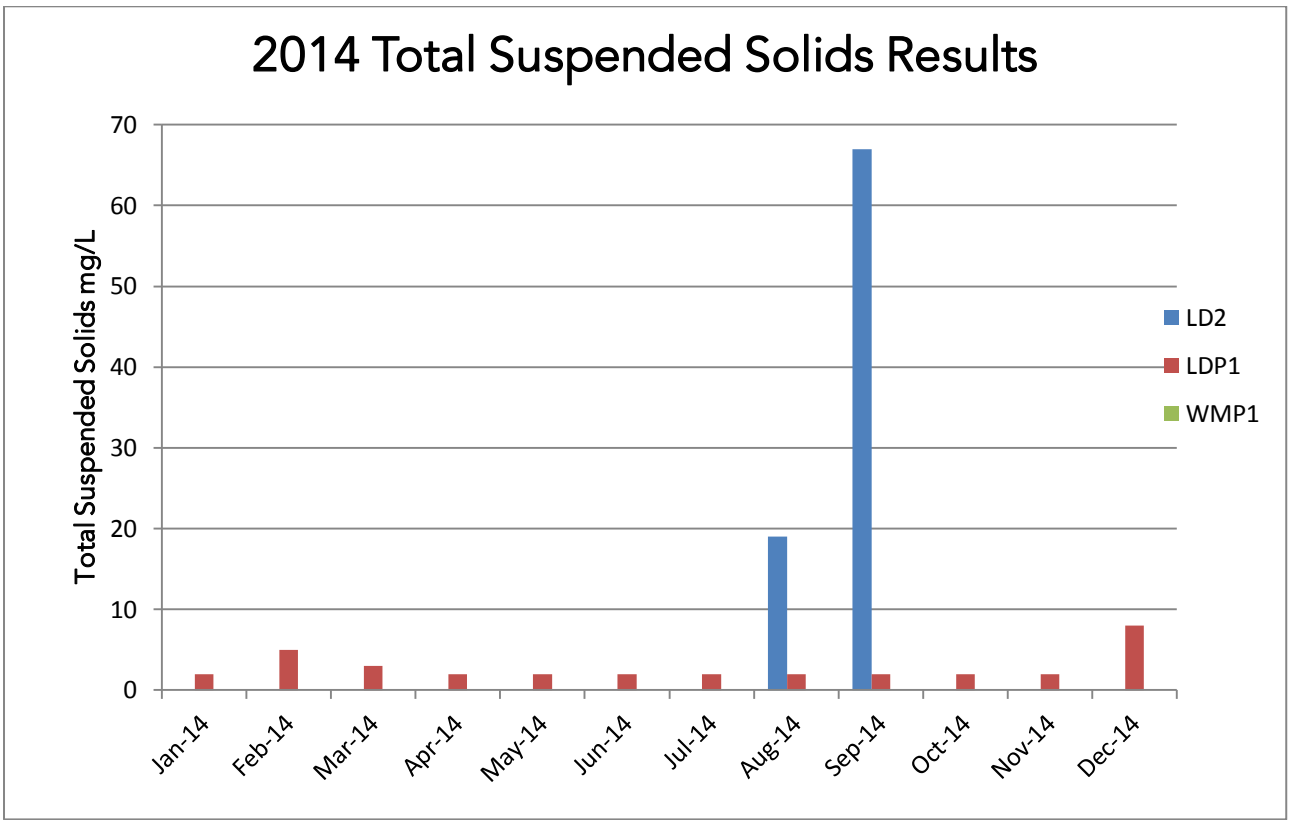


Figure 6: Total Suspended Solids

All samples recorded were within EPL concentration limits during the 2014 reporting period, with the exception of Total Iron exceedances at LDP1 during January. Initial analysis suggested that the elevated Total Iron levels were the result of reduced dilution of mine water as a result of below average rainfall over

the period leading up to sampling. 14mm of rainfall was received during January 2014 and 38mm received during December 2013.
Re-sampling of both LDP01 and the nearby Lake Tegan were performed on 30 January for both Dissolved and Total Iron. Results indicated a return to Iron levels close to the annual average and within compliance.
No climatic changes occurred between sampling on the 13 January and 30 January with no rainfall received and a period of hot weather.
Based on the investigation, the cause was identified as incorrect sampling being carried out on the samples taken on 13 January.

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

- All total iron samples for 2014 were well below the concentration limit of 1 mg/L with the exception of the sample taken in January which was 1.11 mg/L.
- Most samples for oil and grease returned levels of 2 mg/L or less, well below the EPL concentration limit of 10 mg/L.
- All samples returned pH results that were within the upper and lower EPL limits (8.5 and 6.5 respectively).
- All monthly TSS results were below 17mg/L.

Monthly EPL reporting can be accessed here:
www.glencorecoal.com.au/EN/Operations/Baalbone/Pages/BaalBonePublicationsArchive.aspx

3.3.2 Comparison against EA and previous AEMRs

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.

Table 17: Water quality results 2006 - 2013

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 2011 of 1.2, 1.2 and 3mg/L respectively.	Compliant	Compliant	Compliant

2012	1 exceedance at LD6 of 2mg/L in September 2012.	Compliant	Compliant	Compliant
2013	Complaint	Compliant	Compliant	Two Total Suspended Solids (TSS) exceedances at LDP3 (60mg/L) and LDP6 (85mg/L) in February

Occasional exceedances of iron have been recorded in 2006, 2010, 2011 and 2012. Following further investigations, no apparent relation to mining operations was identified.

Monitoring results have remained generally stable across the site since the site entered care and maintenance in 2012.

3.4 Groundwater

Baal Bone Colliery currently has three mine dewatering bores, two groundwater supply bores and four shallow piezometer monitoring bores licenced with NSW Office of Water; these are summarised in Table 18.

Water quality for the three dewatering boreholes was monitored by ALS on a monthly basis in conjunction with the surface water monitoring program up until July 2013 as described above in Section 3.3.

After the relinquishment of LDP3 and LDP6 in July 2013, the north and south de-watering borehole sites were no longer able to be sampled and were removed from the monthly sampling schedule. The two groundwater supply bores WAL27887 (80BK136703 and 80BL135509) are not currently used and samples are therefore not available for testing.

Table 18: Licensed bores and piezometers*

Licence Number	Expiry Date	Location / Use
WAL 27887 (80BL136703)	Perpetuity	CHPP water make-up bore near UC1 (not used during reporting period)
WAL 27887 (80BL135509)		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 and BBPB 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 have been monitored on a regular basis to gather data regarding groundwater level fluctuations in the vicinity of the Coxs River Swamp before, during and after mining 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/alluvial) 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, and 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 below. Response and rehabilitation methodologies have also been included.

Table 19: 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 (groundwater 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 (groundwater 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 (groundwater 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 – see below
Swamp Groundwater		
No significant change in groundwater level/quality (groundwater 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 (groundwater 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 (groundwater 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 – see below

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 (less than 5th Percentile)
Conductivity	increase of 230from 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 IMPACTS = THE RANGE BETWEEN MINOR AND MAJOR TRIGGER LEVELS	
Element	**Short term for > 2 consecutive months (Moderate Impacts)**
pH*	pH < 4.6

Conductivity	EC > 300 µS/cm
Copper	Cu > 0.041 mg/L
Iron	Fe > 15.25 mg/L
Zinc	Zn > 0.143 mg/L

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

GROUNDWATER QUALITY LONG TERM IMPACTS = THE RANGE BETWEEN MINOR AND MAJOR TRIGGER LEVELS		
Post-mining analytes – 50th percentile < 80th percentile pre-mining	Post-mining analytes – 50th percentile > 80th percentile pre-mining for 2 months or less – see above for response	Post-mining analytes – 50th percentile > 80th percentile pre-mining for 2 months or less – see above for response

The water quality trigger values are in three parts, which are:

- Minor Changes
  - Long term minor changes; For each element the 50th percentile ≤ baseline 80th percentile
  - Short term minor changes Greater than the 95th percentile trigger value for < 2 months
- Major Changes
  - Exceed the baseline 80th percentile by 2 standard deviations for > 2 months

3.4.1 Groundwater levels

Groundwater levels in the six groundwater monitoring piezometers during 2014 are presented in Figure 7. Long term trends of groundwater levels are shown in Figure 8.

The north to south downstream groundwater gradient has been maintained over the current period (highest level observed in P1 and lowest level observed in P4), indicating that an overall flow has been maintained down through the swamp. P6 and P2 continued long-term gradients seen previously.

Over the long term, the rainfall deficit curve has, over the period, shown a reversal in deficit, in response to above-average rainfall.

The levels in P2, P3, and P4 usually correlate fairly well with the rainfall deficit. The other piezometers (P1, P5, and P6), have generally been more resistant to short-term weather variations as they are installed in the centre of the swamp, which always remains saturated due to it being fed by groundwater. However, during rains at the end of 2014, P5 and P6 show a rise, due to the wet conditions. P1 remains insensitive to rainfall deficit.

Most groundwater levels appear to be approximately at or above pre-mining levels. The only exception is at piezometer P1, where groundwater level has stabilised at RL 956 m (approximately 5 m below pre-mining level).

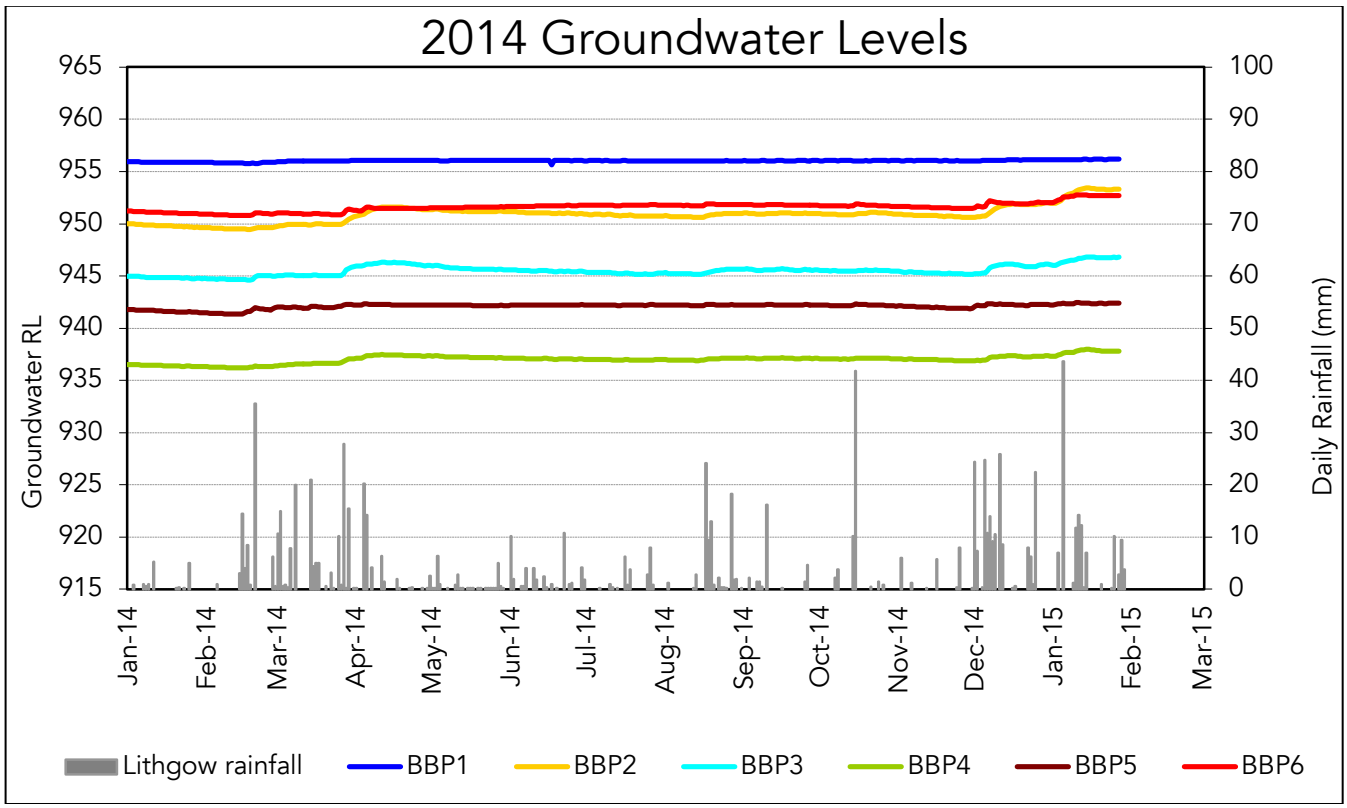


Figure 8: Groundwater levels 2014

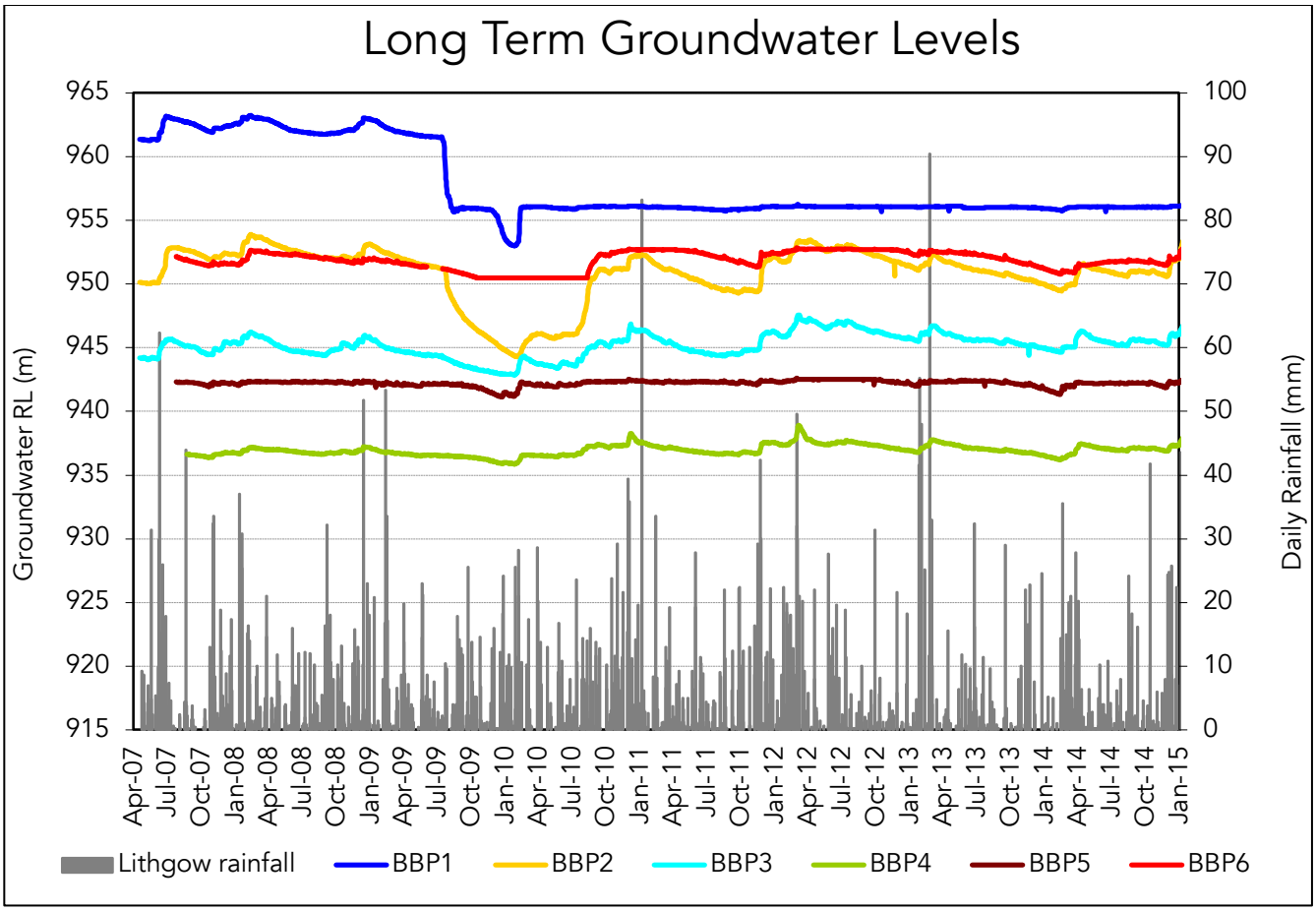


Figure 9: Longterm groundwater trends

3.4.2 Groundwater chemistry

Groundwater chemistry monitoring results for the reporting period are provided below.

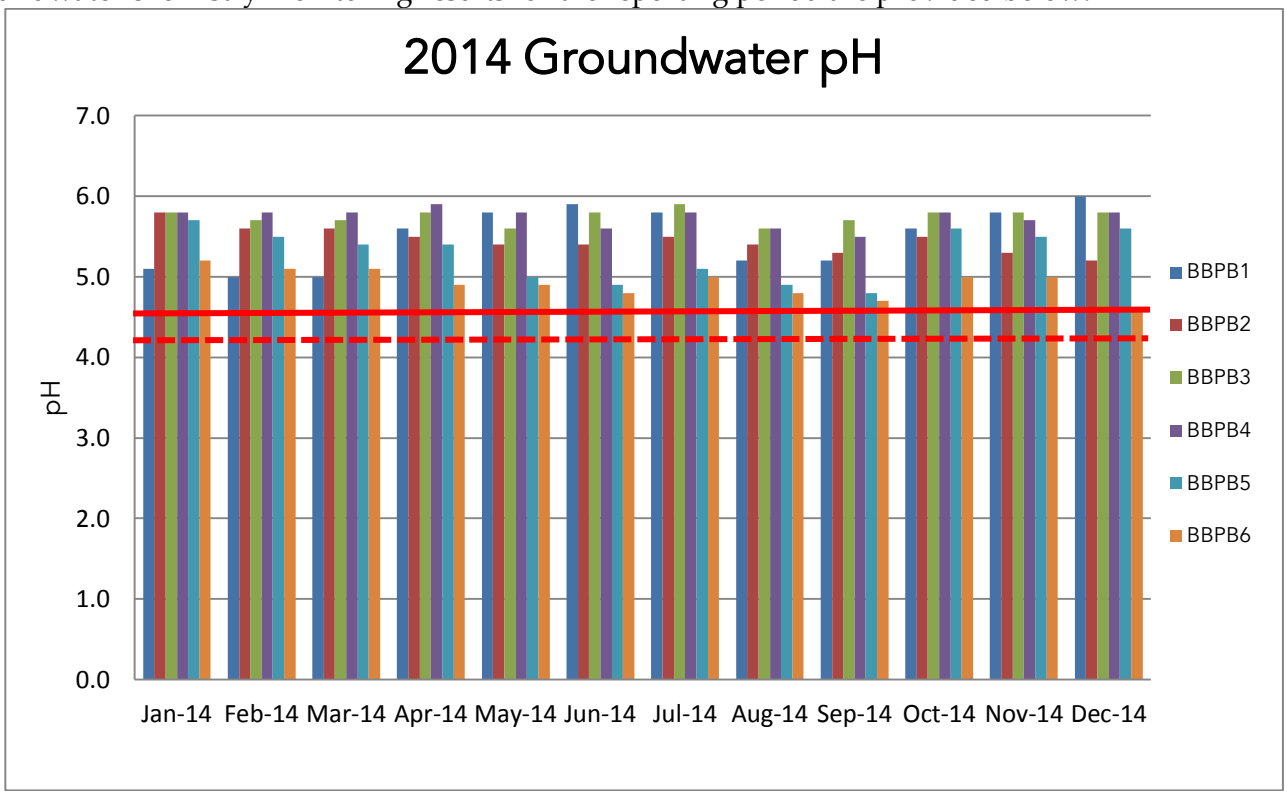


Figure 10: 2014 Groundwater pH levels.

As shown, pH levels for all piezometers were above the minor and major impact trigger levels for 2014.

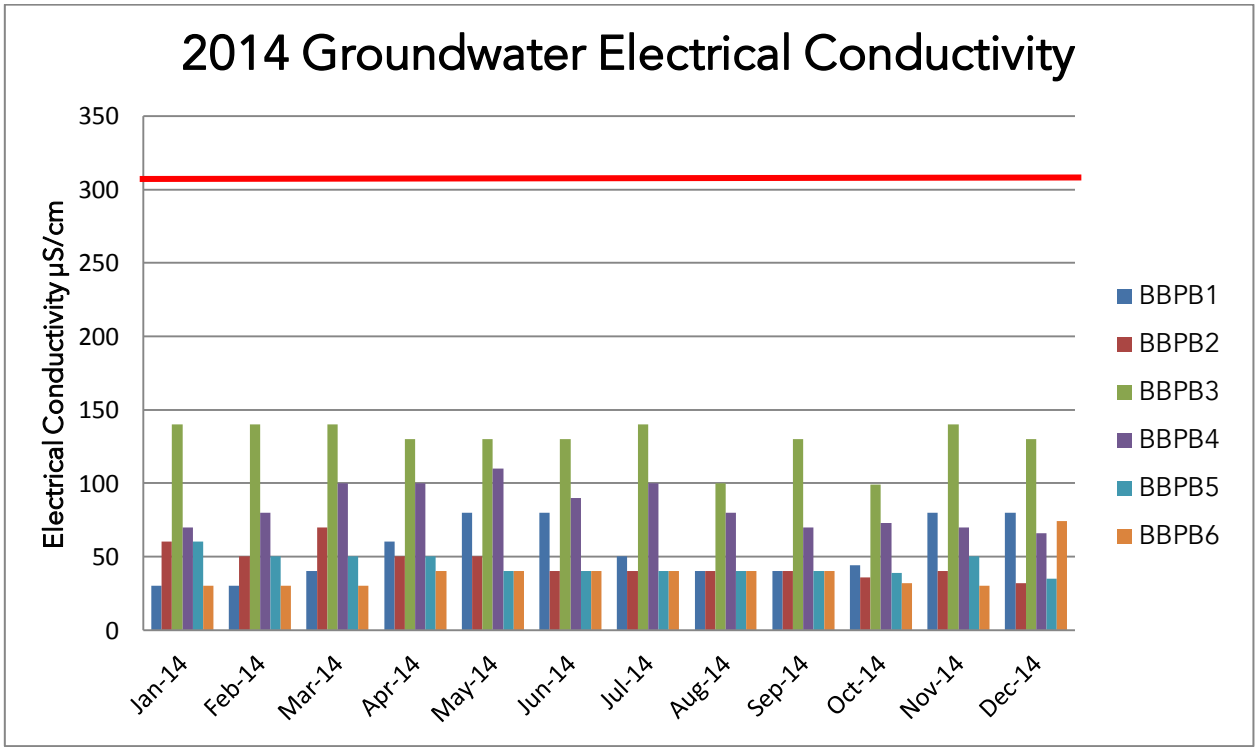


Figure 11: 2014 Groundwater Electrical Conductivity.

As shown above, electrical conductivity levels at all piezometers were below the TARP trigger levels during the reporting period.

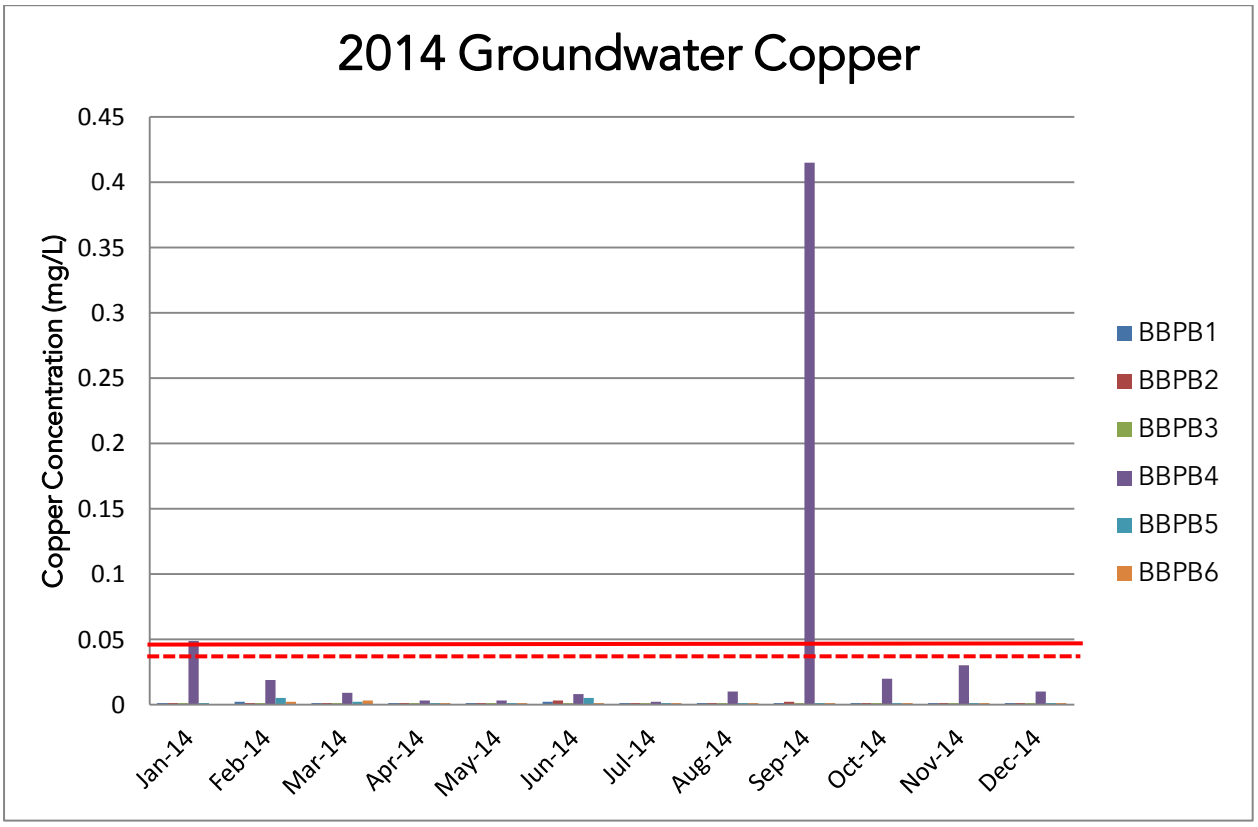


Figure 12: 2014 Groundwater copper levels.

As shown above, copper levels at BBPB4 in 2014 exceeded the major impact trigger level in September. It should be noted that BBPB4 is a background bore and its purpose is to provide a benchmark for comparison with the other potentially affected monitoring bores. BBPB4 is an aquifer groundwater bore and is not located within the Cox's River Swamp. BBPB4 is located approximately 70 metres to the west of the wetland in an area where no subsidence was expected to occur.

The 2014 copper increase coincided with similar events during the 2013 monitoring period where copper levels increased from September to December 2013.

In February 2012 Baal Bone Colliery commissioned a report by Aurecon which investigated groundwater quality and the TARP trigger levels:

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, March 2012).

The Aurecon report found that copper levels increased during spring each year, suggesting a biological process. Aurecon stated 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.

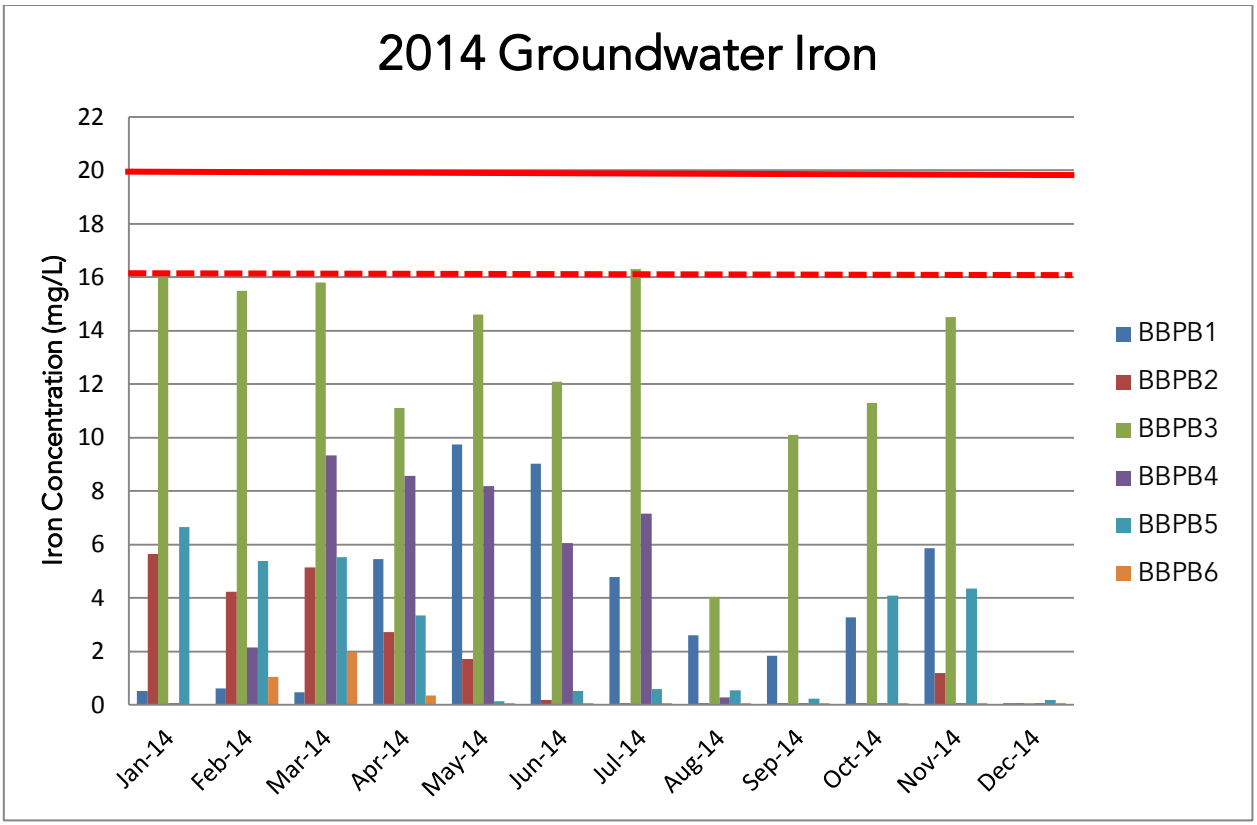


Figure 13: 2014 Groundwater Iron levels.

As shown above, all iron levels were below the minor impact trigger level with the exception of BBPB3. In July, BBPB3 marginally exceeded the minor impact trigger level for only one month.

The elevated iron level was investigated as part of the February 2012 report by Aurecon into groundwater quality and the TARP trigger levels:

> *"Iron is abundant in the groundwater in the area, as indicated by the pre-mining 80th percentile baseline of 12 mg/L for all the bores. 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 the naturally abundant level of iron in the area."*

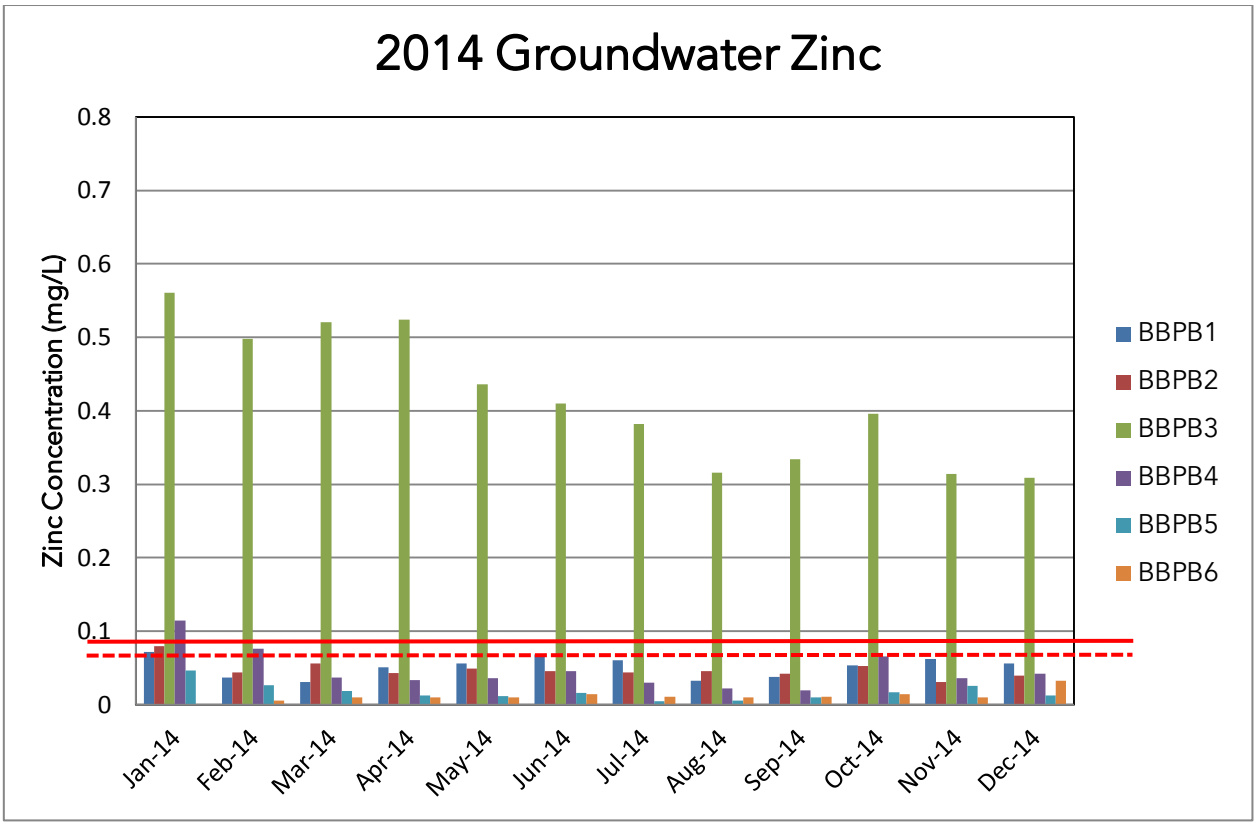


Figure 14: 2014 Groundwater Zinc Levels.

As shown above, zinc levels at BBPB3 exceeded the minor and major impact TARP trigger levels during all months in 2014. This major impact TARP event has continued since August 2012.
The Aurecon (February 2012) report investigated the minor impact increases in zinc at BBPB3 which occurred during the previous reporting period however was unable to find obvious reasons for these increases. The Aurecon investigation suggested that variable rainfall and corresponding changes in groundwater levels could be contributing to changes in zinc levels.
In response to the major impact TARP event at BBPB3, Baal Bone Colliery submitted an initial formal notification to the Principal Subsidence Engineer and Interagency Committee on 5 December 2012. With the continuation of the TARP major impact levels, further formal notifications were issued to the Principal Subsidence Engineer and interagency committee on 17 June and again on 5 December 2013.

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

3.4.3 Groundwater Extraction

Mine water and groundwater intercepted by underground mining operations is extracted from both the north and south boreholes. This water is pumped via a total length of 7 kilometres of pipeline back to the pit top's 'Dirty Water' management system. After discharge through an iron aeration system and retention in Lake Tegan, water overflows into the overshot dam and leaves site through LDP1. Alternatively this water can be discharged into the dirty water dam, after retention time the water is then pumped to the process water dam, overflows onto Ben Bullen Creek and then leaves site through LDP1 at the overshot dam. An over view of the current water management and monitoring system can be seen in Plan 1 and Drawing 1 and locations of the north and south de-watering bores in Drawing 2.

Historically discharges from Longwall 19 and Longwall 1 were discharged via Licence Discharge Points 3 and 6 (LDP3 and LDP6) into the Temperate Peat Swamp of Baal Bone Creek. In late 2012 the EPA requested that Baal Bone Colliery cease discharging into the Temperate Peat Swamp.
Due to the requirement to sustain lowered water levels within the underground mine for the purpose of maintaining the current training facility layout, an agreement was reached by the site and the EPA that water from the boreholes would be piped back to the water management system at the pit top and discharged through LDP1 and into Jews Creek. Subsequently LDP3 and LDP6 were relinquished on 31st July 2013.

With pumping continuing through the northern borehole since 31 July 2013, water extraction has continued to be monitored. The total water extraction through the northern borehole in 2014 was 783.8ML. Figure 15 shows daily extraction from the north mine dewatering bore over the reporting period.
During 2014, the total amount of water extracted through the south bores was a total of 761.9ML. Figure 16 shows daily extractions from the south mine dewatering bores over the 2014 reporting period.

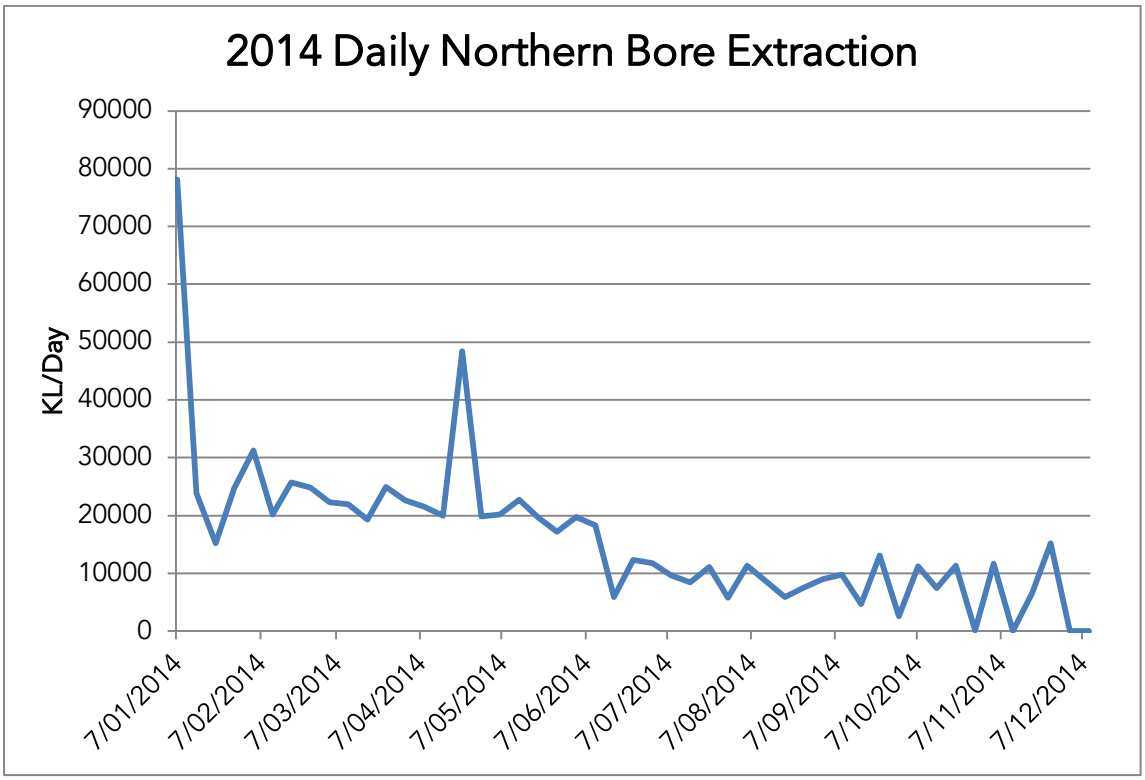


Figure 15: North dewatering bore daily extraction

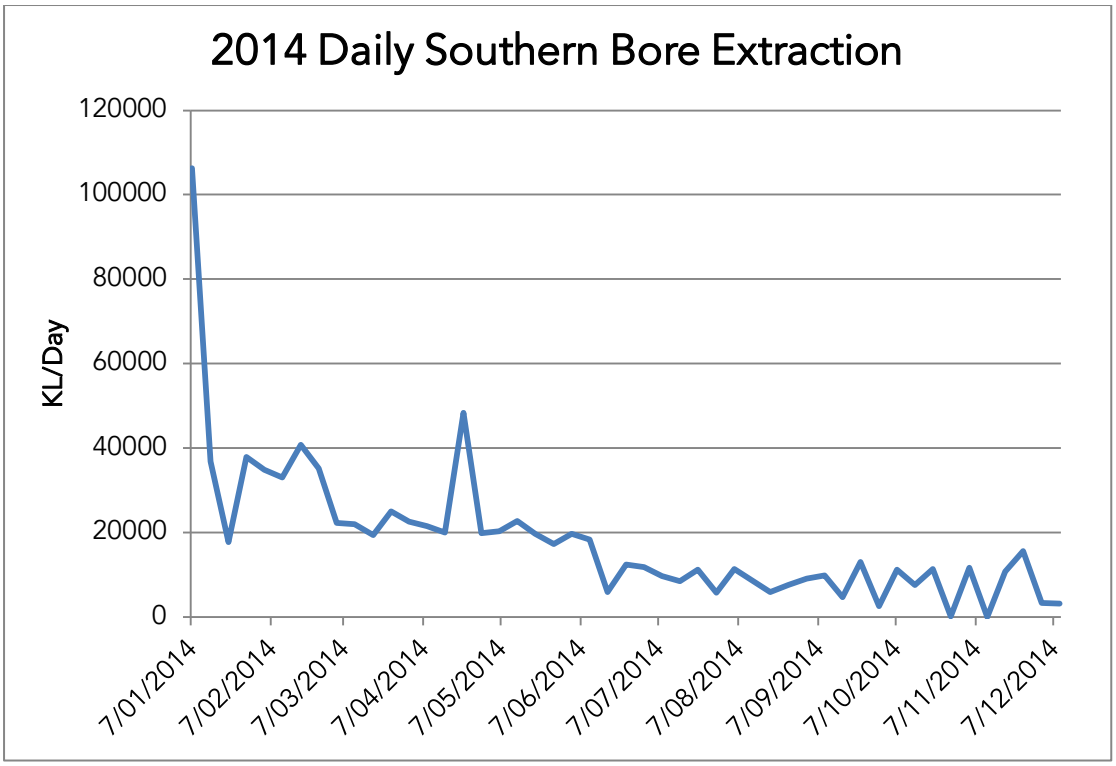


Figure 16: – South dewatering bores daily extraction

3.4.4 Comparison against EA and previous AEMRs

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.

All groundwater levels appear to be approximately at (or above) pre-mining levels, with the only exception being BBPB1, where groundwater has re-stabilised at RL956 (approximately 5 metres below pre-mining level). BBPB1 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.

Over the long-term, an emerging trend shows that groundwater levels in BBPB2, BBPB3 and BBPB4 all appear to correlate well with the overall cumulative rainfall deficit (difference between the monthly rainfall and the long-term average). The other remaining piezometers (BBPB5 and BBPB6), all appear resistant to short-term weather variances, due to the location of BBPB5 and BBPB6 in the centre of the swamp, which always remains saturated.

In terms of groundwater quality, minor and major changes have been noted for pH and trace metals at some bores however 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 100µS/cm.
With the exception of the major changes for copper and zinc, 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 terms of both groundwater levels and quality, monitoring confirms that there has been no measurable impact from mining on the swamp.

To assess potential impacts on the swamp, Monitoring of vegetation on the surface above longwalls 29 to 31 at Baal Bone Colliery commenced with a baseline survey in 2007 and have continued until 2011 with systematic monitoring of selected sites which are within the area predicted to be affected by subsidence. Gingra Ecological Surveys were engaged to prepare the final report in 2011. The report concluded that: *"There has been no evidence which would indicate an effect of subsidence on vegetation distribution and abundance at the monitoring sites."*

Species richness recorded across all sites during spring and autumn since the recoding commenced is provided Figure 17. 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

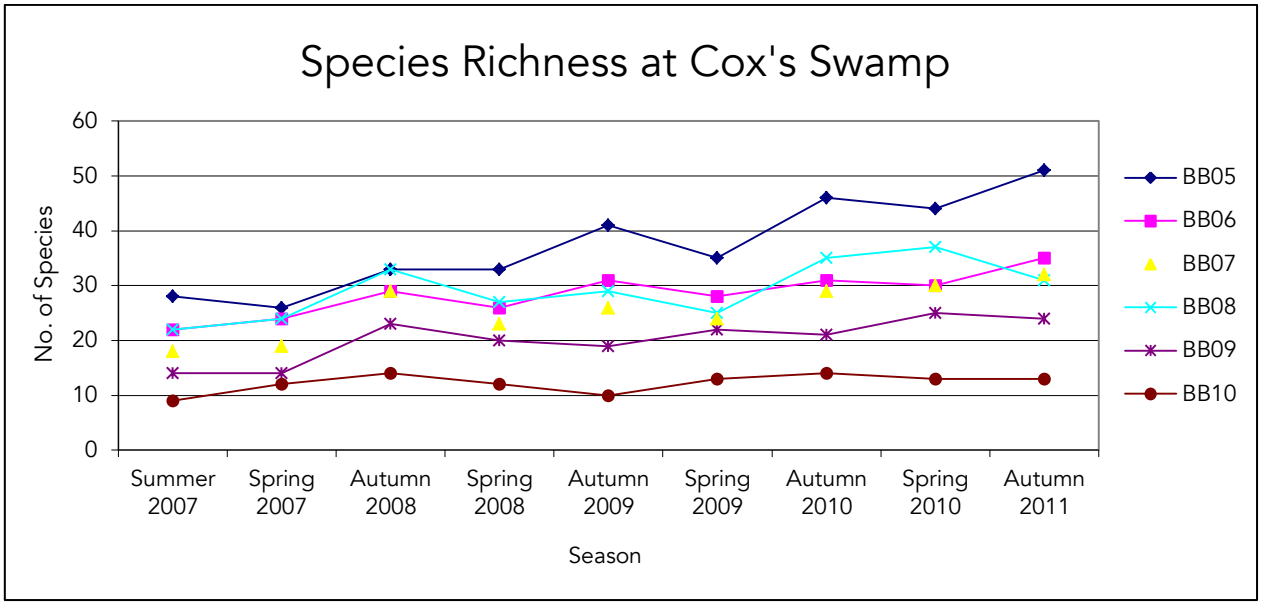


Figure 17: Summary of species richness at the monitoring sites

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

Following the completion of mining on 3 September 2011, no routine flora monitoring of the LW29-31 area was completed during the subsequent reporting periods. The last routine flora monitoring was completed in August 2011 by Gingra Ecological Surveys (Gingra), and the results are summarised below.

Results

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.

Table 20 - 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
TOTAL	113	119	161	141	156	26	176	179	187

*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.

Conclusion

There has been no evidence which would indicate an effect of subsidence on vegetation distribution and abundance at the monitoring sites

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

Following the completion of mining on 3 September 2011, no routine fauna monitoring of the LW29-31 area was completed during the subsequent reporting periods. One targeted fauna study was completed during 2012, to assess the potential impact of subsidence repairs (refer to Section 3.16.4).

The last routine fauna monitoring was completed during September 2011 by Biodiversity Monitoring Services (BMS), and the results are summarised below.

Results

A total of 20 native mammal (plus three introduced), 58 bird, five reptile and three amphibian species have been located within or near Longwall 29-31 SMP Area at Baal Bone Colliery during 2011. The list of fauna species located during the 2011 surveys in the SMP Area provides a total assemblage of species located within Baal Bone Colliery and LW29-31 SMP Area over the years. At present, 30 native mammal, 95 bird, 14 reptile and six amphibian species are known to occur within the LW29-31 SMP Area.

The number of birds, native mammals, reptile and amphibian species located in 2011 was similar to that located in earlier years. 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. Then the final overall species richness can be calculated from the final slope of the asymptote.

New species located during 2011 are the Eastern Pygmy-possum, House Mouse, Large Forest Bat, White-necked Heron, Buff-banded Rail, Golden-headed Cisticola, Beautiful Firetail, White's Rock-skink, Bibron's Toadlet and the Giant Dragonfly.

Overall there have been 11 threatened species located within the LW29-31 SMP Application Area at Baal Bone Colliery as a result of surveys since 2005. In 2011, the following threatened species were located: Gang-gang Cockatoo, Scarlet Robin, Varied Sittella, Eastern Pygmy-possum, Little Pied Bat, Eastern False Pipistrelle, Eastern Bent-wing Bat, and Greater Broad-nosed Bat. The first three species are part of a suite of threatened species that are listed partly because of their declining population status within the western slopes of NSW. This area (called the sheep-wheat belt) has undergone extensive clearing and much of the woodland habitat preferred by these species has been lost. However, in the Newnes Plateau region woodland habitat has been retained (albeit logged), and such bird species are still to be located. None of these threatened bird species would be directly affected by subsidence-induced changes to their preferred habitat.

Two new threatened species were located during the 2011 surveys, the Eastern Pygmy-possum and the Giant Dragonfly. Both were associated with Long Swamp, with the Eastern Pygmy-possum pit-trapped in a stand of banksia close to the swamp and at least five Giant Dragonflies were observed flying over Long Swamp close to piezometer BBPB5.

The Giant Dragonfly is listed as Endangered under the NSW TSC Act.

Table 21: - Results from analysis of data from 2006 to 2011

Biodiversity Indices	Significant Differences Between Pre and Post Mining
Species richness of faunal groups	No
Diversity indices of faunal groups	No
Capture rates of individual species	No
Contribution to the faunal assemblages by species dependent upon woodland	No
Contribution to the faunal assemblages by species declining in the Central West	No
Habitat complexity scores	No

Conclusion

The accumulation of data from the on-going surveys makes it possible to track changes to the terrestrial vertebrate fauna within the Baal Bone Colliery SMP Application Area during and after mining activities. At present, there appears to be no evidence of any significant effects from subsidence upon the fauna diversity at Baal Bone Colliery.

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

Weed management at Baal Bone continued during 2014. In line with the 2012 land management review of the Baal Bone site by Eco Logical Australia, a comprehensive weed spraying program targeting Blackberry, Biddy Bush *(Cassinia arcuata)* and isolated populations of Serrated Tussock (*Nassella trichotoma*) was undertaken in throughout the year.

3.9 Blasting

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

3.10 Operational Noise

For the purpose of assessing the compliance status of site with licence noise limits a site attended audit and noise measurements were conducted in July 2014 By Atkins Acoustics & Associates.

During the site-attended audits noise from activities associated with BBC would not be described as tonal, impulsive, irregularity or with low frequency content. Accordingly no 'modifying factor' corrections are required to satisfy EPL 765 (L4.7). From the audit measurements and assessment, the LAeq, 15 min noise contributions from BBC during the day, evening and night assessment periods satisfied the long-term licence noise limits.

Site related LA_{max} noise levels were not observed to cause exceedances of the licence noise limits at measurement locations for the duration of the audit.
Full noise audit reports can be accessed from the Baal Bone publications webpage at: http://www.glencorecoal.com.au/EN/Operations/Baalbone/Pages/EPLreportingBaalBone.aspx

There were no complaints regarding operational noise received during the reporting period.

3.10.1 Comparison against EA and previous AEMRs

The EA predicted $L_{Aeq\ 15\ minute}$ dB(A) noise levels at residences R1 and R2/R3, both with and without the dozer operating on the ROM stockpile. The EA also predicted $L_{A1,\ 1min}$ dB(A) intermittent noise levels at R1 and R2/R3 at night. The results of the attended noise audits confirm that Baal Bone Colliery noise levels are consistent with the EA predicted noise levels.

Maximum $L_{Aeq\ 15\ minute}$ dB(A) and L_{Amax} noise levels (measured predicted Baal Bone Colliery noise) recorded during audits at R1 throughout the 2012 reporting period were lower than EA predicted levels. At R2/R3 maximums of <39 L_{Aeq} dB(A) and <39 L_{Amax} were recorded during 2012, consistent with the EA predictions of <38 $L_{Aeq\ 15\ minute}$ dB(A) and <39 $L_{A1,\ 1\ min.}$

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. During 2012, a review of lighting requirements during care and maintenance was conducted, and where appropriate lighting was minimised.

No complaints have been received during the 2014 reporting period in respect to lighting.

A Lighting Assessment of Baal Bone operations was undertaken by JP Environmental in November 2011 to determine compliance with Condition 29 of Project Approval 09_0178. All measurements of obtrusive light emitted from Baal Bone were below the relevant light intensity parameters. Any new lighting installations required onsite in the future will be fixed in accordance with the recommendations of the Lighting Assessment to minimise the potential for obtrusive light.

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 2014.

Whilst under care and maintenance no stockpiling of coal products is occurring. The last of Baal Bone's ROM stockpiles were transported off site in April 2012.

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

In October a significant bush fire took place in the neighbouring Gardens of Stone National Park. Baal Bone provided the Rural Fire Service with access to the site as a field headquarters with helicopter landing facilities and access to any other required support facilities. 4 helicopters were based out of Baal Bone during the period.

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;
- 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 firefighting 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

The SMP for development and extraction of Longwalls 29-31 expired on 1 December 2014 with mining operations in the Longwall 29-31 area were completed on 3 September 2011.

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

Surveys of various subsidence monitoring lines were undertaken during mining of Longwalls 29-31. Maximum results of surveys conducted since 2009 are listed below.

Table 22 : 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

As per the Longwall 29-31 SMP, a final post longwall 31 subsidence survey was carried out in May 2012. Summarised results are listed below**.** Results from previous surveys can be found in Subsidence Status

Reports published on the Baal Bone website here: http://www.glencorecoal.com.au/EN/Operations/Baalbone/Pages/EPLreportingBaalBone.aspx

Table 22: 2012 LW29-31 Subsidence Survey Data (8 May 2012)

Line	Measured Subsidence (mm)	Measured Strain (mm/m)	Measured Tilt (mm/m)	Measured Horizontal Movement (mm)
SMP Prediction (mm)	**1400 – 1600**	**9 - 21**	**32 - 52**	**400**
E Line (LW 31)	1742 (LW30)	13.3	43.2	280
Northern Pinch Point Reflectors	+9			33
Northern Pinch Point Prisms	13			24
Southern Pinch Point Reflectors	14			9
Southern Pinch Point Prisms	2			8

The minor exceedance on E Line over LW30 has previously been reported in the 2011 AEMR. The post mining survey conducted on 8 May 2012 noted a further increase of 14mm to a total of 142mm. The distance where this occurred is limited to a length of less than 50 metres.

3.17 Hydrocarbon Contamination

An annual review of the groundwater monitoring wells at Baal Bone was undertaken by AECOM during July 2014. The results of this monitoring program acknowledged that previous activities at the site, 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 2014 review indicated that overall groundwater contaminant concentrations have slightly increased for dissolved metal compounds or remain at concentration below laboratory LORs. TPH concentrations have slightly at MW01, slightly increased at MW03 and were not detected at MW101

TPH concentrations reported a significant decrease between 2007 and 2008 and have remained relatively consistent since, with the exception of the 2011 results where concentrations were reported below the laboratory Limit of Reporting (LOR).

The review included recommendations that the annual groundwater monitoring program continues to confirm the reduction in contaminant concentrations and to enable adverse impacts to shallow groundwater in the pit-top and CHPP vicinities to be readily identified and managed accordingly.

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 extremely low 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.

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. A gate lock change also took place in 2011. During 2012, fences were erected in the CHPP area and access roads blocked.

3.20 Other Issues and Risks

3.20.1 Reportable Incidents

Pursuant to Glencore'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.

Category II: An incident that has caused minor, reversible environmental impact, requiring minor remediation.

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

Category IV: An incident that has cause serious environmental impact, with medium-term effect, requiring significant remediation.

Category V: An incident that has caused disastrous environmental impact, with long-term effect, requiring major remediation.

In accordance with the definitions provided above, there were no reportable environmental incidents recorded by Baal Bone during the reporting period.

There were no fines or penalties recorded during the reporting period

3.20.2 Audits Conducted During the Reporting Period

In 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 2014.

- Internal Environmental Compliance Audit
- Independent Environmental Compliance Audit
- Noise assessment
- Routine audits on dust monitoring gauges.

No Internal Environmental Compliance Audits or Independent Environmental Compliance Audits were conducted during 2014.

The annual attended noise audit was carried out in July 2014 as discussed previously in **Section 3.10**

Audits on the five dust monitoring gauges are conducted annually. The 2014 annual site audit was conducted on 20 January 2014. This audit reported that all dust deposition gauges were compliant with the Australian Standards (AS/NZS3580.1.1:2007 and AS/NZS3580.10.1:2003).

4.0 COMMUNITY RELATIONS

4.1 Environmental Complaints

In accordance with the Baal Bone Sustainable Development Procedure BBN SD PRO 0012 - 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 telephone complaints line 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 2014 reporting period there were no complaints received.

4.2 Community Liaison

4.2.1 Community Initiatives

During 2014 the following community support initiatives were implemented, which included donations to:

- Cullen Bullen Progress Association and
- Australia's Biggest Morning Tea

Funding is allocated for community involvement activities annually.

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 2014 Baal Bone CCC:

- Ray Blackley (Resident);
- Barbara Milne (Resident);
- Karen Desch (Adjacent landholder);
- Steven Coates (Adjacent Landholder);
- Representative from Lithgow City Council;
- Representative from Cullen Bullen Public School;
- Mark Bulkeley (Operations Manager); and
- Ben Anderson (Environment and Community Officer).

A CCC meeting was held during the reporting period in June 2014.

The meeting was well attended by members and the following items were presented by Baal Bone:

- Ben Bullen Creek remediation
- Rehabilitation Update
- Independent Audit & EMS Review
- Annual Environment Management Review

Regular agenda items included:

- Operations Manager's update;
- Health and Safety update;
- Environment and Community update – including rehabilitation and mine closure planning; and
- General Business and any other issues of concern from the community.

5.0 REHABILITATION

5.1 Buildings

A redundant clarifier unit located at Baal Bone CHPP was identified in the mine closure plan as a project for demolition, removal and rehabilitation. During 2014, the clarifier was dismantled and removed from site.

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**).

As part of the Reject Emplacement Area- No.2 Cell final rehabilitation plan for Baal Bone Colliery, stage 1 of the rehabilitation works completed during 2014. Stage one works included filling the void within the cell and capping with inert material

During 2013, the south east ventilation (utilised for longwall panels 29-31) fan was removed and the shaft filled. Site levelling, fence removal and topsoil replacement was completed in June 2013. In consultation with the State Forrest, the area was prepared and seeded in 2014 using a mix of local seeds.

A summary of rehabilitation works at the start of the current MOP period (February 2012), an estimate for the end of the current MOP period (August 2015) and at mine closure are detailed in Table 23, together with actual rehabilitation completed during the 2014 AEMR reporting period.

Table 23: Summary of Rehabilitation Performance

		Area Affected/Rehabilitated (hectares)			
		Start of MOP (Feb 2012)	End of 2014 AEMR Reporting Period	End of MOP Period (August 2015)*	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	Nil
B2: Active Surface Mining Area (excluding items B3 - B5 below)		Nil	Nil	Nil	Nil
B3 Waste emplacements (dozer push and dumps in N		41.86 ha	41.86 ha	41.86 ha	Nil

and S) (active/unshaped/in or out-of-pit)				
B4 Tailings emplacements (REA 5 (cell 2), 6) (active/unshaped/uncapped)	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
ALL DISTURBED AREAS	127.88 ha	127.88 ha	127.88	Nil
C REHABILITATION PROGRESS (Cumulative)				
C1 Total Rehabilitated area (excluding maintenance)	137.37 ha	137.37 ha	137.37	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
D2 Greater than 18 degrees	2.5 ha	2.5 ha	2.5 ha	2.5 ha
E: SURFACE OF REHABILITATED LAND (Cumulative)				
E1 Pasture and grasses	62.49 ha	62.49 ha	62.49 ha	89.39 ha
E2 Native forest/ecosystems	74.88 ha	74.88 ha	74.88 ha	181.48 ha
E3 Plantations and crops	Nil	Nil	Nil	Nil
E4 Other (includes non-vegetative outcomes)	Nil	Nil	Nil	Nil

5.3 Rehabilitation Inspections and Monitoring

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

- Regular inspections by site personnel,
- An annual environmental rehabilitation walk around inspection as per XCN (XCN SD ANN 0039, section 6.4.1), 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 DnA Environmental in September 2014. Consistent with the 2013 inspection, the 2014 inspection identified ongoing improvements in the results of the rehabilitation areas within both the north and south former open cut areas. The inspection noted generally good rehabilitation across all areas, with some isolated areas needing additional work to remediate erosion and rilling.

The inspection also noted that although acacias are dominant across the sites, they are providing valuable ecological services in the short term via the provision of perennial vegetation cover, nitrogen fixation, dead

leaf material and additional micro sites and soil surface relief. They also provide protection to eucalypts and other desirable species from extreme weather. Despite the low proportion of eucalypts in several sites, increasing morality of the acacias is expected to continue, thus increasing the proportion of eucalypts at the sites to more suitable levels in the longer term.

5.3.2 Annual Ecological Rehabilitation Monitoring

Annual Ecological Rehabilitation Monitoring at Baal Bone Colliery commenced in 2009 to develop completion criteria and assess progress. Annually the monitoring methodology encompasses a combination of Landscape Function Analyses (LFA), Vegetation structure and composition analyses and permanent photo-points.

Every second year a more extensive program will be carried out to gauge rehabilitation progress, using a combination of LFA, comprehensive soil analyses and an assessment of ecosystem characteristics.
The ecological assessments provide quantitative data that measure 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.

The Annual Ecological Rehabilitation Monitoring for 2014 was the more extensive program and was conducted onsite by DnA Environmental in November 2014. The results are summarised below:

<u>Native woodland rehabilitation sites</u>
The woodland reference sites consisted of deep, well developed litter layers in moderate to extensive states of decomposition, scattered perennial grass tussocks and herbs and a mature eucalypt canopy, often with some scattered shrubs and sub-shrubs. These sites had a very stable humus layer which was building up the soil profile and increased the capacity for moisture retention and protection against erosive forces.
In comparison, the woodland rehabilitation sites typically had limited perennial ground cover vegetation and a reduced level of litter cover and states of decomposition but often had a high perennial plant cover due to the establishing trees and shrubs, especially in the younger sites which had particularly high stem densities. The once loose and unstable soil surfaces have over time developed stable soil crusts which have become colonised with cryptogams and combined with the increasing levels of protective vegetative cover have become inherently more stable. In some cases the soils had also demonstrated increased coherency and a reduction in slaking potential due to increased microbial activity and development of a humus layer, especially in the older sites. Despite some periods of high rainfall activity, these increased ecological traits have also resulted in a reduction in the extent of erosion and deposition.
In some of the younger rehabilitation areas however there continued to be patches of limited protective cover, limited soil surface relief and combined with the slaking soils, plants and cryptogams have not yet been able to establish in these unstable environment but the extent of these were declining. Many of these

undesirable characteristics have typically improved and have continued to demonstrate an increasing LFA trend since 2009.

Most of the changes being observed are significant positive ecological changes and these are likely to progressively increase the ecological development of the rehabilitation areas over time. While Box Cut and SOC4 sites have previously been slow to establish, there have been significant improvements in these sites over the past year.

There has been considerably good establishment of the seeded trees and shrubs with individuals with a diameter at breast height (dbh) >5cm being recorded in all rehabilitation areas this year indicating good growth and the development of a maturing woodland canopy. The tree population presently ranged from a density of 4 – 47 per 50 x 20m monitoring quadrat and are demonstrating an increasing trend.

There were excessively high number of shrubs and juvenile trees (<5 cm dbh) which far exceeded those of the natural occurring woodlands and had densities that were in the order of 14800 – 31600 stems per ha this year.

There was however a significant and declining trend in the shrub population and while some of the larger individuals were now being recorded as part of the tree population, the vast majority of individuals had died outright as competition levels increase especially during the prolonged dry conditions, with this also evident to some extent in the reference sites. The significant decline in the shrub population in the rehabilitation areas are also considered to be part of the natural successional development of the site as the sites mature, with the loss of individuals and lower braches resulting in a much more open environment which has led to the increase cover of perennial ground cover plants, especially the native grass *Microlaena stipoides*. There continued to be a low proportion of eucalypts compared to acacias in most of the rehabilitation areas however increasing mortality of the acacias is expected to continue, thus increasing the proportion of eucalypts within the sites to more suitable levels in the longer-term. The majority of the shrub population in the older two sites Box Cut and SOC3 were < 0.5m in height as a result of significant natural Acacia and *Cassinia arcuata* regeneration, indicating these sites are potentially self-sustainable in the longer-term. The remaining younger sites on the Northern and Southern Open Cut area are dominated by a population of shrubs which far exceed 2.0m in height.

Total ground cover is a combination of leaf litter, annual plants, cryptogams, rocks, logs and live perennial plants (<0.5m in height) and this continued to improve in all rehabilitation sites largely due to the accumulation of leaf litter and cryptogam cover. SOC3 continued to meet total ground cover targets and this year so did SOC1. Leaf litter continued to be the dominant form of ground cover and all rehabilitation sites except Box Cut had more than 6.5% perennial vegetation cover which was the minimum perennial cover target. Most perennial vegetation cover <0.5m in the younger rehabilitation areas however was provided by low hanging acacia branches and stems and scattered occurrences of the exotic perennial herb *Hypochaeris radicata* (Flatweed) rather than the more desirable perennial ground cover plants such as those recorded in SOC3.

This year all rehabilitation sites except SOC2 contained some vertical structure greater than 6.0m in height with SOC3 having a canopy cover within the target range. The older rehabilitation area SOC3 has developed into a woodland which has a similar structural composition to the reference sites, while NOC1 and SOC1 appear to be trending in that direction. While native plants were more dominant than exotics in the rehabilitation sites, the sites were weedier than desired with native plant cover ranging from 54.5% in Box Cut to 89.5% in NOC1. The diversity of most growth forms in the rehabilitation sites were similar to greater than those recorded in the reference sites however there was often a higher diversity of tree species (i.e. eucalypts) and a low diversity of herbs.

This year three species were common to all rehabilitation areas and these included *Hypochaeris radicata* (Flatweed), *Acacia rubida* (Red-leaved wattle) and *Cassinia arcuata* (Chinese Shrub). Most common species

were likely to be the result of tree seeding as part of the rehabilitation process however, *C. arcuata*, a native shrub and *H. radicata*, an exotic perennial weed were common volunteer species. The rehabilitation sites were dominated by a different range of species to the reference sites with the native perennial grass *Microlaena stipoides* being recorded in relatively high abundance in all rehabilitation areas, except Box Cut. The exotic *H. radicata* occurred in comparatively high abundance in NOC1 and NOC2 while *Anagallis arvensis* (Scarlet Pimpernel) provided the most cover in Box Cut. Some young acacia and eucalypt saplings also provided some low cover and in NOC1, *Pultenaea microphylla* provided comparatively high levels of ground cover.

Exotic pasture rehabilitation sites

Between 2009 and 2011 there were relatively major increases in stability in the pasture rehabilitation sites due to the development of the perennial pasture species, increasing litter and cryptogam cover and improvement in numerous other soil attributes. However since then the thickets of acacias became more dense, resulting in a decline in perennial pasture species and a loss of the low hanging acacia branches causing a marginal decline in stability in both of these rehabilitation sites last year.

The NOC3 and NOC4 rehabilitation sites have continued to develop excellent litter layers which had accumulated to some depth due to high leaf fall from the acacia thickets and within these patches there tended to be moderate rates of litter decomposition, indicating high levels of microbial and fungal activity. In NOC3 and

NOC4 the increased litter layer however has also reduced the abundance of cryptogams. There has also been a significant reduction in soil surface crusting due to the development of a humus layer which is positive and significant successional indicator, with no crusting at all observed in NOC3 this year. In comparison NOC5 has maintained relatively good cover of perennial ground covers but lacked high levels of perennial canopy cover due to the absence of shrubs.

Despite numerous positive changes also occurring in the pasture rehabilitation sites NOC3 and NOC4 there was a decline in canopy cover due to the death of numerous acacias. In NOC5, heavy grazing has significantly affected the abundance of perennial plant covers with increase soil surface crusting and erosion with the exposed soils vulnerable to slaking. All rehabilitation pasture areas however met the 70% completion LFA targets this year as heavy grazing was also evident in the reference sites.

The rehabilitation pastures areas were tree seeded in an attempt to provide some scattered shade trees and as a result there were scattered individuals as well as large thickets of acacias across much of the Northern Open

Cut area, with a reduction in shrub densities this year. All three rehabilitation sites continued to maintain a good cover of exotic pasture species however heavy macropod grazing has resulted in a reduction in total ground cover in both NOC 3 and NOC5 which just fell short of meeting the required total ground cover targets. The rehabilitation sites were largely comprised of perennial plants and dead leaf litter however the proportion of perennial vegetation in comparison to the reference sites was slightly lower and did not yet meet this important ecological indicator. The rehabilitation sites NOC4 and NOC5 also contained a much large proportion of annual plants and cryptogams and some scattered rocks. As the final landuse of the Northern Open Cut is an area of exotic pasture suitable for grazing, total and native species diversity indicators were not considered to be relevant ecological attributes and native plants provided little to no live plant cover in the rehabilitation areas.

Three native species *Acacia rubida*, *Geranium solanderi* (Native Geranium) and *Myriophyllum spp.* (Milfoil) were record in all three rehabilitation sites, with *Myriophyllum spp.* also recorded in both pasture reference sites.

There were also 12 exotic species with species such as *Dactylis glomerata* (Cocksfoot), *Hypochaeris radicata,*

Lolium rigidum (Wimmera Ryegrass) and *Plantago lanceolata* (Ribwort) also recorded in both reference sites, indicating they are locally common species and are a reflection of the level of historical disturbance. The rehabilitation areas were dominated by exotic species which were largely sown as part of the rehabilitation. *Hypochaeris radicata* an exotic perennial ground cover was also abundant in the rehabilitation areas, but it was also a significant part of the native pastures in the Baal Bone area and was recorded in high abundance in both pasture reference sites. Many other common species were sown as part of the seeding program but there other numerous volunteers species such *Cassinia arcuata* which is a common native colonising shrub. The native ground covers *Leptorhynchos squamatus* (Scaly Buttons) and *Oxalis perennans* (Yellow Wood-sorrel) were recorded in two rehabilitation areas as well as being common to both pasture reference sites

Conclusion

Most rehabilitation sites were establishing particularly well despite the extremes in seasonal conditions and increased grazing pressure by resident macropod populations. While the developments occurring within the rehabilitation areas were patchy, there tended to be increasing ecological function with most ecological parameters being recorded showing positive successional trends, especially in the oldest rehabilitation site SOC3 in the Southern Open Cut area. SOC3 continues to transform into an open woodland with many ecological attributes of the remnant reference sites, including a native grass understorey, a well-developed canopy and natural recruitment and NOC1 and SOC1 appear to be trending in that direction. Despite the high stem density and some adverse soil conditions in the younger woodland rehabilitation areas natural succession is likely to see the ongoing transformations in function, structure and composition with little need for direct management intervention across majority of the rehabilitation areas.

This natural successional process was most evident in the NOC and SOC rehabilitation areas this year with the significant decline in shrub densities and concurrent increase in ground cover. The loss of individuals and lower braches of those remaining has resulted in a much more open environment which has led to the increase cover of perennial ground cover plants, especially the native grass *Microlaena stipoides*. While Box Cut and SOC4 sites have previously been slow to establish, there have been significant improvements over the past year.

The pasture rehabilitation sites were already meeting many of the completion targets and these are also likely to continue to improve unassisted in the absence of disturbance events however heavy grazing by macropods resulting in a decline in perennial grasses and increased abundant of annual and exotic weeds over the past year.

The addition of artificial fertilisers is not encouraged on the woodland rehabilitation area as unnatural increases in fertility levels are more likely to promote growth of undesirable weeds rather than invigorate growth of desirable native species which are adapted to naturally low fertility soils. The exotic pasture area on the NOC however may benefit from the application of artificial fertilisers in order to maintain and promote the growth of the desired exotic pasture species.

There was little evidence of adverse impacts by feral animals or noxious weeds however these should be regularly monitored and targeted control programs implemented when required. The impacts of increased macropod grazing was evident in most sites this year, however this is likely to be the direct effect of the prolonged hot dry conditions with more normal grazing intensities returning in better seasonal conditions.

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, mine adits, transmissions lines, pipelines, various water management structures and the southern REA, including REA 5 (cell 2) and REA 6 and the Course Reject Emplacement Area (PLAN 3). These areas will be rehabilitated at the end of the approved mine life. It is anticipated that the rehabilitation of REA 5, cell 2 will commence in the 2015 AEMR period (PLAN 3).

As discussed in Section 3.16.4, remediation of subsidence cracking over Longwalls 29-31 was carried out in June 2013. Follow up inspections and additional remediation works, where required, will be undertaken during the 2015 AEMR period.

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

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 Project Approval 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.

A review of the Ben Bullen Creek Natural Channel Design and Restoration Plan during 2012/2013 indicated that remediation of the current Ben Bullen Creek diversion through the pit top area may be optimal to the reinstatement of the creek to its pre-disturbance pathway (approximately pathway post Ben Bullen Mine 1952).

URS were commissioned in 2013 to carry out a Phase 1 assessment of Ben Bullen Creek to consider the options of rehabilitating the current diversion verse reinstatement of the creek to its approximate pre-disturbance pathway.

Findings from the assessment recommend that the existing diversion be maintained for Ben Bullen Creek.

"The current ecological values along the existing alignment are high, with successful rehabilitation works along a large portion of the creek line. This has provided structured vegetation, a diverse mixture of flora species and fauna habitat potential. With some further remedial works, including further rehabilitation works along eastern bank (e.g. mulch, plantings and installation of woody debris) the ecological value of the creek line will improve. If any civil works are required (e.g. batter the high wall, removal of native vegetation or removal of pipelines/culverts), an impact assessment will be required to assess the effects to threatened species habitat that is currently present.

The pre-disturbance alignment for the creek line traverses the existing pit top area and consequently currently contains low ecological value. It would require substantial rehabilitation works to replicate the ecological value of the current creek alignment. This alignment is not preferred, and potential re-alignment may have impacts upon the ecological values (in-stream vegetation and flora species) of the current creek system.

The remediation of the existing course can commence in a timely manner following receipt of required approvals, allowing for additional benefits. Once the construction works are complete, the revegetation effort can begin. If the site is operational, staff will be available to review the progress of the vegetation on a regular basis. This will allow any issues to be identified and remedial action to be taken in a timely manner. Whilst this would still occur after mine closure, the time between inspections would be much greater and duration of monitoring would be shorter. It is likely that this would impact on the success of the revegetation process.

The existing course is geomorphologically stable and requires only minor adjustments to improve the geotechnical stability and revegetation potential of the banks. The modelling is a conservative estimate of channel conditions, but this also suggests the channel is stable.

The longer path of the existing course suggests that the creek will have less erosive power and is therefore more likely to remain stable in the long term. The pre-disturbance path also passes close to the adits, posing a potential risk of flood waters entering the underground workings."

Following discussions were held with DP&E in 2014, a modification is now being sought by Baal Bone to modify the approved final landform plan and associated conditions for the Baal Bone Coal Project under Project Approval 09_0178. The modification is being sought under Section 75W of the Environmental Planning and Assessment Act 1979 (EP&A Act) will facilitate the changes to final alignment and rehabilitation of Ben Bullen Creek.

5.6 Other Infrastructure

No other rehabilitation was undertaken during 2014 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 Glencore 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 2014 focussed on the following:

- Development of a detailed closure action register
- Review of the Detailed Mine Closure Plan document, and
- Development of a Mine Closure Action Plan for 2015.

5.8.2 Rehabilitation Liability Estimate

Baal Bone's rehabilitation liability estimate was increased in early 2012 to a total of $13,022,000 increasing from $9,723,000 at the end the 2011 reporting period.

An internal review of Baal Bone's rehabilitation liability estimate carried out in December 2012 further increased the liability estimate to $18,770,763. The revised estimate was submitted to DTI for approval together with the 2012 AEMR.

6.0 ACTIVTIES PROPOSED IN THE NEXT AEMR PERIOD

6.1 Operations and Systems

Projects and targets for the 2015 reporting period include the following:

- Pending outcomes of discussions with DP&E regarding Ben Bullen Creek remediation, finalisation of Ben Bullen Creek Management Plan and Water Management Plans;
- Design and confirmation of the Final landform Design
- Continued Rehabilitation of the REA 5 area
- Development of approval of an update MOP
- Closure related surveys. These will include a borehole survey and a survey of subsidence impacted areas across the site

6.2 Care and Maintenance Period (Temporary Closure)

Baal Bone entered a care and maintenance period following the cessation of mining operations in 2011. During the 2015 AEMR period, required 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.

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 standby strategy has been adopted for the CHPP. This has allowed the CHPP to be temporarily decommissioned, and then restarted in the future should investigations identify suitable and economically viable reserves for extraction.
Reclaim tunnels and other infrastructure will be man-proofed.

6.3 ROM and Product Stockpiles

All stockpiles have been depleted, cleaned of carbonaceous material and left in a stable condition. No activities are proposed for the 2015 AEMR period.

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.

All adits have been secured with steel gate. With the exception of No.4 adit, all adits will be kept locked throughout the next AEMR period. The main ingress through No.4 adit is only open during operating hours, and access is 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 after mine closure.

During 2015 investigations will continue on the proposed partial rehabilitation of the southern reject emplacement area, pending the finalised capping of REA 5 and REA 6 remaining open for future use.

6.6 Other Infrastructure

Other infrastructure associated with Baal Bone or in the immediate vicinity includes powerlines, access tracks, boreholes and monitoring sites. 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 and monitoring 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, mine adits, 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 at least fortnightly.

6.8 Community Relations

Community relations projects for the 2015 AEMR reporting period include the following:

- Hosting regular CCC meetings; and
- Distribution of at least one community newsletter
- Donation of a bus and laptop computer to the Cullen Bullen Public School

7.0 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.

Aurecon (2012) REA% Bund Wall Geotechnical Stability Assessment. Aurecon Australia Pty Ltd, Neutral Bay.

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

DnA Environmental (2014). Baal Bone Colliery Rehabilitation Monitoring 2014, 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.

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

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. NGHenvironmental, 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.

URS Australia (2014). Phase 1 – Ben Bullen Creek, Options analysis and concept design. URS Australia Pty Ltd, Hamilton NSW.

LD3 and LD6 approximately 1.7km East - see Drawing 2

DM4

DM3

DM2

DM1

DM5

BBJC2

BBBC

BBLT

LDP1

BBBBC Mid

BBDW

LD2

BBSTP2

BBPRW

BBREAS

BBPOT

WMP1

ROM Stockpile

WASHERY

RAIL LOOP

WS

M.G.A.

SCALE

1 Surface Water Monitoring Site

1 Deposited Dust Monitoring Site

Drainage Path

Fish river pipeline

1 Internal Water Monitoring Points

Weather Station

DRAWN	JWS
DATE	10/1/2008
REVISION	24/2/2015
CHECKED	APPROVED
SCALE	NTS

BAAL BONE COLLIERY

GLENCORE

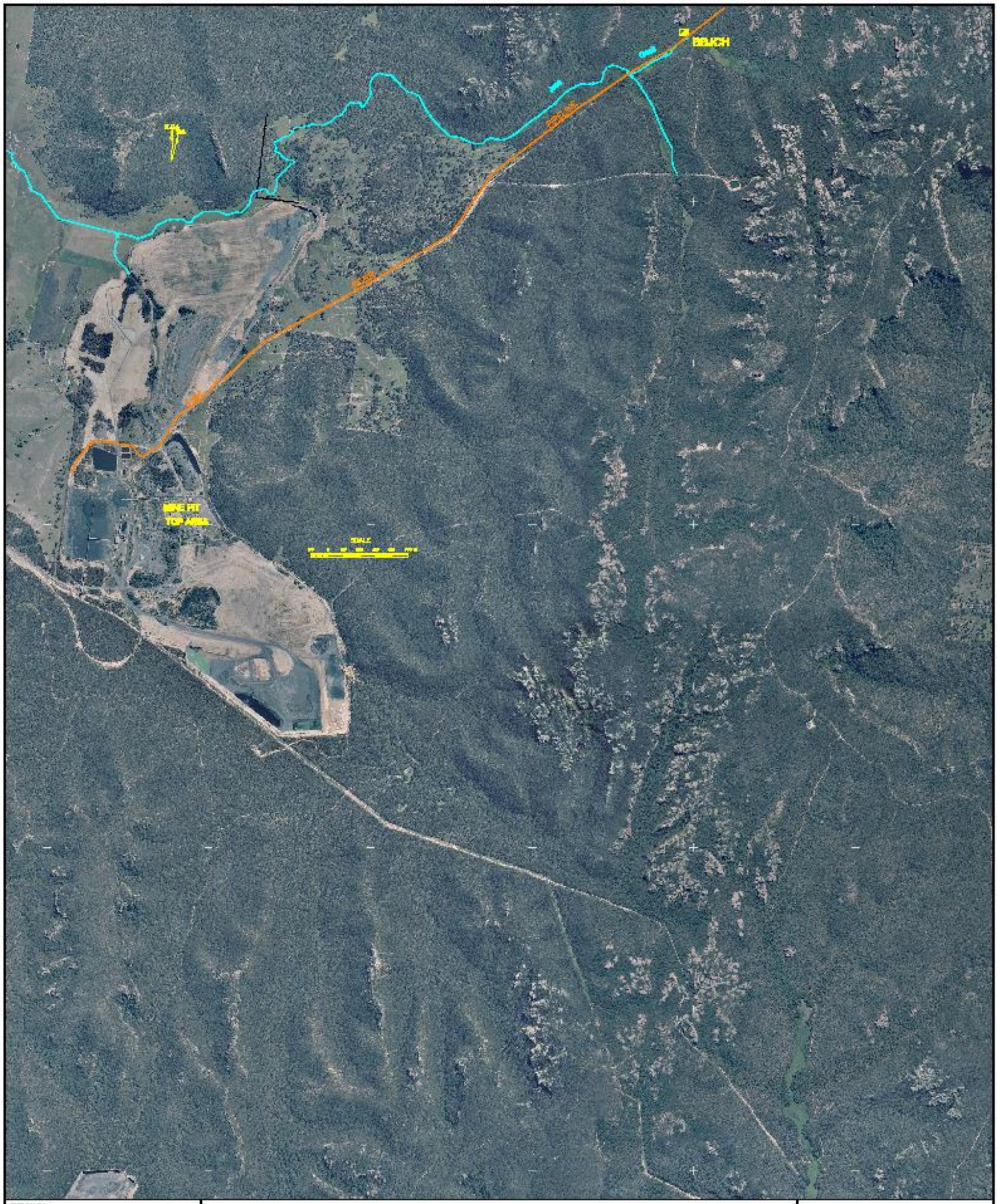
TITLE

2014 LICENCED MONITORING SITES

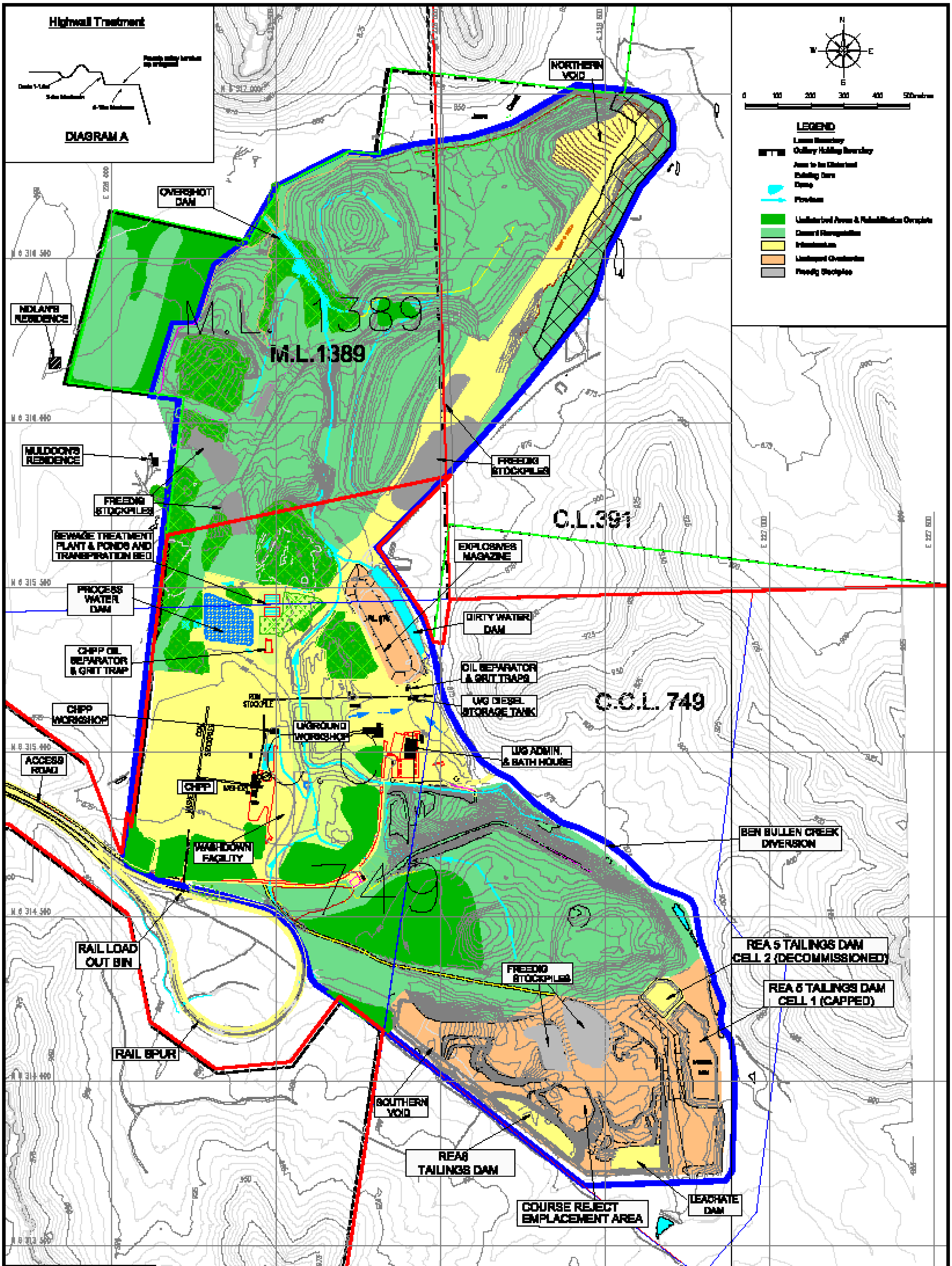
COMPUTER PATH G:\techserv\Technical Services\Survey\Survey Plans\Environmental\MOPs\2014AEMR\

DRAWING No. Drawing 1

A3



DRAWN JWS	BAAL BONE COLLIERY		GLENCORE
DATE 24/2/2015	TITLE **2014 LICENCED MONITORING SITES**		
CHECKED			
APPROVED			
SCALE NTS / REVISION 24/2/2015	COMPUTER PATH G:\techserv\Technical Services\Survey\Survey Plans\Environmental\MOPs\2014AEMR\	DRAWING No. – Drawing 2	A3



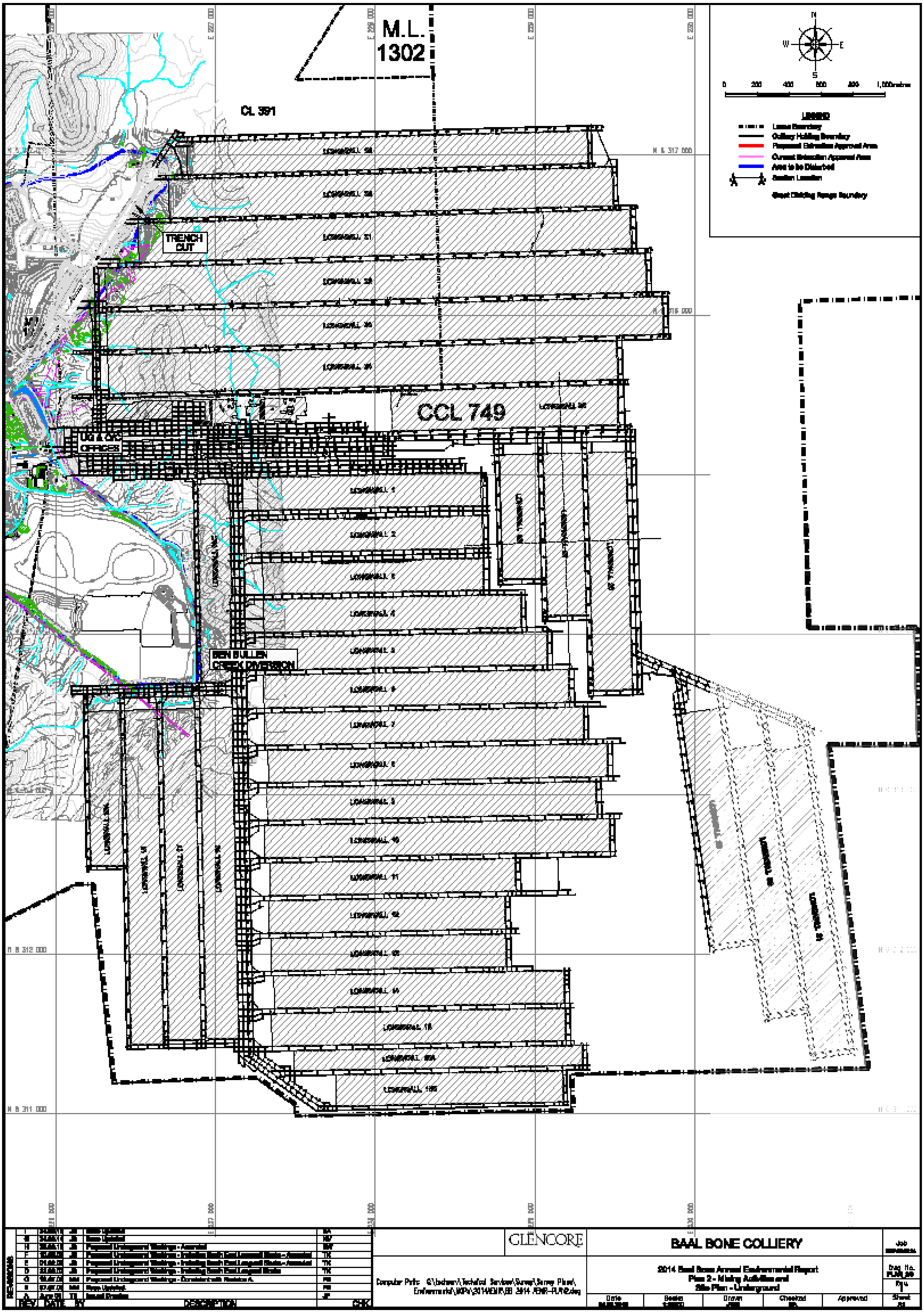
GLENCORE

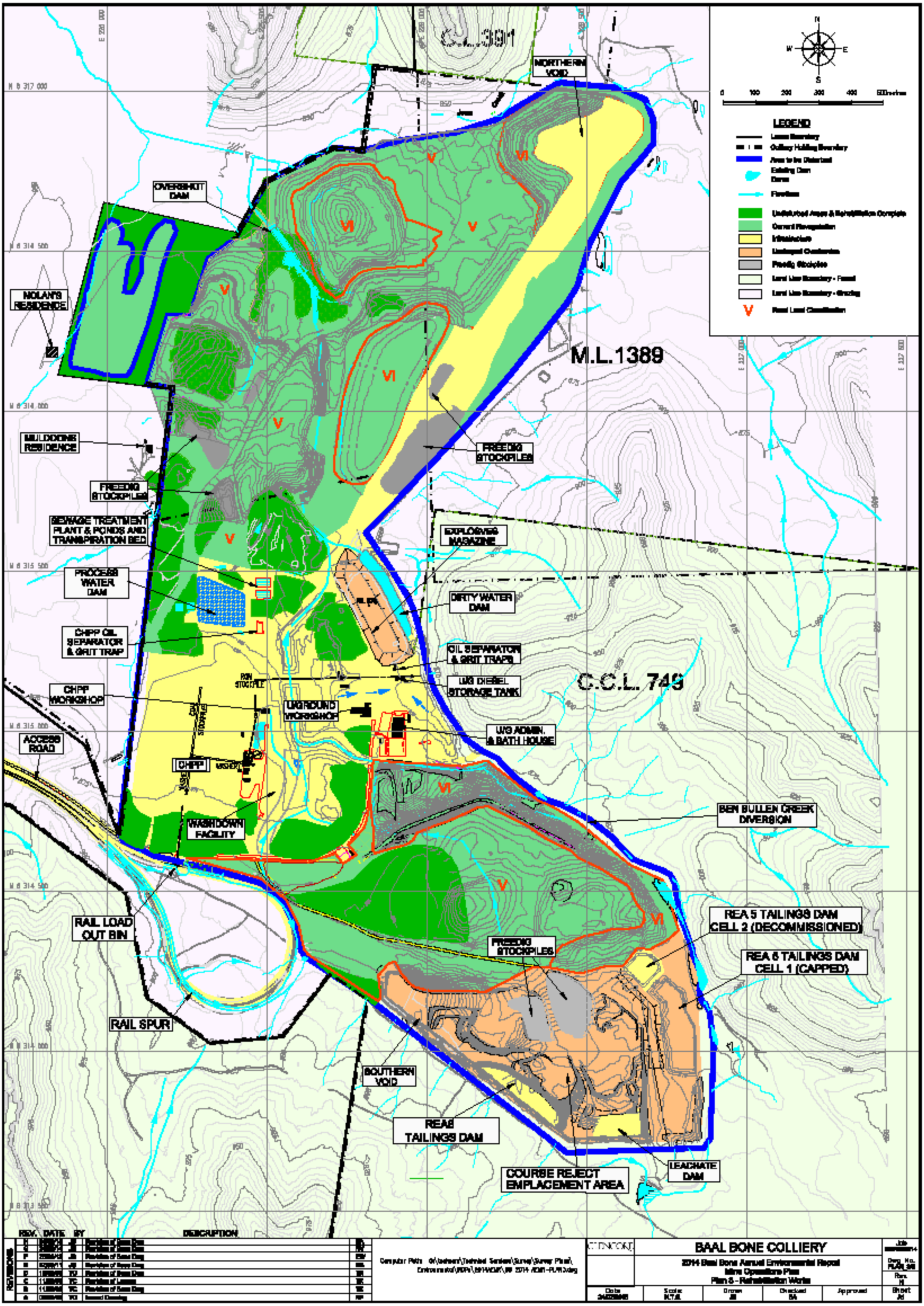
BAAL BONE COLLIERY

2014 Baal Bone Annual Environmental Report
Plan 1 - Mining Activities and Surface Facilities Site Plan

REV.	DATE	BY	DESCRIPTION	CHK

Date | Scale | Drawn | Checked | Approved | Sheet


M.L.
1302
CL 391
TRENCH CUT
CCL 749
UG & O/C OFFICES
BEN BULLEN CREEK DIVERSION
N 6 317 000
N 6 312 000
N 6 311 000
N
S
W
E
0
200
400
600
800
1,000metres
LEGEND
Lease Boundary
Colliery Holding Boundary
Proposed Extraction Approval Area
Current Extraction Approval Area
Area to be Disturbed
Section Location
Great Dividing Range Boundary
REV
DATE
BY
DESCRIPTION
CHK
Proposed Underground Workings - Amended
Proposed Underground Workings - Including South East Longwall Blocks
Proposed Underground Workings - Consistent with Revision A.
Issued Drawing
GLENCORE
BAAL BONE COLLIERY
2014 Baal Bone Annual Environmental Report
Plan 2 - Mining Activities and Site Plan - Underground
Date
Scale
Drawn
Checked
Approved
Sheet
Job
Dwg. No.
Rev.


C.L.391
NORTHERN VOID
LEGEND
Lease Boundary
Colliery Holding Boundary
Area to be Disturbed
Existing Dam
Dams
Flowlines
Undisturbed Areas & Rehabilitation Complete
Current Revegetation
Infrastructure
Unshaped Overburden
Freedig Stockpiles
Land Use Boundary - Forest
Land Use Boundary - Grazing
Rural Land Classification
OVERSHOT DAM
NOLAN'S RESIDENCE
M.L.1389
FREEDIG STOCKPILES
MULDOONS RESIDENCE
FREEDIG STOCKPILES
SEWAGE TREATMENT PLANT & PONDS AND TRANSPIRATION BED
EXPLOSIVES MAGAZINE
PROCESS WATER DAM
DIRTY WATER DAM
CHPP OIL SEPARATOR & GRIT TRAP
OIL SEPARATOR & GRIT TRAPS
U/G DIESEL STORAGE TANK
C.C.L. 749
CHPP WORKSHOP
U/GROUND WORKSHOP
U/G ADMIN. & BATH HOUSE
ACCESS ROAD
CHPP
WASHDOWN FACILITY
BEN BULLEN CREEK DIVERSION
RAIL LOAD OUT BIN
REA 5 TAILINGS DAM CELL 2 (DECOMMISSIONED)
FREEDIG STOCKPILES
REA 6 TAILINGS DAM CELL 1 (CAPPED)
RAIL SPUR
SOUTHERN VOID
REA8 TAILINGS DAM
COURSE REJECT EMPLACEMENT AREA
LEACHATE DAM
REV. DATE BY DESCRIPTION
REVISIONS
BAAL BONE COLLIERY
2014 Baal Bone Annual Environmental Report
Mine Operations Plan
Plan 5 - Rehabilitation Works
Date
Scale N.T.S.
Drawn
Checked
Approved
Sheet