Liddell Coal Operations Pty Ltd

Liddell Colliery
Annual Environmental Management Report
Year Ending June 2009

2008/9 AEMR

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Annual Environmental Management Report
Year Ending June 2009

Prepared by

CARBON BASED ENVIRONMENTAL PTY LTD

on behalf of

Liddell Coal Operations Pty Limited

Carbon Based Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent
Singleton NSW 2330
Phone: 02 6571 3334
Fax: 02 6571 3335
Email:cbased@bigpond.com

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1.0 Introduction

Liddell Colliery, located in the Upper Hunter Valley is operated by Liddell Coal Operations Pty Limited (Liddell Coal) under the conditions of development consent DA 305-11-01. Schedule 5, condition 3 of DA 305-11-01 requires Liddell Coal to prepare and submit an AEMR to the Department of Planning (DoP) and Department of Primary Industries (DPI) on an annual basis. This Annual Environmental Management Report (AEMR) has been prepared as required and in accordance with the DPIs *Guidelines to the Mining, Rehabilitation and Environmental Management Process* (2006) and Schedule 5, Condition 3 of the DA 305-11-01. This AEMR has been prepared by Carbon Based Environmental Pty Limited on behalf of Liddell Coal for the operating period of July 2008 to June 2009.

Liddell Colliery is an open cut coal mine located approximately 25 kilometres north-west of Singleton, NSW (**Figure 1.1**). Liddell Colliery is operated by Liddell Coal Operations Pty Ltd, on behalf of the Liddell Joint Venture between Xstrata Coal Australia Pty Ltd (67.5%) (Xstrata) and Mitsui Matsushima Australia Pty Ltd (32.5%) (MMA).

Mining operations at Liddell Colliery have been continuous since the 1950s. Operations prior to the 1950s were intermittent, with underground operations commencing in 1923 and open cut operations in 1946. Current open cut operations access the coal reserves previously not mined by the underground operations. The current open cut mining operation has been in operation since 1990.

Between July 2008 and June 2009 (the reporting period), Hunter Valley Earthmoving (HVE) carried out mining activities at Liddell Colliery as the principle mining contractor. Mining operations during the reporting period were undertaken using the truck and excavator method of operation. Liddell Coal has consent to produce up to 8 million tonnes of run-of-mine (ROM) coal per annum. Product coal, both semi-soft and thermal, is transported to Newcastle Port by rail via the Hunter Valley Rail Loop and Main Northern Railway Line, for sale to the export market.

1.1 Consents, Leases, Licences and Other Approvals

A number of consents, leases, licences and other approvals regulate mining operations at Liddell Colliery. The status of these approvals is discussed in **Sections 1.1.1** to **1.1.3**.

1.1.1 Development Consent Conditions

Operations at Liddell Colliery are undertaken in accordance with development consent DA 305-11-01. On 7 May 2008 and 18 July 2007 Liddell Coal was granted two modifications to their development consent. Operations during the reporting period were undertaken in accordance with the development consent granted on 18 July 2007 and as such this AEMR assesses Liddell Coal's performance against the modified consent.

The modifications encompassed a number of alterations to the mine plan, the construction of a new office and workshop complex and modifications to the existing CHPP.

1.1.2 Status of Leases

Liddell Colliery operates primarily under one consolidated mining lease, ML 1597, refer to **Figure 1.2**. The approval for ML 1597 was granted by the DPI on 5 November 2007. Small

parts of other leases as detailed in **Table 1.1** are also applicable to Liddell Colliery operations.

Table 1.1 - Leases and Licences

Instrument	Authority	Approval/Expiry
Mining Lease 1597	Department of Primary Industries	Expires 5 November 2028
Consolidated Coal Lease No. 708	Department of Primary Industries	30 December 2023
Mining Lease No. 1313	Department of Primary Industries	13 October 2023
Mining lease No. 1552	Department of Primary Industries	10 March 2008 (renewal submitted)

1.1.3 Status of Licences

1.1.3.1 Environmental Protection Licence

The Environmental Protection Licence (EPL) is administered under the *Protection of the Environment Operations Act 1997*. The EPL outlines specific conditions in regard to environmental reporting and monitoring. Liddell Coal currently holds the following EPL:

- Licence Number: 2094
- File Number: 27051
- Licence Anniversary: 30 June
- Review Due Date: 07 September 2009

A variation to the Liddell Coal EPL was submitted during the reporting period to encompass changes from the modified development consent. Changes to the EPL were made by the Department of Environment and Climate Change (DECC) which provided for the approved increase in production.
Compliance with the EPL is reported annually to the Department of Environment and Climate Change (DECC) in the EPL Annual Return. Liddell Coal's compliance with the EPL is also discussed in **Section 3.0** of this report.

1.1.3.2 Surface Water Licences

Liddell Coal holds six surface water licences, as outlined in **Table 1.2**.

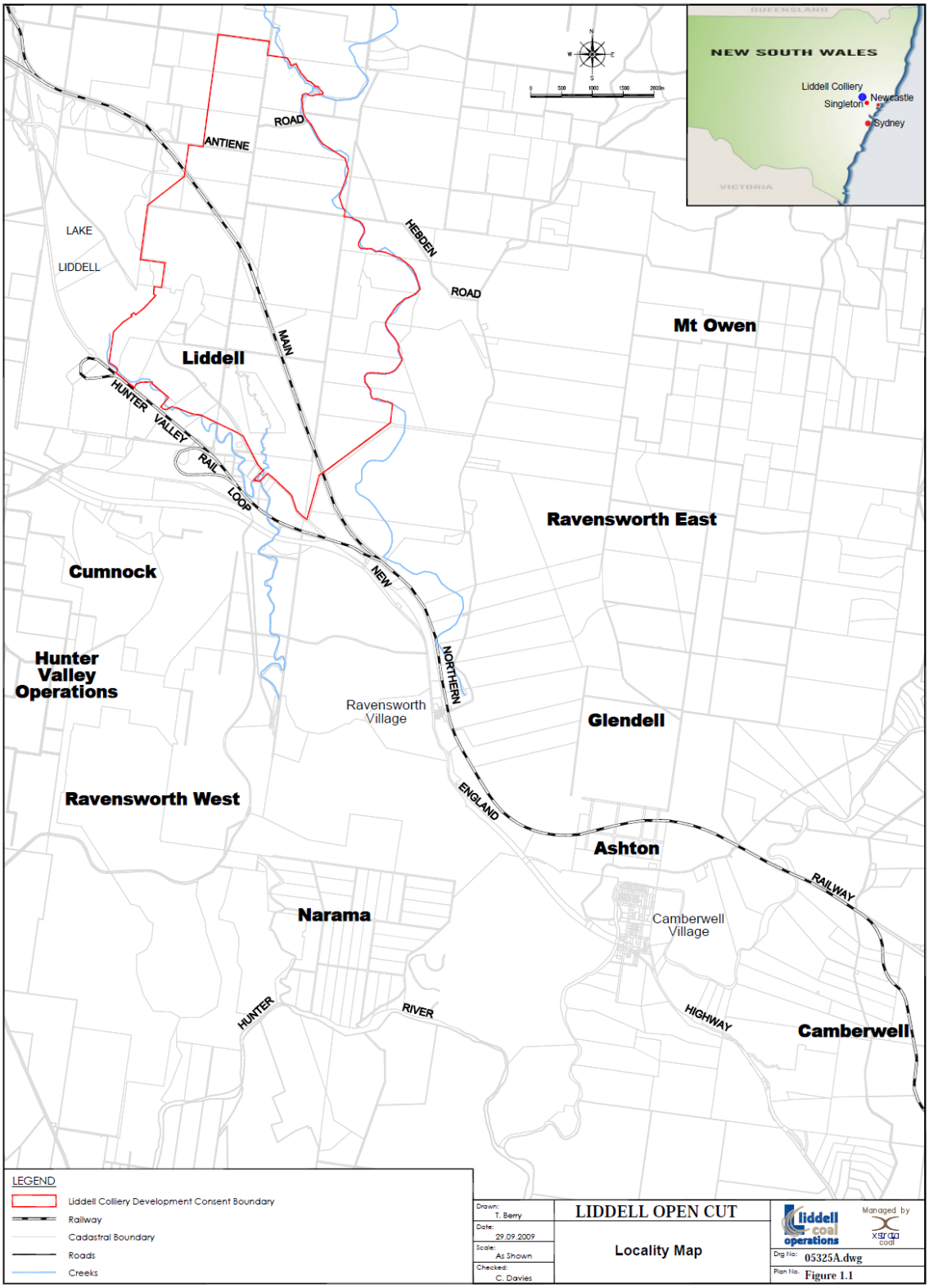


Figure 1.1

Locality Map

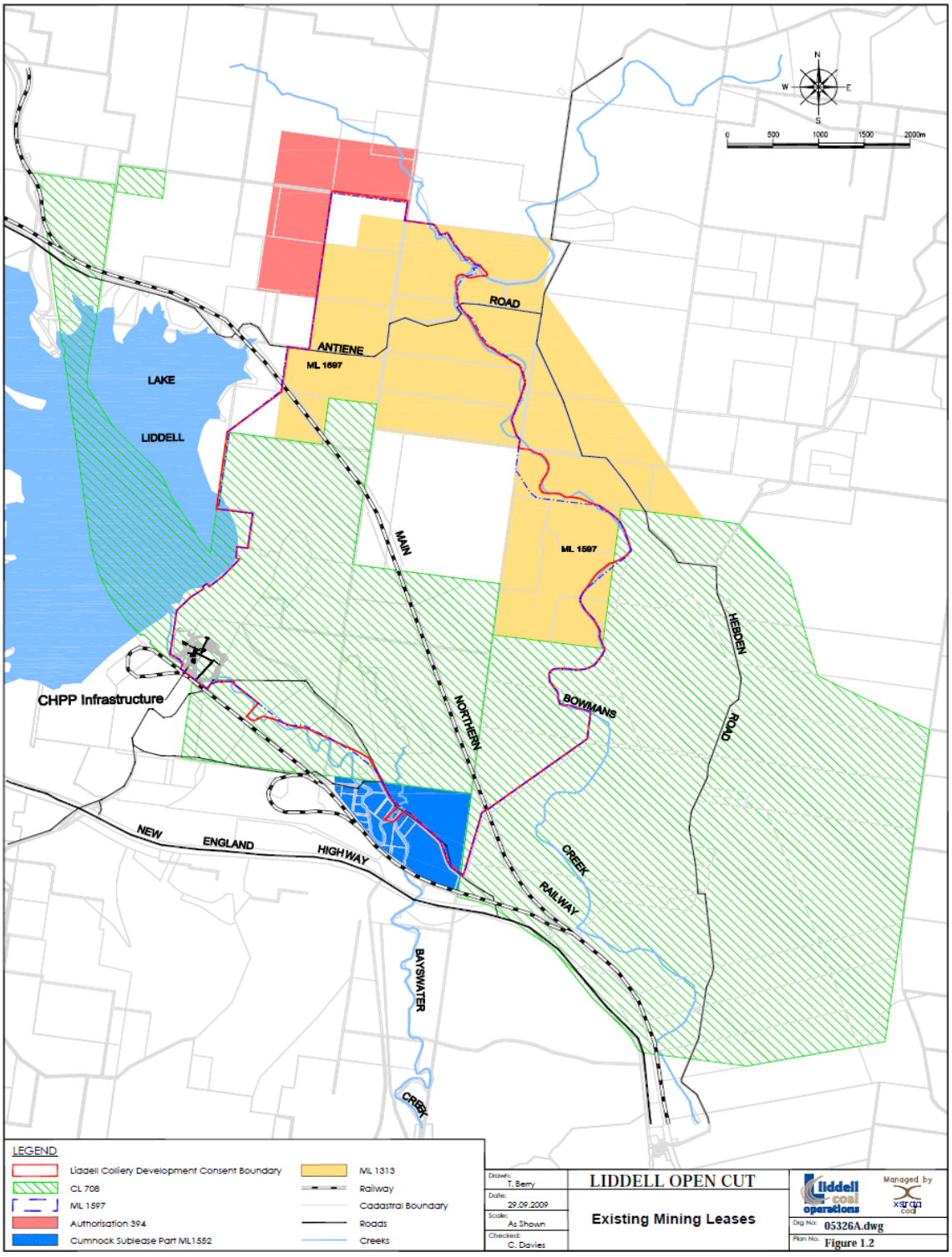


Figure 1.2

Existing Mining Leases

Table 1.2 - Surface Water Extraction Licences

Locality	Licence No.	Holder	Use	Annual usage (ML)	Annual Allocation (ML)
Bowmans Creek	20SL034454	Savage Resources Limited	Irrigation	Nil	50
Bayswater Creek	20SL038644	Savage Coal Pty Ltd and Others	Industrial	Nil	100
Hunter River via Macquarie Generation	20SL060513 20AL200741 WAL7815	Liddell Tenements Pty Ltd	Industrial	Nil	20
Swamp Creek	20SL042837	Liddell Coal Operations Pty Ltd	Diversion	Nil	N/A

Savage Resources Limited and Savage Coal Pty Limited are part of the Liddell Joint Venture. Previous licences owned or transferred to Glendell Tenements have been removed due to the commencement of operations at Glendell Coal.

1.1.3.3 Groundwater Licences

Liddell Coal currently holds ten groundwater extraction and monitoring licences. **Table 1.3** outlines the current groundwater licences and the annual usage for 2008/09.

Table 1.3 - Groundwater Licences

Locality	Licence No.	Holder	Lot/DP	Use	Annual Extraction 2008/09 (ML)	Annual Extraction Allocation (ML)
Haz 6	20BL168066	Liddell Tenements Pty Ltd	81/607296	Monitoring	N/A	N/A
Dur 3	20BL168065	Liddell Tenements Pty Ltd	31/837350	Monitoring	N/A	N/A Redundant due to mine operations
LC1	20BL168064	Liddell Tenements Pty Ltd	353/867083	Monitoring	N/A	N/A
Durham 1	20BL168063	Liddell Tenements Pty Ltd	33/862516	Mine Dewatering	0	6000
8 South 3 & 4	20BL168062	Liddell Tenements Pty Ltd	32/870789	Mine Dewatering	2516	6000
Durham 2 & 4	20BL168061	Liddell Tenements Pty Ltd	3/237654	Mine Dewatering	0	1000 Durham 4 redundant
Haz 2	20BL168060	Liddell Tenements Pty Ltd	81/607296	Mine Dewatering	0	5500

Table 1.3 - Groundwater Licences (continued)

Locality	Licence No.	Holder	Lot/DP	Use	Annual Extraction 2008/09 (ML)	Annual Extraction Allocation (ML)
ALV1, ALV2, ALV3, ALV4, ALV7, ALV8	20BL168053	Liddell Coal Operations Pty Ltd	43/654013 201/848078 4/255403 81/607296 6/255403 32/545601	Monitoring	N/A	N/A
463 Hebden Road, Ravensworth	20BL020923 and 20BL020924	Liddell Southern Tenements Pty Ltd	32/545601	Irrigation	0	5 ML each
	20BL017861	Enex Foydell Limited	6/1077004	Irrigation	0	5
M49	20BL171092	Liddell Southern Tenements Pty Ltd	32/545601	Monitoring	N/A	N/A

Enex Foydell Limited is part of the Liddell Joint Venture. Liddell Coal also utilises a groundwater bore (20BL169544) operating under a Part 5 licence held by Hunter Valley Coal Corporation on behalf of Liddell Coal. Liddell Coal is the primary user of this bore however water from this bore is periodically transferred to Mt Owen operations. The maximum annual volume of groundwater than can be extracted from this bore is 2500 ML.

An application for a new Groundwater Licence was made for the M49 bore during the reporting period.

1.1.3.4 Archaeological Permits

Liddell Coal holds a number of archaeological permits issued under the *National Parks and Wildlife Act 1974*. **Table 1.4** presents the permits expired and current, held by Liddell Coal.

Table 1.4 - Aboriginal Heritage Permits

Site	Permit No.	Salvage Date
LID 11, 13, 14, 15, 16, 20, 21, 22, 26, 28	#1577 (dated 26 March 2003) Expired March 2005	14, 15, 23 May 2003 Sites salvaged or destroyed *in situ*
Bowmans Creek 1	#2213 (dated 25 May 2005) Expired November 2005	26 May 2006 to 9 March 2007
Chain of Ponds Site Area (LID 28, 29, 30, 31, 32)	#2348 (dated 3 October 2006) Valid to October 2016	21, 22, 23 November 2006
LID 33	#2741 (dated 2007) Expired 2008	17 August 2007
Bayswater Creek, LID 5, 23, 24, 25	#2896 (dated 18 March 2008) Valid to March 2010	19 March to 3 April 2008 22 September 2008

1.1.3.5 Density Gauge Licences

Five radiation density gauges are operational at Liddell Coal. Details of licences for fixed radiation devices are shown in **Table 1.5**.

Table 1.5 - Radiation Density Gauge Licences

Radionuclide	EPA Registration Number	Nominal Activity	Expiry Date
Am-241	1259	12 GBq	23 June 2010
Cs-137	1260	370 MBq	23 June 2010
Cs-137	20148	370 MBq	1 Dec 2010
Cs-137	20152	7.4GBq	1Dec 2010
Cs-137	20153	7.4GBq	1 Dec 2010

In addition Liddell Coal holds a current licence (Licence No. 28136) to sell or possess radioactive substances. This licence expires on 24 June 2011.

1.1.4 Mining Operations Plan

As a result of the modification to DA 305-11-01 Liddell Coal was required to prepare a new Mining Operations Plan (MOP). The MOP was prepared in accordance with the Department of Primary Industries (DPI) Guidelines to the Mining, Rehabilitation and Environmental Management Process 2006. The current MOP was accepted by the DPI and is valid for the period January 2008 to January 2015.

1.2 Mine Contacts

The contact details for the personnel directly responsible for the environmental management of the Liddell Colliery are shown in **Table 1.6**.

Table 1.6 - Mine Contacts

Name	Position	Company	Contact Numbers
Tony Galvin	Operations Manager	Liddell Colliery	(02) 6570 9919 (M) 0409 841 161
Neil Gibbs	Coal Preparation Plant Manager	Liddell Colliery	(02) 6570 9915 (M) 0428 643 927
Mark Howes	Environment and Community Co-ordinator	Liddell Colliery	(02) 6570 9923 (M) 0419 436 991

1.3 Actions Requested at Previous AEMR Review

A review was not conducted on the 2007-2008 AEMR by the DPI during the currency of this report. It is expected that the DPI AEMR review will be conducted during the 2009-2010 year. Any actions requested at this review will be reported in the 2009-2010 AEMR.

Actions requested at the 2006-2007 AEMR review are ongoing and details are shown in **Table 1.7**.

Table 1.7 – Actions Requested from 2006-2007 AEMR Review

Issue/Observation	Action	Comments
Unsatisfactory levels of dust were being generated by haul trucks during the inspection.	Review dust management procedures and implement measures to control airborne dust at all times. This should include contingency measures for equipment outages and extreme weather conditions.	An additional water cart was hired by the sites principle mining contractor for the summer period in late 2007-early 2008 to assist with reducing dust levels across the site. A procedure for regular dust inspections was also implemented to assist with identifying and managing dusty areas across the site. A dust management training package was also implemented across the site in early 2008 to increase employee awareness regarding dust issues and to reinforce appropriate management techniques to reduce impacts. HVE modify or suspend operations if too dusty.
Major infestations of environmental weeds were observed throughout the Liddell Colliery rehabilitation.	Maintain an integrated weed control program to systematically remove weeds, particularly Galenia, from rehabilitation.	Liddell Coal has developed and implemented a detailed Weed Management Plan and associated treatment schedule for the control of weeds on site. A detailed weed survey was undertaken by HLA Envirosciences at Liddell on the 9th May 2008 to identify key areas of weed infestation. Approximately 25 Ha of Galenia and Pampass Grass was treated during the previous reporting period. Regular weed control works were undertaken during the reporting period.

1.4 Key Performance Indicators for Liddell Colliery

The following **Table 1.8** provides an overview of the key performance indicators for Liddell Colliery during the reporting period.

Table 1.8 - Key Performance Indicators for Liddell Colliery

Economic Indicators	
Coal ROM (t)	4,851,400
Employees	233
Environmental Indicators	
Land area rehabilitated during reporting period	6 ha
Potable water consumed	3.881 ML
Average annual depositional dust range	1.5 to 5.4 g/m^2/month
Total Suspended Particulate exceedances	1[1]
PM_{10} dust exceedances due to Liddell Colliery activities	5[2]
Percentage of noise samples exceeding criteria	Nil
Number of blasts exceeding residential criteria	1[3]
Social Indicators	
Complaints	9

[1] Ravensworth Farm TSP (HVAS 13) exceeded annual average criteria of 90μg/m^3 (91μg/m^3). Located on Liddell owned property

[2] Located on Liddell owned property. A review of meteorological data from the days criteria were exceeded with predominant winds in brackets: 9/8/08 (NW); 20/9/08 (NNW); 2/10/08 (W); 31/12/08 (WNW); 6/1/09 (W).

[3] An independent consulting firm, *Peter Bellairs Consulting Pty Ltd*, was engaged to analyse the results and found "*that the initial 122.4 dB(L) reading for the Liddell Blast on the 27th April fired at 13:19:45 is not due to the blast but wind. It was recommended that the 'Scrivens' monitor air overpressure measurement be recorded as less than or equal to 110 dBL."*

2.0 Summary of Operations During 2008-2009

An aerial photograph of the Liddell Colliery operations as at June 2009 is shown in **Figure 2.1**.

2.1 Exploration

There were two boreholes drilled for seam gas determination during the reporting period.

2.2 Land Preparation

Land preparation at Liddell Colliery is undertaken in accordance with the Liddell Colliery MOP. During the reporting period, there were no variations from the land preparation practices outlined in the MOP. Land preparation ahead of mining operations involves the construction of appropriate erosion and sediment control structures, the clearing of vegetation and stripping and stockpiling of topsoil.

2.2.1 Clearing

Land disturbance is minimised by clearing the smallest practical area of land for the shortest possible time. This is achieved by:

- limiting the cleared width to that required to accommodate excavation plus areas required for access, overburden emplacement and topsoil stockpiling; and

- programming the works so that only the areas which are actively being excavated are cleared.

- the implementation of erosion and sediment controls in disturbed areas to control and manage dirty water.

Vegetation cleared during land preparation was cleared in accordance with Liddell Coal Environmental Procedure for Site Clearing and the control measures outlined in the Environmental Assessment for Modification to Liddell Colliery Development Consent (EA).

2.2.2 Topsoil Stripping and Handling

Approximately 6.7 hectares equal to 10,050 m^3 of topsoil was removed ahead of open cut mining during the reporting period.

To ensure topsoil is managed effectively at Liddell Coal:

- soils are stripped in optimum moisture conditions, not in wet or dry conditions;

- stripped material is placed directly onto reshaped overburden and spread where possible;

- soils are strategically located in stockpiles not exceeding three metres in height; and

- stockpiles are sown and fertilised as soon as possible to prevent weed growth.

2.3 Construction

During the reporting period, construction activities included completion of the new office and workshop complex as described in detail in the previous AEMR. The layout of the new facilities is shown on **Figure 2.3**.

Numerous other construction activities were undertaken and completed during the previous reporting period which included a new Coal Handling Preparation Plant (CHPP) facility **Figure 2.2**. Demolition of the old CHPP is proposed during the 2009-2010 reporting period.

Figure 2.1

Liddell Colliery Operations

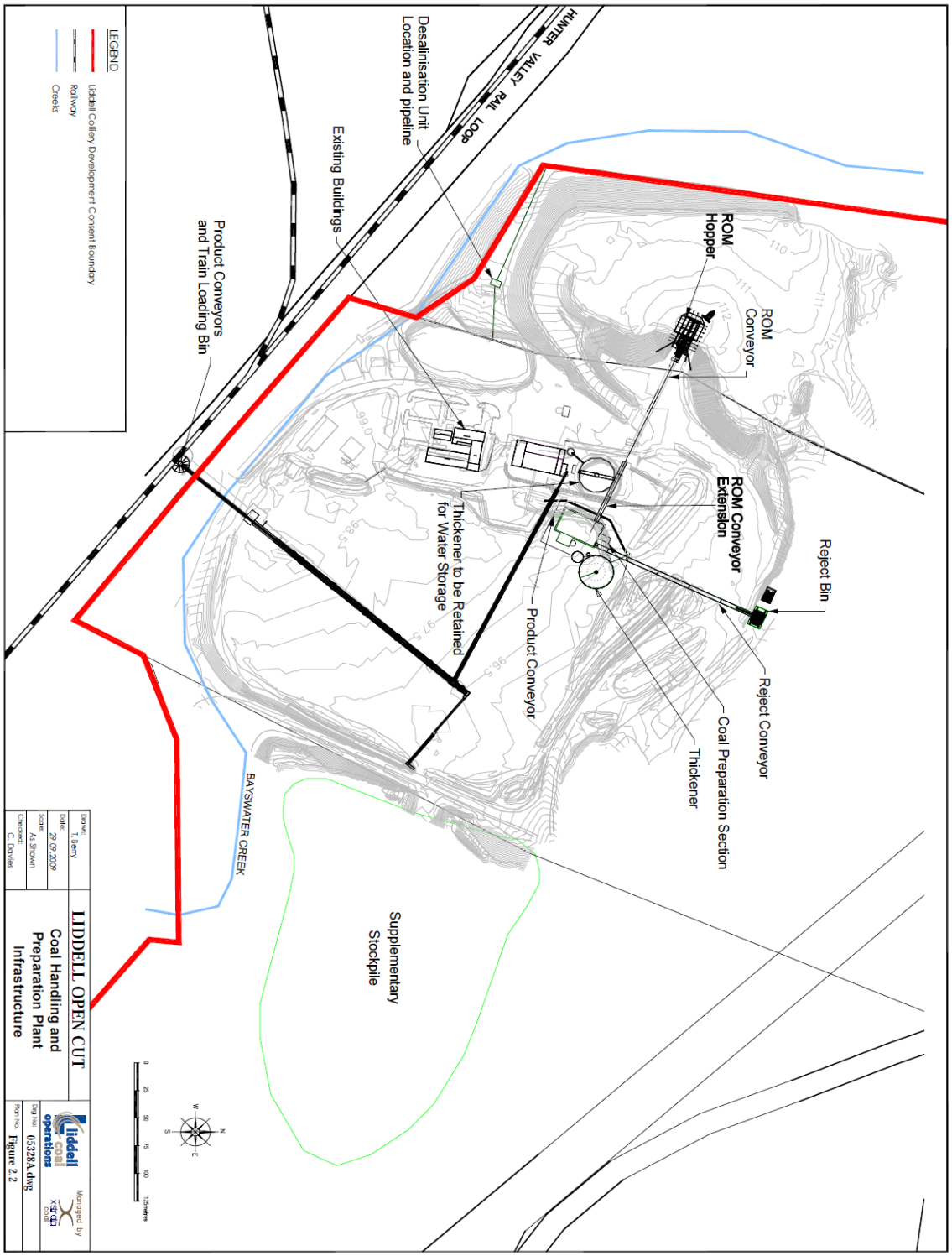


Figure 2.2

Liddell Colliery Operations Coal Handling and Preparation Plant Infrastructure

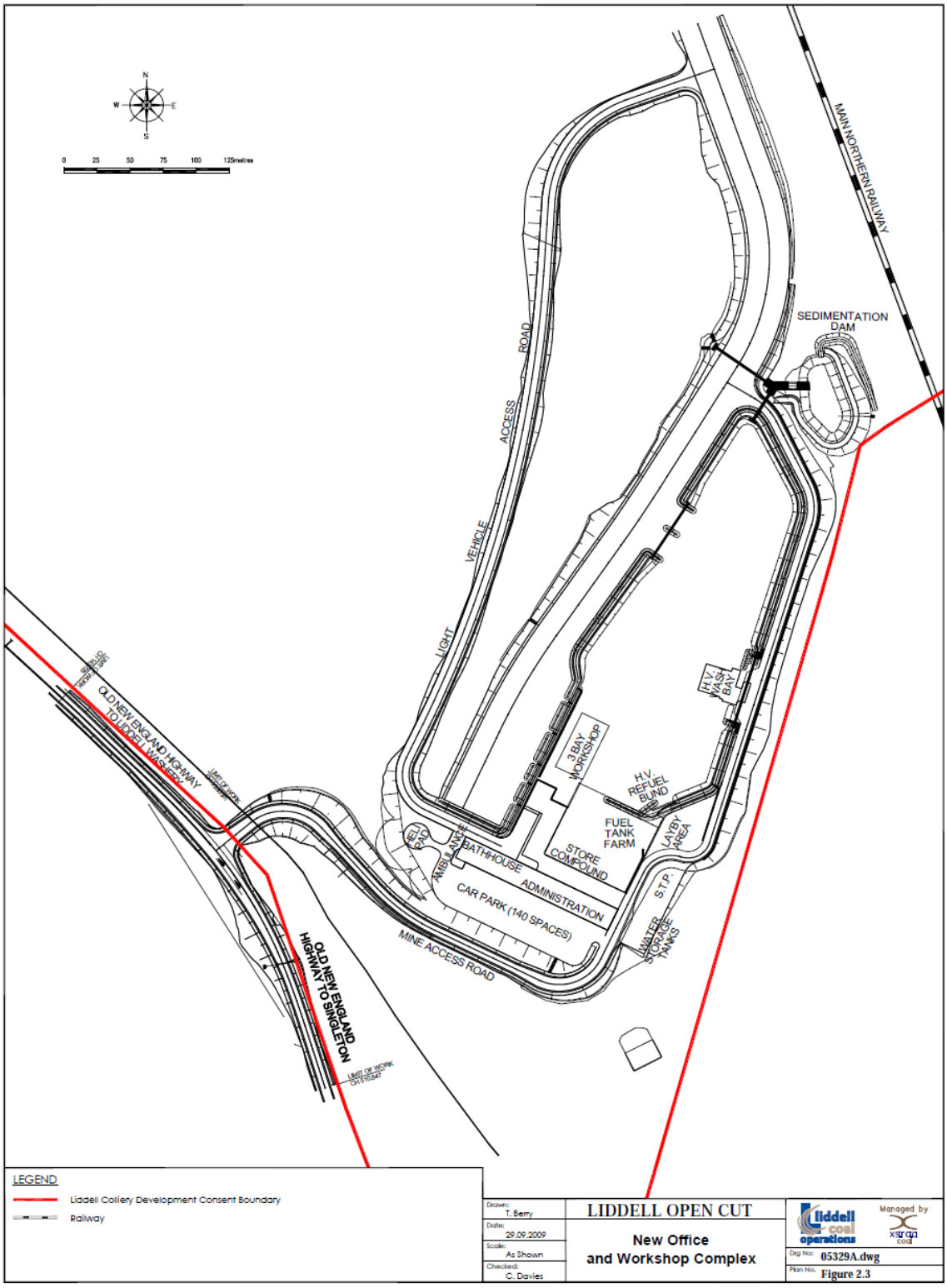


Figure 2.3

Relocated Office and Workshop Complex

2.4 Mining

2.4.1 Mining Operations during 2008-2009

Open cut mining is undertaken at Liddell Colliery using hydraulic excavators and trucks. The mining equipment is operated and maintained by the sites principle mining contractor, Hunter Valley Earthmoving Company Pty Limited (HVE).

During the reporting period, active mining areas included South Pit, the Railway Block and Reservoir Pit (**Figure 2.1**). Mining activities were carried out generally in accordance with the Liddell Colliery MOP. There were no major changes to mining operations during the reporting period.

Mining operations were undertaken with the mining equipment listed in **Table 2.1**.

Table 2.1 - Mining Equipment Fleet for Open Cut Operations as at June 2009

Type	Model	Capacity	Units
Waste Machinery			
Hydraulic Excavator	Hitachi EX5500	29m^3	1
Hydraulic Excavator	Leibherr 994	20m^3	2
Hydraulic Excavator	Leibherr 996	36m^3	4
Rear Dump Trucks	Caterpillar 793	218t	18
Rear Dump Trucks	Caterpillar 789	170t	11
Drill	Reedrill SK50I	250mm	2
Drill	Sandvik D55SP	250mm	1
Coal Machinery			
Hydraulic Excavator	Hitachi EX1900	12m^3	1
Rear Dump Trucks	Caterpillar Cat777	85t	4
Ancillary Equipment			
Bulldozer	Caterpillar D9	-	1
	Caterpillar D10	-	11
Grader	Caterpillar 16H	-	3
Water Cart	Caterpillar 777	-	1
	Caterpillar 773	-	2
	Volvo	-	1
Wheel Loader	Caterpillar 970	-	1
Service Vehicles	Volvo	-	3

A summary of coal production and waste material production is provided in **Table 2.2**.

Table 2.2 - Production and Waste Summary

	Production		
	Prior Reporting Period To June 2008	Current Reporting Period to June 2009	Next Reporting Period to June 2010 (estimated)
Topsoil stripped (m^3)	34,365	10,050	10,200
Topsoil used/spread (m^3)	3,000	6000	5000
Waste rock (m^3)	22,161,247	60,543,472	32,095,000
ROM Coal (tonnes)	4,162,296	4,851,400	6,195,000
Processing waste (reject) (tonnes)	840,043	972,585	1,793,000
Product coal (tonnes)	2,759,048	3,508,871	4,402,000

The total ROM coal mined during the reporting period was 4,851,400 tonnes. No ROM coal was received from Cumnock No. 1 Colliery during this reporting period. ROM coal processed during the reporting period totalled 4,481,456 tonnes. As per development consent DA 305-11-01 Liddell Coal have approval for production of 8.0 Mt of coal per year.

2.4.2 Forecast Production for 2009-2010

Open cut operations in the 2009-2010 reporting period are expected to produce 6,2195,000 tonnes of ROM coal, producing 1,793,000 tonnes of reject and 4,402,000 tonnes of product coal with a yield of approximately 71 per cent.

2.5 Coal Handling

2.5.1 Coal Stockpiles

Coal is transported from the open cut pits by haul trucks to the CHPP ROM Coal Hopper for direct feed into the Liddell Coal Preparation Plant or to one of the on-site ROM Coal stockpiles. The coal is stockpiled in a ROM stockpile prior to processing by the CHPP. Following processing by the CHPP, the coal is stockpiled in a product stockpile with a capacity for 400,000 tonnes before being railed to the Port of Newcastle.

2.5.2 Processing Throughput

The CHPP produces both semi soft coking coal and thermal coal. The CHPP has a capacity of 8 Mtpa and operates 24hrs a day, 7 days a week with the exception of a 10 to 12 hour period every Tuesday when the CHPP is stopped for maintenance.

The total ROM coal processed at Liddell's CHPP during the reporting period was 4,851,400 tonnes. The total product coal produced was 3,508,871 tonnes with 972,585 tonnes of coarse and fine rejects generated.

2.5.3 Product Coal Sale and Transport

The product coal handling facilities include dual product conveying systems from the plant to stockpiles. Facilities also separate stockpiling and reclaiming for semi-soft coking coal and thermal coal.

In accordance with condition 38 (b) of DA 305-11-01, transport of ROM coal to and from Cumnock No. 1 Colliery was restricted to internal mine haul roads, Pikes Gully Road and Liddell Station Road. No ROM coal was received from Cumnock No. 1 Colliery during this reporting period however 152,657 tonnes of ROM coal was transported to Cumnock No. 1 Colliery from Liddell Colliery.

During the reporting period, 3,508,871 tonnes of product coal including export thermal coal and export semi soft coal were railed to the Port of Newcastle by trains along the Main Northern Railway Line.

In accordance with Schedule 3, condition 42 of DA 305-11-01, Liddell Coal monitored coal haulage movements as part of standard operations. Liddell Coal generated 423 loaded coal haulage train movements during the reporting period.

Daily train haulage movements are presented in **Appendix 1**.

There were no sales of tailings during the reporting period and no truck movements for the transportation of tailings along the New England Highway

2.6 Waste Management

Waste management is undertaken in accordance with the Liddell Colliery Waste Management Plan. Reasonable and feasible measures to minimise waste generated on site will include the future establishment of a Total Waste Management System on site including Liddell Coal and the Mining Contractor responsible areas. The objectives of the management plan are:

- minimise waste generation and ensure re-use and recycling of waste streams, where possible;
- maintain compliance with conditions of development consent, environment protection licence (No. 002094) and related legislation with regards to waste storage and disposal;
- ensure appropriate segregation, storage, transportation and disposal of waste generated on site;
- ensure proper hydrocarbon management and wastewater and sewage treatment; and
- provide education and training programs to site personnel and contractors regarding waste minimisation measures and proper waste handling and disposal.

2.6.1 Sewage Treatment and Disposal

Sewage generated by the CHPP and associated workshop and offices is collected in the CHPP sewage treatment tanks, and pumped to the aerated sewage treatment plant prior to disposal at the designated effluent irrigation area. Where required from the results of a regular inspection programme, deactivated sludge from the treatment plant is periodically removed by a licensed contractor for disposal.

Sewage generated by the new office and workshop complex is treated by a waste water treatment system to a quality suitable for human contact. The treated effluent is pumped to

the sites main mine water storage dam (Dam 13) for re-use in the mine water system (see section 2.7).

Both waste water treatment plants are regularly maintained and sampled by a qualified contractor.

2.6.2 Fuel Containment

Fuel, lubricants and waste oil for the open cut operations are stored in a bulk fuel area at the new office and workshop complex, which consists of five tanks with capacities up to 110 kL. The bulk fuel storage area is bunded and linked to an oil water separator located nearby. The area also includes a drum storage pad containing bulk lubricants and oil drums.

The fuel, lubricants and waste oil for the CHPP is stored within two tank farms located adjacent to the CHPP workshop. Both tank farms are contained within a concrete bund.

The waste oil tanks located on site are emptied by licensed contractors, Transpacific Industries (Nationwide Oil), as required. All storage of fuels and chemicals is conducted in accordance with Liddell Coal's Environmental Management System, Work and Environmental Procedure – Storage of Fuel and Chemicals.

2.6.3 Oil and Grease Containment and Disposal

Oil and grease containment and disposal is managed by two different systems, one system at the open cut operations and the second system at the CHPP workshop washdown facilities.

Rainfall runoff from the re-fuelling bays and tank farm bund at the open cut operations site is directed into a large capacity first flush holding tank and through a small secondary oil water separator. The treated water released from the oil water separator is stored in a designated on site dam. The oil refuse is disposed of by a licensed contractor on a monthly basis.

The second oil water separator is located adjacent to the workshop wash down and refuelling area at the CHPP. The rainfall and wash down runoff is reticulated via grit traps to a first flush holding tank prior to controlled flow through the oil water separator. If excess runoff overflows from the first flush tank, the water passes directly to the retention dam adjacent to the diesel workshop before being reused by the CHPP.

Oily water collected on site is removed by a licensed waste reduction and disposal contractor, Valley Vac Trucks.

2.6.4 Rubbish Disposal

The main sources of waste at Liddell Colliery include:

- fuel and fuel filters;
- tyres;
- batteries;
- scrap metal;
- paper and cardboard; and

- domestic waste.

All waste generated by Liddell Coal's operations is stored onsite and removed for recycling or disposal by licensed contractors who are listed below.

Tyres – Klinge & Co M'brook (heavy vehicle); Maitland Diesel (light vehicle)

Solvent/filters/rags – Bulbeck EnviroSolutions

Batteries – Maitland Diesel

Conveyor belt – Port Hunter Conveyors

Pallets/General waste – Thiess Services

Scrap Metal – Metal Corp

2.7 Water Management

2.7.1 Water Management System

Water management is one of the key operational constraints at Liddell Colliery. The current integrated water management system at Liddell Colliery has been designed to address four main issues:

- surface water runoff to existing pits and operational areas;
- groundwater seepage in open cut and old underground workings;
- provision of mine operation water for the coal handling and preparation plant (CHPP) and dust suppression; and
- off-site discharges and water sharing arrangements.

The groundwater environment in the vicinity of Liddell Colliery is complex due to both the local geology and historical seam dewatering that has occurred during previous and current mining operations. Clean water diversion banks and sediment ponds provide a segregated system for the handling of clean and dirty water. Water is used for various purposes including:

- coal washing;
- dust suppression;

Excess water is:

- stored in on-site dams;
- discharged under the Hunter River Salinity Trading Scheme (HRSTS);
- transferred to other mining and associated operations.

The existing water management system at Liddell Colliery (refer to **Figure 2.4**) operates as follows:

- clean water runoff is diverted away from disturbed areas;
- sediment laden runoff is collected in pit floors or sedimentation dams;
- water from these storages is transferred to Dam 13, which provides a central storage for the site, via a number of staging dams and pumps;
- Dam 13 is the main mine water dam which supplies the Liddell Colliery CHPP and from time to time the Howick, Newdell and the Cumnock CHPPs as well as other allied operations;
- water from Mt Owen operations is occasionally stored in the underground workings during periods of excess water;
- water is supplied to Dam 13 from underground storage in the Pikes Gully and Liddell seam workings of the former Hazeldene and Liddell underground coal mines via the 8 South 1 and 2, Hazeldene 1 and 2 and Mt Owen shallow and deep water bores. These have a combined output of approximately 15 ML/day;
- surplus water in Dam 13 may be discharged into Chain of Ponds Creek at a current maximum rate of 100 ML/day in accordance with the HRSTS regulations;
- surplus water can also be pumped back into the underground workings when discharge opportunities under the HRSTS are unavailable;
- coarse rejects are dewatered and co-disposed in pit spoils;
- tailings from the Liddell Colliery CHPP are pumped to Antiene Void;
- tailings supernatant migrates northward and is decanted in to the Antiene East holding dam which overflows into Dam 4. Water recovered from Dam 4 is pumped back to Dam 13 via the Fire Dam;
- excess water is held in Dam 4 where a portion percolates downward into the old Hazeldene underground workings;
- runoff in the Liddell Colliery CHPP area is contained in a local sump and then recycled into the CHPP for use as process water in a closed operating loop.

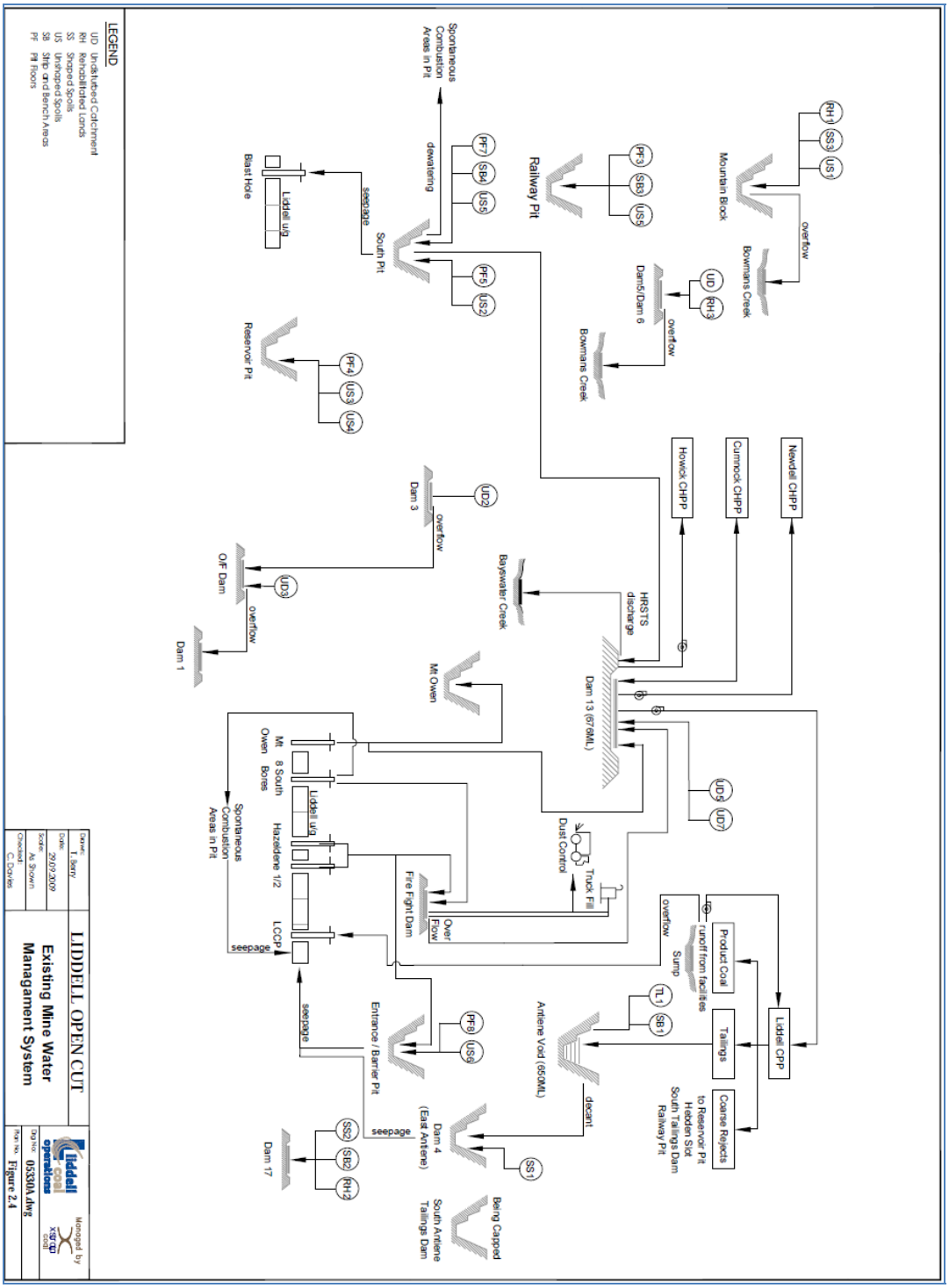


Figure 2.4

Liddell Coal

Water Management System

2.7.2 Water Consumption

The water uses at Liddell Colliery include:

- Coal Processing Plant (CPP) uses;
- tailings export;
- haul road dust suppression usage;
- wash down water and stockpile dust suppression; and
- potable water usage.

Water is also lost on site through evaporation from dam water surfaces.
Measures to minimise water use include:

- monitoring and review of the potable water used on site, taking into account the increase in mine personnel due to an expansion of operations;
- the new CHPP has been designed to be more efficient in the use of raw water used for coal washing compared to the older plant.

Table 2.3 represents water consumed, discharged and exported during the reporting period. A total of 3.9 ML of potable water and 2920.17 ML of raw water were used during the reporting period. Six discharge events occurred during the reporting period. During February and April 2009 a total of 264.78 ML of water was discharged in accordance with the HRSTS, refer to **Section 3.6.4** for monitoring data from the discharge events.

Table 2.3 - Water Consumption at Liddell Colliery for the 2008 - 2009 Reporting Period

	2008						2009						Total
	Jul	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	
Raw Water (ML)	220.24	248.64	233.65	287.57	297.78	293.76	371.63	274.88	237.87	157.92	149.74	146.50	**2920.168**
Export (ML)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Potable (ML)	0.225	0.225	0.237	0.302	0.329	0.420	0.312	0.397	0.348	0.368	0.412	0.309	**3.884**
Discharge (ML)	0	0	0	0	0	0	0	237.78	0	27.00	0	0	**264.776**

The raw water use at Liddell Colliery has increased from 2174.97 ML in the 2007-2008 reporting period to 2920.17 ML during the 2008-2009 reporting period.

During the 2008-2009 reporting period, Liddell Coal did not export any water to other mining operations. This is a significant reduction compared to 124.41 ML exported during the 2007-2008 reporting period.

2.8 Hazard Material Management

All open cut mining operations are undertaken by Hunter Valley Earthmoving (HVE). As such HVE is responsible for the management of all hazardous materials, including explosives, at the open cut.

2.8.1 Inventory of Material Data Sheets

Hazardous materials at Liddell Colliery are managed by the site's ChemAlert data management system at the CHPP and ChemWatch system at the open cut. Hard copies of the Material Safety Data Sheets are held at each site and in locations nominated by the respective Safety Management Plans.

2.9 Other Infrastructure Management

There is no additional infrastructure at Liddell Colliery which is not included in the management of the CPP or Open Cut.

2.10 Modification to Development Consent

There were no modifications to the development consent during the reporting period.

3.0 Environmental Management and Performance

3.1 Environmental Risk Identification

Liddell Coal undertook a Broad Brush Environment and Community Risk Assessment in December 2008 as part of the review process of the EMS.

The risk assessment was undertaken using the Xstrata Risk Management system and was specific to Liddell Coal activities. The methodology used for the internal risk assessment is presented in **Table 3.1** (Risk Ranking Table), **Table 3.2** (Risk Classification), **Table 3.3** (Consequence Table) and **Table 3.4** (Probability Table).

Table 3.1 - Risk Ranking Table

Maximum Reasonable Consequence (MRC)	Probability (P)				
	A	B	C	D	E
1	1	2	4	7	11
2	3	5	8	12	16
3	6	9	13	17	20
4	10	14	18	21	23
5	15	19	22	24	25

Table 3.2 - Risk Classification

1 to 11 (Red)	**High**
11 to 19 (Yellow)	**Medium**
20 to 25 (Green)	**Low**

Table 3.3 - Consequence Table

Score	People	Property	Environment	Community
1 Catastrophic impact	Multiple fatalities. Major permanent negative health impacts on a large number of people.	Unplanned mine closure. Greater than $10M.	Disastrous environmental impact, with long-term effect, requiring major remediation, regulatory intervention or premature closure of the operation.	Public international condemnation. Major breakdown of social order in affected community.
2 Severe negative impact	Single fatality. Severe irreversible disability or impairment (PDI).	Could cause major damage $1M - $10M.	Serious environmental impact, with medium-term effect, requiring significant remediation or resulting in prosecution.	Loss of community's economic viability. Significant damage to reputation of the operations.
3 Major negative impact	Major injury to one or more persons. Severe health impacts on a number of people.	Could cause major damage $100K - $1M.	Moderate, reversible environmental impact with short-term effect, requiring moderate remediation, such as a reportable incident not likely to result in prosecution, e.g.: a minor water discharge.	Significant public criticism (e.g. community complaints) NGO or Media 'taking up the issue'. Major negative impact on economic viability.
4 Negative impact	Significant reportable injury (MTI, or less than 5 days RWI or LTI). Major impact on health of several people.	Could cause moderate damage $10K - $100K.	Minor, reversible environmental impact, requiring minor remediation such as a non-reportable environmental incident e.g.: a minor oil spill.	Flare up of issues in affected communities. Media criticism.
5 Minor negative impact	Minor injury. Slight negative impact on individual health.	Could cause minor damage <$10K.	Negligible, reversible environmental impact, requiring very minor or no remediation.	Slight negative impact on individuals in local community.

Table 3.4 - Probability Table

Code	Probability
A	Almost certain to happen (everyday/weekly event).
B	Likely to happen at some point (typically once a month).
C	Moderate: possible, heard of so it might happen (typically once a year).
D	Unlikely: not likely to happen (typically once every five years).
E	Rare: practically impossible (typically once every twenty five years).

The purpose of the assessment is to reduce the risks associated with hazards to a level As Low As Reasonably Practicable (ALARP) using appropriate controls. Ideally, at least two hard barriers and one soft barrier should be utilised between the hazard/risk and the personnel. Hard barriers include engineering type controls and soft barriers include training or personal protective equipment.

Using the Xstrata Standard risk matrix, the risks identified for Liddell Coal's operations were regarded as medium to low.

During the risk assessment workshop one activity was identified as high risk. This was associated with the aspect of vibration from blasting activities having a potential impact on adjacent coal operations with the potential loss of coal resources.
No activities were classified as catastrophic hazard although a number of activities were classified as high hazard.

A summary of activities classified as high hazard from the risk assessment workshop are detailed in **Table 3.5.**

Table 3.5. Activities classified as high hazards from Liddell Coal Operations ECBBRA workshop.

Activity	Aspect	Potential Impact	Recommended Action
Blasting	Vibration from blasting	Loss of resource	• Develop and finalise consultation strategy (to include agreement on blast design) • Review of blast design. • Complete issue specific risk assessment.
Rehabilitation	Development of agreed rehabilitation closure criteria with stakeholders –failure to reach agreement	Delayed sign-off on rehabilitation	Develop closure criteria and implement rehabilitation monitoring in accordance with XCN HSEC STD 5.13 and Liddell's rehabilitation audit May 2008.
Land Management	Bushfire management	Damage to infrastructure/property	Review bushfire management procedure.
Land Management	Bushfire management	Loss of life or injury to porsonel or community	Review bushfire management procedure.
Water Management	Dam management- dam failure- dam 13	Geotechnical or piping failure of dam wall- contamination of receiving waters from salinity and sediment	Continue formal inspection regime to assess dam condition.

A consolidated action plan to address identified risks is included in the Liddell Coal Operations Environment and community Broad Brush Risk Assessment 2009.

3.2 Environmental Management System

Liddell Coal has developed and implemented an EMS generally in accordance with ISO 14001. The principle focus of Liddell Coal's EMS is on continual environmental improvement. The EMS was first developed in 2001 and was updated in 2003 and again in the previous reporting period in response to the modification of DA 305-11-01. The Environmental Management Strategy was developed in accordance with condition 1, schedule 5 of DA 305-11-01 and updates the Liddell Coal EMS.

The Environmental Management Strategy provides the framework for environmental management during the construction and operation of Liddell Colliery to ensure compliance with development consent conditions and other legal requirements. The Strategy builds on the environmental management controls outlined in the EA prepared for the project.

The Environmental Management Strategy was developed generally in accordance with ISO 14001, the international standard for environmental management systems and is consistent with the Xstrata Coal NSW Environmental Management Framework (Version dated 14/06/2006). The Strategy applies to all components of Liddell Coal's operations.

Implementation of the Environmental Management Strategy assists in minimising the environmental impacts of Liddell Coal by facilitating continual improvement in environmental performance.

The EMS includes management plans and system procedures to manage activities on site and hence minimise the risk of impact to the environment. These plans and procedures are prepared and regularly updated to ensure compliance with both development consent, and EPL conditions.

During the reporting period, the new management plans and programs shown below were approved as a result of the modification to DA 305-11-01. The modified consent required the development and implementation of a number of plans and procedures, including those in **Table 3.6**.

Table 3.6 – Liddell Colliery Environmental Management Plans and Programs

Consent Condition	Plan	Submitted	Approval
Schedule 5, Condition 1	Environmental Management Strategy	31 January 2008	February 2009
Schedule 3, Condition 30	Landscape Management Plan Rehabilitation Management Plan Final Void Management Plan Mine Closure Plan	31 January 2008	February 2009
Schedule 3, Condition 35	Aboriginal Cultural Heritage Management Plan	31 January 2008	February 2009

Table 3.6 – Liddell Colliery Environmental Management Plans and Programs (continued)

Consent Condition	Plan	Submitted	Approval
Schedule 3, Condition 23	Water Management Plan Surface Water Monitoring Program Groundwater Monitoring Program Erosion and Sediment Control Plan	31 January 2008	February 2009
Schedule 5, Condition 2	Environmental Monitoring Program	31 January 2008	February 2009
Schedule 3, Condition 19	Air Quality Monitoring Program	31 January 2008	February 2009
Schedule 3, Condition 5	Noise Monitoring Program	31 January 2008	February 2009
Schedule 3, Condition 45	Energy Savings Action Plan	31 January 2008	February 2009

3.3 Meteorological Monitoring

In accordance with the development consent condition 20, schedule 3, Liddell Coal must ensure that a suitable meteorological station is operating in the vicinity of Liddell Colliery. Development consent condition 20, schedule 3, is outlined below:

> By 31 January 2008, the Applicant shall ensure that there is a suitable meteorological station operating in the vicinity of the development in accordance with the requirements in *Approved Methods for Sampling of Air Pollutants in New South Wales*, and to the satisfaction of the DECC and the Director-General.

Liddell Coal was granted permission by the Department of Environment and Climate Change (DECC) and DoP to continue to utilise the Ravensworth and Camberwell meteorological stations until a new on-site meteorological station is installed and in order to satisfy condition 20, schedule 3.

Meteorological conditions from July 2008 to December 2008 were monitored by Ravensworth meteorological station at Glendell, south of Liddell Colliery (refer to **Figure 3.1**). On 31 December 2008 a new meteorological station was installed at Liddell Colliery's office complex. Meteorological conditions at Liddell Colliery were monitored by the on-site meteorological station from 31 December 2008 to 30 June 2009. Due to technical problems at the Glendell station, meteorological data for the month of July 2008 was obtained from the Camberwell Coal meteorological station.

The new meteorological station established at the office and workshop complex was installed and is operated in accordance with the DECC *Approved Methods for Sampling of Air Pollutants in New South Wales 2007* and the requirements outlined in the DECC submission for the Environmental Assessment for the Liddell Colliery Modification to Development Consent.

Rainfall

During the 2008-2009 monitoring period the total annual rainfall was 764.8 millimetres. The highest rainfall of 181.2 millimetres was recorded in February. The driest month was

January, recording only 2.6 millimetres of rainfall. The total monthly rainfall data for the monitoring period is shown on **Figure 3.2**.

Temperature

The temperatures recorded at the meteorological stations varied from -1.5°C to 42.3°C during the reporting period. The minimum value of -1.5°C was recorded in July 2008 and the maximum value of 42.3°C was recorded in February 2009. The temperature data was consistent with standard seasonal patterns.

The annual temperature data is presented in **Figure 3.2**.

Wind and Wind Direction

Seasonal patterns for wind direction are evident at Liddell Colliery. During the summer and autumn months (November to April) wind direction is predominantly south east. In comparison, during the winter and spring months (May to October) the prevailing wind direction is north-west.

The wind speed and wind data is presented in the wind roses in **Figure 3.3** and **Figure 3.4**.

3.4 Air Quality

Air quality monitoring is undertaken in accordance with the Liddell Colliery Air Quality Monitoring Program. In addition, the Liddell Colliery Environmental Monitoring Program, Dust Management Procedure and Spontaneous Combustion Management Plan are used for the ongoing management of air quality. The Air Quality Monitoring Program was developed in accordance with schedule 3 condition 19 of the development consent. As such, the Air Quality Monitoring Program includes a combination of high volume air samplers and dust deposition gauges to monitor the dust emissions of the development, and an air quality monitoring protocol for evaluation of compliance with the air quality impact assessment and land acquisition criteria.

3.4.1 Air Quality Criteria

Schedule 3, Condition 16, of DA 305-11-01 requires that Liddell Coal manage their operations so as to satisfy the relevant DECC air quality criteria for dust deposition and dust concentration. Dust deposition levels refer to the quantity of dust particles that settle out from the air as measured in grams per square metre per month (g/m^2/month) at a particular location. Dust concentration refers to airborne dust and is measured in micrograms per cubic metre ($\mu g/m^3$).

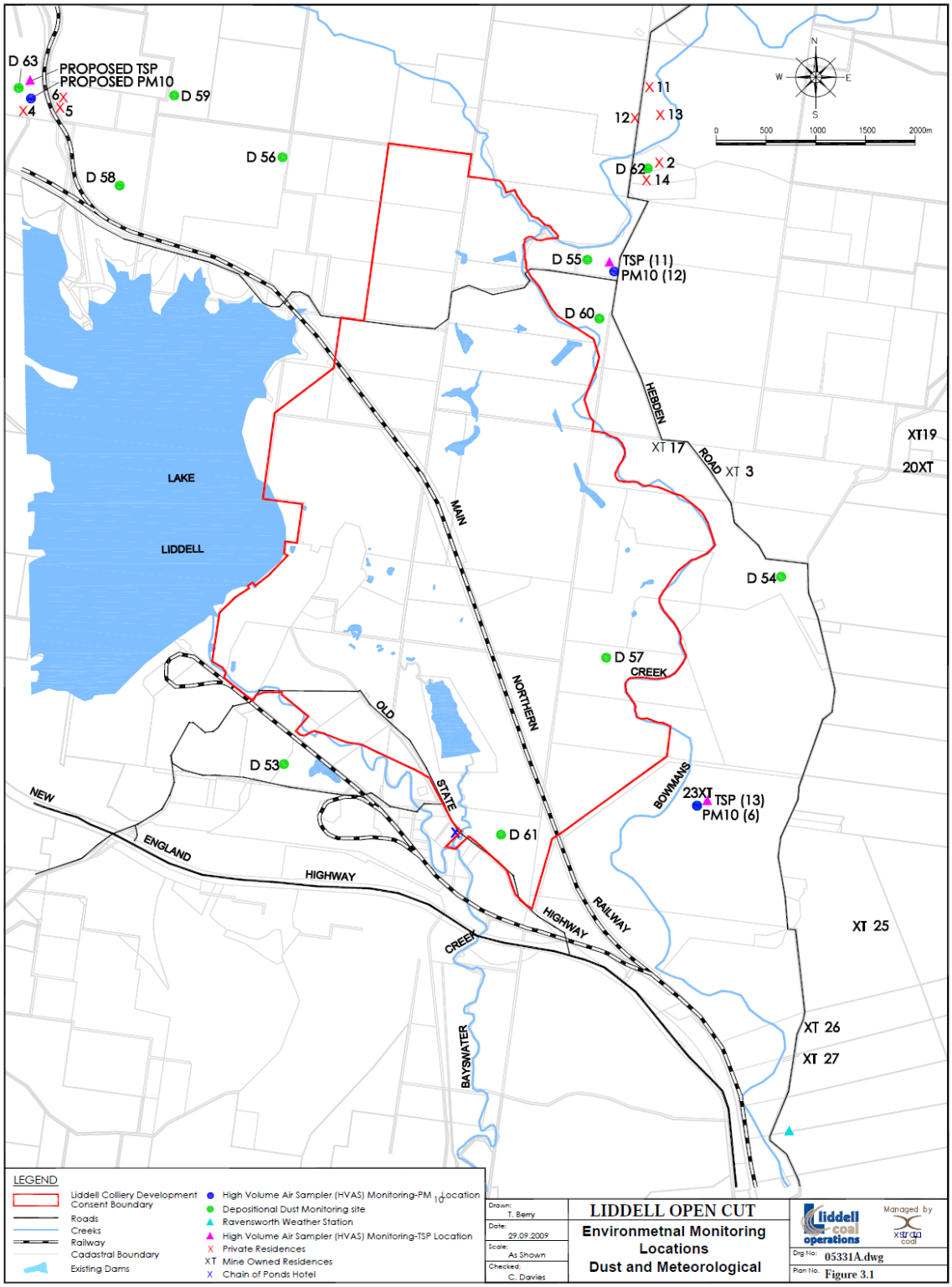
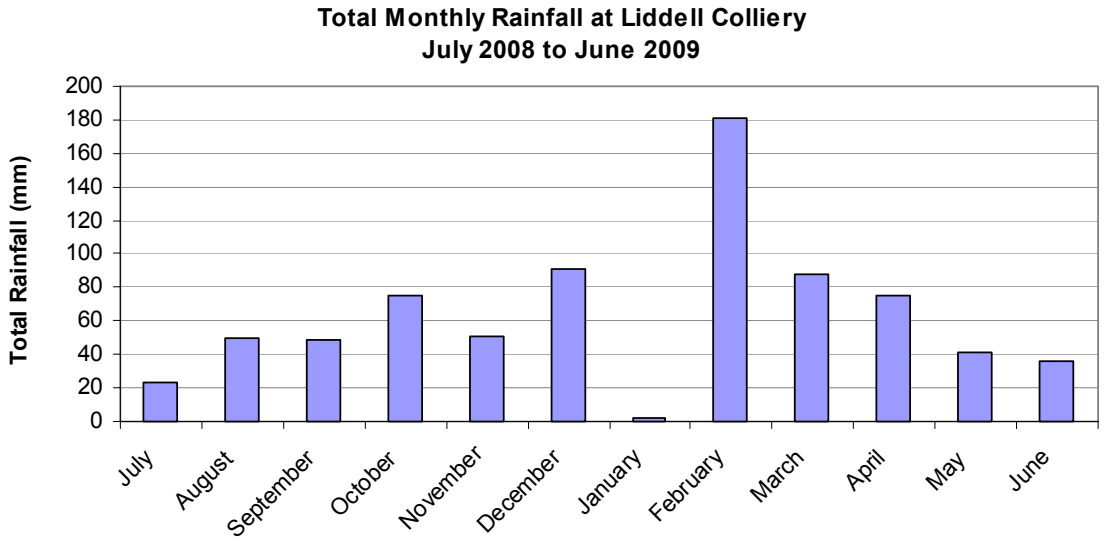


Figure 3.1

Environmental Monitoring Locations: Dust and Meteorological



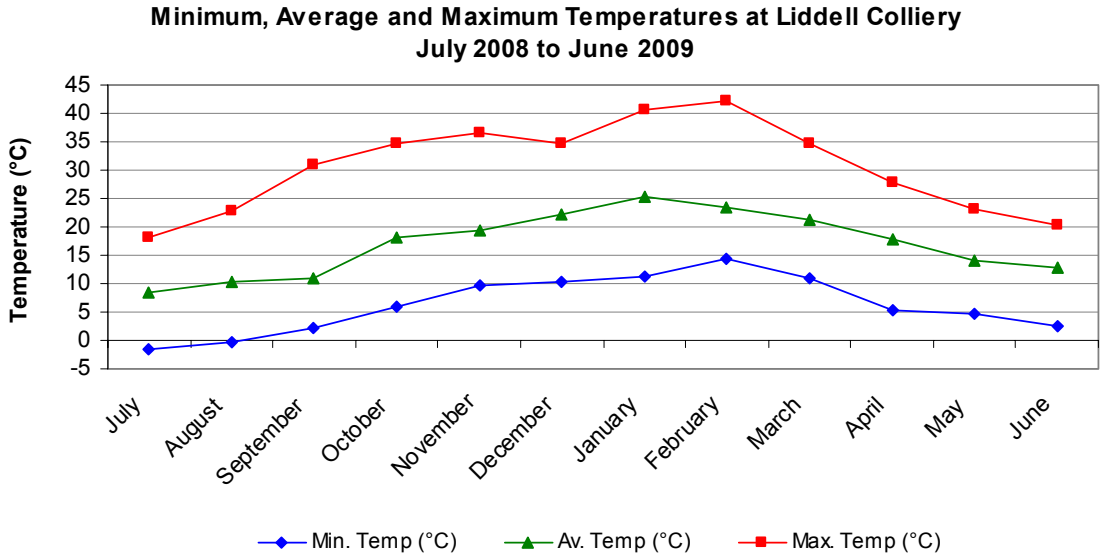
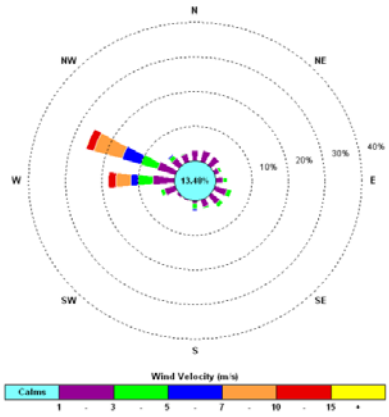


Figure 3.2

Liddell Colliery Rainfall and Temperature 2008-2009

JULY 2008



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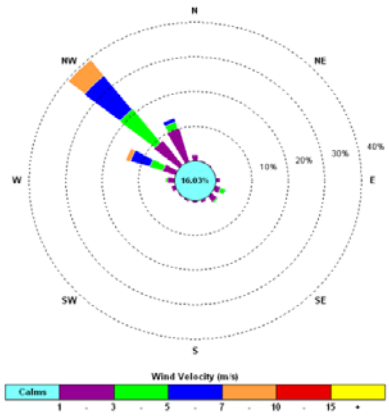

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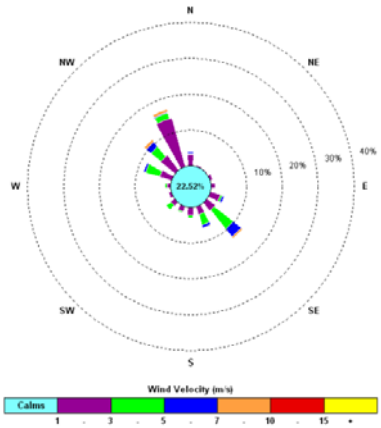
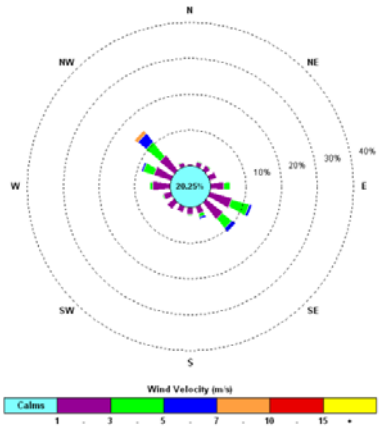


OCTOBER 2008



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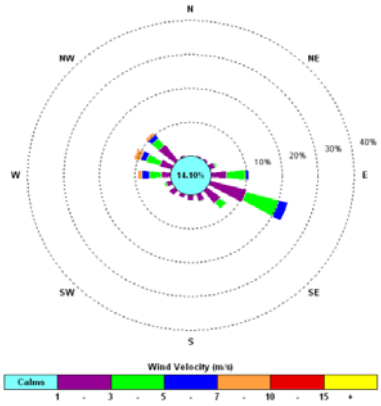


DECEMBER 2008

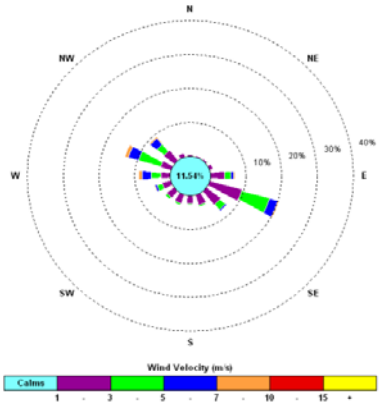
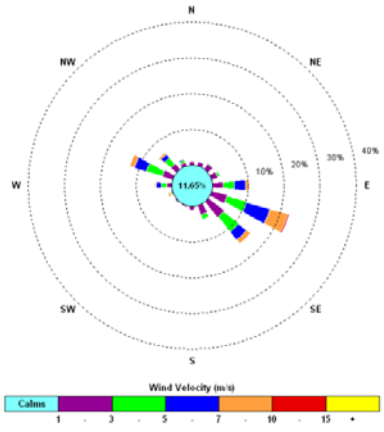


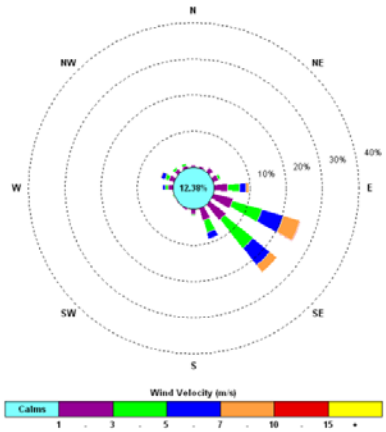
Figure 3.3

Monthly Wind Roses 2008

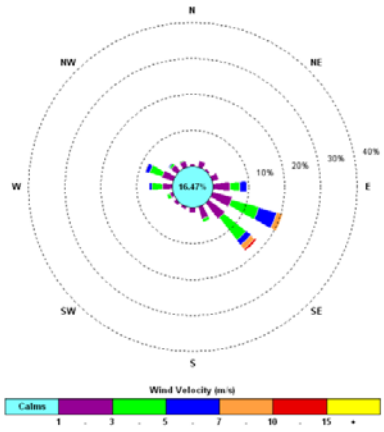
JANUARY 2009



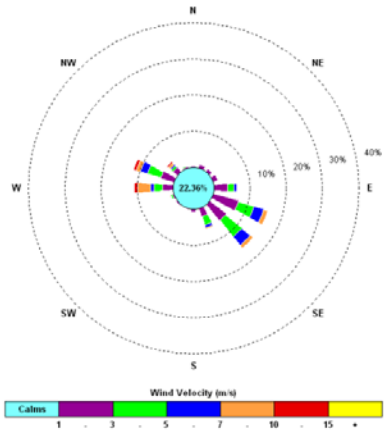
FEBRUARY 2009



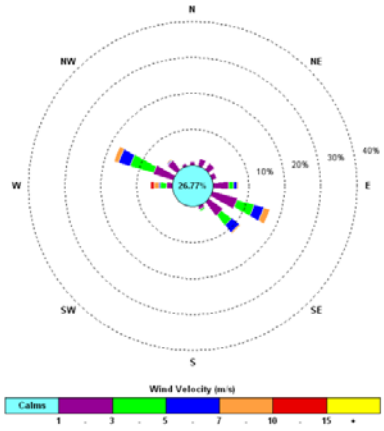
MARCH 2009



APRIL 2009



MAY 2009



JUNE 2009

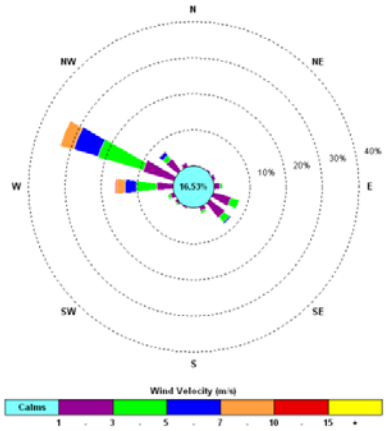


Figure 3.4

Monthly Wind Roses 2009

3.4.1.1 Dust Depositional Impact Assessment Criteria

The dust deposition goals (long term dust fallout goals) are based on an acceptable increase in dust deposition over the existing background levels. Dust deposition goals, as specified in the Liddell Colliery EA, are presented in **Table 3.7**.

Table 3.7 - Dust Deposition Impact Assessment Criteria (Insoluble Solids)

Pollutant	Averaging Period	Maximum increase in deposition dust level	Maximum total deposition dust level
Deposited dust	Annual	2 g/m^2/month	4 g/m^2/month

3.4.1.2 Particulate Matter Goals

Dust concentration is measured as total suspended particulate matter (TSP) and particulate matter of less than 10 microns (PM_{10}). TSP relates to all suspended particles, which are usually in size range of zero to 50 micrometres (μm). Particle sizes larger than 50 μm are measured as depositional dust. PM_{10} refers to particulate matter with a diameter less than 10μm. TSP measurements include PM_{10} particles.

TSP and PM_{10} are compared to long term (annual average) and short term (24 hour maximum) goals. The TSP and PM_{10} goals are summarised in **Table 3.8**, and refer to privately owned land not owned by Liddell.

Table 3.8 - Goals for Particulate Matter Concentrations

Pollutant	Standard/Goal	Averaging Period
Total Suspended Particulate Matter (TSP)	90 $\mu g/m^3$	Annual
Particulate Matter <10μg (PM_{10})	50 $\mu g/m^3$ Short Term goal	24 hour maximum
	30 $\mu g/m^3$ Long-term goal	Annual
	50 $\mu g/m^3$	24 hour average, 5 exceedances permitted per year
	150 $\mu g/m^3$	24 hour average which includes cumulative emissions from other external sources

3.4.2 Air Quality Monitoring

Liddell Coal's dust monitoring system is comprised of 10 dust gauges and four high volume air samplers (HVAS) including two TSP samplers and two PM_{10} samplers (refer to **Figure 3.1**). All sampling equipment, procedures, data analysis and reporting is carried out in accordance with the relevant Australian Standards and Liddell's EMS procedure - *Environmental Monitoring and Evaluation*.

Condition M2.1 of the Liddell Colliery EPL stipulates that high volume air sampling must be carried out at sites representative of impacts from the operation. The EPL also stipulates that depositional dust monitoring must be carried out across the depositional dust network on a monthly basis.

3.4.2.1 Dust Depositional Monitoring

The location of Liddell Coal's dust deposition gauges are shown on **Figure 3.1**. In accordance with the EPL and Air Quality Monitoring Program, monitoring results are collected from all depositional dust gauges on a monthly basis. The monitoring results for depositional dust are analysed each month for insoluble solids, these results are presented in **Table 3.10**. Two dust gauges (D55 and D62) are located on privately owned property, whilst the remaining dust gauges are located on mine owned land.

As shown in **Table 3.10**, two of the annual average results are above the long term goal of 4 g/m^2/month. The annual average dust deposition results for each gauge ranged from 1.5 g/m^2/month at D59 to 5.4 g/m^2/month at D57. While the annual averages at D54 and D57 were above the depositional dust criteria, the monitoring locations are located on mine owned property and are not representative of the dust deposition rate on any private properties.

Annual average dust deposition results are also presented as isopleths in **Figure 3.5**.

Two dust gauges maintained by Liddell Coal are representative of private residences (D55, and D62) and the results at these sites range from 0.9 g/m^2/month at D55 (July & August 2008) to 6.4 g/m^2/month at D55 (September 2008). During the reporting period, there was a monthly result above the annual criteria for one monitoring event but both sites met the annual average criteria, refer to **Table 3.9**.

The remaining eight dust gauges are representative of mine owned residences for internal management purposes.

Table 3.9 – Monthly Depositional Dust above the Annual Criteria during the Reporting Period (at a private residence)

Station	Monthly Insoluble Solids (g/m^2/month)	Annual Average Criteria (g/m^2/month)	Explanation
D55	6.4 (September 2008)	4.0	Based on a review of meteorological data, the high level is most likely due to sources other than Liddell Colliery operations due to the location of the site and the predominant north north-west wind direction during September 2008.

Four monthly depositional dust samples became contaminated during the reporting period. Gauges can become contaminated with organic material such as bird droppings, insects, vegetation or algae growth and the contamination of gauges is determined on the basis of field observations and laboratory analysis. The contaminated results were not included when calculating the annual average results.

Data for gauge D55 in December 2008 was not obtained due to a technical issue.

Three Year Comparison

Comparison of the annual average dust deposition levels to the previous two reporting periods are presented in **Appendix 6**. Results generally show steady state dust deposition levels at most monitoring locations, including those gauges representative of private residences, with a few exceptions at mined owned property locations. Levels at private residences have remained below the annual average criteria while some mined owned properties are above the criteria. Location D54 (mine owned land) showed an increase in annual average dust deposition in the 2007-2008 reporting period and again in the 2008-2009 reporting period. Both of these results are above the annual average dust deposition criteria of 4 g/m^2/month. Annual average dust deposition at location D57 (mine owned land) decreased during the 2007-2008 reporting period and increased during the following (2008-2009) reporting period, to a level above the annual average dust deposition criteria of 4 g/m^2/month. This is most likely due to an expansion of the mining operation nearby. Dust deposition at location D59 (mine owned land) decreased steadily over the three year reporting periods and location D61 (mine owned land) showed a steady increase over the three year reporting periods.

Comparison to EA Predictions

The Liddell Colliery Modification to Development Consent Environmental Assessment (EA) (2006) makes predictions that the modifications will not result in exceedances of the relevant depositional dust criteria at any private residence in the surrounding area. This is an annual average criterion.

A summary of annual average depositional dust predictions is given in the EA. Annual average dust deposition predictions from Liddell operations considered in isolation are above 2 g/m^2/month with no residences affected. Annual average dust deposition predictions from Liddell operations and other sources combined are above 4 g/m^2/month with no residences affected.

All annual averages at dust gauges representative of private residences were below the maximum annual average deposited dust level of 4 g/m^2/month, as the modelling predicted.

3.4.2.2 High Volume Air Sampling

Total Suspended Particulate Monitoring Results

Liddell Coal operates two High Volume Air Samplers (HVAS) which sample Total Suspended Particulates (TSP). HVAS 13 is located at Ravensworth Farm and HVAS 11 is located at the Scrivens property (refer to **Figure 3.1**). In accordance with the Air Quality Monitoring Program and EPL requirements, both samplers collect data every six days.

Results from the HVAS at Scrivens and Ravensworth Farm are presented in **Figure 3.6** and provided in **Appendix 2**.

During the reporting period Liddell Coal complied with the TSP annual average goal (90 μg/m^3) at the Scrivens property (HVAS 11) but exceeded this goal slightly at Ravensworth Farm (HVAS 13). The Scrivens property is privately owned land and Ravensworth Farm is owned by Liddell Coal. The annual average TSP at HVAS 13 and HVAS 11, were 90.7 μg/m^3 and 50.7 μg/m^3 respectively. The highest TSP concentration, 215 μg/m^3 was recorded at HVAS 13 (mine owned land) on 31 September 2008.

The highest concentration recorded at the HVAS 11 (privately owned land) was 125 μg/m^3 recorded on 7 November 2008.

Three Year Comparison

Comparison of annual average TSP levels to the previous two reporting periods is presented in **Appendix 6**. HVAS 13 showed a slight decrease in TSP from 2006-2007 to 2007-2008 followed by an increase in the 2008-2009 reporting period, where the annual average is slightly above the 90 ug/m^3 criteria. HVAS 11 showed a similar pattern of a decrease in TSP in the 2007-2008 reporting period and an increase in the 2008-2009 reporting period. All HVAS annual averages prior to 2008/09 were below the 90 ug/m^3 criteria.

Comparison to EA Predictions

Predictions made in the EA (2006) indicate that when considered in isolation Liddell operations is unlikely to result in exceedances of the air quality goals for annual average TSP at any private properties in the vicinity of the site. Exceedances of annual average TSP above 90 μg/m^3 due to Liddell operations and other sources combined were identified with no privately owned residences predicted to be affected. Monitoring results during the reporting period confirm these predictions.

PM_{10} Monitoring Results

Liddell also operates two HVAS which sample fine particulates with an aerodynamic diameter of less than 10 microns (PM_{10}). HVAS 6 is located at Ravensworth Farm (owned by Liddell Coal) and HVAS 12 is located at the Scrivens Property (privately owned). In accordance with the Air Quality Monitoring Program and EPL requirements, PM_{10} is measured by the samplers every six days.

Results from HVAS 6 and HVAS 12 are presented in **Figure 3.7** and provided in **Appendix 2**. These results are compared against daily meteorological dates (wind speed and direction) to determine whether dust levels are attributable to Liddell Coal operations. Average prevailing wind conditions for each month are shown in **Figures 3.3** and **3.4**.

During the 2008-2009 reporting period, Liddell Coal complied with the PM_{10} long term (annual average) goal (30μg/m^3) at both monitoring locations. However, the short term (24 hour) goal of 50 μg/m^3 was exceeded on a number of occasions at HVAS 6 (mine owned property). **Table 3.11** outlines these occurrences with appropriate explanations for the high results.

All high PM_{10} levels listed in **Table 3.11** were primarily recorded during westerly or north-west winds. Based on a review of the meteorological data, it is possible that Liddell Colliery operations contributed to the elevated results at HVAS 6 when there was a predominant north-west wind direction. As mentioned previously Ravensworth Farm (HVAS 6) is owned by the mining operation. HVAS 12 is located north-west of mining operations and would be unlikely to be impacted by Liddell Coal under west to north-west winds.

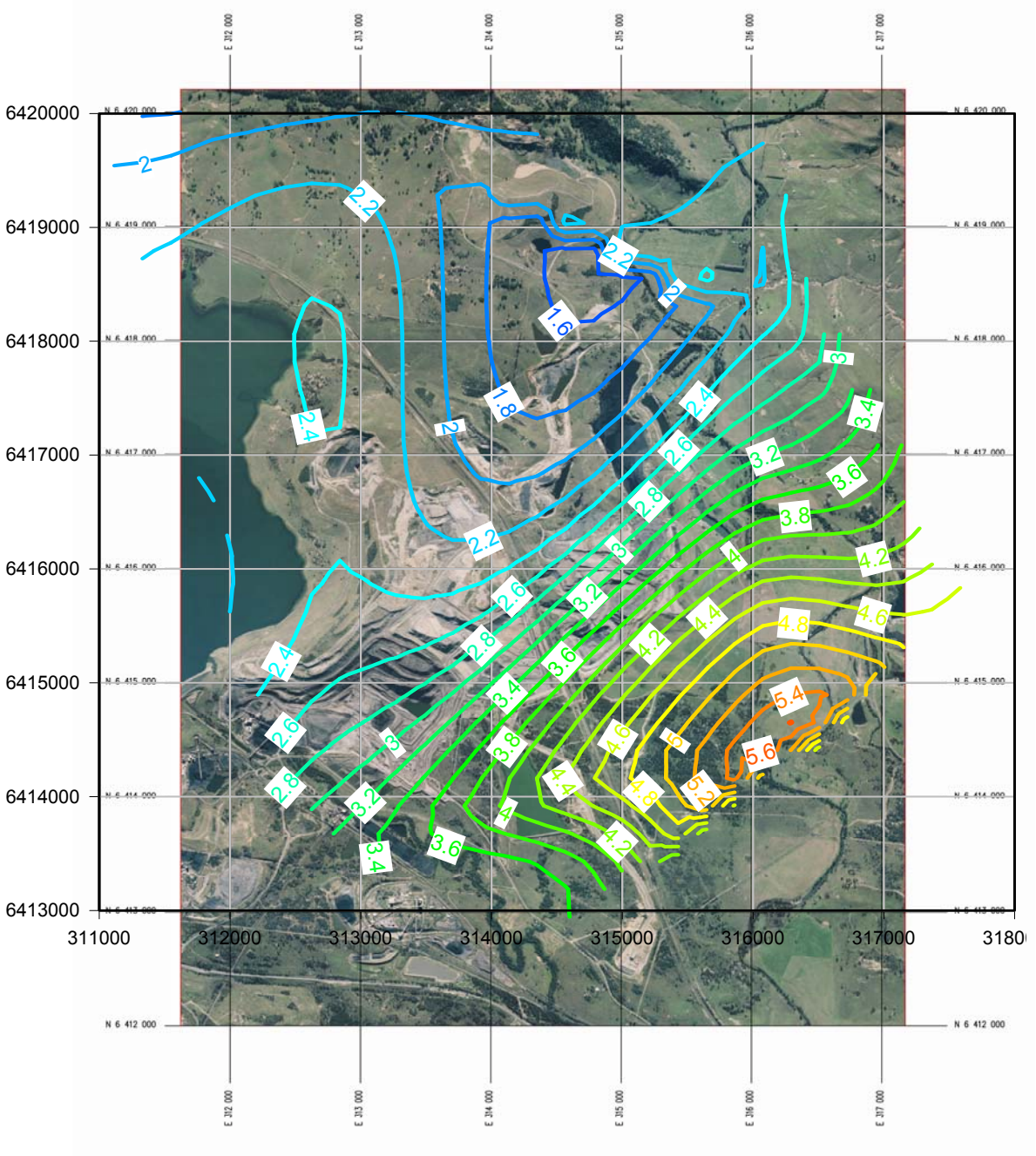


Figure 3.5

Annual Average Depositional Dust Isopleths

Table 3.10 - Dust Depositional Results for 2008-2009

Monitoring Location	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Annual Average
D53	2.6	2.1	2.0	2.5	3.8	5.4	2.9	3.2	3.2	2.8	4.1	2.0	3.1
D54	2.6	1.9	7.1	4.1	9.1c	5.4	5.6	5.8	4.7	5.0	3.5	3.3	4.8
D55*	0.9	0.9	6.4	2.4	2.6	NR	2.2	2.8	2.4	3.6	1.2	1.3	2.4
D56	1.4	1.1	0.9	1.7	2.0	2.6	1.9	3.5	3.0	3.7	1.2	1.1	2.0
D57	3.9	4.0	5.8	8.1	9.6	5.9	5.2	3.2	5.1	4.2	4.9	5.3	5.4
D58	1.4	0.8	1.0	1.7	2.4	2.6	3.1	2.8	3.1	1.8	1.5	1.2	2.0
D59	0.8	0.6	0.4	1.5	2.8	1.3	2.3	2.2	2.3	1.4	1.0	0.9	1.5
D60	1.0	2.0	1.2	1.7	2.6	3.3	2.1	2.1	3.0	2.9	3.1	1.7	2.2
D61	2.6	2.1	2.6	5.3	3.9	2.7	3.5	3.4	4.3	5.5	5.8	3.1	3.7
D62*	1.7	15.1c	2.3	2.6c	2.4	2.4	2.6	1.8	3.9c	3.5	1.6	1.3	2.2

Notes: *c = contaminated result (Bird droppings, vegetation or insects)*
All samples are reported as g/m^2/month
NR = No Reading Obtained
** Dust Gauge located on privately owned property*

Three Year Comparison

Comparison of annual average PM_{10} levels to the previous two reporting periods is presented in **Appendix 6**. Results show slight fluctuations in PM_{10} over the three year period. HVAS 6 showed a steady increase but all averages are below the 30µg/m^3 annual average criteria. This increase is likely due to an expansion of the mining operation towards HVAS 6. HVAS 12 remained relatively steady and all averages are below the 30µg/m^3 annual average criteria.

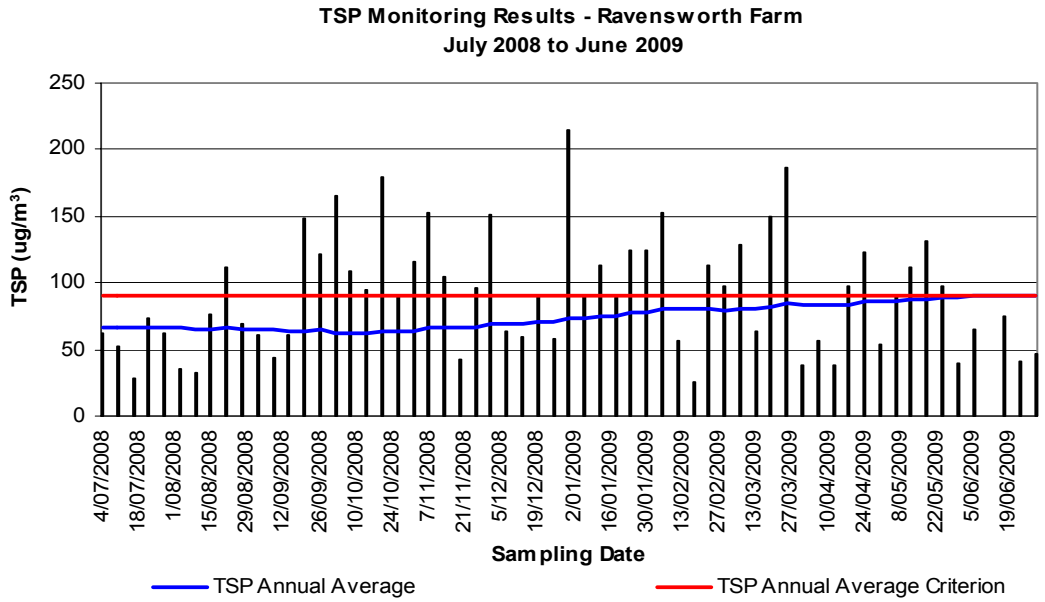
Comparison to EA Predictions

The Liddell Colliery EA (2006) predicts that when considered in isolation, Liddell operations is unlikely to result in exceedances of the air quality goals for annual average PM_{10} at any privately owned properties in the vicinity of the site. However, when considering Liddell operations and other sources combined, annual average PM_{10} exceedances above 30 µg/m^3 and 24-hour PM_{10} exceedances above 150 µg/m^3 are identified with mine owned properties 23 and 25 most affected. HVAS 6 is located at mine owned property 23. The PM_{10} monitoring results for the reporting period generally confirm these predictions with no exceedance at the monitor located on privately owned land.

Although PM_{10} levels exceeded the short term goal of 50 µg/m^3 on five occasions at HVAS 6 (mine owned property), five exceedances of the short term goal are permitted per year by the National Environment Protection Measure (NEPM) for air quality.

Table 3.11 - PM_{10} Short Term Goal Exceedances During the Reporting Period

Station	Result (µg/m^3)	Criteria (µg/m^3)	Explanation
HVAS 6 (09-Aug-08)	70	50	Based on a review of the meteorological data, it is possible that Liddell Colliery operations contributed to the elevated results due to the predominant north-west wind direction on this day.
HVAS 6 (20-Sept-08)	58	50	Based on a review of the meteorological data, it is possible that Liddell Colliery operations contributed to the elevated results due to the predominant north-north--west wind direction on this day.
HVAS 6 (02-Oct-08)	58	50	Based on a review of the meteorological data, the high level is most likely due to sources other than Liddell Colliery operations due to the predominant westerly wind direction on this day.
HVAS 6 (31-Dec-08)	79	50	Based on a review of the meteorological data, it is possible that Liddell Colliery operations contributed to the elevated results due to the predominant west-north-west wind direction on this day.
HVAS 6 (06-Jan-09)	53	50	Based on a review of the meteorological data, the high level is most likely due to sources other than Liddell Colliery operations due to the predominant westerly wind direction on this day.



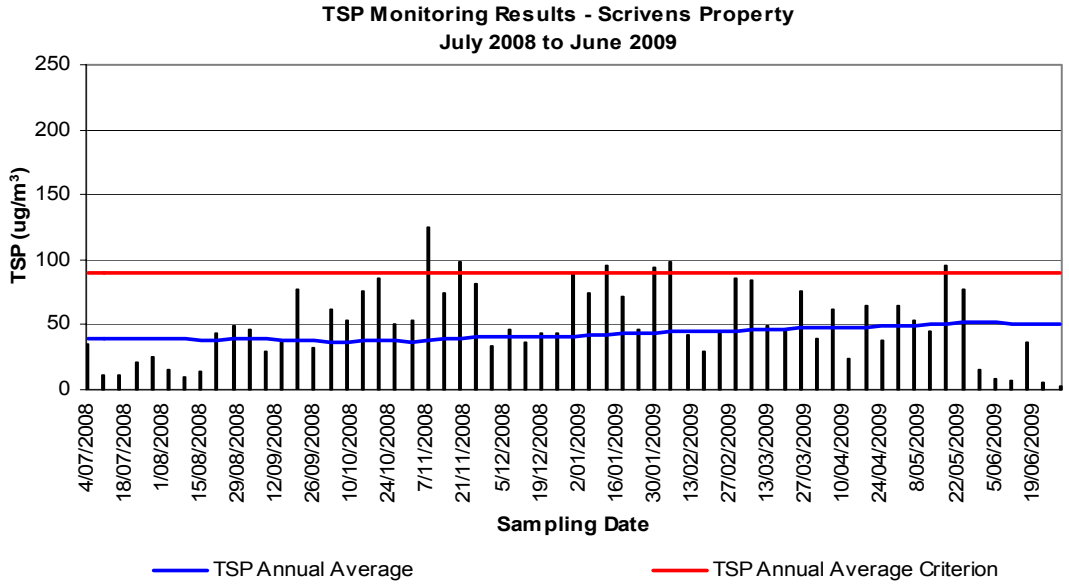
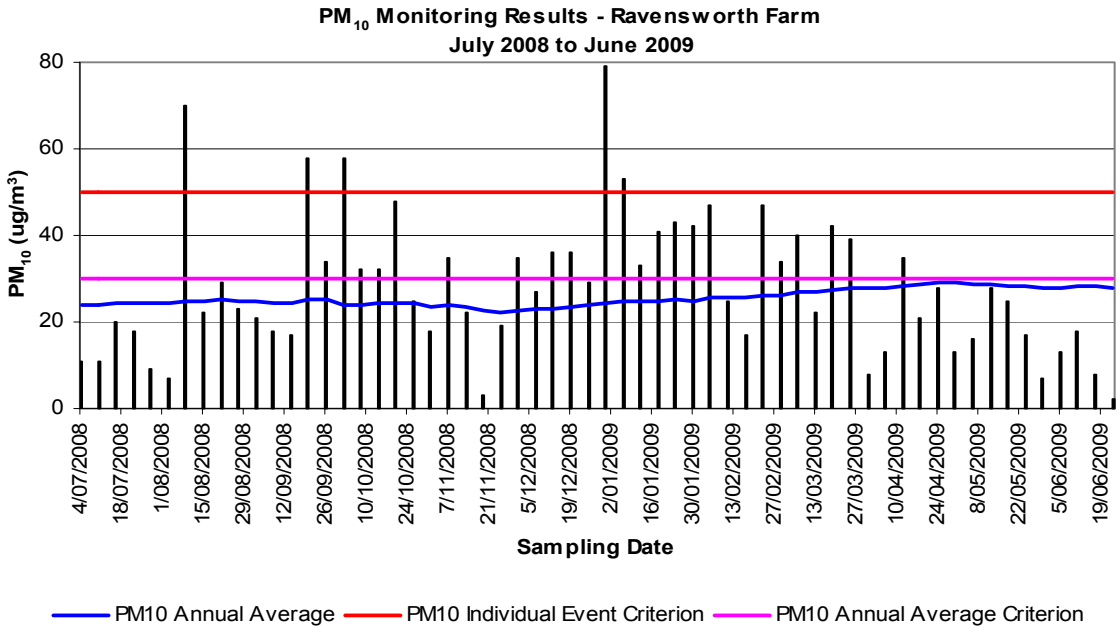


Figure 3.6

Liddell Colliery Total Suspended Particulates Results 2008 -2009



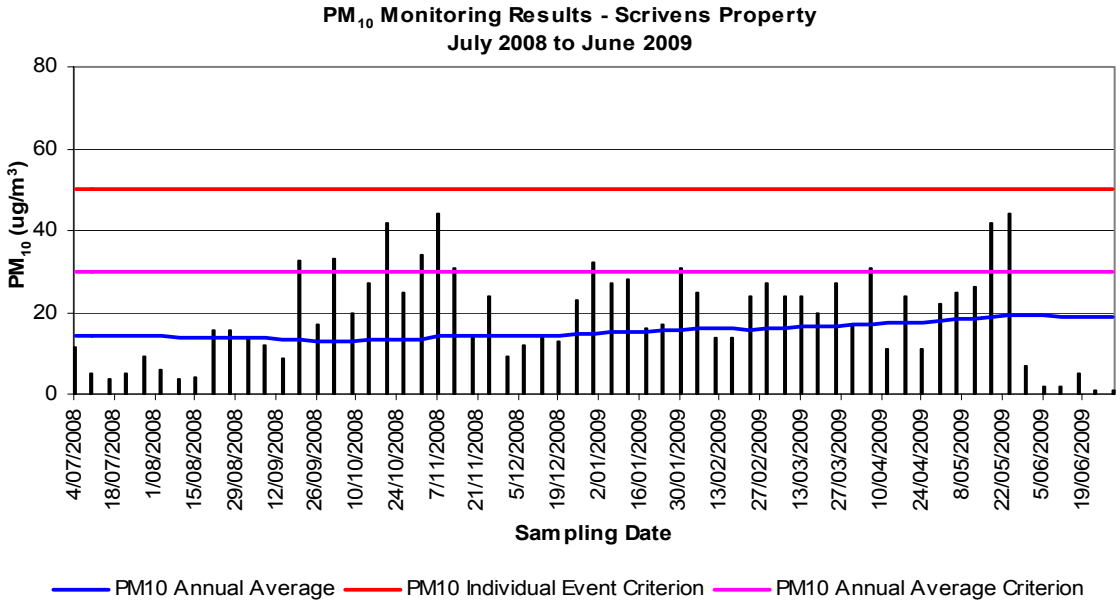


Figure 3.7

Liddell Colliery

PM_{10} Results

2008 -2009

3.4.3 Control Measures and Monitoring Performance

Control measures undertaken to minimise potential impact on air quality at Liddell Colliery include:

- Regular dust inspections are carried out and excavation and tipping activities may be ceased or modified if excessive dust is observed;
- Real time dust monitoring is undertaken to determine measure dust levels;
- disturbance of the minimum area necessary for construction and prompt rehabilitation of construction areas;
- watering of all roads and trafficked areas to minimise the generation of dust;
- permanent roads are constructed from hard non-friable material and have defined marker posts to prevent vehicle deviations;
- long term topsoil stockpiles are vegetated to reduce dust generation;
- overburden emplacements are shaped to 10 degrees or less and seeded;
- dust suppression sprays situated on the ROM dump hopper and transfer conveyor points are actuated to reduce potential dust generation; and
- all equipment is maintained in good working order to reduce emissions.

3.5 Erosion and Sediment Control

Liddell Coal undertakes erosion and sediment control in accordance with the Liddell Colliery Erosion and Sediment Control Plan. The Erosion and Sediment Control Plan forms part of the Liddell Colliery Water Management Plan, required under schedule 3, condition 23, of DA 305-11-01.

Furthermore, in accordance with schedule 3, condition 25, Liddell Coal implements a range of standard erosion and sediment controls during both construction and operational phases. Controls are generally implemented in accordance with the requirements of the Department of Housing's *Managing Urban Stormwater: Soils and Construction* manual. The requirements outlined under schedule 3, condition 25, of the development consent are contained in the Erosion and Sediment Control Plan.

In accordance with the plan, control measures are implemented at Liddell Colliery to limit erosion and sediment issues arising from construction and mining operations and include:

- catch drains;
- clean water diversion banks and drains;
- sediment dams; and
- silt fences.

In addition to the above mentioned controls, erosion and sedimentation management is achieved through the implementation of the following measures:

- minimising all disturbed areas and stabilisation by progressive rehabilitation as soon as practicable;
- construction of diversion drains upslope of areas to be disturbed to direct clean runoff away from disturbed areas These drains were designed to ensure effective segregation of sediment-laden runoff and allow clean surface water to return to natural watercourses;
- construction of catch drains to capture runoff from disturbed areas and direct runoff into sediment dams;
- other erosion and sediment controls works were constructed such as silt fences and sediment basins prior to construction works commencing within the catchment area;
- construction of culverts under the realigned access road and services corridor;
- construction of drainage controls such as table drains at roadsides and on hardstand areas;
- construction of sediment dams to capture runoff from the office and workshop facility and roadside table drains;
- placement of geotextile liners and rock check dams in drains where appropriate to reduce water velocities and prevent scouring;
- regular maintenance of all controls was undertaken and inspections of all works were regularly conducted to ensure erosion and sediment controls were performing adequately;
- earthworks stockpiles were maintained in a condition that minimised wind blown dust;
- road and earthworks cut and fill batters were constructed at slopes of 1V: 2H (vertical: horizontal) or less, where possible, to maximise long term stability; and
- erosion and sediment controls that were not performing adequately were repaired or redesigned.

In addition, the construction plans for the site detailed the specific inspection, maintenance and revegetation requirements for each works area.

3.6 Surface Water

Surface water at Liddell Colliery is managed in accordance with the Liddell Colliery Water Management Plan (WMP) which was developed to satisfy Schedule 3, Condition 23 to Condition 27 of DA 305-11-01.

Liddell Colliery is located within three separate natural catchment areas. The catchment area of Bayswater Creek is located south of the mine, Bowmans Creek to the east of the mine and Lake Liddell to the west of the mine. The water quality monitoring program and procedures for Bayswater Creek and Bowmans Creek, as well as for the on-site dams are described in the Liddell Colliery Surface Water Monitoring Program which is a part of the WMP (see **Figure 3.8).**

The water management practices at Liddell Colliery focus on water capture and treatment, recycling and maximising on-site water reuse. On-site runoff is either captured and stored in Dams 1, 3, 6 and 17 (if clean, i.e. from undisturbed or rehabilitated catchment areas), or

captured and stored in Dam 13 or the Antiene Void (if dirty, i.e. from disturbed catchment areas).

3.6.1 Surface Water Monitoring Program

The Surface Water Monitoring Program provides mechanisms to monitor the changes in surface water quality and flow over time against impact assessment criteria and gives procedures for reporting the results of monitoring undertaken.

Surface water monitoring is undertaken at three locations along Bayswater Creek, eight locations along Bowmans Creek and at nine other locations (mostly in on-site dams) within the Liddell Colliery Water Management System (refer **Figure 3.8**).

The parameters of pH, electrical conductivity, total suspended solids (TSS) and total dissolved solids (TDS) are measured on a monthly basis at:

- Bayswater Creek (upstream, midstream and downstream of Liddell Colliery);
- Bowmans Creek (upstream and downstream of Liddell Colliery);
- Dam 1;
- Dam 4;
- Dam 6;
- Dam 13;
- Dam 17;
- Supernatant (tailings supernatant at Antiene Void); and
- Mt Owen Transfer Dam

In addition to the following recently constructed dams which have been monitored since June 2008;

- Howick Fines Sediment Dam 1 (HSFD1);
- Howick Fines Sediment Dam 2 (HSFD2);
- Howick Fines Sediment Dam 3 (HSFD3);
- Howick Fines Holding Pond (HFHP); and
- Infrastructure Sediment Dam (ISD)

Six of the remaining Bowmans Creek locations are monitored quarterly for pH, electrical conductivity, TSS and TDS and the other seven are monitored quarterly for flow rates.

In addition to the above monitoring regime, speciation sampling is undertaken bi-annually at: Bayswater Creek (upstream, midstream and downstream), Bowmans Creek (upstream and downstream), Dam 1, Dam 4, Dam 7, Dam 17, the Supernatant and Dam 13. Chemical speciation testing is carried out in order to identify presence and levels of: S, Ca, Fe-Sol, K, Mg, Na, Si, B, Cu, Ni, Zn, Mn, Cr, Sr, As, Ba, Hg, Pb, Cd, Co, Se, Li, Be, Rb, Cs, Cl, OH, CO3, HCO3 and TDS.

Discharge events are monitored real time and continuously throughout their duration for flow rate and electrical conductivity. Environmental Protection Licence (EPL 2094) permits Liddell Colliery to discharge up to 100 ML/day when the river is full flood flow provided that salt concentrations do not exceed 900 µS/cm.

All discharge events are monitored on a daily basis during the event at the stilling basin, downstream of Dam 13 for:

- pH;
- electrical conductivity; and
- TSS.

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000) contains default trigger values, above or below acceptable values for key water quality parameters. The pH range for acceptable values is 6.5 to 8.0, for electrical conductivity, 125 µS/cm to 2200 µS/cm and for TSS 0 mg/L to 50 mg/L.

However, due to the highly disturbed nature of these water bodies and allowed by ANZECC 2000, water quality trigger values have been set using an 80th percentile approach determined from baseline monitoring data or the default ANZECC 2000 trigger values. These are detailed in **Table 3.12** and are referenced from the approved Liddell Colliery Surface Water Monitoring Program (SWMP).

Table 3.12 – Trigger Values and Ranges for Key Water Quality Parameters

Water Quality Variable	Bayswater Creek		Bowmans Creek		On-site Dam Surface	
	80th %ile	Maximum	80th %ile	Maximum	80th %ile	Maximum
pH	6.5[1] – 8.3	6.5[1] – 8.7	6.5[1] – 7.9	6.5[1] – 8.0	6.5[1] – 9.2	6.5[1] – 10.2
Conductivity (µS/cm)	5,024	7,110	2,270	2,450	6,180	12,000
TSS (mg/L)	50[2]	235	50[2]	50[2]	50[2]	386
TDS (mg/L)	3,460	6,845	1,168	1,420	3,880	10,500

Note 1: Use ANZECC criteria of 6.5 as the lower limit
Note 2: Use ANZECC criteria of 50 mg/L as the upper limit
Source: Liddell Colliery Surface Water Monitoring Program (Umwelt 2008)

The surface water quality trigger values define key water quality performance indicators and are included in the reporting process. Outside of these values there is a potential risk that adverse environmental effects may occur. These values are designed to be used in conjunction with professional judgement to provide an initial assessment of the state of the water body. Should a maximum trigger value or three successive values outside the 80th percentile trigger value be exceeded, further site specific investigations may be undertaken. These investigations are used to assess if a potential risk or an acute problem exists.

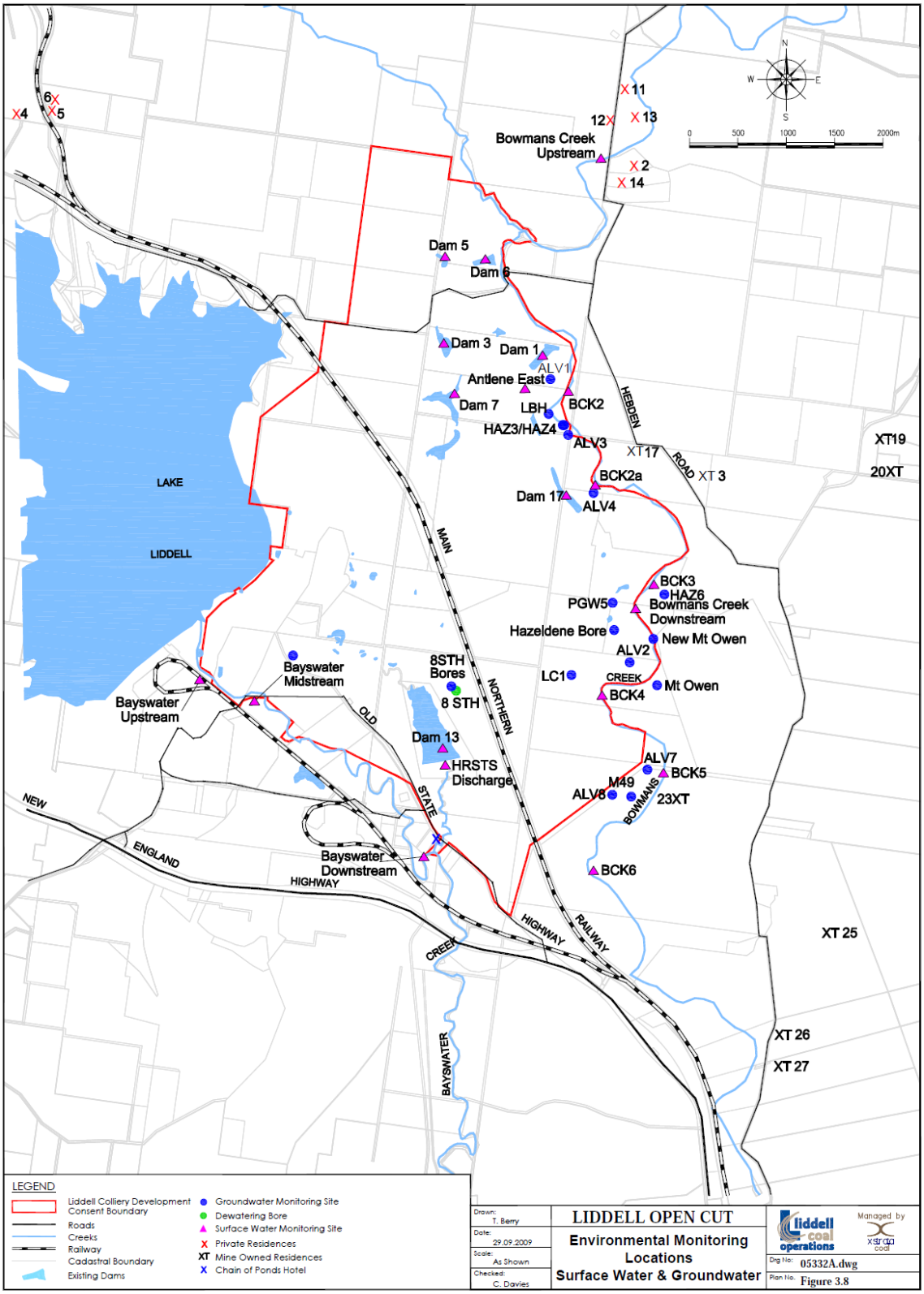


Figure 3.8

Environmental Monitoring Locations

Surface Water and Groundwater

3.6.2 Surface Water Monitoring Results for Bayswater and Bowmans Creeks

Surface water quality is monitored in both Bowmans Creek and Bayswater Creek on a monthly basis. Surface water pH, EC, TDS and TSS levels are all measured monthly at upstream, midstream and downstream sites along Bayswater Creek and upstream and Downstream sites along Bowmans Creek. These sites are also analysed on a bi-annual basis for chemical species present.

3.6.2.1 Bayswater Creek

The downstream sampling location at Bayswater Creek was dry at the time of sampling during the January and February 2009 testing periods. As such no data is available for these months.

The monthly monitoring results for pH, EC, TDS and TSS for Bayswater Creek are shown on **Figure 3.9**. Full surface water monitoring results are presented in **Appendix 3**.

pH

Monthly pH testing of Bayswater Creek indicates that pH levels ranged from 7.2 (upstream) to 8.4 (midstream). All except one of the pH level readings lie within the defined 80th percentile trigger values (6.5 - 8.3) as outlined in the Liddell Colliery Water Management Plan (refer to **Table 3.11**). However, this 80th percentile exceedance lies beneath the maximum trigger value (pH 8.7). Analysis of the results indicates that the midstream pH levels have shown the least variation during the reporting period.

Electrical Conductivity

Monthly electrical conductivity (EC) testing for Bayswater Creek showed large variations in downstream results for the reporting period. EC results for the downstream sampling point range from 2410 µS/cm to 8980 µS/cm.

The highest recorded value of 8980 µS/cm (May 2009) was above the maximum trigger values assigned in the WMP (refer to **Table 3.11**). The assigned maximum trigger value for Bayswater Creek EC was also exceeded in November 2008 and March 2009. The midstream sampling location also exceeded the 80th percentile trigger value several times during the reporting period. Six successive exceedances occur from January 2009 to June 2009 and one other exceedance in July 2008. These exceedences could be due to stagnant water being sampled from ponds that have partially evaporated, thus concentrating salts and giving higher EC levels.

Monitoring in Bayswater Creek will continue to investigate the trends in EC and correlations with flow periods and rainfall events.

Total Dissolved Solids

Similar to the electrical conductivity results, the monitoring results for Total Dissolved Solids (TDS) for the reporting period show 80th percentile trigger value exceedances at the downstream site in May 2009 (7900 mg/L) and six additional exceedences from January to June 2009. The midstream TDS results show an 80th percentile exceedance in July 2008 and six successive 80th percentile exceedances from January 2009 to June 2009. Two 80th percentile exceedances were recorded upstream during the reporting period. Liddell will continue to monitor TDS trends in Bayswater Creek. Generally, as expected, the results for TDS correlate with the EC results (i.e. high TDS and EC, low TDS and EC).

Total Suspended Solids

Monitoring results for monthly Total Suspended Solids (TSS) for Bayswater Creek show a maximum TSS reading of 48 mg/L for the downstream sampling location during the November 2008 sampling period. This reading is below the 80th percentile TSS trigger value of 50 mg/L (refer to **Table 3.11**). The upstream and midstream sampling locations also did not return any 80th percentile trigger value exceedances for the reporting period. Liddell will continue to monitor TSS trends in Bayswater Creek.

Chemical Speciation

The chemical speciation of surface water samples for July 2008 and January 2009 have been analysed to enable longer term trends to be monitored and allow for future trigger values based on statistical distribution to be developed, as stated in the Liddell Colliery Surface Water Monitoring Program. Results for speciation testing showed that Bayswater Creek upstream, midstream and downstream had slightly elevated levels of copper (0.002 mg/L at each location) in addition to slightly elevated boron levels upstream and midstream (0.78 mg/L and 0.58 mg/L respectively) in July 2008. Speciation testing in January 2009 showed Bayswater Creek upstream and Bayswater Creek midstream to have elevated levels of boron (0.91 mg/L and 0.65 mg/L respectively) in addition to a slightly elevated zinc level midstream (0.020 mg/L). Liddell Colliery proposes to continue to monitor the catchment so that site specific long term monitoring trigger values can be established. No other samples recorded heavy metal concentrations greater than the ANZECC Water Quality Guidelines (ANZECC, 2000) 95 percent trigger values for fresh water.

Three Year Comparison

Comparison of annual average pH, EC, TSS and TDS levels to the previous two reporting periods is presented in **Appendix 6**. Annual average results for pH remained steady at all Bayswater Creek monitoring locations over the three year comparison period. Electrical conductivity increased steadily at both upstream and downstream locations and decreased at the midstream monitoring location over the three year reporting periods. Annual average TSS fluctuated up and down at all monitoring locations and TDS showed a steady increase over the three year comparison period at upstream and downstream locations but remained relatively steady midstream.

No long term trends were detailed in the Environmental Assessment, and as such, no comparison between the predicted and observed surface water quality can be provided.

3.6.2.2 Bowmans Creek

Bowmans Creek was flowing for all the monthly sampling periods. Bowmans Creek has a large catchment area and generates sufficient runoff such that the creek system maintains flow under most climatic conditions.

The monthly and quarterly monitoring results for pH, EC, TDS and TSS for Bowmans Creek are shown on **Figure 3.10** and **Figure 3.11**, respectively.

pH

Monthly pH testing in Bowmans Creek shows pH levels ranging from 7.5 (downstream) to 8.5 (upstream). Fourteen readings lie outside the maximum percentile trigger value (pH 8.0, refer to **Table 3.11**) as defined in the SWMP. The maximum trigger value (pH 8.0) was exceeded seven times at the upstream monitoring location and seven times at the downstream monitoring location during the annual monitoring period.

The analysis also indicates that one reading lies outside of the 80th percentile trigger value (pH 7.9). This reading was taken from the upstream monitoring site during April 2009.

The trends in pH and influence of rainfall and associated creek flows on pH readings in Bowmans Creek will continue to be monitored by Liddell Colliery.

Electrical Conductivity

Monthly EC results vary between 616 µS/cm and 1060 µS/cm for the annual reporting period. The EC results for Bowmans Creek all lie below the 80th percentile trigger values defined in the WMP. As shown in **Figure 3.10** and **Figure 3.11**, the results highlight the relationship between increasing rainfall and decreasing electrical conductivity.

Total Dissolved Solids

Monitoring results for the Total Dissolved Solids (TDS) for Bowmans Creek generally correlate with the EC results with the exception of one downstream result in October 2008 (3240 mg/L). This result lies above the maximum trigger value of 1420 mg/L.

Total Suspended Solids

Monitoring results for the Total Suspended Solids (TSS) range between <1 mg/L and 25 mg/L for the July 2008 to June 2009 monitoring period. All of the monitoring results lie below the maximum and 80th percentile trigger values set in the WMP (refer to **Table 3.11**).

Quarterly Monitoring Results for pH, EC, TSS and TDS

Quarterly monitoring is undertaken at six locations along Bowmans Creek which are shown in **Figure 3.8**. All results for the 12 month reporting period lie below the 80th percentile trigger values for EC with the exception of one result which exceeded the EC maximum trigger value (2450 µS/cm). The EC result for BCK1A (January 2009) had a reading of 3060 µS/cm. One TSS trigger value exceedance and one TDS trigger value exceedance occurred during the reporting period. In January 2009 a TSS reading of 7.8mg/L was recorded at BCK2 and in October 2008 a TDS reading of 3240mg/L was recorded at BCK6. Results from the reporting period show sixteen pH maximum trigger value exceedances. All monitoring locations recorded pH maximum trigger value exceedances in October 2008. BCK1, BCK1A, BCK4 and BCK6 recorded exceedances in July 2008. BCK2, BCK5 and BCK6 all recorded exceedances in January 2009 and BCK6 recorded an exceedance in April 2009.

Surface water monitoring will continue to investigate the trends in pH and correlations with flow periods and rainfall events.

Chemical Speciation

The results from the biannual speciation testing showed that Bowmans Creek had slightly elevated levels of copper both upstream (0.002 mg/L) and downstream (0.002 mg/L) in July 2008. The January 2009 results show one slightly elevated zinc level (0.023 mg/L) at the upstream sampling location. All other results lie below the ANZECC 2000 Guidelines 95 percent trigger values for fresh water. Liddell Colliery proposes to continue to monitor the catchment so that site specific long term monitoring trigger values can be established as specified in the SWMP.

Three Year Comparison

Comparison of annual average pH, EC, TSS and TDS levels to the previous two reporting periods is presented in **Appendix 6.** Annual average pH results at Bowmans Creek Upstream and Downstream locations showed a slight steady increase over the three year

reporting periods. Electrical conductivity decreased significantly from 2006-2007 to 2007-2008 and remained steady into 2008-2009, at both locations. TSS decreased significantly during 2007-2008 and then again slightly during 2008-2009 at both monitoring locations. Similarly, TDS decreased steadily over the three year period at the upstream location. TDS decreased in 2007-2008 followed by an increase during 2008-2009.

Of the remaining eight Bowmans Creek monitoring locations, annual average pH results remained relatively consistent over the three year reporting periods. Annual average conductivity, TSS and TDS results are varied and no significant trends are identifiable over the three year reporting periods.

No long term trends were detailed in the environmental assessment, and as such, no comparison between the predicted and observed surface water quality can be provided.

3.6.3 Surface Water Monitoring Results for On-site Dams

Dam 6 was not accessible during the July 2008 to January 2009 sampling periods with monitoring recommencing in February 2009.

The monthly monitoring results for pH, EC, TDS and TSS for the on-site dams are shown on **Figures 3.12** and **3.13.**

pH

Monthly pH testing for the annual reporting period shows variations between pH 6.9 (Dam 6) and pH 9.3 (ISD). The February 2009 pH value of 9.3 at ISD was the only 80th percentile trigger value (pH 6.5-9.2) exceedance. Liddell colliery will continue to monitor pH for the on-site dams.

Electrical Conductivity

The EC results for the on-site dams remained fairly consistent for the reporting period ranging from a maximum value of 7430 µS/cm (Supernatant) to 902 µS/cm (Dam 1). The Supernatant dam showed two 80th percentile trigger limit (6180 µS/cm) exceedances for EC with readings of 6540 µS/cm in December 2008 and 7430 µS/cm in January 2009. Readings remained below the 80th percentile trigger limit for the remainder of the reporting period.

Total Dissolved Solids

Monitoring results for the Total Dissolved Solids (TDS) for the on-site dams correlate well with the EC readings. Five results for the Supernatant Dam and one result for Dam 13 exceed the 80th percentile trigger values (3880 mg/L). These results did not exceed the maximum trigger value for TDS.

One TDS result each for HFSD2 (4200 mg/L) and HFSD3 (5200 mg/L) also exceeded the 80th percentile trigger value (3880 mg/L) however these result did not exceed the maximum trigger value (10500 mg/L).

Total Suspended Solids

Monitoring results for Total Suspended Solids (TSS) remained below the 80th percentile trigger value for the reporting period for all but the Supernatant dam . The Supernatant dam exceeded the 80th percentile trigger value on one occasion in December 2008 with a reading of 52 mg/L. However, this reading lies below the maximum trigger value for TSS (386 mg/L).

One TSS result each for HFSD2 (67mg/L) and HPHP (81 mg/L) lie above the 80th percentile trigger value (50 mg/L) however these results do not exceed the maximum trigger values.

Five TSS results for ISD lie above the 80th percentile trigger value with two of these results exceeding the maximum trigger value of 386 mg/L.

Chemical Speciation

Results for chemical speciation testing (excluding those analysis listed above) showed that all above ground water storages had results below the ANZECC 2000 Guidelines long term trigger values for irrigation use.

Three Year Comparison

Comparison of annual average pH, EC, TSS and TDS levels to the previous two reporting periods is presented in **Appendix 6.** Annual average pH levels remained generally constant at all dams over the three year reporting periods. No significant trends were identified in annual average EC levels. Annual Average TSS is shown to be variable at all dams over the three years and TDS levels vary at Dams 1, 7 and Mt Owen Transfer Dam. Annual average TDS remained consistent at Dams 3,13, 17 and Supernatant.

No long term trends were detailed in the environmental assessment, and as such, no comparison between the predicted and observed surface water quality can be provided.

3.6.4 HRSTS Discharge Monitoring

Any discharges from the Liddell Colliery must be undertaken in accordance with the Hunter River Salinity Trading Scheme (HRSTS). Six discharge events occurred during the reporting period. Monitoring results at the Stilling Basin during the discharge events are presented in **Table 3.13.**

The EPL discharge license stipulates criteria for pH and TSS during discharge events. During a discharge event, pH must fall within the range of 6.5 to 9.0 while TSS cannot exceed 120 mg/L. All discharge monitoring results were within the criteria outlined in the EPL.

Table 3.13 – HRSTS Discharge Monitoring Results

Start	Finish	Discharge Volume	pH (stilling basin)	EC (µS/cm) (stilling basin)	TSS (mg/L) (stilling basin)
16/2/09 10:00	16/2/09 23:00	29.258 ML	8.8	6120	22
16/2/09 23:00	17/2/09 23:00	39.003 ML	8.8	6100	10
17/2/09 23:00	18/2/09 23:00	53.487 ML	8.9	5200	17
18/2/09 23:00	19/2/09 23:00	80.061 ML	8.9	5400	10
19/2/09 23:00	20/2/09 23:00	35.967 ML	8.8	5500	21
2/4/09 22:00	3/4/09 22:00	26.37 ML	8.7	5500	14

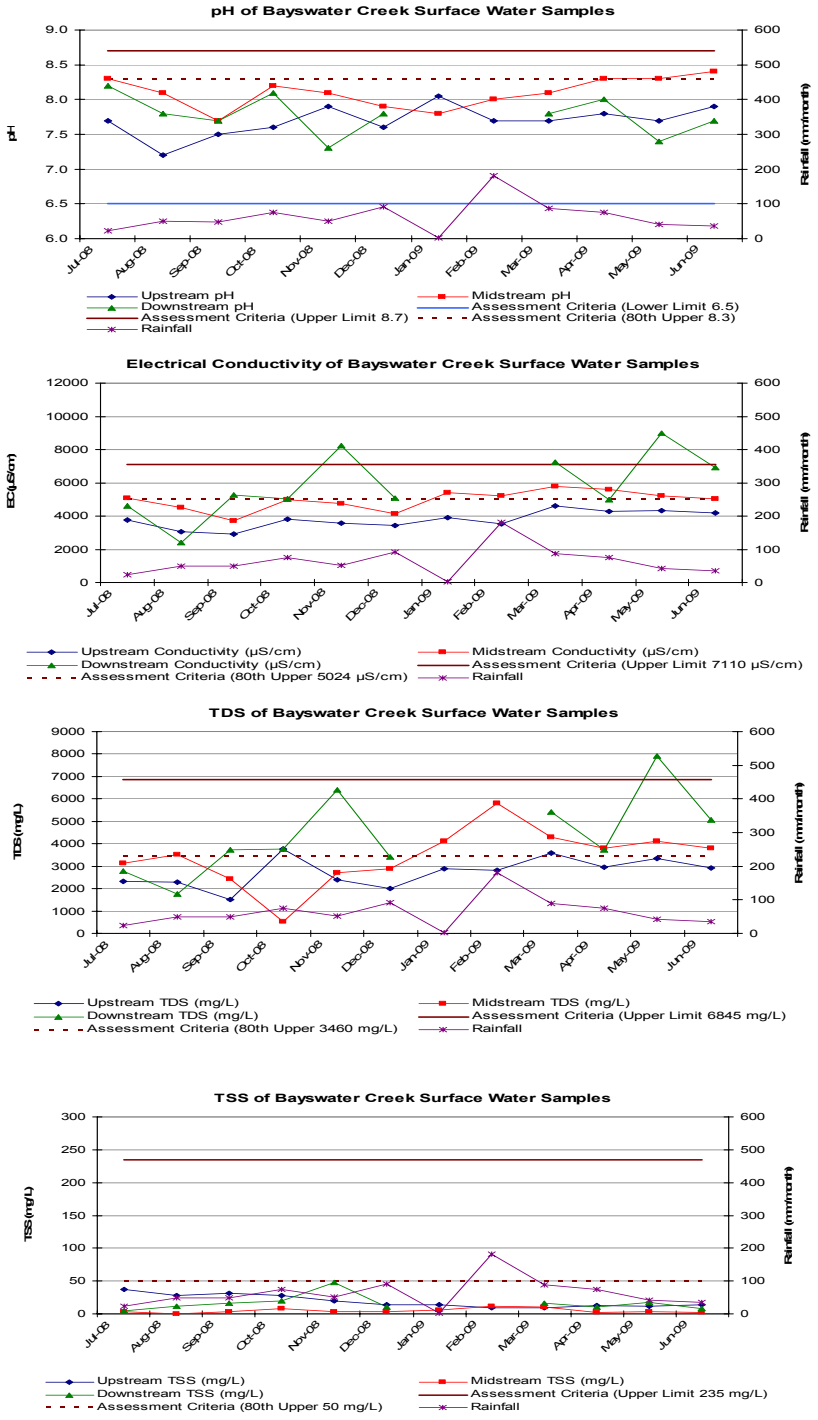


Figure 3.9

Water Quality Bayswater Creek

2008 -2009

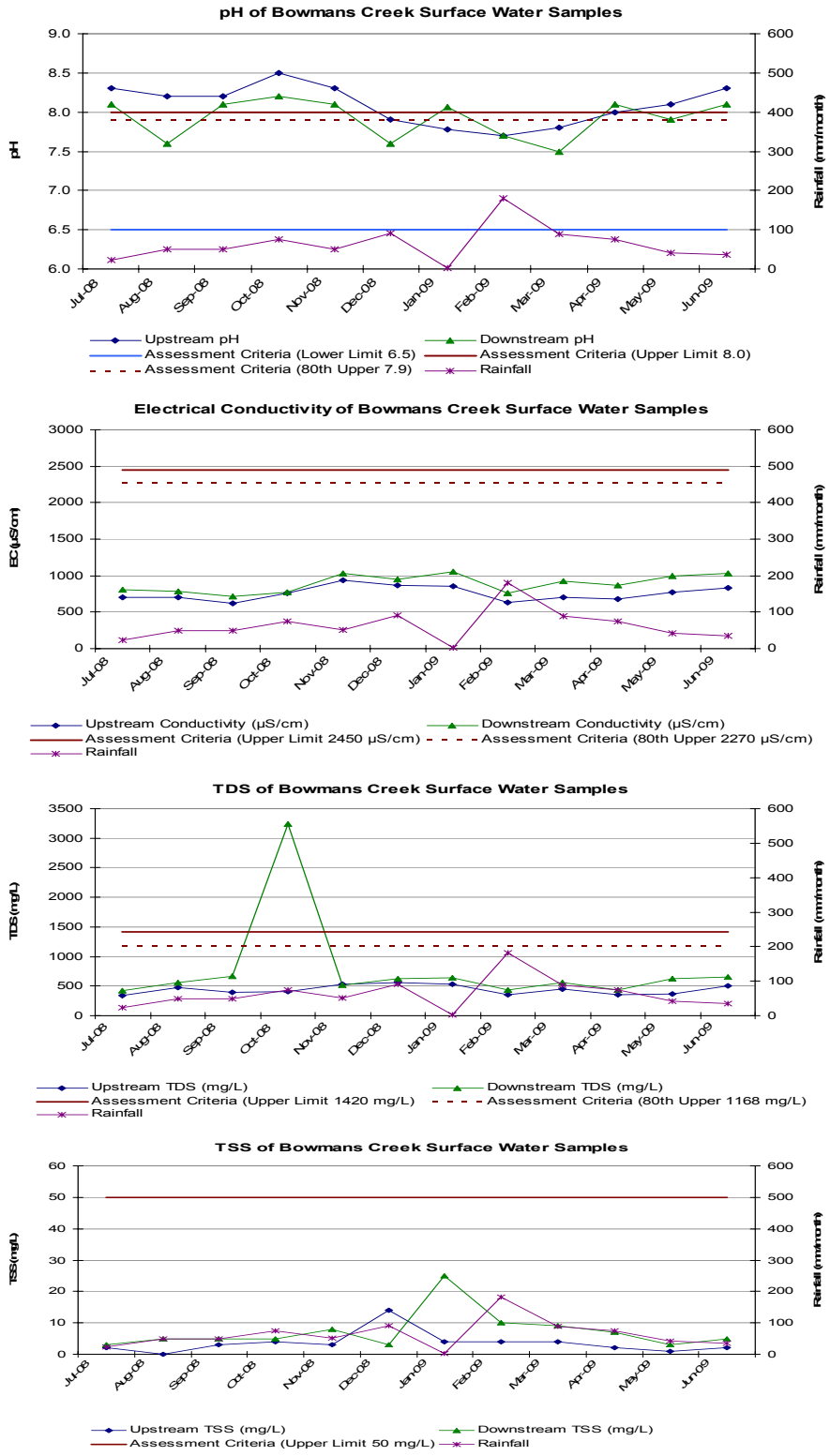


Figure 3.10

Water Quality Bowmans Creek

2008 -2009

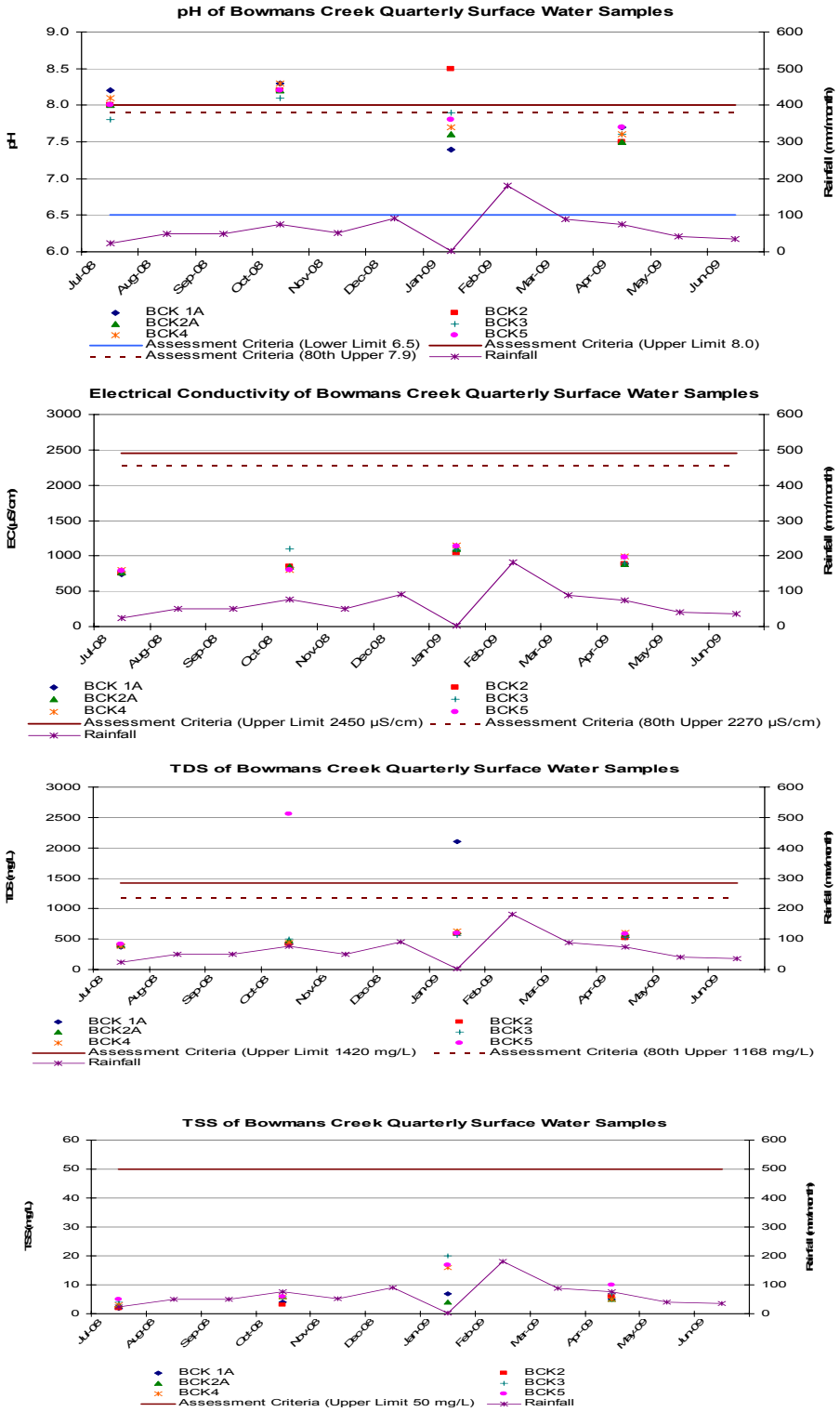


Figure 3.11

Water Quality Bowmans Creek

2008-2009 (Quarterly)

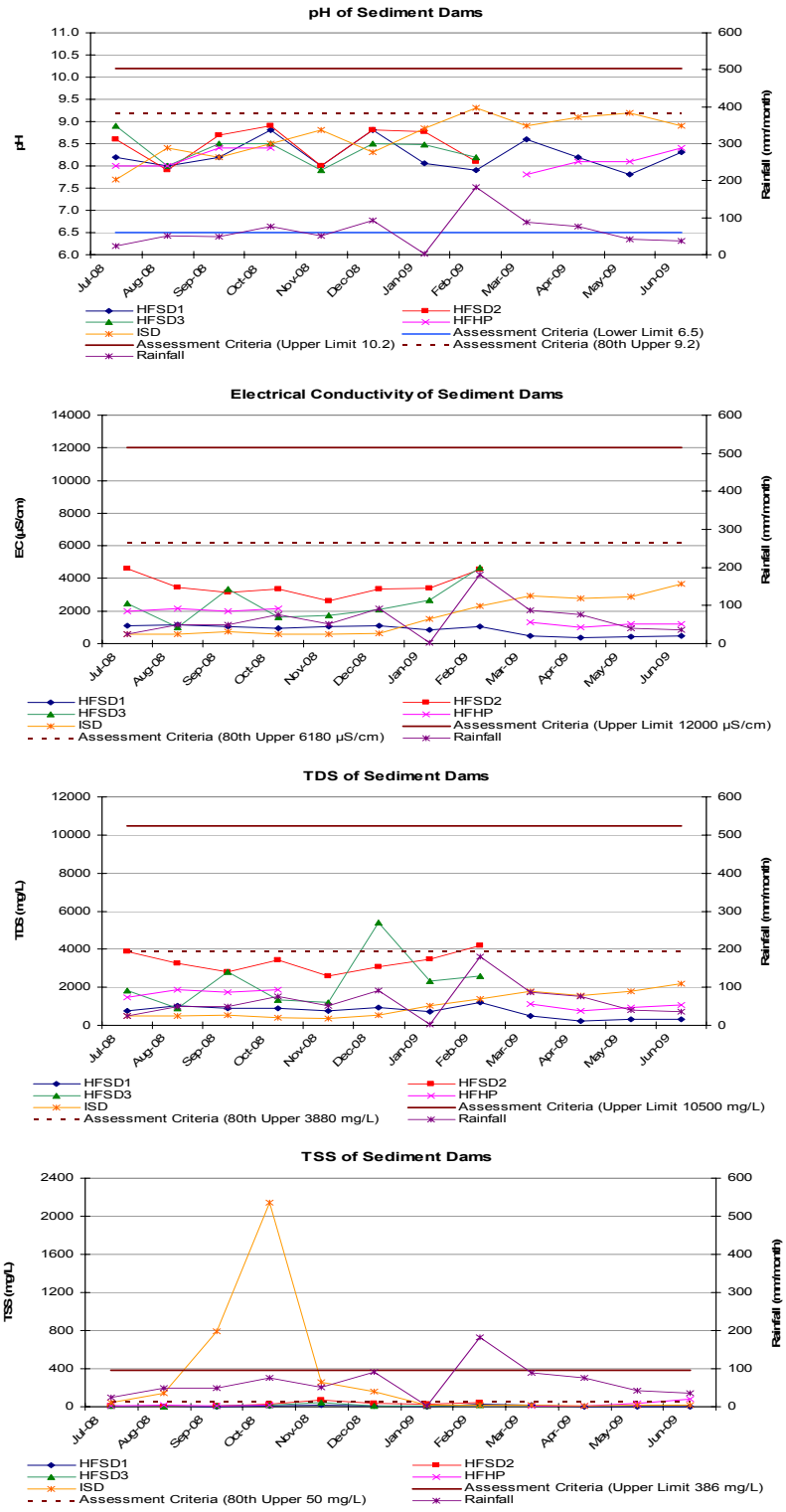


Figure 3.12

Water Quality On-Site Dams
2008 -2009

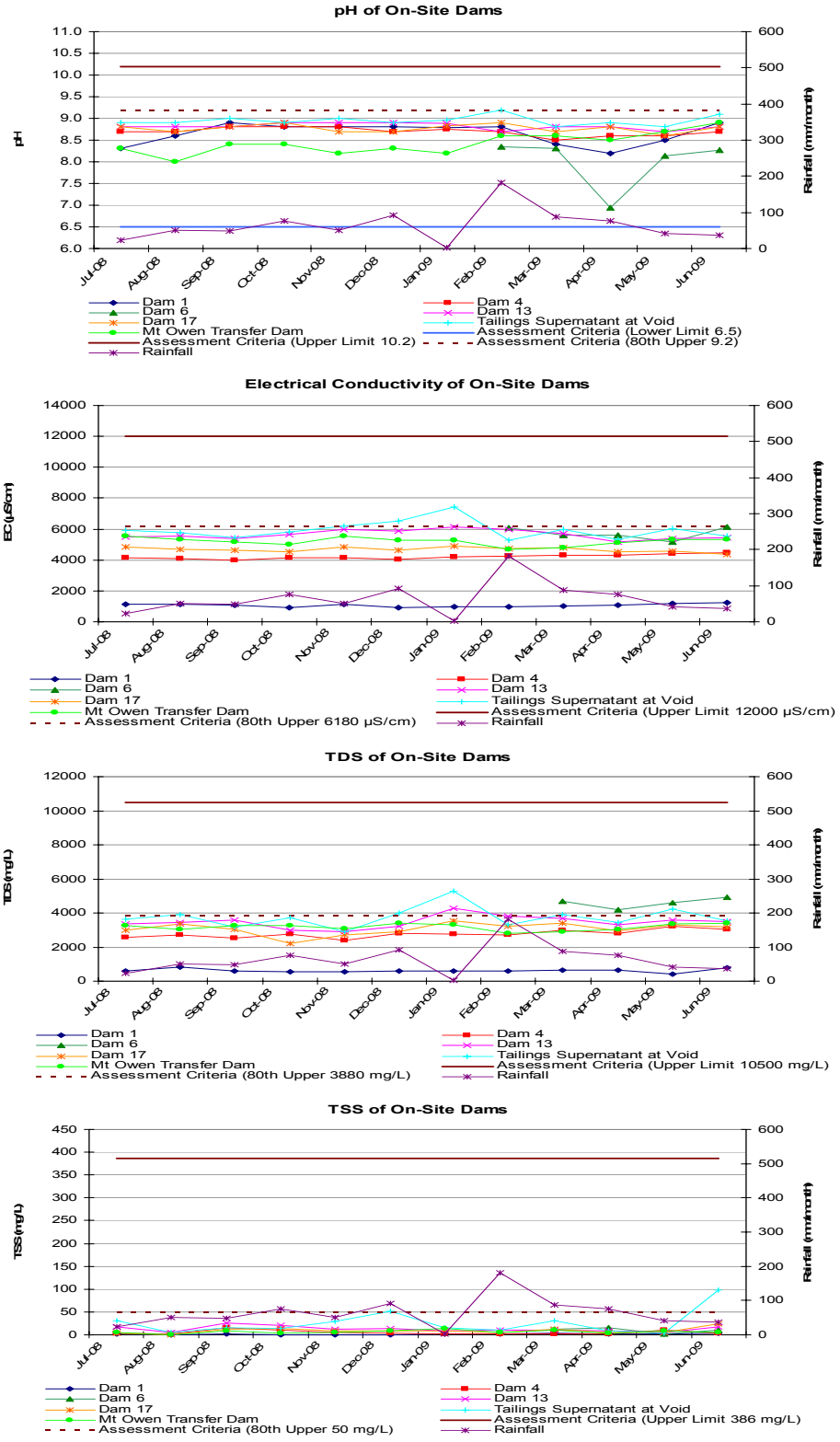


Figure 3.13

Water Quality On-Site Dams

2008-2009

3.7 Groundwater

The groundwater monitoring section of this report was prepared from a review of the available Liddell Coal groundwater assessments and monitoring data conducted by Geoterra Pty Ltd.

There are two general aquifer types within the region of Liddell Colliery:

- an alluvial aquifer which is localised and associated with Bayswater and Bowmans Creeks; and

- a hard rock aquifer which is more regional and associated with the coal measures.

These two aquifers have vastly different properties from one another. The unconsolidated alluvial aquifer is highly permeable, while the hard rock aquifer exhibits variable storage and transmission properties. Historical seam dewatering in the region accompanied by local geology have both contributed to what is now considered to be a complex groundwater system.

3.7.1 Groundwater Monitoring Program

The Liddell Colliery Groundwater Monitoring Program was established to satisfy Schedule, Condition 27 of DA 305-11-01. The Groundwater Monitoring Program provides mechanisms to monitor the changes in groundwater quality and levels over time and impact assessment criteria and gives procedures for reporting of results of monitoring undertaken.

Liddell Colliery has an established groundwater monitoring program consisting of a network of 19 piezometers installed in 2002 (refer to **Figure 3.8**). The piezometers are measured monthly for groundwater level and every two months for water quality. Eleven of the piezometers are also sampled biannually and analysed for a range of inorganics. A number of the piezometers are paired and are either of a large or small diameter.

The results of the groundwater monitoring program have indicated that despite fluctuations in some water quality parameters, groundwater quality ay Liddell Colliery has historically remained fairly consistent at each sampling location. The groundwater monitoring program has indicated that in some cases the baseline concentrations of the water quality parameters throughout the Liddell Colliery groundwater monitoring area are outside the default trigger values specified in the ANZECC 2000 guidelines.

Due to the highly disturbed nature of the site, baseline monitoring data has been used to define the trigger values for TSS and the upper bound value for pH to be used in groundwater monitoring at Liddell Colliery. An 80th percentile value has been applied to these values to account for the highly disturbed nature of the ecosystem. The trigger value for the lower bound for pH has been adopted from the default trigger value defined by ANZECC 2000. The trigger values based on the available baseline monitoring data to date for the alluvial and non-alluvial (or hardrock) aquifers are outlined in **Table 3.14**.

Table 3.14 – Trigger Values for Key Water Quality Parameters

Water Quality Variable	Alluvial Aquifer Groundwater		Hardrock Aquifer Groundwater	
	80th %ile	Maximum	80th %ile	Maximum
pH	6.5[1] – 7.8	3.2 – 9.6	6.5[1] – 8.2	6.5[1] – 10.7
Conductivity	2791	5480	5356	5840

Note 1: Use ANZECC criteria of 6.5 as the lower limit
Source: Liddell Colliery Groundwater Monitoring Program (Umwelt, 2008)

Where the impact assessment criteria values listed in **Table 3.14** are exceeded, the Liddell Coal Environment and Community Coordinator shall act in accordance with Section 3.3.2.3 of ANZECC (2000), as outlined in the Groundwater Monitoring Program, which suggests that that if a trigger value is exceeded the aim of further site-specific investigations is to assess if a 'potential risk' or an actual problem exists. The Liddell Coal Environment and Community Coordinator will initiate further site-specific investigations when:

• in their professional judgement, the indicator value(s) could result in environmental harm;
• three (3) consecutive values are outside the trigger value; or
• any value exceeds the maximum trigger value.

Under the Liddell Colliery Groundwater Monitoring Program the key groundwater parameters to be measured are pH and electrical conductivity in addition to water level.

The monitoring of these parameters will address both the pressure/water level regime within the coal measures and the water table within shallow strata near or beneath the alluvium. Measured values will be compared to background values and an investigation of potential cause only undertaken where a deviation from background trends is identified. Should an investigation be required it will be undertaken by the Liddell Coal Environment and Community coordinator in accordance with the Groundwater Monitoring Program.

3.7.2 Groundwater Quality Monitoring Results

The groundwater quality monitoring results for the reporting period are shown on **Figures 3.14, 3.15, 3.16** and in **Appendix 4.**

3.7.2.1 Alluvial Aquifers

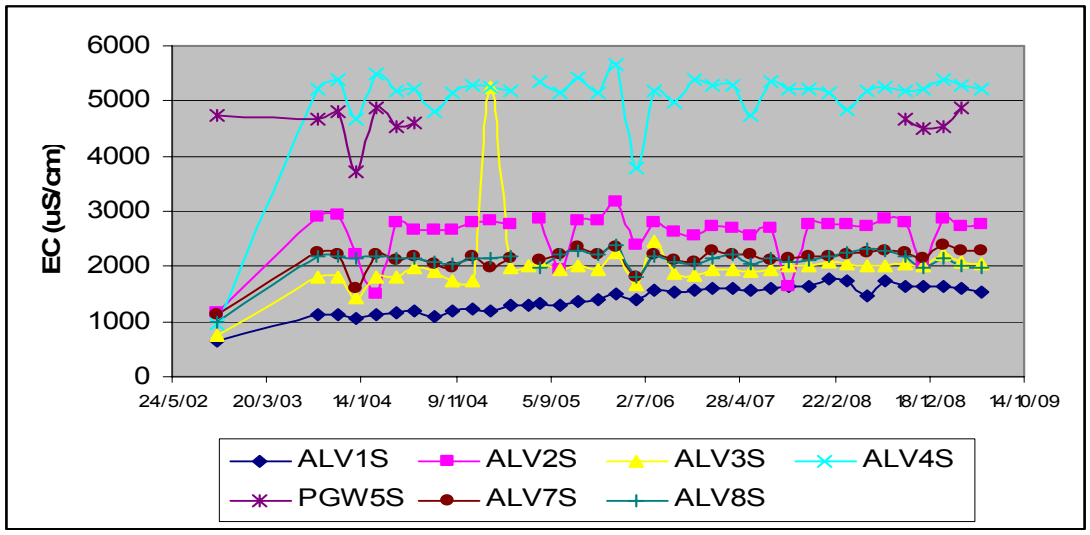
During the reporting period, no pH trigger values were exceeded in Bowmans Creek alluvium. Results for ALV4S and PGW5S showed exceedances of the salinity trigger values, however the salinity did not increase in comparison to the baseline range over the last year in Bowmans Creek alluvium. In addition, no pH or salinity trigger values were exceeded in the shallow basement piezometers during the reporting period.

The Bowmans Creek alluvium has been generally unchanged since monitoring began in late 2002, with all bores ranging from pH 7 to pH 8, apart from a short period in late 2003 when the pH ranged from 8 to 10.

Groundwater salinity within the Bowmans Creek alluvium has not changed significantly as a result of the open cut operation in the alluvial piezometers at locations ALV2, 3 and 4, PGW5, or ALV7 and ALV8, although it has risen slightly from 648µS/cm to 1548µS/cm at ALV1. Periods of higher rainfall generate temporary lower salinities, which generally recover to the baseline level once the higher salinity runoff effect has reduced. From 2002 to present, salinity levels in the alluvium have ranged from 648µS/cm to 5660µS/cm.

Groundwater salinity within the shallow basement beneath the Bowmans Creek alluvium has not changed significantly as a result of the open cut operation, however, an indistinct trend to increasing salinity before June 2007 and reducing salinity since then are identifiable.

No long term trends were detailed in the environmental assessment, and as such, no comparison between the predicted and observed regional groundwater quality can be provided.



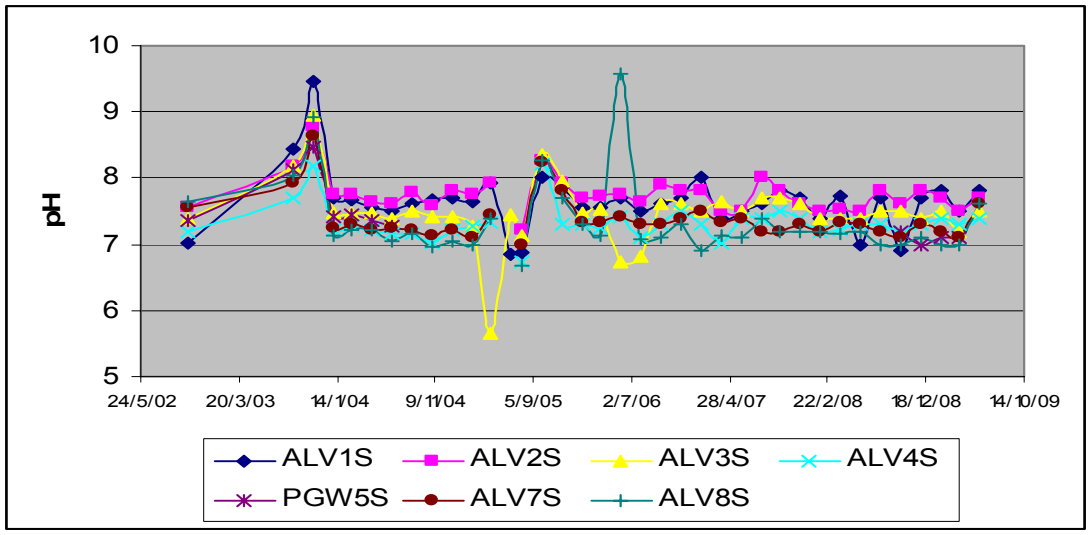
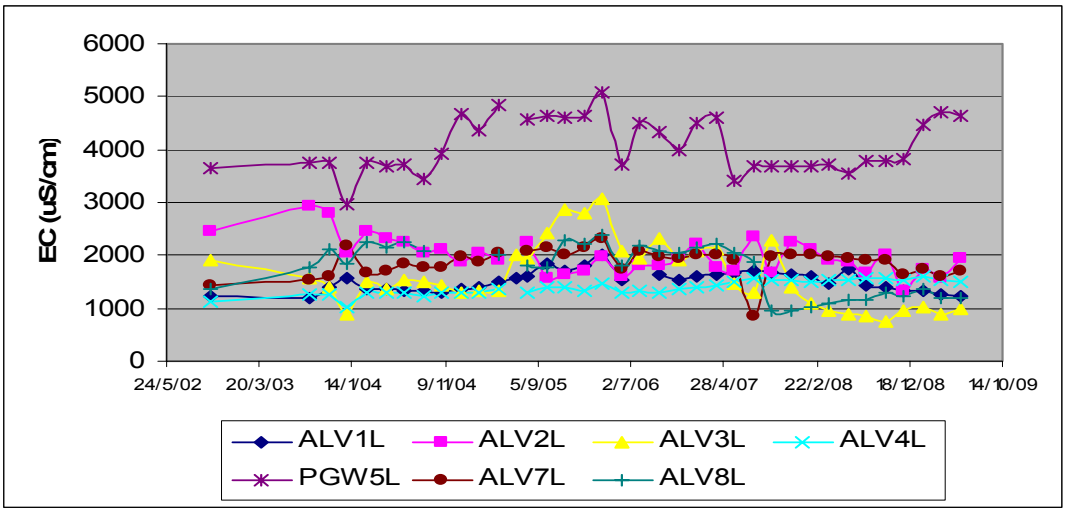


Figure 3.14

Groundwater Quality Trends

Alluvium Salinity and pH



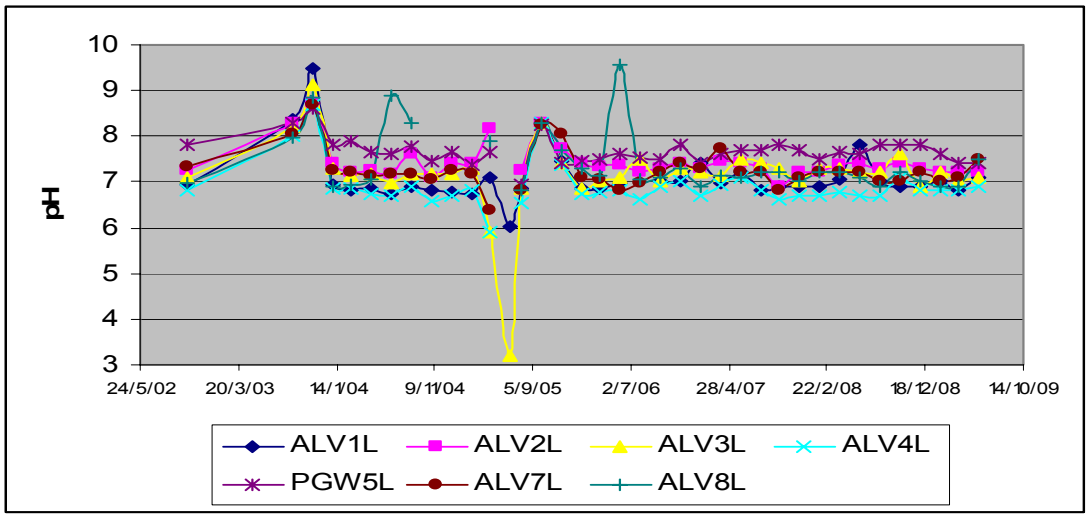
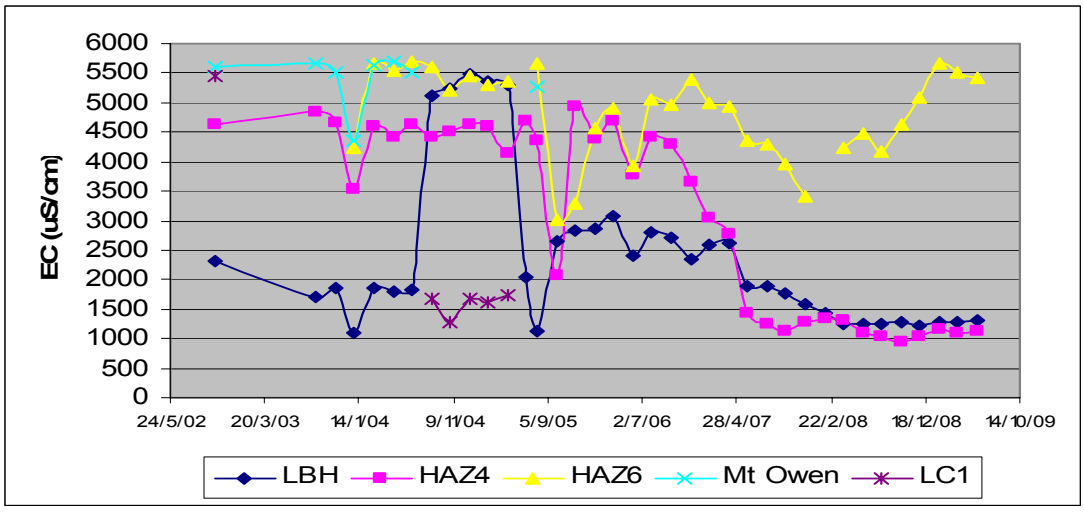


Figure 3.15

Groundwater Quality Trends

Shallow Basement Salinity and pH



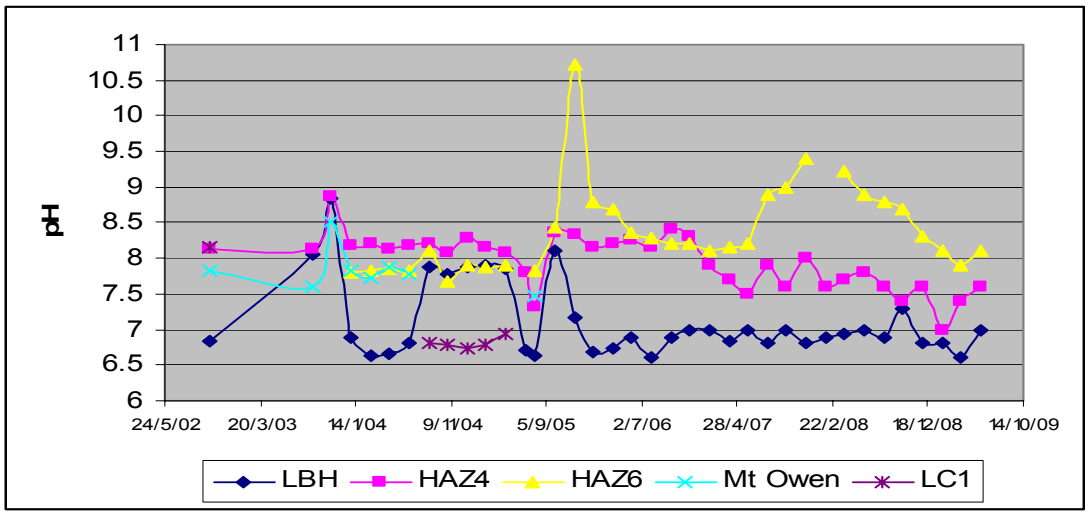
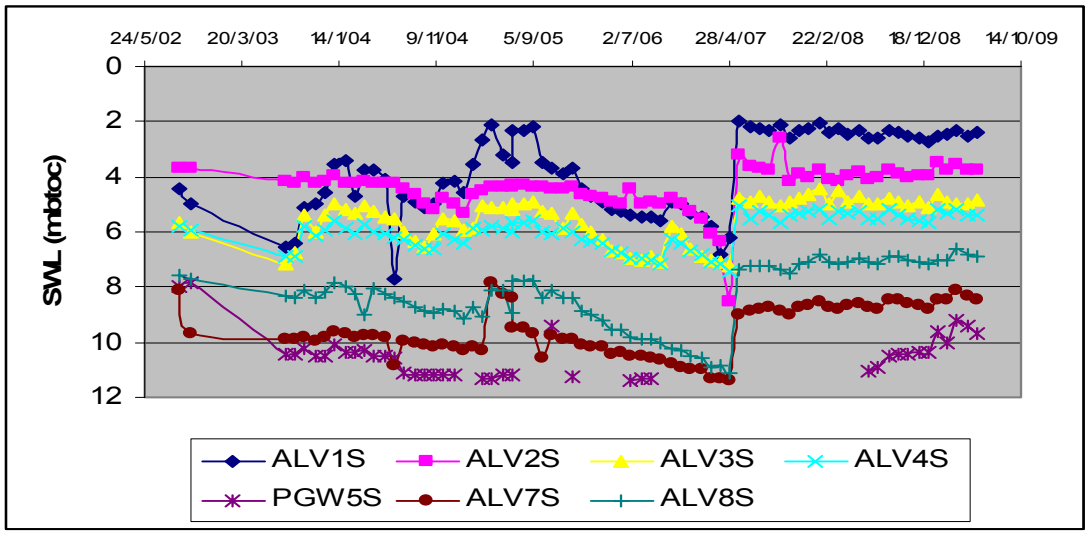


Figure 3.16

Groundwater Quality Trends

Deeper Basement Salinity and pH



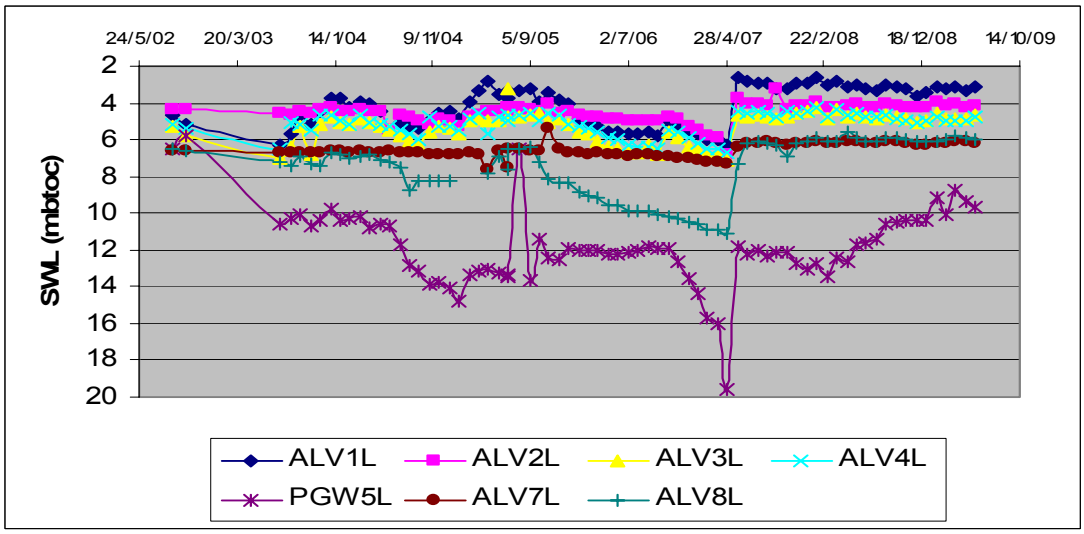


Figure 3.17

Groundwater Level Trends

Paired Alluvium and Shallow Basement Standing Water Level

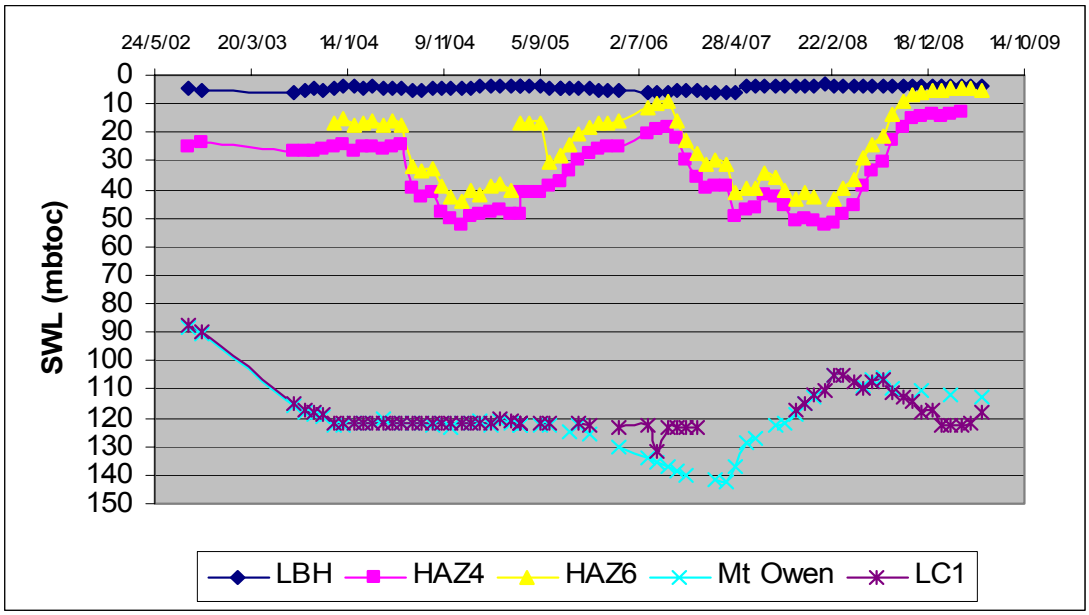


Figure 3.18

Groundwater Level Trends

Deep Basement Standing Water Level

3.7.2.2 Hardrock Aquifer (Deep Basement)

During the reporting period, monitoring results showed exceedances of the pH and salinity trigger values at HAZ6, however no exceedances of the upper baseline range for salinity were recorded. The pH of HAZ6 temporarily exceeded the upper trigger, and upper baseline range, by approximately 1 pH unit, although has since receded to its upper baseline range.

Groundwater salinity within the deep basement is more variable than the Bowmans Creek alluvium or shallow basement piezometers. The long term trend in HAZ6 shows it to be essentially the same as the baseline salinity in late 2002. HAZ4 has significantly reduced from 4640µS/cm in late 2002 to 1140µS/cm, whilst LBH has reduced its long term salinity from 2320µS/cm to 1320µS/cm.

Salinity and pH monitoring in LC1 and Mt Owen was discontinued in April to August 2005.

The pH levels at the deeper basement alluvium are more variable than the Bowmans Creek alluvium or shallow basement, although have been essentially unchanged in the long term, outside of short term variability of up to 1.5 pH units. The only bore that has changed to some degree is HAZ4, which has become slightly less alkaline, with a change from around pH 8 to pH 7.5.

No long term trends were detailed in the environmental assessment, and as such, no comparison between the predicted and observed regional groundwater quality can be provided.

3.7.3 Groundwater Levels

Historical trends in groundwater levels are shown in **Figures 3.17 and 3.18** for all of the Liddell Colliery groundwater monitoring locations.

3.7.3.1 Paired Alluvium and Shallow Basement Piezometers

The depth to standing water in both the alluvium and shallow basement increases with distance downstream, with ALV1, 3 and 4 (large and small) extending up to 7 - 8m below surface, whilst ALV2, 7 and 8 (large and small) extend from 8.5 - 11.0m below surface.

The paired water levels in PGW5 are anomalously deeper compared to the other piezometers, with water levels up to 19.5m in the alluvium. The maximum depth in the shallow basement water levels at PGW5 is likely to be similar, although approximately 2m shallower, however the deeper data from the piezometer is not available.

The alluvial standing water level in ALV3, 4, 7 and 8 is generally higher than the shallow basement water level, indicating recharge from the alluvium into the shallow basement aquifer, however, the shallow basement piezometric levels are generally higher than the alluvial levels in ALV1, PGW5 and ALV2, indicating upward seepage from the shallow basement into the alluvium.

In general, the trend of the alluvial and shallow basement water levels mimic each other at each piezometer location, indicating that the two systems are hydraulically connected.

Hydrographs of the paired alluvium and shallow basement indicate that standing water levels generically decreased in the alluvium and shallow basement from the beginning of the monitoring period in late 2002 up until the flooding rains in June 2007, with a lesser recharge period within that time between appoximately September 2004 and April 2005.

Following the June 2007 flooding rains, and during the wetter period that has existed since then, the paired water levels significantly rose by up to approximately 4m, and have either remained essentially static, or have slightly fallen up to the latest readings.

No discernable impact is observed on the alluvial aquifer in response to mine dewatering of the open cut pits, with the main influence being the degree of rainfall and runoff in the catchment.

3.7.3.2 Deeper Basement Standing Water Levels

A groundwater level decrease of approximately 28m in HAZ4 and HAZ6 occurred between June 2004 and December 2004, which then recovered to October 2006. After October 2006, the water levels again decreased by approximately 34m up to March 2008. Since March 2008, water levels in HAZ4 and HAZ6 have fully recovered, and are now around 11.5m higher than at the beginning of the monitoring period in September 2002.

The drop in water levels correlates to pumping from the Hazeldene workings.

No long term distinctive depressurisation in HAZ4 and HAZ6 due to operation of the current open cut pits is apparent.

The water level in both LC1 and the Mt Owen bore decreased by approximately 34m between September 2002 and December 2003, then remained esentially static until January 2006. The level in the Mt Owen bore then decreased by 20.6m between January 2006 and April 2007 associated with pumping from Mt Owen bore, and recovered by approximately 36m up to 15m above the initial 2002 water level by August 2008 after pumping ceased. The water level in LC1 did not respond to depressurisation observed in the Mt Owen Bore between January 2006 and April 2007, but did rise between April 2007 and August 2008. Since August 2008 both LC1 and Mt Owen have fallen by 11.3m and 6.23m respectively. Both LC1 and Mt Owen bore are screened within the eastern underground workings.

The depressurisation in both LC1 and Mt Owen may be due to dewatering effects from operation of the current Open Cut pits during dewatering operations for the open cut pits.

A fall in the LBH bore occurred during the early stages of monitoring due to drought. The LBH bore has since recovered by around 2m since records began in late 2002, with the recovery occurring after the June 2007 rains.

To date, the groundwater monitoring data shows that the LC1 and Mt Owen groundwater levels are consistent with the predictions in the environmental assessment, however the LC1 and Mt Owen groundwater levels are highly responsive to dewatering campaigns, with reductions during periods of pumping and recovery during non pumping periods. The significant recovery period between April 2007 and March 2008 would likely be due to both recharge into the workings after the June 2007 rain event as well as cessation of pumping during that period.

3.8 Contaminated Land

Operations at Liddell Coal are conducted with the aim of minimising the potential for land contamination. In accordance with the Liddell Colliery Waste Management Procedure, all contaminated waste, with the exception of hydrocarbon contaminated soil, is removed from site by a licensed contractor.

Liddell Colliery operates an on site bioremediation area for hydrocarbon contaminated soil where biological degradation of hydrocarbons is used to reduce the hydrocarbon

concentration in the soil to an acceptable level. The management of hydrocarbon contaminated soils is detailed in the Liddell Coal Hydrocarbon Remediation Action Plan. During the reporting period the old open cut facilities were demolished and some hydrocarbon contaminated soil was identified and transported to the bioremediation area. Additional information is provided in **Section 5.1**.

There were no other areas of significant contamination identified at Liddell Coal during the reporting period.

3.9 Threatened Flora

Flora monitoring was not undertaken during the reporting period although a survey was undertaken in April 2008 at four sites at Liddell Colliery, refer to **Figure 3.13**. The locations of the survey plots includes two plots at Entrance Block (south side) east of the Main Northern Railway (remnant vegetation), one plot at Mountain Block (remnant vegetation) and one plot at Mountain Block (rehabilitated vegetation).

A combined total of 97 flora species have been recorded across the four monitoring plots, 81 of which are native and 18 of which are introduced.

A large, healthy specimen of tiger orchid (*Cymbidium canaliculatum*) was recorded near Plot 4 during 2005, 2006 and 2007 surveys and was again observed in 2008. Tiger orchid (*Cymbidium canaliculatum*) is listed as an endangered population in the Hunter Catchment under the *Threatened Species Conservation Act 1995* (TSC).

No other threatened flora species or threatened ecological communities (TECs) have been recorded within the Liddell Colliery development consent area to date.

It is planned to conduct the next flora monitoring survey in the second half of the 2009.

3.10 Threatened Fauna

Fauna monitoring was not undertaken during the reporting period although a survey was undertaken in March 2008. Five fauna monitoring areas were identified in 2005 during the initial monitoring program undertaken by HLA Envirosciences (HLA 2005) (refer to **Figure 3.14**). These same areas were surveyed during the 2006, 2007 and 2008 monitoring program undertaken by Umwelt. These areas are known as the Entrance Block, Mountain Block rehabilitation area, Mountain Block remnant area, Dam 13 and Bowmans Creek. At each of the five fauna monitoring locations a range of monitoring techniques were used to determine the faunal utilisation of Liddell Colliery, including the identification of threatened species. Further surveys are also conducted at Dam 1, Dam 3, Dam 5, Dam 6, Dam 7 and Dam 17.

A total of 150 fauna species have been recorded across the five standard monitoring sites to date, including 101 bird species, 27 mammals, 15 reptiles and 7 species of amphibians. A total of 66 species have been recorded from the dam sites surveyed in 2007 and 2008.

It is planned to conduct the next monitoring project in the second half of the 2009.

Five fauna species listed in the schedules of the TSC Act were recorded during the 2008 monitoring surveys: the grey-crowned babbler (*Pomatostomus temporalis temporalis*), spotted-tail quoll (*Dasyurus maculatus*), eastern freetail-bat (*Mormopterus norfolkensis*), eastern bentwing-bat (*Miniopterus schreibersii oceanensis*) and the large-footed myotis (*Myotis adversus (*syn. *macropus*)).

The spotted-tail quoll (*Dasyurus maculatus*) was recorded at the Bowmans Creek site during the 2008 surveys. This species has not been previously recorded in the study area. Searches for den and latrine sites at the Bowmans Creek site could not identify any evidence of permanent occupation and therefore this site is considered to form part of a extensive home range for this species.

Of the five threatened fauna species recorded in 2008, two have not been previously recorded, being the spotted-tailed quoll (*Dasyurus maculatus*) and the large-footed myotis (*Myotis adversus*).

Threatened fauna species recorded in previous years, but not during 2008, were the blue-billed duck (*Oxyurus australis*), eastern cave bat (*Vespadelus troughtoni*) and the speckled warbler (*Pyrrholaemus sagittatus*).

3.10.1 Blue Billed Duck Habitat Enhancement

In accordance with DA 305-11-01 Liddell Coal has committed to undertaking habitat enhancement measures at Dam 3 and a Dam in the Mountain Block area to offset impacts on the blue-billed duck as a result of mining operations.

The blue-billed duck (*Oxyura australis*), a species listed in the schedules of the NSW *Threatened Species Conservation Act 1995* (TSC Act) as vulnerable, has been identified at Dams 7 and 13 in fauna monitoring surveys. Liddell Coal has committed to undertaking habitat enhancement measures at Dam 3 and a dam in the Mountain Block Dam area where practical, with the aim of providing potential compensatory habitat for the blue-billed duck (*Oxyura australis)*.

A blue-billed duck management strategy was developed during the reporting period to guide the creation and ongoing maintenance of habitat for the blue-billed duck at each of the dams. The strategy is incorporated in the Landscape Management Plan.

Figure 3.19

Flora Plot Monitoring Locations

Figure 3.20

Fauna Monitoring Locations

3.11 Weeds

A number of introduced species occur within the Liddell Colliery development consent area including galenia (*Galenia pubescens*), tiger pear (*Opuntia aurantiaca*), creeping pear (*Opuntia humifusum*) and pampas grass (*Cortaderia selloana*). All species of *Opuntia* are listed as noxious in all local government areas (LGAs) within NSW, and pampas grass (*Cortaderia selloana*) is listed as noxious in the Singleton LGA.

Liddell Colliery has previously developed a comprehensive Weed Management Plan to assist with the management of weed control across the site. During the development of the plan a two day weed survey was undertaken across Liddell's mining operation and a detailed treatment schedule and action plan developed. Liddell Colliery undertakes the weed control program in accordance with the site Landscape Management Plan in accordance with schedule 3, condition 30, of the development consent.

During the reporting period a weed monitoring survey was undertaken in accordance with the Liddell Colliery Weed Management Plan. Weed species detected at Liddell Colliery during the June 2009 site inspection are listed in **Table 3.15**

Table 3.15 - **Weeds detected at Liddell Colliery 2009**

Weed Species	Scientific Name	Legislative Listing	Control Priority
African Boxthorn	*Lycium ferrocissimum*	Noxious Weed- Class 4	High
African Olive	*Olea europaea*	Environmental Weed	Medium
Blackberry	*Rubus fruiticosus*	Noxious Weed-Class 4; WONS	High
Camphor Laurel[1]	*Cinnamomum camphora*	Environmental Weed	Low
Castor Oil Plant	*Ricinus communis*	Environmental Weed	Medium
Galenia	*Galenia pubescens*	Environmental Weed	High
Green Cestrum	*Cestrum parqui*	Noxious Weed – Class 3	High
Lantana	*Lantana camara*	Noxious Weed – Class 5; WONS	High
Mother of Millions	*Bryophyllum delagoense*	Noxious Weed – Class 3	High
Pampas Grass	*Cortaderia selloana*	Noxious Weed – Class 4	High
Poplar[1]	*Populus alba*	Environmental Weed	Low
Prickly Pear	*Opuntia* species	Noxious Weed– Class 4	Medium
St Johns Wort	*Hypericum perforatum*	Noxious Weed - Class 4	High

[1] New weed species detected at Liddell Colliery during 2008-2009

Weed control practices undertaken at Liddell Coal include:

- regular site inspections to identify areas of weed infestation and weed species;
- development and implementation of an eradication plan applicable to the circumstances, which may include manual removal, spot spraying, boom spraying, aerial spraying or biological control;
- maintenance of regular contact with neighbouring property owners in an attempt to eradicate weed species from the surrounding area;
- minimisation of vegetation disturbance by reducing the number of tracks and using the same access routes, where practicable;
- minimisation of clearing and other disturbance of vegetation associated with civil works;
- early establishment and maintenance of grasses and native trees particularly during rehabilitation of overburden dumps; and
- regular maintenance of topsoil stockpiles to eradicate weed infestation.

Regular weed control works were undertaken during the reporting period.

3.12 Blasting

3.12.1 Blast Criteria and Control Procedures

Blasting criteria for Liddell Colliery are prescribed in schedule 3, conditions 6 and 7, of DA 305-11-01. The consent condition covers criteria for overpressure, ground vibration and vibration limits at designed structures.

The development consent stipulates that the air blast overpressure level from blasting operations must not exceed 115 dB(L) for more than 5% of the total number of blasts during each reporting period and never exceed 120 dB(L) at any residence on privately owned land. Limits for ground vibration caused by blasting have also been specified in the development consent, and should not exceed a peak velocity of 5 mm/s for more than 5% and must never exceed 10 mm/s at any time, at any residence on privately owned land.

Blasting activities can only be undertaken at Liddell Colliery between 9 am and 5 pm Monday to Saturday, inclusive. No blasting is allowed to be undertaken on Sundays, public holidays, or at any other time without the written approval of DECC.

The drill and blast contractor, Hunter Valley Earthmoving, continues to operate a blasting notification telephone line on 1800 037 317.

3.12.2 Blast Results

Blast monitoring was undertaken at two privately owned residences and the Chain of Ponds Hotel throughout the 2008-2009 reporting period. Blast monitoring locations are presented in **Figure 3.15**. There were 136 blasts undertaken throughout the 2008-2009 reporting period and no levels above the vibration limit (5 mm/s) were recorded at privately owned residences. There were no levels recorded above the air blast overpressure threshold limit (115 dB(L)) at the Burlings privately owned residence however, four blasts (3%) were recorded between 115 dB(L) and 120 dB(L) at the Scrivens private residence. In addition, one exceedance of the air blast overpressure threshold limit of 120 dB(L) was recorded at Scrivens. All blasts were conducted within the hours of 0900 and 1700 and on Monday to Saturday. No blasts were undertaken on Public Holidays.

Blast monitoring results for the reporting period are provided in **Appendix 5**.

The result in excess of 120 dB(L) at the Scrivens property on 27 April 2009 was reported by Liddell Coal as a non-compliance to the DECC in accordance with EPL requirements. There were no complaints received from the community as a result of the blast and an independent consultants report states that the result was wind affected and should be recorded as equal to or less than 110 dB(L).

As a result of several non-compliances for the loss of blast data during the previous reporting period, Liddell Coal conducted a review of the sites blast monitoring system. The review assessed the effectiveness of the existing system and assessed options to upgrade/improve the system to ensure that all blast results are captured from future blasting activities on site. As a result of the investigation, a new blast monitoring system, Datamasters V6 Blast Monitoring System, was installed on 19 June 2008. The Datamaster V6 Blast Monitoring system provides superior blast capture results than the previous Texcel system as the technology used does not rely on the transmission of SMS messages to capture blasting events or to start recording blast data. The new system continuously records data 24 hours per day, 7 days per week which significantly reduces the risk of missed blast capture events.

The new blast monitoring system recorded 100% blast data capture during the 2008-2009 reporting period. A comparison of blast monitoring compliance for the last three reporting periods is presented in **Table 3.16.**

Table 3.16 – Three Year Blast Monitoring Compliance Comparison

	Number of Blasts	Criteria exceedances	Non-compliance
July 2006 to June 2007	92	Five 2mm/s exceedances at Chain of Ponds Hotel	5 (Vibration exceedences)
July 2007 to June 2008	95	Nil	4 (blast monitoring data not collected)
July 2008 to June 2009	136	Four blasts (3%) above 115dB(L) (within 5% criteria) and one result above 120dB(L) at 'Scrivens' which was wind affected.	1(Overpressure >120dB(L))

Comparison to EA Predictions

The Liddell Colliery EA (2006) predicts blast impacts at private residences and other structures. Airblast overpressure and ground vibration levels are predicted to meet the DEC guidelines and the development consent conditions, for blasting, at all privately owned residences. Monitoring results for the reporting period generally conform with these predictions except for the one airblast exceedance however, as discussed above, this exceedance was found to be wind affected and not as a direct result of the Liddell Coal blast.

3.13 Operational Noise

3.13.1 Noise Criteria and Control Procedures

Noise criteria for Liddell Colliery are prescribed in schedule 3, condition 1 of DA 305-11-01. Liddell Coal are required to ensure that noise generated by the development does not exceed the noise impact criteria in **Table 3.17** at any residence on, or on more than 25 percent of, any privately owned land.

Table 3.17 - Noise Criteria

Assigned Residential Location Number	Noise Criteria LAeq (15 minute)	Sleep Disturbance Noise Criteria LA (1 min)
1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	35 dB(A) Day	
	35 dB(A) Evening	
	35 dB(A) Night	45 dB(A) Night

Day – 7 am to 10 pm Monday to Saturday;
8 am to 10 pm Sundays and Public Holidays

Night – 10 pm to 7 am Monday to Saturday;
10 pm to 8 am Sundays and Public Holidays

The noise emission limits identified in **Table 3.17** applies under meteorological conditions of:

- wind speeds up to 3 m/s at 10 metres above ground level; or
- temperature inversion conditions of up to 3^{o}C/100 metres, and wind speeds of up to 2 m/s at 10 metres above ground level.

The criteria outlined in **Table 3.17** apply to all private residences, as illustrated in **Figure 3.12**. The criteria do not apply to mine owned residences.

3.13.2 Noise Monitoring Program

The Noise Monitoring Program outlines the noise monitoring required to be undertaken by Liddell Coal to ensure compliance with statutory requirements at Liddell Colliery. The program addresses the requirements contained in DA 305-11-01 and the general terms of approval issued by the DECC in relation to the required EPL. The program was developed to satisfy schedule 3, condition 5, of DA 305-11-01.

All monitoring is undertaken in accordance with the Liddell Colliery procedure for environmental monitoring and evaluation.

Regular attended noise monitoring is undertaken at representative locations surrounding Liddell Colliery, refer to **Figure 3.22**. Monitoring also consists of unattended continuous noise logging over a minimum 72 hour period on a bi-annual basis during the mining operations at Liddell Colliery. Operator attended noise measurements over 15 minute periods are also undertaken during the bi-annual monitoring which is undertaken at representative periods of the summer and winter seasons.

3.13.3 Noise Monitoring Results

Long term noise monitoring is undertaken for a period of at least three days using loggers programmed to measure and store average (LAeq) noise levels every second. Short term noise monitoring is attended by a noise consultant, at each location, noise levels are surveyed for two minute periods during the day and evening.

Noise monitoring during the reporting period was undertaken by a noise consultant, Spectrum Acoustics, on two occasions being August 2008 and February 2009. Both long term and short term noise measurements were conducted at six residences surrounding Liddell Colliery, noise monitoring sites are shown on **Figure 3.15**. Results of attended noise monitoring events are presented in **Tables 3.18 and 3.19**.

Table 3.18 - Attended Noise Monitoring Results August 2008

Location	Period	Total dB(A), Leq (15min)	Wind Speed (m/s)/ Direction (degrees)	Liddell Coal's Operational Noise Contribution dB(A), Leq (15 min)
2	Day	43	6.4/307	inaudible
	Evening	40	6.2/299	33
	Night	39	5.5/313	inaudible
3*	Day	50	7.7/310	inaudible
	Evening	42	4.5/294	37
	Night	44	5.6/312	est 35
6	Day	53	6.3/306	inaudible
	Evening	49	4.6/298	inaudible
	Night	50	5.8/307	Inaudible
17*	Day	42	6.2/303	28
	Evening	41	5.0/299	39
	Night	41	5.2/312	est 27
23*	Day	48	7.1/303	inaudible
	Evening	44	4.6/305	est 30
	Night	41	4.5/302	35
Liddell Recreation Area	Day	49	6.0/309	inaudible
	Evening	47	4.3/292	inaudible
	Night	52	5.9/309	inaudible

*Mine owned residences

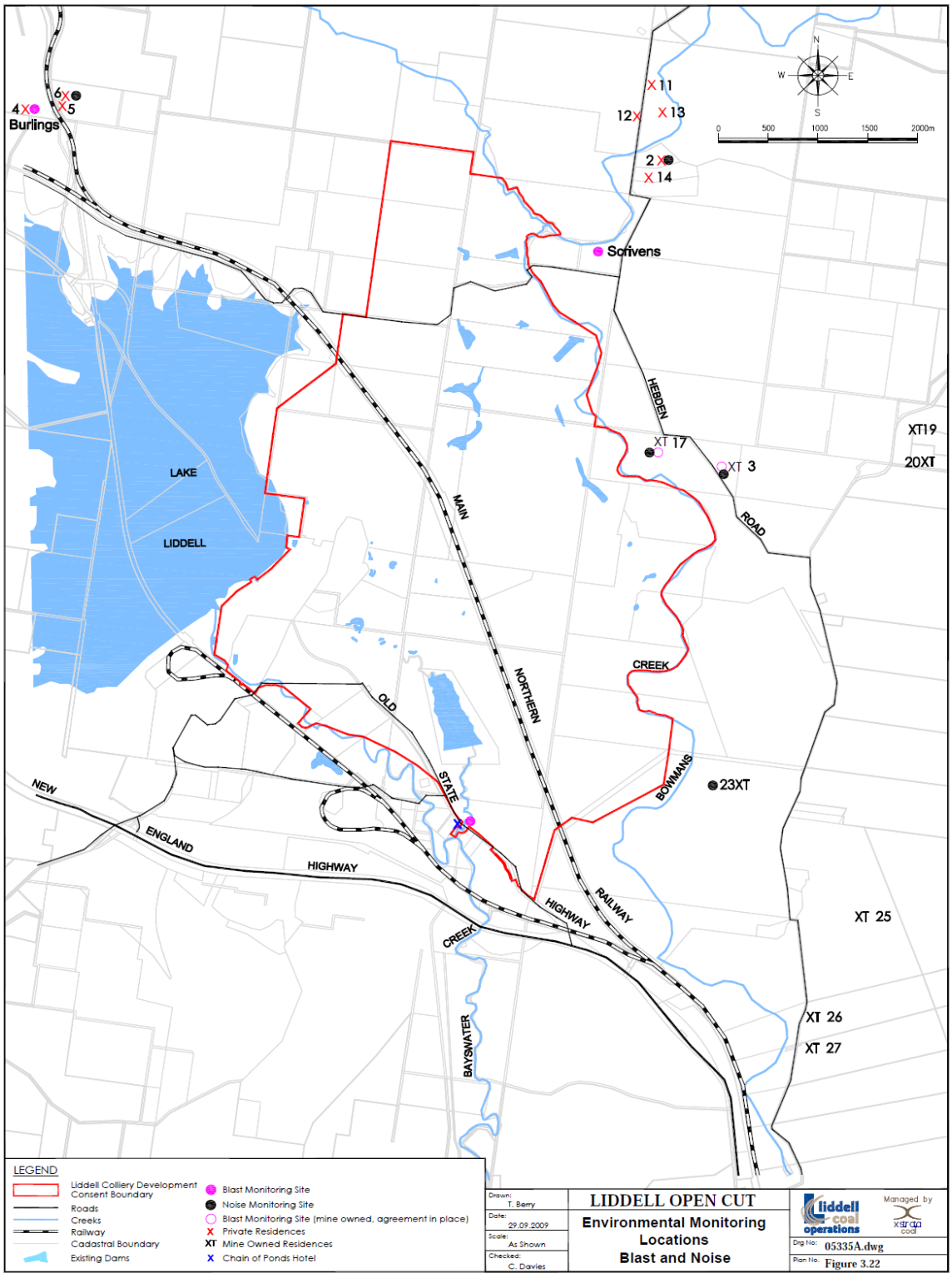


Figure 3.21
Environmental Monitoring
Locations Blast and Noise

Noise monitoring results for August 2008 show that noise emissions from Liddell Colliery were higher than the noise criteria, at monitoring locations 3 and 17, during the evening period. Both of these residences are mined owned properties.

Section 2.1 of the Liddell Colliery Noise Monitoring Program indicates that compliance with noise emission criteria is not applicable under atmospheric conditions where wind speeds are higher than 3 m/s. Wind speed data from the site showed that wind speed at the time of the exceedances during the evening were greater than 3 m/s.

Table 3.19 - Attended Noise Monitoring Results February 2009

Location	Period	Total dB(A), Leq (15min)	Wind Speed (m/s)/ Direction	Liddell Coal's Operational Noise Contribution dB(A), Leq (15min)
2	Day	38	4.9/WNW	inaudible
	Evening	48	0.5/E	inaudible
	Night	46	1.5/SE	35
3*	Day	37	6.0/WNW	30
	Evening	48	2.5/E	inaudible
	Night	45	1.1/ENE	35
6	Day	41	5.6/W	inaudible
	Evening	39	0.6/SE	inaudible
	Night	42	1.1/NE	inaudible
17*	Day	38	5.6/WNW	30
	Evening	48	1.7/E	inaudible
	Night	49	1.8/NE	35
23*	Day	38	4.9/WNW	inaudible
	Evening	55	2.9/E	inaudible
	Night	45	1.3/SSE	32
Liddell Recreation Area	Day	45	4.2/W	inaudible
	Evening	65	1.1/SE	inaudible
	Night	50	1.3/NE	34

*Mine owned Residences

Noise monitoring results for February 2009 show that noise emissions did not exceed the relevant noise criteria at any monitoring location during the monitoring periods.

The results indicated that Liddell Coal's mining activities were generally audible at the private residence 2 and the Lake Liddell Recreation Area during the evening or night time periods in the February and August monitoring rounds. The relevant noise criterion was not exceeded at any of the private residences. There were a number of noise complaints received during this reporting period from the upper Hebden area near residence 2 and these are explained in further detail in **Section 4.2**.

A review of operational noise results for the previous two reporting periods indicates that in the 2006 to 2007 and 2007 to 2008 reporting periods all results were below the noise criteria with Liddell Coal operational noise rarely audible. The 2008 to 2009 reporting period had exceedances at locations 3 and 17 (both mine owned properties) during August 2008 monitoring, however, wind speeds were greater than 3m/s at the time therefore Liddell Coal was complying with noise criteria.

Comparison to EA Predictions

The Liddell Colliery EA (2006) proposes that modifications to the development consent will not produce an exceedance of the Liddell Coal operational specific noise criteria at any surrounding privately owned residence however, noise levels are expected to exceed criteria at a number of mined owned residences. The noise monitoring results for the reporting period conform these predictions with two exceedances (albeit wind affected) at mine owned residences only.

3.14 Visual and Stray Light

Visual impact management is undertaken in accordance with the practices outlined in the Liddell Colliery MOP (2008) and the Landscape Management Plan. Under the Plan, visual impacts are managed through:

- prompt rehabilitation;
- prioritisation of rehabilitation, focusing effort on areas that are most visually prominent from off-site private residences and public transport routes; and
- directing of light away from residences.

During the reporting period, flood lighting in mining areas was located to ensure no direct light was emitted on to Hebden Road, Antiene Road, the New England Highway, the Main Northern Railway, or towards any dwellings. Lighting louvers or shields are fitted to equipment lights to minimise peripheral illumination of the night sky. Night inspections of the mining areas were undertaken by the Open Cut Examiner to determine the impact of lighting and where appropriate, the implementation of mitigation measures such as relocation of machinery to less intrusive areas.

Additionally, the new office and workshop complex area was designed and constructed to minimise the visual intrusiveness of the buildings and to reduce the amount of stray light leaving the site. The tree line adjacent to the Old New England Highway was deliberately left in place to reduce the visual impact from the site.

3.15 Aboriginal Heritage

The Liddell Colliery development consent area has been the subject of a number of archaeological investigations including those undertaken by Haglund (1982), Brayshaw (1982, 1983), Davies (1991) and Umwelt (2001). A total of 40 sites have been recorded within the Liddell Colliery development consent area, consisting of 27 artefact scatters and 13 isolated finds. The recorded sites are mapped in **Figure 3.22** and a description of each site and its current status is provided in **Table 3.20**.

The most extensive sites (both in terms of areal extent and numbers of artefacts) were identified along the major drainage lines within the development consent area, namely Bayswater Creek, Chain of Ponds Creek and Bowmans Creek. Three site complexes were identified by Umwelt (2001) and consisted of separate artefact exposures (recorded as loci or sites) bordering these watercourses. The site complexes were the Bayswater Creek site area (containing Brayshaw Site A, Brayshaw Site B, Brayshaw Site C, Brayshaw Site D and LID4) (refer to **Figure 3.23**), the Bowmans Creek site area (containing sites PL1, Davies' Site 5) and the Chain of Ponds site area (containing LID29, LID31 and LID32).

Table 3.20 - Previously Recorded Sites within the Liddell Colliery Development Consent Area

Site Name	Site Number (AHIMS)	Site Type	Description	Status
LID1	37-3-0454	Artefact scatter	Three artefacts exposed in area of sheet wash erosion on a lower slope.	Section 90 consent #1443 granted 12 November 2002 Site salvaged 5 December 2002
LID2	37-3-0453	Artefact scatter	Eight artefacts exposed on a lower slope in association with core sampling activity.	Extant site
LID3	37-3-0452	Artefact scatter	Fifty-three artefacts located in an area of moderate gully erosion on a tributary of Bowmans Creek.	Extant site
LID5	37-3-0450	Isolated artefact	An artefact located on an upper slope approximately 200 metres north-east of Bayswater Creek.	Aboriginal Heritage Impact Permit (AHIP)#2896 granted 18 March 2008 Site salvaged as part of works program undertaken between 19 March and 3 April 2008
LID7	37-3-0447	Artefact scatter	Three artefacts located on a gently inclined mid slope.	Section 90 consent #1301 granted 8 March 2002 Site salvaged 11-15 March 2002
LID8	37-3-0446	Artefact scatter	Six artefacts located on a minor drainage line.	Section 90 consent #1301 granted 8 March 2002 Site salvaged 11-15 March 2002
LID9	37-3-0445	Isolated artefact	An artefact located on a gently inclined upper slope above a drainage depression.	Section 90 consent #1301 granted 8 March 2002 Site salvaged 11-15 March 2002
LID10	37-3-0444	Artefact scatter	Seventeen artefacts exposed in a disturbed area on a crest.	Section 90 consent #1301 granted 8 March 2002 Site salvaged 11-15 March 2002
LID11	37-3-0443	Artefact scatter	Five artefacts located in a very disturbed area associated with dam construction on a minor drainage line.	Section 90 consent #1577 granted 26 March 2003 Site salvaged 14 May 2003
LID12	37-3-0442	Artefact scatter	Two artefacts in an area of sheet wash erosion on a crest.	Section 90 consent #1301 granted 8 March 2002 Site salvaged 11-15 March 2002

Table 3.20 - Previously Recorded Sites within the Liddell Colliery Development Consent Area (continued)

Site Name	Site Number (AHIMS)	Site Type	Description	Status
LID13	37-3-0441	Artefact scatter	A dispersed scatter of 52 artefacts in a highly disturbed area adjacent to Chain of Ponds Creek.	Section 90 consent #1577 granted 26 March 2003 Site salvaged 14 May 2003
LID14	37-3-0440	Artefact scatter	A discontinuous scatter of 35 artefacts along a stream channel.	Section 90 consent #1577 granted on 26 March 2003 Site salvaged on 15 May and 23 May 2003
LID15	37-3-0439	Artefact scatter	Eight artefacts in an area of sheet wash erosion on an upper slope.	Section 90 consent #1577 granted on 26 March 2003 Site salvaged on 14 May 2003
LID16	37-3-0438	Artefact scatter	A total of 26 artefacts located in an area of disturbance associated with pipeline construction.	Section 90 consent #1577 granted on 26 March 2003 Site salvaged on 14 May and 23 May 2003
LID17	37-3-0437	Isolated artefact	A single artefact present in an area of high disturbance along a drainage depression.	Section 90 consent #1577 granted on 26 March 2003 No salvage required
LID18	37-3-0436	Isolated artefact	A single artefact located in an area of disturbance along a drainage channel.	Section 90 consent #1577 granted on 26 March 2003 No salvage required
LID19	37-3-0435	Isolated artefact	A single artefact in an area of disturbance on a crest.	Section 90 consent #1301 granted 8 March 2002 Site salvaged 11-15 March 2002
LID20	37-3-0434	Artefact scatter	Five artefacts present in an area of sheet wash erosion on a drainage depression.	Section 90 consent #1577 granted on 26 March 2003 Site salvaged on 14 May 2003
LID21	37-3-0433	Artefact scatter	Seven artefacts located on vehicle track running across a flat bordering Chain of Ponds Creek.	Section 90 consent #1577 granted on 26 March 2003 Site salvaged on 14 May 2003

Table 3.20 - Previously Recorded Sites within the Liddell Colliery Development Consent Area (continued)

Site Name	Site Number (AHIMS)	Site Type	Description	Status
LID22	37-3-0432	Artefact scatter	A scatter of 24 artefacts present on a lower slope in an area of disturbance associated with pipeline construction.	Section 90 consent #1577 granted on 26 March 2003 Site salvaged on 14 May 2003
LID23	37-3-0467	Isolated find	A single artefact present on the bank of stream channel.	AHIP#2896 granted 18 March 2008 Site salvaged as part of works program undertaken between 19 March and 3 April 2008
LID24	37-3-0465	Artefact scatter	Five artefacts located in a drainage depression in an area that has been disturbed by sheet wash erosion associated with a nearby dam.	AHIP#2896 granted 18 March 2008 Site salvaged as part of works program undertaken between 19 March and 3 April 2008
LID25	37-3-0466	Artefact scatter	Three artefacts located in an area of gully erosion on a drainage depression.	AHIP#2896 granted 18 March 2008 Site salvaged as part of works program undertaken between 19 March and 3 April 2008
LID26	37-3-0431	Isolated artefact	A single artefact located in a graded drainage channel on a drainage depression.	Section 90 consent #1577 granted on 26 March 2003 No salvage required
LID27	37-3-0430	Isolated artefact	A single artefact on a drainage depression.	Extant site
LID28	37-3-0429	Isolated artefact	A single artefact located on a crest in an area of disturbance associated with pipeline construction.	Section 90 consent #2348 granted on 3 October 2006 No salvage required
LID29	37-3-0427	Artefact scatter	A scatter of least 64 artefacts located on the banks and flats of Chain of Ponds Creek.	Section 90 consent #2348 granted on 3 October 2006 Site salvaged 21-23 November 2006
LID30	37-3-0426	Artefact scatter	Five artefacts located on a ridge.	Section 90 consent #2348 granted on 3 October 2006 Site salvaged 21-23 November 2006
LID31	37-3-0428	Isolated artefact	A single artefact located on the bank of Chain of Ponds Creek.	Section 90 consent #2348 granted on 3 October 2006 Site salvaged 21-23 November 2006

Table 3.20 - Previously Recorded Sites within the Liddell Colliery Development Consent Area (continued)

Site Name	Site Number (AHIMS)	Site Type	Description	Status
LID32	37-3-0464	Artefact scatter	A scatter of 57 artefacts exposed by gully erosion on the banks of Chain of Ponds Creek.	Section 90 consent #2348 granted on 3 October 2006 Site salvaged 21-23 November 2006
LID33	37-3-0463	Artefact scatter	Three artefacts present in an erosion scour on an upper slope adjacent to the Old New England Highway.	AHIP#2741 granted in 2007 Site salvaged 17 August 2007
Brayshaw Site A	37-3-0055/ 37-3-0461	Artefact scatter	Three artefacts located in an area of sheet wash erosion on Bayswater Creek.	Section 90 consent granted in 1983 but predicted impacts to the area did not occur Variation to AHIP#2896 providing Section 90 consent for part of Brayshaw A granted 18 April 2008 No salvage works required under AHIP#2896
Brayshaw Site B	37-3-0052/ 37-3-0460	Artefact scatter	A scatter of at least 114 artefacts was recorded at this site in 2001 despite the fact that previous surface and subsurface salvage had taken place at the site in 1983.	Section 90 consent granted in 1983. Salvage undertaken in 1983 but additional artefacts (114) recorded by Umwelt (2001a) AHIP#2883 granted 18 February 2008 providing Section 87 consent for part of Brayshaw Site B Test excavations undertaken from 19 March to 3 April 2008 Variation to AHIP#2896 providing Section 90 consent for part of Brayshaw B granted 18 April 2008 Sub-surface salvage of part of Brayshaw B (and an associated portion of Bayswater Creek site area) undertaken between 21 April and 15 May 2008
Brayshaw Site C	37-3-0053/ 37-3-0459	Artefact scatter	Two artefacts located on a bank of Bayswater Creek.	Section 90 consent granted in 1983 but predicted impacts to the area did not occur Extant site

Table 3.20 - Previously Recorded Sites within the Liddell Colliery Development Consent Area (continued)

Site Name	Site Number (AHIMS)	Site Type	Description	Status
Brayshaw Site D	37-3-0054/ 37-3-0458	Isolated artefact	A single artefact located on the southern bank of Bayswater Creek.	Extant site
SP1	37-3-0457	Isolated artefact	A single artefact located in area of gully erosion on a minor drainage depression.	AHIP#2896 granted 18 March 2008 Site salvaged as part of works program undertaken between 19 March and 3 April 2008
SP2	37-3-0456	Artefact scatter	A scatter of 19 artefacts in a drainage depression that has been altered by railway embankment and dam construction.	AHIP#2896 granted 18 March 2008 Site salvaged as part of works program undertaken between 19 March and 3 April 2008
SP3	37-3-0455	Isolated artefact	A single artefact located in an area of sheet wash erosion on an upper slope leading to a minor drainage depression.	AHIP#2896 granted 18 March 2008 Site salvaged as part of works program undertaken between 19 March and 3 April 2008
Liddell Fines 1	37-3-0738	Artefact scatter	Two artefacts located in a highly disturbed context adjacent to an access road to the Howick fines dump.	AHIP#2896 granted 18 March 2008 Site salvaged as part of works program undertaken between 19 March and 3 April 2008
LHP1	37-3-0739	Artefact scatter	Three artefacts located in a highly disturbed context adjacent to an emergency helicopter pad.	Variation to AHIP#2896 granted 17 August 2008 Site salvaged 22 September 2008

Figure 3.22

Archaeological Sites

Within the Liddell Colliery Consent Area

3.15.1 Consent Conditions Relating to Aboriginal Cultural Heritage

As discussed, in **Section 1.1.1**, Liddell Coal was granted a modification to development consent DA 305-11-01 on 18 July 2007. Two Development Consent Conditions relate specifically to Aboriginal cultural heritage. These are listed below.

34. The Applicant shall obtain consents from DECC under Section 90 of the National Parks and Wildlife Act 1974, prior to disturbing any of the following Aboriginal sites and artefacts: LID2, LID3, LID4, LID5, LID23, LID24, LID25, LID27, LID33, SP1, SP2, SP3, and Brayshaw B.
35. By 31 January 2008, the Applicant shall revise its Aboriginal Cultural Heritage Management Plan in consultation with relevant Aboriginal stakeholders and to the satisfaction of the Director-General.

3.15.2 Aboriginal Cultural Heritage Testing and Salvage Works Undertaken 2008-2009

During the previous reporting period a series of salvage activities were undertaken under AHIP#2896. These involved the surface collection of artefacts at LID5, LID23, LID24, LID25, SP1, SP2, SP3 and Liddell Fines 1 and the monitoring of topsoil removal in specified portions of the Bayswater Creek site area outside the focal areas in PA1 and PA2. Following the completion of this work and test excavations under AHIP#2883, a variation to AHIP#2896 was sought to enable sub-surface salvage within PA1 and the destruction of PA2 without further sub-surface salvage. The proposed variation to AHIP#2896 was granted on 18 April 2008 and a large open area excavation was undertaken within PA1 between 21 April and 15 May 2008, resulting in the recovery of a large number of stone artefacts.

During the course of works undertaken under AHIP#2896 an additional site (LHP1) was identified in a highly disturbed context adjacent to an emergency helicopter pad. An additional variation to AHIP#2896 to enable surface collection of LHP1 was granted on 17 August 2008. The surface collection was conducted on 22 September 2008.

3.15.3 Revision of the Aboriginal Cultural Heritage Management Plan

Condition 35 of Development Consent DA 305-11-01 required that Liddell Coal prepare a revision of its Aboriginal Cultural Heritage Management Plan (ACHMP). In accordance with this condition, Liddell Coal commissioned Umwelt to complete a revision of the ACHMP in consultation with the relevant Aboriginal stakeholders. The revised ACHMP was completed in consultation with the following Aboriginal stakeholders:

- Aboriginal Native Title Consultants;
- Hunter Valley Aboriginal Corporation;
- Ungooroo Aboriginal Corporation;
- Upper Hunter Heritage Consultants;
- Wanaruah Custodians;
- Wanaruah Local Aboriginal Land Council;
- Wattaka Wonnarua CC Service;

- Yarrawalk;
- Wonnarua Culture Heritage;
- Wonn1 Contracting;
- Valley Culture;
- Giwiirr Consultants;
- Upper Hunter Wonnarua Council Inc;
- Hunter Valley Cultural Surveying;
- Hunter Valley Cultural Consultants;
- Mingga Consultants; and
- Ungooroo Cultural & Community Services.

The revised ACHMP was submitted to DoP on 31 January 2008 and was approved by DoP on the 4th February 2009.

3.16 Historic Heritage

3.16.1 Chain of Ponds Hotel

The Chain of Ponds Hotel is located adjacent to the project area and approximately 40 metres south-west of the development consent boundary. The Chain of Ponds Hotel is listed on the Register of the National Estate maintained by the Australian Heritage Commission and is also listed on the State Heritage Register maintained by the NSW Heritage Commission.

Schedule 3, condition 36 of DA 305-11-01 requires Liddell Coal to prepare a photographic record of the condition and integrity of the accessible sections of the Chain of Ponds Hotel site. A photographic record was prepared in accordance with schedule 3, condition 36, of DA 305-11-01 and provided to DoP on 29 January 2008 and NSW Heritage on 23 May 2008.

No correspondence has been received from the DoP to date regarding the approval of the photographic record.

3.16.2 Former Police Lock-up Site

The Police Lock-up is located approximately 40 metres south-west of the development consent boundary. The Liddell Coal Continued Operations EIS assessment concluded that if any residual material evidence remains of the former Police Lock-up, it is likely to be entirely subsurface and unlikely to be subject to damage from vibration as the result of operational blasting. The assessment identified that there was some potential for impact from the operation of machinery during drainage works in Chain of Ponds Creek or other works within the area. The drainage works in Chain of Ponds Creek have not been undertaken.

DA 305-11-01 outlines the following condition:

> Archival Record
>
> 37. The Applicant shall prepare an archival record of the former Police Lock Up precinct, prior to any activity associated with the development that may disturb this site, in accordance with the requirements of the NSW Heritage Office, and to the satisfaction of the Director-General.

At this point in time the works at Chain of Ponds Creek have not been required.

3.17 Spontaneous Combustion

During the reporting period, mining operations were undertaken in accordance with the Liddell Colliery Spontaneous Combustion Management Plan. The management plan outlines the standards to be maintained, the monitoring system and the procedures to be followed in the case of a spontaneous combustion incident.

Areas of spontaneous combustion have been found when mining through the old underground workings in the Liddell Seam. A procedure has been developed for managing drill and blast operation of area suspected to be liable to spontaneous combustion. The mine design incorporates the use of benches for sealing off the highwall to minimise the ingress of oxygen, and the flooding of heated areas prior to mining with recycled mine water.

When hot material is to be dumped, it is either block dumped or dumped over a low lift and covered by a substantial quantity of inert material. If heat effected coal is to be mined every effort is made to minimise dust being raised into suspension. Coal is processed through the preparation plant as soon as practicable to minimise stockpile time and exposure to oxygen.

3.18 Bushfire

Between the Open Cut and LCPP Operations, Liddell Colliery maintains up to five water carts equipped with fire fighting equipment and capable of extinguishing fire outbreaks. This fire fighting equipment, together with graders and bulldozers used for mining, provides effective bushfire fighting capability. In addition, emergency preparedness training for mine-site personnel enhances the responsiveness.

The trucks are fully equipped with both rear and side sprays and a 64 millimetre stortz coupling, to which a standard fire hose can be fitted. The trucks have a carrying capacity of up to 70 kilolitres each with a fill time of between two to four minutes. Some trucks are equipped with a fire monitor.

Bushfire management is undertaken in accordance with the Liddell Colliery Landscape Management Plan.

There were no incidents of bushfire at Liddell Coal during the reporting period.

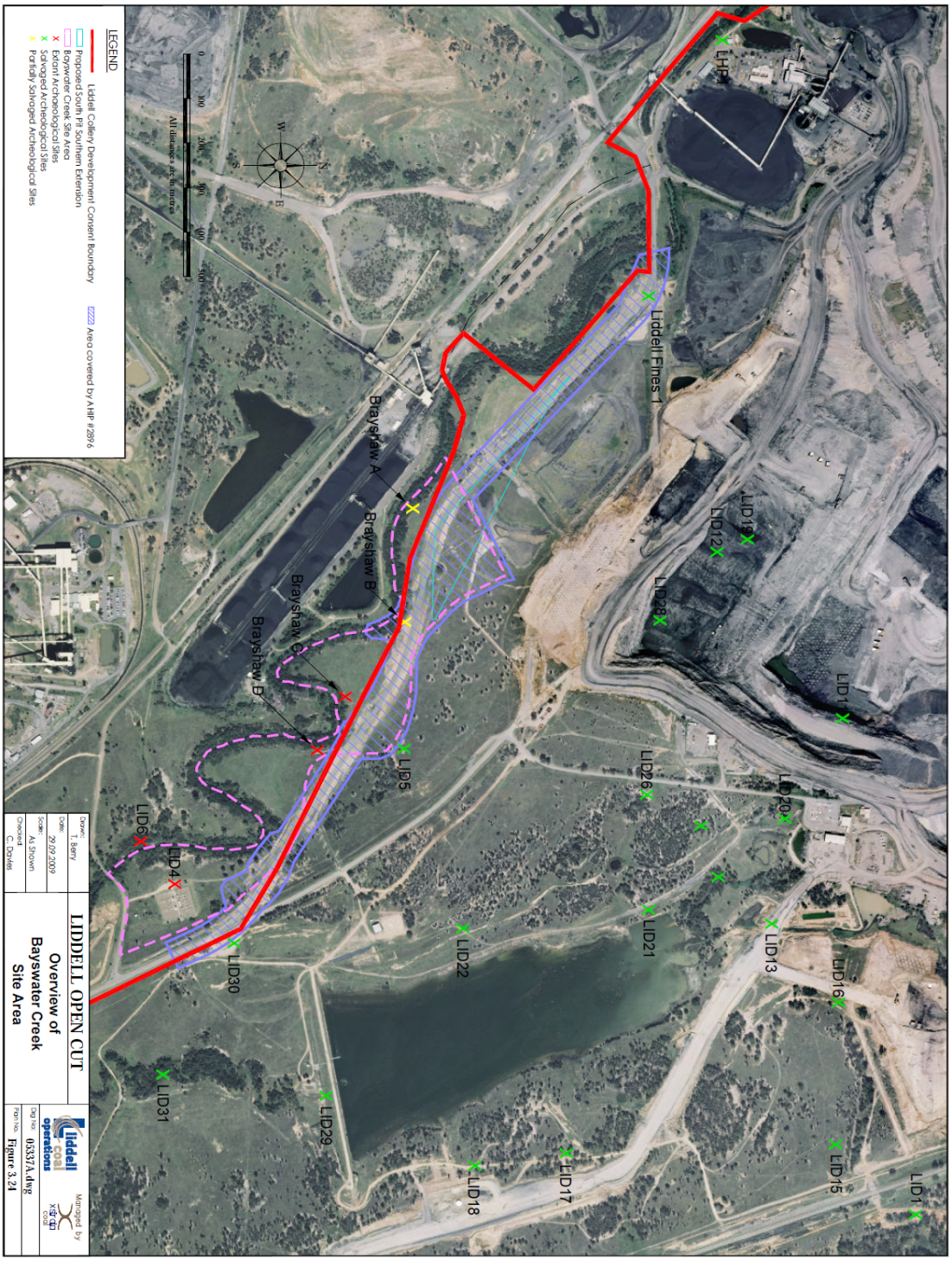


Figure 3.23

Overview of Bayswater Creek Site Area

3.19 Hydrocarbon Contamination

Environmental incidents relating to hydrocarbons are captured by the incident reporting system XstraSafe, which is operated by Xstrata.

There were four hydrocarbon contamination incidents during the reporting period. All incidents were minor and resulted in no detrimental impact on the environment. Two incidents were classed as Category 1 – Negligible, reversible environmental impact and the other two were classed as Nil Category – below Category 1.

3.20 Greenhouse Gas and Energy

Liddell Coal is required to monitor the greenhouse gas emissions generated by the development and investigate ways to reduce greenhouse gas emissions. Greenhouse gas emission monitoring and investigation is covered by Xstrata Corporate (XCN) on a Group wide basis.
Greenhouse emissions are estimated on coal production, electricity usage and diesel consumption.

Liddell Coal seeks ways of reducing emissions through mine planning, revision of current practices, regular monitoring, and the reduction of fuel consumption through the efficient operation and regular maintenance of machinery. During the reporting period, Liddell Coal undertook a series of actions to assist in the reduction of greenhouse gas emissions and energy usage from the site, including:

- the development and implementation of the Liddell Coal Energy Savings Action Plan, in accordance with condition 45, schedule 3, of the development consent;
- establishment of an Energy Management Working Group, which will review Liddell Coal's energy consumption quarterly;
- implementation of a Fuel Smart tracking system to enable the site to track and analyse energy usage per piece of plant equipment;
- installation of real time metering in new preparation plant to provide information on electricity usage by major users; and

3.21 Public Safety

Liddell Colliery is has perimeter fencing to exclude unauthorised personnel entry. All visitors to Liddell Colliery are required to report to the main offices and log in as a visitor indicating who they are visiting. When visitors leave the site, they are required to log out. All contractors and employees working on site are inducted in mine safety and environmental management issues prior to working within the mine area. During blasting activities sentries are posted to prevent unauthorised entry.

3.22 Other Issues and Risks

3.22.1 Feral Animal Control

Feral animal control is undertaken in consultation with the Mid Coast Livestock Health and Pest Authority, the Hebden Wild Dog Association and neighbouring landholders. Programs to control feral animals include the determination of appropriate control practices, consultation with appropriate authority, obtaining appropriate approvals, implementing control practice and undertaking follow-up monitoring and control as required.

If monitoring shows a substantial increase in the density of any known feral fauna species, or the occurrence of a previously unrecorded feral fauna species, is discovered, Liddell Colliery will seek expert advice on the management and control options for that species and endeavour to minimise its impact on native flora and fauna.

During the reporting period, Liddell Coal contributed to the Hebden Wild Dog Association for wild dog control in autumn 2009, which consisted of aerial baiting within the mine owned "Hillcrest" property.

4.0 Community Relations

4.1 Community Consultative Committee

Liddell Coal has continued to maintain the important dialogue with its local community during the reporting period. DA 305-11-01 requires Liddell Coal maintain a Community Consultative Committee (CCC) comprising of:

- two representatives from Liddell Coal, including the person responsible for environmental management at the mine;
- at least one representative from each of Muswellbrook Shire Council and Singleton Shire Council (if available); and
- at least three (or as otherwise agreed with the Director-General) representatives from the local community whose appointment has been approved by the Director-General.

The Liddell Coal CCC previously had one community representative on its committee. The community positions on the committee were re-advertised during the reporting period and three local representatives applied and were selected for positions.

The community consultative committee (CCC) met on two occasions during the reporting period. The first meeting was held on 28 October 2008 and the second meeting was held on 12 May 2009. The first meeting was attended by representatives of Liddell Coal, Singleton Shire Council, Muswellbrook Shire Council, a community representative and a representative from Carbon Based Environmental. The second meeting was attended by representatives from Liddell Coal, Singleton Shire Council, Muswellbrook Shire Council and three community representatives.

A number of items were addressed at the meetings, including:

- safety performance;

- production performance;
- modification to development consent;
- environmental performance, including;
  - community complaints;
  - air quality;
  - environmental incidents
  - blasting;
  - noise;
  - water;
  - rehabilitation; and
- community involvement.

4.2 Environmental Complaints

The management of complaints is undertaken in accordance with EMS procedures and the development consent conditions. A permanent environmental complaints line has been set up at Liddell Coal (02) 6570 9939 and is advertised in the community newsletter and on the Liddell Coal website.

There were nine community complaints received during the reporting period. The complaints received were in relation to noise, dust and hydrocarbons. One additional complaint was received from the Department of Environment and Climate Change (DECC) in relation to dust. Details of complaints received during the reporting period are presented **Table 4.1.**

Table 4.1 - Summary of Complaints July 2008 to June 2009

Date	Source	Detail	Management
05/08/08	Noise	Heavy machinery noise at approximately 3.40am.	Investigation into cause, review of HVE dumping operations and additional noise monitoring undertaken, followup discussion held with complainant.
23/03/09	Noise	Intrusive machinery noise, early morning hours.	HVE OCE informed at time of complaint and would minimise noise where possible, noise monitoring undertaken the following night, followup discussion held with complainant.
06/04/09	Noise	Intrusive machinery noise, early morning hours.	Attended noise monitoring arranged for complainants residence the next night, Sentinex continuous noise monitor set up beside house, longer term action included preparation of dumping strategy and construction of bunding to minimise noise emissions, followup discussion held with complainant.
01/05/09	Noise	Dozer tracks and reversing beepers early morning hours.	Information obtained about location, machine type/number, weather conditions, future installation of smart alarm reversing beepers to minimise noise, followup discussion held with complainant.

Table 4.1 - Summary of Complaints July 2008 to June 2009 (continued)

Date	Source	Detail	Management
03/05/09	Noise	Operations noise heard inside complainants house approximately 11.30am.	HVE OCE contacted to determine where equipment was working and to minimise noise where possible, preparation of dumping strategy and construction of bunding to minimise noise emissions, followup discussion held with complainant.
04/05/09	Noise	Operational noise particularly loud previous night.	Noise monitoring alongside Sentinex unit, Followup discussion with complainant about dumping strategy, construction of noise bund, modifying operations, lower noise reversing beepers.
11/05/09	Dust	Anonymous complaint to DECC regarding dust emissions.	Investigation into source of dust, meeting held with DECC and information provided on Liddell's dust and spontaneous combustion management, site inspection.
12/06/09	Dust	DECC surveillance recorded emissions from traffic generated dust that appeared to be excessive.	Investigation undertaken by HVE, letter sent to DECC on dust management and road watering procedures, results obtained from downwind dust monitor showed no off-site impacts, followup discussion with DECC.
22/06/09	Hydrocarbons	Anonymous complaint to DECC regarding oil spillage during servicing of equipment.	HVE provided a written report to Liddell on hydrocarbon management and oil capture, report sent to DECC, discussion held with DECC.

A complaints comparison summary for the previous five years is presented in **Table 4.2**.

Table 4.2 - Complaints comparison summary for the previous 5 years

Reporting Year	Number of complaints	Source
July 2003 – June 2004	0	N/A
July 2004 – June 2005	0	N/A
July 2005 – June 2006	0	N/A
July 2006 – June 2007	0	N/A
July 2007 – June 2008	2	Noise (1), Steam Generation (1)
July 2008 – June 2009	9	Noise (6), Dust (2), Hydrocarbon(1)

There were no complaints received from July 2003 through to June 2007. In the 2007 to 2008 reporting period, two complaints were received, one each in relation to noise and steam generation. During the 2008 to 2009 reporting period nine complaints were received in relation to noise (6), dust (2) and hydrocarbons(1).

4.3 Community Liaison

Liddell Coal undertakes community liaison activities in accordance with the Social Involvement Plan which was developed in consultation with the CCC. The plan identifies the objectives for consultation and community engagement, methods of consultation for the various stakeholder groups and priorities for community enhancement.

In February 2009, a Liddell Coal Community Newsletter was distributed to the local community and other stakeholders. The newsletter provided and update on the infrastructure development in addition to environment and community news and an update on mining production. A copy of the newsletter is provided in **Appendix 8**.

The details of donations are outline in **Table 4.3**.

Table 4.3 - Liddell Coal Community Donations for the 2008-2009 Reporting Period

Date	Recipient	
July 2008	Hebden Wild Dog Association	Donation to assist the association with the control of wild dogs in the Ravensworth Area. The donation contributed to the annual aerial baiting program undertaken in consultation with the Rural Lands Protection Board.
July 2008	Lake Liddell Recreation Area	Provision of 8 m^3 of firewood to assist with depleting firewood supplies during the winter period.
August 2008	Singleton Legacy Group	Purchase of Legacy Badge.
August 2008	Special Children's Christmas Parties	Sponsorship of the Special Children's Christmas Party.
October 2008	St Catherine's College, Singleton	Donation towards college hall refurbishment.
October 2008	Ungooroo Aboriginal Corporation	Purchase of an Aboriginal painting as part of the Wannarua Cultural Festival.
October 2008	Lake Liddell Recreation Area	Delivery of 8 m^3 of firewood for the October long weekend.
November 2008	Bowel & Cancer Research Trust	Donation to 'Shave Off' event.
November 2008	Muswellbrook High School	Financial contribution towards annual presentation night awards for students.
November 2008	Sandy Hollow Public School	Financial donation towards end of year prizes, trophies, vouchers, certificates etc for students.
November 2008	Singleton Public School	Financial contribution towards annual presentation certificates, books, prizes and medallions for students.
January 2009	Lake Liddell Recreation Area	Donation of firewood.
February 2009	Hebden Wild Dog Association	Contributions to assist with the aerial baiting of wild dogs in the Mountain Block and Hillcrest areas.
March 2009	Singleton Theatrical Society	Gold Sponsor to the Singleton Theatrical Society 2009 production of "Beauty and the Beast".
March 2009	Lake Liddell Trust	Rip ground for tube stock planting at Lake Liddell - Dozer provided and operated by Liddell. Plantings by Scouts for Jamboree.
April 2009	Lake Liddell Recreation Area	Donation of firewood for Easter holidays.
June 2009	Lake Liddell Recreation Area	Donation of firewood for June long weekend.

4.3.1 Liddell Coal Website

Liddell Colliery has established a website in accordance with condition 9, schedule 5, of the development consent. The website includes information on Liddell Coal's operations including environmental, community and operational updates.

Liddell Coal is required to place a copy of all relevant plans, programs and strategies on their website in accordance with the development consent once approved. Once the plans, programs and strategies required under the development consent have been approved by DoP, or other relevant agencies, these will be placed on the Liddell Coal website accordingly. As such, data is uploaded to the website quarterly.

The website is located at www.liddellcoal.com.au.

5.0 Rehabilitation

5.1 Buildings

No buildings were renovated during the reporting period however, the old open cut workshop, office and fuel storage area known as the Hunter Valley Earthmoving Open Cut facilities were demolished during the reporting period to allow mining operations to proceed through this area.

The Phase 1 Preliminary Environmental Assessment was conducted by David Lane and Associates in 2005 where hydrocarbon contamination from the workshop, diesel and oil storage tanks was identified.

A Hydrocarbon Remediation Action Plan (HRAP) was developed and implemented for the demolition by Carbon Based Environmental Pty Limited. The HRAP was based on the requirements of the *DECC Guidelines for Assessing Service Station sites* (DECC).

Between the 17 and 30 June 2009, during the demolition process in preparation for open cut mining, the hydrocarbon contaminated soil in the area was excavated and removed to an on-site bioremediation area for further treatment. The extent of the hydrocarbon contamination was determined by undertaking test scrapes and excavations based on the most likely locations identified in the Preliminary Environmental Assessment. Soil samples were analysed by Australian Laboratory Services Pty Limited (ALS) for Total Petroleum Hydrocarbons (TPH) and material was excavated until soil TPH levels were below the Liddell Coal HRAP hydrocarbon threshold of 1000mg/kg.

Hydrocarbon contaminated soil was removed and transported to the bioremediation area for on-site remediation. Inert demolition waste from buildings was disposed on site

5.2 Rehabilitation

The principle objective for rehabilitation of mined land at Liddell is to return the site to a condition where its landforms, soils, hydrology, and flora and fauna are self-sustaining and compatible with the surrounding land uses. The proposed end land use for the site includes a combination of grazing and bushland/wildlife habitat. The post mining landscape will be dominated by a land capability of Class VI grazing land and Class VI and VII bushland habitat.

Rehabilitation of disturbed land during the reporting period was carried out in general accordance with the Liddell MOP. Further details regarding Liddell's rehabilitation progress are outlined in **Section 5.2.4**.

5.2.1 Rehabilitation Methods

5.2.1.1 Landform Design

The post-mining landform design of Liddell Colliery has been generally undertaken in accordance with the Synoptic Plan.

Overburden dumps will be reshaped to around 10 degrees slope with a maximum of 18 degrees. Where steep slopes are constructed, suitable erosion control structures such as contour banks, drop structures may be utilised to provide for stability.

Elements such as drainage paths, contour drains, ridgelines, and emplacements are shaped into undulating informal profiles in keeping with natural landforms of the surrounding environment and allowing for a greater diversity of plant species over time.

The drainage characteristics for the site have been developed in accordance with the *Draft Guidelines for Designing Stable Drainage Lines on Rehabilitated Mine Sites* formulated by the former NSW Department of Land and Water Conservation (1999). The drainage system at Liddell Colliery provides for the combination of a connected surface drainage network and distributed storage/infiltration. The system integrates surface storage during periods of high runoff and manages deep infiltration to levels which can be safely tolerated and at the same time reduced size surface drainage conveyances to remove excess water safely from the system.

5.2.1.2 Topsoil Management

Where topsoil is available, the following measures will be adopted to protect its quality and enhance rehabilitation outcomes:

- where possible, topsoil will be stripped at optimum moisture to help maintain soil structure and to reduce dust generation;
- topsoil stockpiles are to be located away from mining, traffic areas and watercourses;
- level or gently sloping areas will be selected as stockpiles sites to minimise erosion and potential soil loss;
- appropriate sediment controls will be installed at the base of stockpiles to prevent soil loss;
- stockpiles will be generally less than three metres high and will be set out in windrows to maximise surface exposure and biological activity;
- stockpiles to be kept longer than three months will be sown with a suitable cover crop to minimise soil erosion and invasion of weed species;
- weed growth will be monitored and subsequently controlled if necessary;
- prior to re-spreading, weed growth may be scalped from the surface of the stockpiles to minimise the transport of weeds into rehabilitated areas; and
- stockpiles will be appropriately sign-posted to identify the area and minimise the potential for unauthorised use or disturbance.

5.2.1.3 Surface Preparation

Surface preparation activities for rehabilitated areas are commenced as soon as possible following the completion of mining activities. A general overview of surface preparation activities undertaken at Liddell Colliery include:

- prior to revegetation activities, spoils and topsoils will be characterised to determine the type and application rate that may be required for the addition of soil ameliorants (e.g. gypsum, lime, fertiliser, biosolids etc.);
- appropriate soil ameliorants will be applied for incorporation into the final shaped surface;
- where direct tree seeding is planned, final shaped surfaces will be deep ripped parallel with the contour prior to the application of seed to provide for an adequate seed bed is obtained;
- where pasture seeding is planned the surface will be cultivated across the contour to provide for an adequate seed bed;
- suitable erosion control measures (e.g. silt fences, mulches etc.) will be implemented to minimise soil loss from areas undergoing rehabilitation; and
- where appropriate and practical, structures such as tree hollows and logs may be incorporated into the final landform to augment the habitat value of proposed habitat corridors.

5.2.1.4 Revegetation

Revegetation activities will generally be undertaken in spring and autumn; however, opportunistic revegetation may be practised if areas become available for sowing in summer and winter. After surface soil amelioration and tillage is completed for any given area, revegetation will commence as soon as practicable.

Primarily, revegetation will involve sowing of pasture species and direct seeding of native tree species. A range of other techniques may also be utilised where appropriate over isolated areas associated with steep slopes.

Revegetation techniques will be continually developed and refined over the life of the mine through a continual process of research, trialling, monitoring and improvement.

The establishment of the proposed habitat corridors will be undertaken using a native species seed mix. The habitat corridors will be developed with the aim of providing a functional and sustainable ecosystem which will be consistent with the rehabilitation closure criteria.

The species to be utilised within habitat corridors will be assessed following the completion of baseline monitoring of proposed analogue sites with the aim that the species are self sustaining and endemic to the area. Native seed collection will be undertaken in the local area, where possible. The use of locally sourced native seed, where possible, will assist in maintaining local genetic diversity and the genetic integrity of the region. However, dependent upon seed availability, the seed mix may need to be supplemented with stocks sourced from outside of the region.

Tree and shrub seed will be applied at a rate determined appropriate to site conditions. Where required, seed will be appropriately pre-treated to enhance germination and will be evenly mixed and spread.

Areas to be rehabilitated to pasture will generally include the following species:

- Cover crops of Ryecorn/Oats or Japanese Millet;
- Couch Grass;
- Wimmera Ryegrass;
- White Clover;
- Sub Clover; and
- Lucerne.

The seed mix may vary dependent upon the season and other species may be utilised where appropriate. Similar to direct seeding of native tree species, the sowing application rate for pasture species will be determined upon a review of site conditions.

Steep Slope Treatment

Slope stabilisation techniques incorporating straw mulching and bitumen sealing were utilised at the Mountain Block for slopes exceeding 23 degrees to enhance pasture germination.

5.2.2 Rehabilitation Monitoring

Rehabilitation monitoring was not undertaken during the reporting period. Rehabilitation monitoring was last undertaken in March and April 2008, by Umwelt (Australia), as a part of Liddell Colliery's annual ecological monitoring program. The results of the rehabilitation monitoring were discussed in detail in the previous AEMR. Rehabilitation monitoring will be undertaken in the second half of 2009.

A rehabilitation monitoring program is currently being developed and implemented in accordance with the Liddell Colliery Landscape Management Plan. Results of the 2009 rehabilitation monitoring survey will be discussed in the next AEMR.

5.2.3 Rehabilitation Assessment

A rehabilitation assessment was undertaken by Global Soil Systems during April 2009 (GSS 2009). The main objectives of the assessment were to assess previously rehabilitated areas and the need for remediation works, and to develop a successful rehabilitation strategy for future areas.

The main comments and recommendations from the Rehabilitation Assessment included: directly seeded tree establishment in higher elevations of Lakeside Drive is some of the best in the Hunter Valley and should be extended wherever possible, conduct aerial fertilising, prioritization of available topsoil resources, maximizing topsoil recovery, removal of existing tree plots dominated by *Acacia saligna*, undertake tree establishment program.

5.2.4 Rehabilitation Progress

The rehabilitation programme for 2007/08 was disrupted due to the period of time required for gaining approvals for the modified mining operations (modified DA 305-11-01 approved in July 2007), and the preparation and approval of the new MOP. A new MOP was approved by the NSW Department of Primary Industries - Mineral Resources (DPI-MR) on the 11th April 2008 to align with the modified operations. Liddell Coal did not want to commence rehabilitation of areas in accordance with the former MOP, when these areas may be disturbed at a later date in line with the new MOP.

The 2007/08 AEMR stated that 42 Ha was planned to be rehabilitated in 2008/09. The area rehabilitated in 2008/09 was 6 Ha. A large portion of rehabilitation for 2008/09 was planned at the Mountain Block rehabilitation area and this rehabilitation (23 Ha) was commenced in May 2009 and was completed in October 2009. Liddell plan to carry over a portion of the area not rehabilitated in 2007/08 AEMR period into the Jan – Dec 2009 MOP year.

Table 5.1 presents a summary of the rehabilitation undertaken by Liddell during the reporting period.

5.3 Other Infrastructure

No rehabilitation of other infrastructure was undertaken during the reporting period.

5.4 Rehabilitation Trials and Research

No rehabilitation trials or research studies were undertaken during the reporting period.

Table 5.1 - Summary of Rehabilitation for 2008-2009 Reporting Period

Area	Area Affected (ha)		
	To Date	Last Report	At Next report (estimated)
A: MINE LEASE AREA			
A1 Mine Lease(s) Area	2084	2084	2084
B: DISTURBED AREAS			
B1 Infrastructure area (other disturbed areas to be rehabilitated at closure including facilities, roads)	113.9	117.8	118
B2 Active mining area (excluding items B3-B5 below)	112.9	111.3	113
B3 Waste emplacements (active/unshaped/uncapped)	394.6	361.3	364
B4 Tailings emplacements (active/unshaped/uncapped)	55.8	55.8	56
B5 Shaped waste emplacement (awaits final vegetation	14.7	14.7	30
TOTAL DISTURBED AREA	**691.9**	**660.9**	**681**
C: REHABILITATION PROGRESS			
C1 Total rehabilitated area (except for maintenance)	**471.8**	**466**	**514**
D: REHABILITATION ON SLOPES			
D1 10 to 18 degrees	60.4	60.4	70
D2 Greater than 18 degrees	10	10	32
E: SURFACE OF REHABILITATED LAND			
E1 Pasture and grasses	435.8	433.2	478
E2 Native forest/ecosystems	34.3	30.9	34.3
E3 Plantations and crops	1.7	1.7	1.7
E4 Other (include non-vegetative outcomes)	0	0	0

Maintenance activities undertaken on the rehabilitation land are summarised in **Table 5.2**.

Table 5.2 – Maintenance Activities on Rehabilitated Land

Treatment	Area Treated (ha)		Comment/ Control Strategies/ Treatment Detail
	2008-2009	2009-2010	
Additional erosion control works (drains re-contouring, rock protection)	2	5	Erosion and sediment control structures at the Mine Infrastructure Area and rehabilitated areas
Re-covering (detail – further topsoil, subsoil sealing, etc)	-	-	As required
Soil treatment (detail – fertiliser, lime, gypsum, etc)	Nil	100	Aerial fertilizer planned dependent on the season.
Treatment/management (detail – grazing, cropping, slashing, etc)	40	40	Mountain Block fenced and rotational grazing conducted.
Re-seeding/replanting (detail – species density, season, etc)	-	-	As required
Adversely affected by weeds (detail – type and treatment)	Refer to WMCP	Refer to WMCP	Detailed Weed Management and Control Plan (WMCP) developed.
Feral animal control (detail – additional fencing, trapping, baiting, etc)	100	100	Wild Dog baiting at Mountain Block during reporting period and next period.

5.5 Further Development of the Final Rehabilitation Plan

The rehabilitation objectives and final landform will be further developed during the MOP period and through detailed mine closure planning. The current final landform design is provided on Plan 6 of the MOP.

The Landscape Management Plan was developed in accordance with schedule 3, conditions 30 to 33, of the development consent and includes the following:

- the rehabilitation objectives for the site;
- a strategic description of how rehabilitation of the site would be integrated with land surrounding the site, with a view to improving or enhancing the regional landscape and flora and fauna habitat values;
- a general description of the short, medium and long term measures that would be implemented to rehabilitate the site;

- a detailed description of the measures that would be implemented over the next three years to rehabilitate the site, including the measures to be implemented to address:
  - progressively rehabilitating areas disturbed by mining operations on the site;
  - managing the remnant vegetation and habitat on site;
  - minimising impacts on threatened fauna;
  - minimising visual impacts;
  - conserving and reusing topsoil;
  - collecting and propagating seeds for rehabilitation works;
  - salvaging and reusing material from the site for habitat enhancement;
  - controlling weeds, feral pests, and access;
  - managing bushfires; and
  - managing any potential conflicts between the rehabilitation works and Aboriginal cultural heritage;
- detailed performance and completion criteria for the rehabilitation of the site;
- a detailed description of how the performance of the rehabilitation works would be monitored over time to achieve the stated objectives and against the relevant performance and completion criteria;
- details of who is responsible for monitoring, reviewing and implementing the plan;
- minimise any potential adverse impacts associated with final voids on the site;
- manage and monitor the potential impacts of final voids over time;
- define the objectives and criteria for mine closure;
- investigate options for the future use of the site, including the final voids;
- investigate ways to minimise the adverse socio-economic effects associated with mine closure, including reduction in local and regional employment levels;
- describe the measures that would be implemented to minimise or manage the on-going environmental effects of the development; and
- describe how the performance of these measures would be monitored over time.

5.5.1 Mine Planning Objectives and Criteria

The Liddell Colliery Environmental Assessment (2006) identified the nominated end land use for Liddell Colliery following rehabilitation as pasture designed to emulate the pre-mining grazing areas. The end land use also includes habitat corridors to enable the protection and preservation of natural ecological systems and processes by linking existing areas of vegetation in surrounding areas.

The primary objectives of the closure, decommissioning and rehabilitation of Liddell Colliery will be to:

- create a stable final landform with acceptable post-mining land use capability; and
- provide for the safety of employees and the public during and following the closure of the mining operations.

Secondary objectives will be to:

- minimise the potential for long-term environmental impact and liability;
- minimise the potential impacts from closure activities;
- comply with relevant regulatory requirements and attain regulatory consensus on the successful closure and rehabilitation of the site;
- reduce the need for long term monitoring and maintenance;
- complete the closure, decommissioning and rehabilitation works as efficiently as possible whilst achieving the objectives outline above;
- provide for a rehabilitated post-mining landform, including remaining structures which will be physically and chemically stable and present no hazard to public health and safety as a result of failure or physical deterioration;
- through rehabilitation of disturbed areas, provide a sustainable vegetative cover;
- implement appropriate control and remediation strategies in the event that contamination sources are identified, so as to prevent off-site impacts;
- provide for the design periods and factors of safety for all site works to take into account extreme events and other natural process such as erosion; and
- provide for the successful relinquishment of all mining leases and recovery of the security bond held by the DPI.

The end land use and landscape design for Liddell Colliery is intended to be compatible with adjoining lands and the DPI's 'Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of NSW'.

6.0 Activities Proposed in Next AEMR Period

All activities proposed in the next AEMR period will be consistent with the new MOP that was approved by DPI on 24th April 2008. According to the guidelines for AEMRs (DPI, 2002), three plans are required for submission with the AEMR. The plans are to be current at the end date of the reporting period, of the same scale and with equivalent information to **Plan 3 Land Preparation**, **Plan 4 Proposed Mining Activities** and **Plan 5 Proposed Rehabilitation** of the current MOP. These plans are included in **Appendix 7**.

During the next reporting period, mining activities are to continue in the South Cut, Entrance Block and Reservoir areas as shown on **Plan 4**.

Liddell has a number of activities planned for the next reporting period, including

- Continuation of stabilisation and rehabilitation of the Mountain Block area;
- Rehabilitation of the Reservoir Block area;
- A general increase in coal production levels;
- Demolition of the redundant CHPP.

6.1 Targets for Next Reporting Period

Consistent with the Liddell Coal HSEC Plan, key targets for the next reporting include but are not limited to:

- compliance with regulatory requirements during the expansion of the operation;
- comply with Xstrata Coal NSW (XCN) mine closure and rehabilitation standards;
- continual improvement of the mine water balance;
- improve water efficiency and maximize recycling of mine water;
- implementation of energy action savings plans (ESAPs);
- minimise the number of environmental incidents and community complaints across site;
- continuing development and review of the mine's EMS;
- improve baseline survey information from the XCN community viewpoint program;
- conduct CCC meetings as scheduled;
- distribute Liddell Coal community newsletters as scheduled;
- implement recommendations from environmental inspections and audits; and
- continue to support community initiatives in accordance with Liddell Coal Social Involvement Plan.

The continual review of environmental performance is critical to ensuring on-going improvement in environmental performance. Environmental performance is assessed in the following manner:

- annual planning and budgeting;
- annual review and development of environmental targets and improvement programs by management team and other key personnel;
- development of key environmental performance indicators aligned with overall business objectives and XCN requirements;
- continual review of environmental monitoring data;
- environmental inspections;

- a scheduled program of internal and external environmental auditing; and
- participation in a variety of environmental and community forums.

7.0 References

ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.*

Department of Mineral Resources (1999) *Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of NSW.*

Department of Primary Industries (2006*) Guidelines to the Mining, Rehabilitation, and Environmental Management Process.*

Global Soil Systems (2009), *Liddell Coal Operations Rehabilitation Assessment Report.*

HLA-Envirosciences, 2005. *Flora and Fauna Monitoring Liddell Coal*, prepared for Liddell Coal Operations Pty Ltd, Singleton, NSW.

Liddell Colliery (2006) *Modification to Development Consent Environmental Assessment.*

Liddell Colliery (2008a) *Liddell Colliery Mining Operations Plan 2008-2012*

Liddell Colliery (2008b) *Liddell Colliery Air Quality Monitoring Program*

Liddell Colliery (2008c) *Environmental Monitoring Program*

Spectrum Acoustics (2008) *Liddell Coal Operations August 2008 Attended Noise Monitoring Results*

Spectrum Acoustics (2009) *Liddell Coal Operations February 2009 Attended Noise Monitoring Results*

Umwelt (2009) *Liddell Colliery Annual Environmental Management Report 2007-8*

Appendix 1

Daily Train Haulage Movements

Appendix 1 – Daily Train Haulage Movements

Date	Number of Trains
7/7/2008	1
8/7/2008	1
9/7/2008	1
12/7/2008	1
15/7/2008	2
16/7/2008	1
19/7/2008	1
21/7/2008	1
31/7/2008	1
1/8/2008	1
2/8/2008	2
3/8/2008	3
4/8/2008	4
5/8/2008	1
8/8/2008	3
9/8/2008	2
10/8/2008	2
11/8/2008	3
12/8/2008	2
27/8/2008	1
28/8/2008	2
29/8/2008	1
31/8/2008	1
2/9/2008	1
4/9/2008	1
6/9/2008	1
7/9/2008	4
9/9/2008	2
10/9/2008	3
11/9/2008	1
16/9/2008	1
20/9/2008	1
21/9/2008	1
24/9/2008	4
25/9/2008	2
26/9/2008	1
27/9/2008	1
28/9/2008	3
29/9/2008	2
30/9/2008	2
3/10/2008	3
4/10/2008	3
5/10/2008	1
6/10/2008	1
7/10/2008	1
8/10/2008	3
9/10/2008	2
10/10/2008	5
11/10/2008	3
12/10/2008	1
13/10/2008	3
14/10/2008	1
17/10/2008	2
18/10/2008	1

Date	Number of Trains
20/10/2008	2
22/10/2008	2
23/10/2008	2
24/10/2008	3
25/10/2008	3
29/10/2008	1
30/10/2008	1
31/10/2008	1
1/11/2008	1
3/11/2008	2
4/11/2008	1
5/11/2008	2
8/11/2008	1
9/11/2008	2
10/11/2008	2
11/11/2008	1
12/11/2008	4
14/11/2008	2
15/11/2008	1
19/11/2008	1
22/11/2008	2
23/11/2008	2
24/11/2008	4
25/11/2008	2
26/11/2008	2
27/11/2008	3
28/11/2008	2
29/11/2008	1
1/12/2008	1
2/12/2008	2
5/12/2008	1
6/12/2008	2
7/12/2008	1
9/12/2008	1
10/12/2008	1
12/12/2008	1
16/12/2008	3
17/12/2008	2
18/12/2008	1
19/12/2008	3
20/12/2008	1
21/12/2008	3
22/12/2008	2
23/12/2008	4
24/12/2008	1
26/12/2008	1
27/12/2008	1
28/12/2008	2
29/12/2008	3
30/12/2008	1
1/1/2009	2
2/1/2009	2
3/1/2009	1
4/1/2009	2
5/1/2009	5
6/1/2009	4
7/1/2009	3

Date	Number of Trains
8/1/2009	5
9/1/2009	2
10/1/2009	3
11/1/2009	2
12/1/2009	2
13/1/2009	3
15/1/2009	3
16/1/2009	1
18/1/2009	2
22/1/2009	3
23/1/2009	1
24/1/2009	3
25/1/2009	4
26/1/2009	4
27/1/2009	3
28/1/2009	2
29/1/2009	2
30/1/2009	3
31/1/2009	4
1/2/2009	4
2/2/2009	3
3/2/2009	2
4/2/2009	2
5/2/2009	1
6/2/2009	2
7/2/2009	2
8/2/2009	2
9/2/2009	3
10/2/2009	1
11/2/2009	2
12/2/2009	3
14/2/2009	2
15/2/2009	3
20/2/2009	2
21/2/2009	3
22/2/2009	2
23/2/2009	1
24/2/2009	2
25/2/2009	1
27/2/2009	1
28/2/2009	2
2/3/2009	2
4/3/2009	2
7/3/2009	1
9/3/2009	1
10/3/2009	1
11/3/2009	1
12/3/2009	1
13/3/2009	3
15/3/2009	1
16/3/2009	2
17/3/2009	1
18/3/2009	1
19/3/2009	1
20/3/2009	3
21/3/2009	2
22/3/2009	1

Date	Number of Trains
23/3/2009	1
27/3/2009	1
28/3/2009	1
2/4/2009	1
3/4/2009	1
4/4/2009	1
5/4/2009	1
16/4/2009	2
17/4/2009	2
18/4/2009	1
21/4/2009	2
23/4/2009	1
28/4/2009	1
30/4/2009	1
1/5/2009	2
8/5/2009	1
9/5/2009	2
10/5/2009	4
11/5/2009	3
12/5/2009	3
14/5/2009	1
16/5/2009	2
17/5/2009	2
18/5/2009	3
19/5/2009	5
20/5/2009	3
21/5/2009	1
23/5/2009	2
24/5/2009	2
25/5/2009	1
26/5/2009	3
27/5/2009	1
29/5/2009	3
9/6/2009	1
10/6/2009	2
11/6/2009	1
12/6/2009	2
13/6/2009	5
14/6/2009	2
15/6/2009	1
16/6/2009	1
17/6/2009	1
18/6/2009	1
19/6/2009	2
24/6/2009	2
25/6/2009	1
26/6/2009	1
27/6/2009	4
28/6/2009	4

Appendix 2

High Volume Air Sampler Dust Monitoring

Results

Appendix 2 – PM_{10} and TSP Monitoring Results for Ravensworth Farm and Scrivens Property July 2008 to June 2009 Reporting Period

	Ravensworth Farm (HVAS 6)		Scrivens (HVAS 12)	
Date	**PM_{10} (ug/m^3)**	**Monthly Mean**	**PM_{10} (ug/m^3)**	**Monthly Mean**
4-Jul-08	11		12	
10-Jul-08	11		5	
16-Jul-08	20		4	
22-Jul-08	18		5	
28-Jul-08	9	**14**	9	**7**
3-Aug-08	7		6	
9-Aug-08	70		4	
15-Aug-08	22		4	
21-Aug-08	29		16	
27-Aug-08	23	**30**	16	**9**
2-Sep-08	21		14	
8-Sep-08	18		12	
14-Sep-08	17		9	
20-Sep-08	58		33	
26-Sep-08	34	**30**	17	**17**
2-Oct-08	58		33	
8-Oct-08	32		20	
14-Oct-08	32		27	
20-Oct-08	48		42	
26-Oct-08	25	**39**	25	**29**
1-Nov-08	18		34	
7-Nov-08	35		44	
13-Nov-08	22		31	
19-Nov-08	3		14	
25-Nov-08	19	**19**	24	**29**
1-Dec-08	35		9	
7-Dec-08	27		12	
13-Dec-08	36		14	
19-Dec-08	36		13	
25-Dec-08	29		23	
31-Dec-08	79	**40**	32	**17**
6-Jan-09	53		27	
12-Jan-09	33		28	
18-Jan-09	41		16	
24-Jan-09	43		17	
30-Jan-09	42	**42**	31	**24**
5-Feb-09	47		25	
11-Feb-09	25		14	
17-Feb-09	17		14	
23-Feb-09	47	**34**	24	**19**
1-Mar-09	34		27	
7-Mar-09	40		24	
13-Mar-09	22		24	
19-Mar-09	42		20	
25-Mar-09	39		27	
31-Mar-09	8	**31**	17	**23**

	Ravensworth Farm (HVAS 6)		Scrivens (HVAS 12)	
Date	**PM_{10} (ug/m^3)**	**Monthly Mean**	**PM_{10} (ug/m^3)**	**Monthly Mean**
6-Apr-09	13		31	
12-Apr-09	35		11	
18-Apr-09	21		24	
24-Apr-09	28		11	
30-Apr-09	13	**22**	22	**20**
6-May-09	16		25	
12-May-09	28		26	
18-May-09	25		42	
24-May-09	17		44	
30-May-09	7	**19**	7	**29**
5-Jun-09	13		2	
11-Jun-09	18		2	
17-Jun-09	8		5	
23-Jun-09	2		1	
29-Jun-09	5	**9**	1	**2**
Annual Average	**27.6**		**18.9**	

	Ravensworth Farm (HVAS 13)		Scrivens (HVAS 11)	
Date	TSP (ug.m^{-3})	Monthly Mean	TSP (ug.m^{-3})	Monthly Mean
4-Jul-08	62		35	
10-Jul-08	52		11	
16-Jul-08	28		12	
22-Jul-08	73		22	
28-Jul-08	62	**55**	25	**21**
3-Aug-08	35		16	
9-Aug-08	33		9	
15-Aug-08	76		14	
21-Aug-08	111		44	
27-Aug-08	70	**65**	49	**26**
2-Sep-08	61		46	
8-Sep-08	44		29	
14-Sep-08	61		36	
20-Sep-08	148		77	
26-Sep-08	122	**87**	33	**44**
2-Oct-08	165		62	
8-Oct-08	109		54	
14-Oct-08	95		76	
20-Oct-08	180		85	
26-Oct-08	90	**128**	51	**66**
1-Nov-08	116		53	
7-Nov-08	153		125	
13-Nov-08	105		75	
19-Nov-08	42		99	
25-Nov-08	96	**102**	82	**87**
1-Dec-08	151		34	
7-Dec-08	63		46	
13-Dec-08	60		37	
19-Dec-08	90		44	
25-Dec-08	58		43	
31-Dec-08	215	**106**	89	**49**
6-Jan-09	90		75	
12-Jan-09	113		95	
18-Jan-09	89		72	
24-Jan-09	125		46	
30-Jan-09	124	**108**	94	**76**
5-Feb-09	152		99	
11-Feb-09	57		42	
17-Feb-09	25		29	
23-Feb-09	113	**87**	45	**54**
1-Mar-09	97		85	
7-Mar-09	129		84	
13-Mar-09	64		49	
19-Mar-09	150		47	
25-Mar-09	186		76	
31-Mar-09	38	**111**	40	**64**

	Ravensworth Farm (HVAS 13)		Scrivens (HVAS 11)	
Date	**TSP (ug.m^{-3})**	**Monthly Mean**	**TSP (ug.m^{-3})**	**Monthly Mean**
6-Apr-09	56		62	
12-Apr-09	38		24	
18-Apr-09	97		65	
24-Apr-09	123		38	
30-Apr-09	54	**74**	64	**51**
6-May-09	90		53	
12-May-09	112		45	
18-May-09	132		96	
24-May-09	97		77	
30-May-09	39	**94**	16	**57**
5-Jun-09	65		8	
11-Jun-09	109		7	
17-Jun-09	75		37	
23-Jun-09	41		5	
29-Jun-09	46	**57**	3	**12**
Annual Average	**90.7**		**50.7**	

Appendix 3

Surface Water Monitoring Results

Appendix 3 – Liddell Colliery Monthly Surface Water Results for Bayswater Creek for July 2008 to June 2009 pH, EC, TSS and TDS

Month	Bayswater Ck Upstream				Bayswater Ck Midstream				Bayswater Ck Downstream			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jul-08	7.7	3750	37	2310	8.3	5060	4	3140	8.2	4610	5	2770
Aug-08	7.2	3060	28	2280	8.1	4520	<1	3530	7.8	2410	12	1750
Sep-08	7.5	2920	31	1510	7.7	3710	4	2420	7.7	5290	16	3730
Oct-08	7.6	3830	28	3760	8.2	4980	8	530	8.1	5050	20	3760
Nov-08	7.9	3600	20	2400	8.1	4750	4	2700	7.3	8220	48	6400
Dec-08	7.6	3430	14	2000	7.9	4130	3	2900	7.8	5090	10	3400
Jan-09	8.1	3890	14	2900	7.8	5390	6	4120	Dry	Dry	Dry	Dry
Feb-09	7.7	3540	9	2800	8.0	5220	12	5800	Dry	Dry	Dry	Dry
Mar-09	7.7	4590	9	3600	8.1	5780	11	4300	7.8	7230	16	5400
Apr-09	7.8	4280	13	2950	8.3	5580	2	3790	8.0	4970	11	3730
May-09	7.7	4330	12	3340	8.3	5220	3	4100	7.4	8980	18	7900
Jun-09	7.9	4210	14	2910	8.4	5040	2	3800	7.7	6900	8	5080
Average	**7.7**	**3786**	**19**	**2730**	**8.1**	**4948**	**5**	**3428**	**7.8**	**5875**	**16**	**4392**

Recommended criteria for best practice

ANZECC Guideline Range for pH: 6.5 to 8.5

ANZECC Guideline Range for Conductivity: 125 - 2200uS.cm^{-1}

ANZECC Guideline Range for TSS: 50mg.L^{-1}

For surface water collected from Bayswater Creek, the Site Water Management Plan outlines acceptable criterion for EC be the upper limit of mine discharge water TDS: 7000mg.L^{-1}

Month	BCK1 (Bowmans Creek Upstream)				BCK6 (Bowmans Creek Downstream)			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jul-08	8.3	702	2	346	8.1	806	3	420
Aug-08	8.2	698	<1	480	7.6	782	5	560
Sep-08	8.2	616	3	400	8.1	717	5	670
Oct-08	8.5	756	4	410	8.2	779	5	3240
Nov-08	8.3	935	3	530	8.1	1029	8	520
Dec-08	7.9	870	14	560	7.6	954	3	620
Jan-09	7.8	852	4	534	8.1	1060	25	636
Feb-09	7.7	638	4	360	7.7	764	10	440
Mar-09	7.8	706	4	450	7.5	925	9	560
Apr-09	8.0	681	2	350	8.1	866	7	430
May-09	8.1	773	1	370	7.9	1001	3	620
Jun-09	8.3	834	2	510	8.1	1026	5	650
Average	**8.1**	**755**	**4**	**442**	**7.9**	**892**	**7**	**781**

Recommended criteria for best practice

ANZECC Guideline Range for pH: 6.5 to 8.5

ANZECC Guideline Range for TSS: 50mg.L^{-1}

EC of samples from Bowmans Creek is assessed against a trigger value of 1910 µS/cm. The Site Water Management Plan assigns the use of this trigger level, which is based on the 80th Percentile of the salinity range at Bowmans Creek gauge station 210130 from 1994-2001.

Month	BCK1				BCK 1A				BCK2				BCK2A			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jul-08	8.3	702	2	346	8.2	743	2	372	8.0	751	2	394	8.0	761	3	392
Oct-08	8.5	756	4	410	8.3	839	4	420	8.2	848	3	420	8.2	846	6	480
Jan-09	7.8	852	4	534	7.4	3060	7	2100	8.5	1034	78	580	7.6	1104	4	620
Apr-09	8.0	681	2	350	7.7	882	5	530	7.5	884	6	510	7.5	884	5	580
Average	**8.1**	**748**	**3**	**410**	**7.9**	**1381**	**5**	**856**	**8.1**	**879**	**22**	**476**	**7.8**	**899**	**5**	**518**

Month	BCK3				BCK4				BCK5				BCK6			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jul-08	7.8	778	4	404	8.1	795	3	386	8.0	791	5	418	8.1	806	3	420
Oct-08	8.1	1100	6	500	8.3	799	6	440	8.2	805	6	2560	8.2	779	5	3240
Jan-09	7.9	1086	20	560	7.7	1144	16	630	7.8	1134	17	600	8.1	1060	25	636
Apr-09	7.6	902	7	520	7.6	987	5	610	7.7	978	10	590	8.1	866	7	430
Average	**7.9**	**967**	**9**	**496**	**7.9**	**931**	**8**	**517**	**7.9**	**927**	**10**	**1042**	**8.1**	**878**	**10**	**1182**

Recommended criteria for best practice

ANZECC Guideline Range for pH: 6.5 to 8.5

ANZECC Guideline Range for TSS: 50mg.L^{-1}

EC of samples from Bowmans Creek are assessed against a trigger value of 1910 µS/cm. The Site Water Management Plan assigns the use of this trigger level, which is based on the 80th Percentile of the salinity range at Bowmans Creek gauge station 210130 from 1994-2001.

Samples Collected: 29 July 2008

ANALYSIS DESCRIPTION	ANZECC Guideline[1]	UNIT	Bowmans Creek Upstream	Bowmans Creek Downstream	Bayswater Creek Upstream	Bayswater Creek Midstream	Bayswater Creek Downstream
pH	-						
Conductivity @ 25°C	-	uS/cm					
Total Dissolved Solids	-	mg/L	346	420	2310	3140	2770
Total Suspended Solids	-	mg/L	2	3	37	4	5
Hydroxide as $CaCO_3$	-	mg/L	<1	<1	<1	<1	<1
Carbonate as $CaCO_3$	-	mg/L	<1	<1	<1	25	4
Bicarbonate as $CaCO_3$	-	mg/L	176	188	310	530	344
Total Alkalinity as $CaCO_3$	-	mg/L	176	188	310	554	347
Silicon - Filtered	-	mg/L	8.94	8.75	3.02	5.27	0.18
Sulfate - Filtered	-	mg/L	27	49	522	881	800
Chloride	-	mg/L	96.2	103	716	899	884
Calcium - Filtered	-	mg/L	45	43	117	115	104
Magnesium - Filtered	-	mg/L	20	21	128	156	136
Sodium - Filtered	-	mg/L	60	81	522	819	706
Potassium - Filtered	-	mg/L	2	2	13	12	12
Aluminium - Filtered	0.055	mg/L	0.02	0.02	<0.01	<0.01	<0.01
Arsenic - Filtered	0.024	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium - Filtered	-	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Barium - Filtered	-	mg/L	0.022	0.025	0.081	0.05	0.058
Cadmium - Filtered	-	mg/L	0.0006	<0.0001	<0.0001	<0.0001	<0.0001
Caesium - Filtered	-	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium - Filtered	-	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt - Filtered	-	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper - Filtered	0.0014	mg/L	0.002	0.002	0.002	0.002	0.002
Lead - Filtered	0.0034	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium - Filtered	-	mg/L	0.007	0.006	0.159	0.141	0.09
Manganese - Filtered	1.9	mg/L	0.013	0.018	0.038	0.003	0.008
Nickel - Filtered	0.011	mg/L	<0.001	<0.001	0.002	0.002	0.003
Rubidium - Filtered	-	mg/L	<0.001	<0.001	0.004	0.003	0.003
Selenium - Filtered	0.0011	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Strontium - Filtered	-	mg/L	0.315	0.36	2.16	2.45	2.74
Zinc - Filtered	0.008	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Boron - Filtered	0.37	mg/L	0.07	0.06	0.78	0.58	0.27
Iron - Filtered	-	mg/L	0.05	<0.05	<0.05	<0.05	<0.05
Mercury - Filtered	0.0006	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Anions	-	meq/L	6.81	7.69	37.2	54.8	48.5
Total Cations	-	meq/L	6.54	7.47	39.4	54.5	47.4
Actual (Anion/Cation) Difference	-	meq/L					

1: ANZECC Water Quality Guideline for Fresh Water 95% Trigger Level：

Samples Collected: 20 January 2009

ANALYSIS DESCRIPTION	ANZECC Guideline[1]	UNIT	Bowmans Creek Upstream	Bowmans Creek Downstream	Bayswater Creek Upstream	Bayswater Creek Midstream
pH	-		7.78	8.06	8.05	7.80
Conductivity @ 25°C	-	uS/cm	852	1060	3890	5390
Total Dissolved Solids	-	mg/L	534	636	2900	4120
Total Suspended Solids	-	mg/L	4	25	14	6
Hydroxide as $CaCO_3$	-	mg/L	<1	<1	<1	<1
Carbonate as $CaCO_3$	-	mg/L	<1	<1	<1	<1
Bicarbonate as $CaCO_3$	-	mg/L	236	240	363	615
Total Alkalinity as $CaCO_3$	-	mg/L	236	240	363	615
Sulfate - Filtered	-	mg/L	47	104	952	1400
Silica	-	mg/L	25.3	22.4	6.0	7.1
Chloride	-	mg/L	117	134	737	1010
Calcium - Filtered	-	mg/L	57	46	156	145
Magnesium - Filtered	-	mg/L	24	27	158	198
Sodium - Filtered	-	mg/L	93	164	676	1100
Potassium - Filtered	-	mg/L	2	3	16	15
Aluminium - Filtered	-	mg/L	<0.01	<0.01	<0.01	<0.01
Arsenic - Filtered	0.055	mg/L	0.001	0.001	0.002	0.002
Beryllium - Filtered	0.024	mg/L	<0.001	<0.001	<0.001	<0.001
Barium - Filtered	0.37	mg/L	0.028	0.040	0.093	0.076
Cadmium - Filtered	-	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Caesium - Filtered	-	mg/L	<0.001	<0.001	<0.001	<0.001
Chromium - Filtered	-	mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt - Filtered	-	mg/L	<0.001	<0.001	<0.001	<0.001
Copper - Filtered	0.001	mg/L	<0.001	<0.001	0.001	0.002
Lead - Filtered	-	mg/L	<0.001	<0.001	<0.001	<0.001
Lithium - Filtered	0.0014	mg/L	0.006	0.004	0.173	0.150
Manganese - Filtered	-	mg/L	0.089	0.016	0.077	0.022
Nickel - Filtered	1.9	mg/L	<0.001	<0.001	0.002	0.002
Rubidium - Filtered	0.011	mg/L	<0.001	<0.001	0.005	0.005
Selenium - Filtered	0.0034	mg/L	<0.01	<0.01	<0.01	<0.01
Strontium - Filtered	-	mg/L	0.383	0.508	2.44	2.65
Zinc - Filtered	0.0011	mg/L	0.023	0.007	<0.005	0.020
Boron - Filtered	-	mg/L	0.09	0.07	0.91	0.65
Iron - Filtered	0.008	mg/L	<0.05	<0.05	<0.05	<0.05
Mercury - Filtered	0.0006	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Total Anions	-	meq/L	8.99	10.8	47.9	69.9
Total Cations	-	meq/L	8.99	11.7	50.6	71.7
Actual (Anion/Cation) Difference	-	meq/L				

1: ANZECC Water Quality Guideline for Fresh Water 95% Trigger Level
Bayswater Creek Downstream was dry

Month	Dam 1				Dam 4				Dam 6			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jul-08	8.3	1123	2	616	8.7	4140	3	2570	MONITORING RECOMMENCED			
Aug-08	8.6	1109	<1	850	8.7	4110	2	2700				
Sep-08	8.9	1062	2	620	8.8	4010	16	2530				
Oct-08	8.8	908	<1	530	8.8	4150	10	2740				
Nov-08	8.8	1147	<1	540	8.8	4140	5	2400				
Dec-08	8.8	902	<1	580	8.7	4040	3	2800				
Jan-09	8.8	977	2	594	8.8	4180	2	2770				
Feb-09	8.8	991	2	590	8.7	4250	2	2700	8.3	6080	---	---
Mar-09	8.4	1018	3	630	8.5	4320	1	3000	8.3	5620	12	4700
Apr-09	8.2	1061	2	640	8.6	4330	2	2800	6.9	5580	15	4194
May-09	8.5	1187	2	420	8.6	4390	10	3240	8.1	5180	1	4600
Jun-09	8.9	1241	4	770	8.7	4460	3	3050	8.3	6150	11	4940
Average	**8.6**	**1061**	**2**	**615**	**8.7**	**4210**	**5**	**2775**	**8.0**	**5722**	**10**	**4609**

Month	Dam 13				Dam 17				Tailings Supernatant at Void				Mt Owen Transfer Dam			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jul-08	8.8	5480	18	3350	8.8	4850	3	3010	8.9	5920	31	3640	8.3	5530	5	3280
Aug-08	8.8	5550	5	3470	8.7	4680	<1	3350	8.9	5770	5	3910	8.0	5320	<1	3040
Sep-08	8.8	5390	25	3570	8.8	4620	12	3050	9.0	5440	16	3180	8.4	5160	8	3280
Oct-08	8.9	5630	21	3000	8.9	4500	13	2200	8.9	5810	13	3730	8.4	5000	3	3270
Nov-08	8.9	5970	12	2900	8.7	4840	8	2700	9.0	6210	29	2900	8.2	5530	6	3100
Dec-08	8.9	5860	13	3200	8.7	4650	8	2900	8.9	6540	52	4000	8.3	5290	8	3400
Jan-09	8.9	6160	9	4260	8.8	4880	9	3530	9.0	7430	16	5280	8.2	5280	14	3320
Feb-09	8.7	6000	11	3800	8.9	4750	6	3200	9.2	5290	10	3300	8.6	4710	5	2800
Mar-09	8.8	5730	11	3700	8.7	4770	12	3400	8.8	5980	31	3900	8.6	4770	11	2900
Apr-09	8.8	5190	8	3310	8.8	4550	5	2920	8.9	5350	8	3470	8.5	5090	4	3020
May-09	8.7	5370	6	3580	8.6	4600	5	3300	8.8	6050	4	4230	8.7	5330	8	3350
Jun-09	8.8	5460	17	3480	8.8	4360	24	3190	9.1	5540	98	3560	8.9	5320	5	3380
Average	**8.8**	**5649**	**13**	**3468**	**8.8**	**4671**	**10**	**3063**	**8.9**	**5944**	**26**	**3758**	**8.4**	**5194**	**7**	**3178**

EPA Licence Criteria for Dam 13:
TSS 120 mg/L
pH 6.5 - 9.0
no limit EC
Results outside these criteria highlighted red bold

Samples Collected: 29 July 2008

ANALYSIS DESCRIPTION	UNIT	Dam 1	Dam 4	Dam 13	Dam 17	Tailings Supernatant	Mt Owen Transfer Dam
pH							
Conductivity @ 25°C	uS/cm						
Total Dissolved Solids	mg/L	616	2570	3350	3010	3640	3280
Total Suspended Solids	mg/L	2	3	18	3	31	5
Hydroxide as $CaCO_3$	mg/L	<1	<1	<1	<1	<1	<1
Carbonate as $CaCO_3$	mg/L	<1	92	161	102	148	80
Bicarbonate as $CaCO_3$	mg/L	191	370	786	363	597	1130
Total Alkalinity as $CaCO_3$	mg/L	191	462	948	465	745	1210
Silicon - Filtered	mg/L	7.73	1.13	3.19	1.22	2.04	5.44
Sulfate - Filtered	mg/L	191	761	788	1170	1280	374
Chloride	mg/L	146	728	935	838	1000	994
Calcium - Filtered	mg/L	36	49	27	34	52	29
Magnesium - Filtered	mg/L	31	132	86	149	112	44
Sodium - Filtered	mg/L	154	718	1160	883	1190	1220
Potassium - Filtered	mg/L	4	12	11	14	18	8
Aluminium - Filtered	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	0.02
Arsenic - Filtered	mg/L	0.001	0.002	<0.001	0.002	0.004	<0.001
Beryllium - Filtered	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium - Filtered	mg/L	0.028	0.058	0.082	0.036	0.053	0.115
Cadmium - Filtered	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Caesium - Filtered	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium - Filtered	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005
Cobalt - Filtered	mg/L	<0.001	<0.001	0.001	<0.001	0.005	<0.001
Copper - Filtered	mg/L	0.006	0.003	0.002	0.002	0.004	<0.001
Lead - Filtered	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium - Filtered	mg/L	0.016	0.129	0.282	0.167	0.312	0.306
Manganese - Filtered	mg/L	0.007	0.001	<0.001	0.007	0.061	0.013
Nickel - Filtered	mg/L	<0.001	0.002	0.002	0.002	0.005	0.002
Rubidium - Filtered	mg/L	<0.001	0.005	0.014	0.005	0.02	0.02
Selenium - Filtered	mg/L	<0.010	<0.010	<0.010	<0.010	0.011	<0.010
Strontium - Filtered	mg/L	0.519	2.1	4.66	2.58	4.74	3.68
Zinc - Filtered	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Boron - Filtered	mg/L	0.08	0.07	0.18	0.09	0.17	0.13
Iron - Filtered	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury - Filtered	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Anions	me/L	11.9	45.6	61.7	57.3	69.9	60
Total Cations	me/L	11.2	44.9	59.4	52.8	64.2	58.2
Actual (Anion/Cation) Difference	me/L						

Samples Collected: 20 January 2009

ANALYSIS DESCRIPTION	UNIT	Dam 1	Dam 4	Dam 13	Dam 17	Tailings Supernatant	Mt Owen Transfer Dam
pH		8.78	8.75	8.88	8.83	8.97	8.23
Conductivity @ 25°C	uS/cm	977	4180	6160	4880	7430	5280
Total Dissolved Solids	mg/L	594	2770	4260	3530	5280	3320
Total Suspended Solids	mg/L	2	2	9	9	16	14
Hydroxide as $CaCO_3$	mg/L	<1	<1	<1	<1	<1	<1
Carbonate as $CaCO_3$	mg/L	13	57	146	121	203	<1
Bicarbonate as $CaCO_3$	mg/L	207	451	918	363	615	1260
Total Alkalinity as $CaCO_3$	mg/L	220	508	1060	484	818	1260
Sulfate - Filtered	mg/L	132	978	1180	1200	1940	470
Silica	mg/L	18.9	3.0	6.2	2.3	4.2	11.0
Chloride	mg/L	116	724	1060	843	1170	953
Calcium - Filtered	mg/L	45	47	32	26	42	29
Magnesium - Filtered	mg/L	33	154	109	171	178	44
Sodium - Filtered	mg/L	144	861	1540	1030	1840	1410
Potassium - Filtered	mg/L	4	14	16	16	26	8
Aluminium - Filtered	mg/L	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Arsenic - Filtered	mg/L	0.001	0.002	0.006	0.002	0.027	<0.001
Beryllium - Filtered	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium - Filtered	mg/L	0.032	0.046	0.080	0.022	0.113	0.101
Cadmium - Filtered	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Caesium - Filtered	mg/L	<0.001	<0.001	<0.001	<0.001	0.001	0.001
Chromium - Filtered	mg/L	<0.001	<0.001	<0.005	<0.001	<0.001	<0.005
Cobalt - Filtered	mg/L	<0.001	<0.001	0.002	<0.001	0.006	<0.001
Copper - Filtered	mg/L	<0.001	0.002	0.001	0.002	0.004	<0.001
Lead - Filtered	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium - Filtered	mg/L	0.010	0.119	0.348	0.163	0.370	0.267
Manganese - Filtered	mg/L	0.002	0.001	<0.001	<0.001	0.003	0.008
Nickel - Filtered	mg/L	<0.001	0.002	0.002	0.002	0.006	0.001
Rubidium - Filtered	mg/L	<0.001	0.006	0.022	0.006	0.026	0.021
Selenium - Filtered	mg/L	<0.01	<0.01	<0.01	<0.01	0.02	<0.01
Strontium - Filtered	mg/L	0.471	1.74	6.56	1.52	6.56	3.23
Zinc - Filtered	mg/L	0.010	0.025	0.012	0.006	0.008	0.006
Boron - Filtered	mg/L	0.07	0.06	0.28	0.10	0.25	0.17
Iron - Filtered	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury - Filtered	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Anions	meq/L	10.4	50.9	75.7	58.5	89.6	61.9
Total Cations	meq/L	11.3	52.8	77.8	60.4	97.5	66.7
Actual (Anion/Cation) Difference	meq/L						

Appendix 4

Groundwater Monitoring Results

Appendix 4 – Liddell Colliery Groundwater Monitoring Results July 2008 to June 2009 Reporting Period

Samples Collected on 12 & 24 December 2008

ANALYSIS DESCRIPTION	UNIT	ALV 1 Large	ALV 1 Small	ALV 2 Large	ALV2 Small	ALV 3 Large	ALV 3 Small	ALV 4 Large	ALV 4 Small	PGW5 Large	PGW5 Small	ALV 7 Large	ALV 7 Small	ALV8 Large	ALV 8 Small	HAZ 4	HAZ 6	LBH
pH Value																		
Electrical Conductivity @ 25°C	uS/cm																	
Total Dissolved Solids @180°C	mg/L	790	952	794	1540	578	1270	934	2960	2380		1060	1280	770	1230	540	3590	730
Suspended Solids (SS)	mg/L	50	38	194	32	274	34	234	70	49		1070	51	69	23	53	12	7
Hydroxide Alkalinity as CaCO3	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	192	222	281	496	190	355	246	659	710		242	456	156	432	121	912	230
Total Alkalinity as CaCO3	mg/L	192	222	281	496	190	355	246	659	710		242	456	156	432	121	912	230
Sulphate as SO4 2-	mg/L	211	232	124	139	119	274	197	494	627		264	125	156	120	120	880	143
Chloride	mg/L	183	224	208	641	119	356	228	1290	497		308	462	227	421	155	1030	157
Calcium	mg/L	77	51	53	30	37	54	65	65	54		95	76	54	89	57	33	38
Magnesium	mg/L	31	53	31	35	21	62	50	122	84		44	65	31	57	27	67	20
Sodium	mg/L	159	217	207	591	135	361	189	943	736		230	359	184	298	89	1200	210
Potassium	mg/L	3	4	3	5	3	4	3	10	8		2	5	2	4	2	8	3
Aluminium	mg/L	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	0.01	<0.01	0.01	<0.01	0.02	<0.01
Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.09	0.182	0.047	0.054	0.026	0.111	0.098	0.088	0.05		0.055	0.063	0.037	0.092	0.07	0.066	0.017
Cadmium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Caesium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	Dry	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		<0.001	<0.001	<0.001	0.001	<0.001	0.003	<0.001
Cobalt	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001
Copper	mg/L	<0.001	<0.001	<0.001	0.004	<0.001	0.002	<0.001	<0.001	0.101		<0.001	0.003	<0.001	0.003	<0.001	0.001	<0.001
Lead	mg/L	<0.001	0.006	<0.001	0.01	<0.001	0.014	<0.001	0.004	0.005		<0.001	0.009	<0.001	0.003	<0.001	<0.001	<0.001
Lithium	mg/L	0.008	0.051	0.02	0.132	0.006	0.054	0.022	0.125	0.179		0.006	0.057	0.003	0.022	0.005	0.264	<0.001
Manganese	mg/L	0.266	0.119	0.025	0.029	<0.001	0.041	0.281	0.237	0.222		0.017	0.069	0.001	0.14	<0.001	0.033	0.016
Nickel	mg/L	<0.001	<0.001	<0.001	0.005	<0.001	0.003	<0.001	0.001	0.009		0.002	0.011	<0.001	0.004	<0.001	0.003	<0.001
Rubidium	mg/L	0.002	0.005	0.003	0.015	<0.001	0.006	0.003	0.009	0.016		0.001	0.01	<0.001	0.005	<0.001	0.016	<0.001
Selenium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium	mg/L	0.997	6.06	1.23	2.86	0.5	4.78	1.41	8.88	7.33		1.05	3.79	0.598	1.58	1.2	8.09	0.227
Zinc	mg/L	<0.005	<0.005	0.012	0.052	0.007	0.069	<0.005	0.008	1.45		0.038	0.116	0.037	0.04	0.183	0.007	<0.005
Boron	mg/L	<0.05	0.08	0.06	0.1	0.06	0.08	0.05	0.18	0.1		0.07	0.06	<0.05	<0.05	<0.05	0.14	<0.05
Iron	mg/L	2.33	0.58	<0.05	<0.05	<0.05	0.14	1.04	0.65	<0.05		<0.05	0.06	<0.05	<0.05	<0.05	0.05	<0.05
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silica	mg/L	8.23	8.43	9.56	6.2	9.3	11.1	10.3	8.74	5.49		12.4	12.9	21.4	14.2	2.06	8.55	8.99
Total Anions	me/L	13.4	15.6	14.1	30.9	9.62	22.8	15.4	59.8	41.2		19	24.8	12.8	23	9.28	65.7	12
Total Cations	me/L	13.4	16.4	14.2	30.2	9.51	23.6	15.7	54.6	41.9		18.4	24.9	13.3	22.2	9.05	59.6	12.8
Ionic Balance	me/L	0.1	2.66	0.62	1.11	0.58	1.61	0.92	4.64	0.7		1.54	0.25	2	1.69	1.23	4.87	3.22

Samples Collected on 19-20 June 2009

ANALYSIS DESCRIPTION	UNIT	ALV 1 Large	ALV 1 Small	ALV 2 Large	ALV2 Small	ALV 3 Large	ALV 3 Small	ALV 4 Large	ALV 4 Small	PGW5 Large	PGW5 Small	ALV 7 Large	ALV 7 Small	ALV8 Large	ALV 8 Small	HAZ 4	HAZ 6	LBH
pH Value		7.1	7.8	7.2	7.7	7.1	7.5	6.9	7.4	7.4		7.5	7.6	7.5	7.6	7.6	8.1	7.0
Electrical Conductivity @ 25°C	uS/cm	1238	1548	1960	2770	980	2030	1511	5220	4650		1715	2300	1197	1970	1138	5430	1321
Total Dissolved Solids @180°C	mg/L	730	932	1210	1580	576	1180	900	3170	3150		1090	1370	740	1190	670	3600	806
Suspended Solids (SS)	mg/L	29	10	85	26	190	28	66	26	10		844	12	66	23	24	16	5
Chloride	mg/L	183	221	327	558	130	342	239	1280	545		261	447	179	328	194	917	181
Sulphate as SO4 2-	mg/L	187	269	281	125	76	157	180	331	714		208	98	168	166	125	638	207
Hydroxide Alkalinity as CaCO3	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	211	237	344	490	190	345	283	691	1030		285	414	177	386	201	908	213
Total Alkalinity as CaCO3	mg/L	211	237	344	490	190	345	283	691	1030		285	414	177	386	201	908	213
Silicon	mg/L	9.92	8.6	10.8	5.45	10.7	11.7	11.8	9.32	6.24		11	12.3	21.6	13.4	2.32	8.39	9.09
Calcium	mg/L	72	63	107	23	41	54	76	79	62		90	75	45	76	75	46	47
Magnesium	mg/L	29	50	54	30	22	52	51	127	125		42	60	26	48	28	75	25
Sodium	mg/L	143	201	270	586	138	337	173	939	932		220	348	167	290	118	1180	213
Potassium	mg/L	3	4	4	5	3	4	4	10	11		3	5	2	4	3	9	4
Aluminium	mg/L	<0.01	<0.01	<0.01	0.01	0.01	0.01	<0.01	<0.01	<0.01		0.08	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.084	0.169	0.078	0.047	0.029	0.06	0.096	0.091	0.042		0.055	0.058	0.032	0.078	0.133	0.063	0.041
Cadmium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	Dry	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Caesium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	mg/L	<0.001	<0.001	0.001	<0.005	<0.001	<0.001	<0.001	<0.005	<0.005		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001
Copper	mg/L	<0.001	<0.001	<0.001	0.008	0.001	0.005	<0.001	<0.001	0.002		0.002	<0.001	<0.001	0.011	0.005	<0.001	<0.001
Lead	mg/L	<0.001	<0.001	<0.001	0.004	<0.001	0.004	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001
Lithium	mg/L	0.008	0.046	0.013	0.127	0.006	0.037	0.023	0.13	0.238		0.006	0.056	0.003	0.02	0.011	0.251	0.002
Manganese	mg/L	0.239	0.048	0.003	0.012	0.001	0.063	0.341	0.236	0.08		0.207	0.054	<0.001	0.107	0.001	0.041	0.009
Nickel	mg/L	<0.001	0.01	<0.001	0.017	<0.001	0.023	<0.001	0.005	0.001		0.007	0.007	<0.001	0.007	0.001	0.003	<0.001
Rubidium	mg/L	0.002	0.005	0.002	0.015	<0.001	0.004	0.003	0.009	0.018		0.001	0.009	<0.001	0.005	0.002	0.015	<0.001
Selenium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium	mg/L	0.937	5.74	1.73	2.72	0.524	3.51	1.42	9.23	7.96		1.02	3.71	0.508	1.39	2.54	8.3	0.52
Zinc	mg/L	0.006	0.014	0.009	0.035	0.018	0.062	<0.005	<0.005	0.011		0.049	<0.005	0.006	0.034	0.597	<0.005	0.009
Boron	mg/L	0.06	0.09	0.07	0.1	0.07	0.07	0.06	0.2	0.11		0.07	0.06	<0.05	<0.05	0.07	0.14	0.07
Iron	mg/L	1.87	<0.05	<0.05	<0.05	<0.05	0.12	1.03	0.98	0.33		<0.05	0.44	<0.05	0.1	<0.05	0.1	<0.05
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Anions	meq/L	13.4	16.6	22	28.1	9.04	19.8	16.2	56.9	50.8		17.4	22.9	12.1	20.4	12.1	57.3	13.7
Total Cations	meq/L	12.2	16.1	21.6	29.2	9.91	21.8	15.6	55.5	54.2		17.6	23.9	11.7	20.5	11.2	60.2	13.7
Ionic Balance	%	4.74	1.84	1.06	2.9	1.92	4.56	2.78	3.27	0.57		0.01	2.76	1.56	1.08	3.83	2.38	0.61

Appendix 5

Blast Monitoring Results

Appendix 5 – Liddell Colliery Blast Monitoring Results 2008 to 2009 Reporting Period
Liddell On Site Trigger Unit and Chain of Ponds Hotel

Date	Time	Location	Blast ID	Liddell On Site (Trigger Unit)		Chain of Ponds Hotel		
				Ground Vibration (mm/s)	Waveform Capture	Ground Vibration (mm/s)	Over pressure (dBL)	Waveform Capture
3/7/2008	9.42	E101-lid	606	0.47	Yes	0.35	101.4	Yes
3/7/2008	9.46	W10-1 Arties	603	0.42	Yes	0.45	104.4	Yes
4/7/2008	13.04	South Cut	593	2.37	Yes	0.97	100.9	Yes
8/7/2008	12.31	Waterfill Pt WO1-1-ART	607	1.08	Yes	1.09	110.3	Yes
14/7/2008	12.12	Entrance	605	1.17	Yes	0.71	104.4	Yes
14/7/2008	13.11	S11-LMPG	608	1.29	Yes	1.17	102.2	Yes
15/7/2008	13.10	S10-4-LID	509	1.52	Yes	0.77	101.8	Yes
24/7/2008	13.04	South Cut S11-3-LMPG	611	1.85	Yes	1.33	94.9	Yes
28/7/2008	113.08	South Cut S11-3-LMPG	609	1.53	Yes	0.73	105.9	Yes
5/8/2008	13.37	Entrance Lid	594	1.92	Yes	0.88	104.9	Yes
18/8/2008	12.37	South Cut S10-4 Lid	614	2.24	Yes	0.97	103.4	Yes
18/8/2008	13.16	Entrance E01-1-BAR	612	2.45	Yes	6.18	106.7	Yes
19/8/2008	13.00	Waterfall pit W01-02-Art	613	1.08	Yes	0.63	105.9	Yes
22/8/2008	13.06	South Cut S12-3 upg	517	1.13	Yes	0.56	107.6	Yes
25/8/2008	13.02	Waterfall pit W01-1- Lid	615	1.24	Yes	1.06	105.6	Yes
28/8/2008	13.04	Entrance Liddell	622/618	0.51	Yes	0.56	103.4	Yes
29/8/2008	13.01	Lower Pikes Gully	623	2.45	Yes	0.91	105	Yes
2/9/2008	13.04	South Cut S11-2-LPG	623/626	1.73	Yes	0.78	103	Yes
9/9/2008	13.02	Entrance Block E-01-1-LID	619	0.66	Yes	0.51	105.9	Yes
11/9/2008	13.04	Entrance Block E-01-1-LID	618	0.47	Yes	0.35	98.1	Yes
12/9/2008	13.14	Southcut S11-3LPG	624	3.86	Yes	0.88	107.4	Yes
12/9/2008	13.21	Southcut S12-2LPG	616	0.82	Yes	0.35	105.3	Yes
18/9/2008	12.58	South Cut S10-1 Bar	627	0.77	Yes	0.82	98.7	Yes
19/9/2008	13.04	Entrance E01-1LID	521	0.99	Yes	0.83	115	Yes
22/9/2008	12.46	South Cut S10-3 Lid	638	0.48	Yes	0.2	103.7	Yes
26/9/2008	13.26	South Cut S11-3LMPG	625	4.2	Yes	0.77	109	Yes
29/9/2008	12.24	Entrance E01-1LID	633	0.99	Yes	0.72	104.7	Yes
30/9/2008	13.26	Southcut S10-1Lid	628	0.91	Yes	0.63	108.7	Yes
1/10/2008	13:29	Entrance E01-1 LID	632	0.97	Yes	1.15	**101.30**	Yes
3/10/2008	13:12	Entrance E01-1 LID	636	0.84	Yes	0.91	**113.00**	Yes
7/10/2008	13:01	Waterfall Pit W01-UPG	630	2.11	Yes	2.46	**119.60**	Yes
11/10/2008	10:07	South Cut S10-2 Barrett	640	1.2	Yes	1.81	**104.10**	Yes
14/10/2008	13:16	South Cut S10-2 Barrett	639	1.45	Yes	2.29	**96.30**	Yes
16/10/2008	13:02	South Cut S10-3 Liddell	648	0.52	Yes	0.39	**91.90**	Yes
20/10/2008	12:13	South Cut S10-3 Barrett	646	3.48	Yes	1.71	**94.40**	Yes
21/10/2008	13:06	Waterfall Pit W01-UPG/ Waterfall Pit W01-BAR	634/635	2.36	Yes	1.57	**103.10**	Yes
23/10/2008	16:05	South Cut S10-3 Barrett	647	1.69	Yes	1.44	**108.30**	Yes
28/10/2008	16:05	Entrance E01-1 BAR	645	0.83	Yes	1.49	**94.10**	Yes
29/10/2008	13:04	South Cut S10-2 Barrett	641	0.31	Yes	0.44	**101.10**	Yes
30/10/2008	13:01	South Cut S10-1 Art	642a	0.5	Yes	0.84	**105.10**	Yes
3/11/2008	13:07	Waterfall Pit W01-UPG/ Waterfall Pit W01-ROB	643/644	1.72	Yes	2.37	**112.50**	Yes
5/11/2008	16:06	South Cut S10-1 BAR	649	1.19	Yes	1.06	**103.80**	Yes
7/11/2008	13:10	South Cut S11-1 ART	642	1.11	Yes	1.35	**99.90**	Yes
10/11/2008	13:08	South Cut S10-2 BAR/ South Cut S10-4 BAR	653/651	1.05	Yes	1.51	**96.10**	Yes
13/11/2008	12:59	Entrance E01-1 LID	659/654	0.1	Yes	0.06	**86.30**	Yes
17/11/2008	13:09	South Cut S10-4 BAR	651	1.76	Yes	1.39	**115.20**	Yes
17/11/2008	16:10	South Cut S11-2 LID	650	1.08	Yes	1.79	**98.10**	Yes
25/11/2008	13:05	South Cut S10-4 BAR	652	1.84	Yes	1.38	**107.20**	Yes
26/11/2008	13:05	South Cut S11-1 ART	660A	0.64	Yes	0.86	**95.30**	Yes
28/11/2008	10:12	South Cut S11-1 ART	660	0.82	Yes	0.89	**104.90**	Yes

Appendix 5 – Liddell Colliery Blast Monitoring Results 2008 to 2009 Reporting Period
Liddell On Site Trigger Unit and Chain of Ponds Hotel

Date	Time	Location	Blast ID	Liddell On Site (Trigger Unit)		Chain of Ponds Hotel		
				Ground Vibration (mm/s)	Waveform Capture	Ground Vibration (mm/s)	Over pressure (dBL)	Waveform Capture
4/12/2008	13:02	South Cut S10-3 BAR	655	2.07	Yes	1.29	**102.40**	Yes
12/12/2008	13:11	South Cut S12-3 LPG	657/658	1.4	Yes	1.44	**99.80**	Yes
16/12/2008	13:10	Entrance E01-1 LID	667	0.29	Yes	0.19	**108.80**	Yes
23/12/2008	13:04	South Cut S11-3 ART	663	1.15	Yes	1.50	**106.90**	Yes
24/12/2008	9:29	South Cut S11-2 ART	661A	0.87	Yes	1.02	**90.90**	Yes
29/12/2008	13:03	South Cut S11-1 ART	669	0.15	Yes	0.16	**101.30**	Yes
31/12/2008	12:52	W01-1-Liddell	673	0.01	Yes	0.01	**110.00**	Yes
2/1/2009	9:34	South Cut S12-1 LPG	668	0.16	Yes	0.23	**99.00**	Yes
7/1/2009	16:09	South Cut S11-3 ART	664	1.48	Yes	1.47	**103.40**	Yes
8/1/2009	15:26	South Cut S11-3 ART	661b	0.88	Yes	0.93	**105.40**	Yes
14/1/2009	16:05	South Cut S11-3 ART	665	1.24	Yes	1.53	**95.60**	Yes
19/1/2009	12:12	South Cut S10-3 BAR/ South Cut S10-2 ART	662/665B	0.87	Yes	0.96	**100.90**	Yes
22/1/2009	13:09	South Cut S12-1 LPG	674/666	0.59	Yes	0.70	**109.40**	Yes
28/1/2009	13:04	South Cut S12-2 LPG	671	0.76	Yes	0.54	**101.10**	Yes
30/1/2009	12:57	Water Fill Pit W01-1-LGP	670	1.35	Yes	0.97	**103.60**	Yes
30/1/2009	12:57	South Cut S11-3 ART	672	1.85	Yes	1.12	**103.90**	Yes
3/2/2009	12:04	Water Fill Pit W01-1-ART	677	4.38	Yes	3.29	**102.80**	Yes
3/2/2009	12:57	South Cut S11-2 LID	675	0.14	Yes	0.22	**99.90**	Yes
5/2/2009	12:44	Entrance E01-1 BAR	680	0.89	Yes	1.19	**96.80**	Yes
6/2/2009	13:00	South Cut S11-1 Liddell	679	0	Yes	0.01	**100.70**	Yes
9/2/2009	16:06	South Cut S11-2 Arties	685	0.16	Yes	0.19	**109.60**	Yes
12/2/2009	13:36	South Cut S11-2 Arties	676A	0.67	Yes	0.84	**101.00**	Yes
10/2/2009	12:58	Water Fill Pit Strip 1	673	1.51	Yes	1.11	**98.10**	Yes
19/2/2009	12:48	South Cut S11-2 Liddell	676	0.91	Yes	1.03	**110.40**	Yes
23/2/2009	12:53	Entrance E02-1 Barrett	687	0.4	Yes	0.46	**85.90**	Yes
26/2/2009	14:28	South Cut S13-1 Arties	681	0.28	Yes	0.42	**91.40**	Yes
25/2/2009	13:23	Waterfill W01-1 Arties	678	1.55	Yes	1.18	**106.10**	Yes
28/2/2009	12:23	South Cut S13-1 Arties	689	0.28	Yes	0.33	**123.70**	Yes
28/2/2009	12:26	South Cut S13-1 Arties	698	0.83	Yes	1.05	**103.80**	Yes
3/3/2009	13:20	South Cut S11-2 Arties	699	0.34	Yes	0.25	**96.90**	Yes
5/3/2009	16:21	South Cut S13-1 Arties	682/690	0.58	Yes	0.76	**106.80**	Yes
5/3/2009	16:11	South Cut S11-2 Arties	700	0.6	Yes	0.35	**104.00**	Yes
9/3/2009	13:13	Waterfill W02_1Lmpg	683	0.67	Yes	0.49	**101.80**	Yes
9/3/2009	13:09	S11-2 Arties	703	0.19	Yes	0.17	**102.30**	Yes
11/3/2009	16:09	South Cut S11-2 Arties	704	0.12	Yes	0.16	**101.20**	Yes
13/3/2009	13:09	South Cut S11-1 Liddell	693	1.51	Yes	0.97	**97.30**	Yes
16/3/2009	13:14	Entrance Barrett	688	1.1	Yes	1.45	**102.70**	Yes
16/3/2009	13:18	Waterfill IPG	708	0.63	Yes	0.33	**105.20**	Yes
17/3/2009	13:01	South Cut S11-1 Liddell	693	1.81	Yes	1.76	**101.40**	Yes
18/3/2009	13:05	South Cut S11-1 Liddell	706	0.32	Yes	0.24	**94.30**	Yes
19/3/2009	13:09	South Cut S11-1 Liddell	694	0.93	Yes	0.94	**106.50**	Yes
20/3/2009	13:05	South Cut S12-1 Arties	695	0.29	Yes	0.39	**103.30**	Yes
23/3/2009	12:10	South Cut S13-1 Liddell	707	0.28	Yes	0.29	**102.10**	Yes
23/3/2009	12:23	South Cut S11-3 Arties	695	0.22	Yes	0.20	**97.90**	Yes
24/3/2009	13:04	South Cut S11-2 Liddell	694	1.69	Yes	1.09	**98.50**	Yes
25/3/2009	13:10	South Cut S12-1 Arties	696	0.66	Yes	0.41	**104.60**	Yes
27/3/2009	13:05	South Cut S11-1 Liddell	691	0.53	Yes	0.61	**107.30**	Yes
28/3/2009	11:38	South Cut S12-2 Arties	697	0.12	Yes	0.08	**104.80**	Yes
28/3/2009	12:18	Entrance E02-1 Dyke	717	1.23	Yes	1.15	**102.90**	Yes
30/3/2009	13:31	South Cut S11-1 Liddell	711	0.57	Yes	0.48	**90.80**	Yes
31/3/2009	10:14	South Cut S11 Ramp	701	1.07	Yes	0.99	**107.10**	Yes

Appendix 5 – Liddell Colliery Blast Monitoring Results 2008 to 2009 Reporting Period
Liddell On Site Trigger Unit and Chain of Ponds Hotel

Date	Time	Location	Blast ID	Liddell On Site (Trigger Unit)		Chain of Ponds Hotel		
				Ground Vibration (mm/s)	Waveform Capture	Ground Vibration (mm/s)	Over pressure (dBL)	Waveform Capture
6/4/2009	13:18	South Cut S12-1 Arties	695	0.2	Yes	0.29	**101.30**	Yes
7/4/2009	12:08	SouthCut S11-1	716	0.16	Yes	0.28	**92.80**	Yes
9/4/2009	13:02	Entrance EO1_1Barrett	710	1.26	Yes	1.39	**93.50**	Yes
16/4/2009	12:57	Entrance EO1_1Barrett	713	0.91	Yes	1.17	**99.00**	Yes
17/4/2009	13:12	South Cut S12-1 Arties	695/696	0.23	Yes	0.40	**99.90**	Yes
17/4/2009	13:15	South Cut S12-B Lemingtons	725	0.27	Yes	0.19	**98.90**	Yes
22/4/2009	13:15	Waterfill W01-1 LMPG	718/710	1.61	Yes	1.14	**104.50**	Yes
24/4/2009	13:10	South Cut S11-3	709	2.27	Yes	2.49	**106.50**	Yes
27/4/2009	13:19	Southcut S11_1 Lid	B730	0.4	Yes	0.38	**100.50**	Yes
30/4/2009	13:03	SouthCut S13-1 Arties	720	1.8	Yes	1.77	**100.80**	Yes
1/5/2009	13:09	Southcut	714/715	1.19	Yes	1.11	**100.60**	Yes
5/5/2009	13:17	SouthCut S011_2 Liddell	724/721	1.75	Yes	0.97	**112.50**	Yes
7/5/2009	13:12	Southcut S12_3 UPG	728	0.8	Yes	1.02	**109.40**	Yes
8/5/2009	13:09	Waterfill W01_1 Arties	726	1.02	Yes	1.07	**113.80**	Yes
11/5/2009	13:13	Waterfill W01_1 Arties	726m	0.92	Yes	0.59	**104.30**	Yes
13/5/2009	13:09	SouthCut S11-1 Liddell	723	1.59	Yes	1.10	**103.80**	Yes
18/5/2009	12:41	Southcut S12 Arties	720/727	1.11	Yes	1.37	**97.90**	Yes
18/5/2009	13:07	Waterfill W01_1 Liddell	B729_ramp	0.93	Yes	0.60	**109.10**	Yes
20/5/2009	13:10	Waterfill W01_1 Liddell	B729_Hot	0.52	Yes	0.33	**116.90**	Yes
21/5/2009	12:46	Waterfill W01_1_1 Liddell	B712	2.04	Yes	1.15	**111.60**	Yes
25/5/2009	13:07	Southcut S12_3 UPG	B733	0.14	Yes	0.13	**105.30**	Yes
26/5/2009	13:19	Waterfill W01_1 Liddell	B731_hot	0.68	Yes	0.44	**117.60**	Yes
28/5/2009	13:12	Waterfill W01_1 Liddell	B729	1.01	Yes	0.70	**107.90**	Yes
3/6/209	13:13	Southcut S10_1Barrett	B732	1.71	Yes	1.21	**98.30**	Yes
9/6/2009	13:05	Waterfill W01_1 Liddell	B734	2	Yes	1.24	**108.40**	Yes
11/6/2009	13:23	Waterfill W01_1 Liddell	B712p2	0.47	Yes	0.40	**111.90**	Yes
11/6/2009	13:27	Southcut S11_1 Barrett	B731_hot	0.7	Yes	0.74	**104.30**	Yes
12/6/2009	13:04	Southcut S11_1 Barrett	B732b	1.41	Yes	0.96	**105.10**	Yes
15/6/2009	13:07	Waterfill W01_1 LMPG	B746	0.51	Yes	0.31	**103.90**	Yes
17/6/2009	13:12	Southcut S12_3 LMPG	B736	1.75	Yes	1.66	**111.10**	Yes
18/6/2009	13:21	Southcut S11_1 Lid	B748	0.28	Yes	0.18	**94.80**	Yes
26/6/2009	13:09	Southcut S12_2 Arties	B735	1.33	Yes	2.06	**103.70**	Yes
26/6/2009	13:37	Waterfill W01_1 Liddell	B731	1.78	Yes	1.28	**104.70**	Yes
29/6/2009	13:14	Southcut S12_1 Liddell	B742	0.75	Yes	0.88	**107.50**	Yes
30/6/02009	13:16	Waterfill W01_1 Lid	B737	0.75	Yes	0.49	**110.60**	Yes

NA = Not Applicable
ND = No data available due to communication failure
NT = No trigger on monitor
NM = Not Monitored

Appendix 4 – Liddell Colliery Blast Monitoring Results 2008 to 2009 Reporting Period
Burlings and Scriven Blast Monitors

Date	Time	Location	Blast ID	Burlings			Scrivens		
				Ground Vibration (mm/s)	Over pressure (dBL)	Waveform Capture	Ground Vibration (mm/s)	Over pressure (dBL)	Waveform Capture
3/7/2008	9.42	E101-lid	606	0.10	**99.40**	Yes	0.07	**95.40**	Yes
3/7/2008	9.46	W10-1 Arties	603	0.10	**97.90**	Yes	0.07	**96.40**	Yes
4/7/2008	13.04	South Cut	593	0.13	**101.70**	Yes	0.07	**98.10**	yes
8/7/2008	12.31	Waterfill Pt WO1-1-ART	607	0.15	**91.80**	Yes	0.19	**98.90**	Yes
14/7/2008	12.12	Entrance	605	0.13	**95.40**	Yes	0.10	**97.30**	Yes
14/7/2008	13.11	S11-LMPG	608	0.18	**92.90**	Yes	**NR**	**NR**	No
15/7/2008	13.10	S10-4-LID	509	0.15	**95.40**	Yes	0.11	**100.20**	Yes
24/7/2008	13.04	South Cut S11-3-LMPG	611	0.15	**98.90**	Yes	0.09	**95.40**	Yes
28/7/2008	113.08	South Cut S11-3-LMPG	609	0.20	**98.40**	Yes	0.07	**97.30**	Yes
5/8/2008	13.37	Entrance Lid	594	0.18	**95.40**	Yes	0.11	**97.30**	Yes
18/8/2008	12.37	South Cut S10-4 Lid	614	0.10	**112.10**	Yes	0.12	**115.70**	Yes
18/8/2008	13.16	Entrance E01-1-BAR	612	0.29	**98.90**	Yes	0.50	**109.60**	Yes
19/8/2008	13.00	Waterfall pit W01-02-Art	613	0.12	**96.10**	Yes	0.10	**96.40**	Yes
22/8/2008	13.06	South Cut S12-3 upg	517	0.10	**95.40**	Yes	0.06	**95.40**	Yes
25/8/2008	13.02	Waterfall pit W01-1- Lid	615	0.20	**98.40**	Yes	0.15	**97.30**	Yes
28/8/2008	13.04	Entrance Liddell	622/618	0.10	**97.90**	Yes	0.06	**101.90**	Yes
29/8/2008	13.01	Lower Pikes Gully	623	0.19	**110.60**	Yes	0.09	**104.50**	Yes
2/9/2008	13.04	South Cut S11-2-LPG	623/626	0.12	**96.10**	Yes	0.09	**91.30**	Yes
9/9/2008	13.02	Entrance Block E-01-1-LID	619	0.13	**98.40**	Yes	0.07	**106.30**	Yes
11/9/2008	13.04	Entrance Block E-01-1-LID	618	0.13	**91.80**	Yes	0.06	**100.20**	Yes
12/9/2008	13.14	Southcut S11-3LPG	624	0.19	**96.70**	Yes	0.09	**98.90**	Yes
12/9/2008	13.21	Southcut S12-2LPG	616	0.14	**98.90**	Yes	0.06	**102.90**	Yes
18/9/2008	12.58	South Cut S10-1 Bar	627	0.30	**99.20**	yes	0.07	**86.40**	Yes
19/9/2008	13.04	Entrance E01-1LID	521	0.30	**112.60**	Yes	0.05	**107.10**	Yes
22/9/2008	12.46	South Cut S10-3 Lid	638	0.19	**109.80**	Yes	0.03	**111.10**	Yes
26/9/2008	13.26	South Cut S11-3LMPG	625	0.27	**101.50**	Yes	0.09	**99.30**	Yes
29/9/2008	12.24	Entrance E01-1LID	633	0.14	**106.00**	Yes	0.06	**100.60**	Yes
30/9/2008	13.26	Southcut S10-1Lid	628	0.23	**102.50**	Yes	0.09	**97.60**	Yes
1/10/2008	13:29	Entrance E01-1 LID	632	0.13	**103.60**	Yes	0.17	100.9	Yes
3/10/2008	13:12	Entrance E01-1 LID	636	0.10	**112.70**	Yes	0.12	116.4	Yes
7/10/2008	13:01	Waterfall Pit W01-UPG	630	0.13	**107.10**	Yes	0.2	99.8	Yes
11/10/2008	10:07	South Cut S10-2 Barrett	640	0.16	**81.20**	Yes	0.13	91.9	Yes
14/10/2008	13:16	South Cut S10-2 Barrett	639	0.30	**81.40**	Yes	0.15	93.4	Yes
16/10/2008	13:02	South Cut S10-3 Liddell	648	0.04	**91.50**	Yes	0.05	96.6	Yes
20/10/2008	12:13	South Cut S10-3 Barrett	646	0.19	**87.10**	Yes	0.16	92.7	Yes
21/10/2008	13:06	Waterfall Pit W01-UPG/ Waterfall Pit W01-BAR	634/635	0.14	**93.00**	Yes	0.17	99.2	Yes
23/10/2008	16:05	South Cut S10-3 Barrett	647	0.11	**103.90**	Yes	0.11	110.4	Yes
28/10/2008	16:05	Entrance E01-1 BAR	645	0.08	**100.40**	Yes	0.13	98.3	Yes
29/10/2008	13:04	South Cut S10-2 Barrett	641	0.06	**98.70**	Yes	0.05	110.4	Yes
30/10/2008	13:01	South Cut S10-1 Art	642a	0.06	**87.50**	Yes	0.02	96	Yes
3/11/2008	13:07	Waterfall Pit W01-UPG/ Waterfall Pit W01-ROB	643/644	0.11	**104.60**	Yes	0.1	110.2	Yes
5/11/2008	16:06	South Cut S10-1 BAR	649	0.14	**82.80**	Yes	0.11	92	Yes
7/11/2008	13:10	South Cut S11-1 ART	642	0.09	**92.20**	Yes	0.05	95.8	Yes
10/11/2008	13:08	South Cut S10-2 BAR/ South Cut S10-4 BAR	653/651	0.23	**95.80**	Yes	0.09	95.6	Yes
13/11/2008	12:59	Entrance E01-1 LID	659/654	0.01	**91.80**	Yes	0.01	94.3	Yes
17/11/2008	13:09	South Cut S10-4 BAR	651	0.13	**108.60**	Yes	0.09	104.6	Yes
17/11/2008	16:10	South Cut S11-2 LID	650	0.09	**92.20**	Yes	0.06	99.1	Yes
25/11/2008	13:05	South Cut S10-4 BAR	652	0.19	**105.90**	Yes	0.12	114.7	Yes
26/11/2008	13:05	South Cut S11-1 ART	660A	0.07	**101.90**	Yes	0.04	97.3	Yes
28/11/2008	10:12	South Cut S11-1 ART	660	0.11	**82.20**	Yes	0.05	93.3	Yes

Appendix 4 – Liddell Colliery Blast Monitoring Results 2008 to 2009 Reporting Period
Burlings and Scriven Blast Monitors

Date	Time	Location	Blast ID	Burlings			Scrivens		
				Ground Vibration (mm/s)	Over pressure (dBL)	Waveform Capture	Ground Vibration (mm/s)	Over pressure (dBL)	Waveform Capture
4/12/2008	13:02	South Cut S10-3 BAR	655	0.22	**98.00**	Yes	0.16	108.2	Yes
12/12/2008	13:11	South Cut S12-3 LPG	657/658	0.19	**89.90**	Yes	0.11	89.6	Yes
16/12/2008	13:10	Entrance E01-1 LID	667	0.03	**100.20**	Yes	0.04	105.2	Yes
23/12/2008	13:04	South Cut S11-3 ART	663	0.14	**82.40**	Yes	0.08	93.2	Yes
24/12/2008	9:29	South Cut S11-2 ART	661A	0.11	**95.50**	Yes	0.06	103.4	Yes
29/12/2008	13:03	South Cut S11-1 ART	669	0.02	**100.10**	Yes	0.01	104.7	Yes
31/12/2008	12:52	W01-1-Liddell	673	0.01	**111.20**	Yes	0	114.8	Yes
2/1/2009	9:34	South Cut S12-1 LPG	668	0.02	**90.10**	Yes	0.01	92.5	Yes
7/1/2009	16:09	South Cut S11-3 ART	664	0.17	**97.60**	Yes	0.09	107.3	Yes
8/1/2009	15:26	South Cut S11-3 ART	661b	0.12	**103.40**	Yes	0.04	105.5	Yes
14/1/2009	16:05	South Cut S11-3 ART	665	0.12	**92.80**	Yes	0.07	88.4	Yes
19/1/2009	12:12	South Cut S10-3 BAR/ South Cut S10-2 ART	662/665B	0.20	**77.50**	Yes	0.08	92	Yes
22/1/2009	13:09	South Cut S12-1 LPG	674/666	0.08	**100.10**	Yes	0.07	108.2	Yes
28/1/2009	13:04	South Cut S12-2 LPG	671	0.08	**92.10**	Yes	0.04	87.3	Yes
30/1/2009	12:57	Water Fill Pit W01-1-LGP	670	0.12	**81.20**	Yes	0.14	89.6	Yes
30/1/2009	12:57	South Cut S11-3 ART	672	0.06	**93.10**	Yes	0.08	92.5	Yes
3/2/2009	12:04	Water Fill Pit W01-1-ART	677	0.21	**98.70**	Yes	0.15	96.1	Yes
3/2/2009	12:57	South Cut S11-2 LID	675	0.03	**90.70**	Yes	0.01	98.8	Yes
5/2/2009	12:44	Entrance E01-1 BAR	680	0.14	**97.60**	Yes	0.17	95.2	Yes
6/2/2009	13:00	South Cut S11-1 Liddell	679	0.00	**85.50**	Yes	0	97.3	Yes
9/2/2009	16:06	South Cut S11-2 Arties	685	0.02	**98.90**	Yes	0.04	118.1	Yes
12/2/2009	13:36	South Cut S11-2 Arties	676A	0.09	**105.70**	Yes	0.03	111.3	Yes
10/2/2009	12:58	Water Fill Pit Strip 1	673	0.07	**95.40**	Yes	0.12	103.6	Yes
19/2/2009	12:48	South Cut S11-2 Liddell	676	0.08	**91.60**	Yes	0.03	101.5	Yes
23/2/2009	12:53	Entrance E02-1 Barrett	687	0.04	**92.90**	Yes	0.06	96.2	Yes
26/2/2009	14:28	South Cut S13-1 Arties	681	0.06	**101.20**	Yes	0.03	101	Yes
25/2/2009	13:23	Waterfill W01-1 Arties	678	0.13	**92.40**	Yes	0.1	98.3	Yes
28/2/2009	12:23	South Cut S13-1 Arties	689	0.05	**103.10**	Yes	0.02	106.9	Yes
28/2/2009	12:26	South Cut S13-1 Arties	698	0.18	**104.90**	Yes	0.1	111.4	Yes
3/3/2009	13:20	South Cut S11-2 Arties	699	0.05	**86.70**	Yes	0.03	101	Yes
5/3/2009	16:21	South Cut S13-1 Arties	682/690	0.12	**86.30**	Yes	0.05	102.6	Yes
5/3/2009	16:11	South Cut S11-2 Arties	700	0.04	**83.30**	Yes	0.02	107.2	Yes
9/3/2009	13:13	Waterfill W02_1Lmpg	683	0.04	**100.50**	Yes	0.03	106.8	Yes
9/3/2009	13:09	S11-2 Arties	703	0.03	**91.20**	Yes	0.02	98.6	Yes
11/3/2009	16:09	South Cut S11-2 Arties	704	0.03	**100.10**	Yes	0.01	102.7	Yes
13/3/2009	13:09	South Cut S11-1 Liddell	693	0.09	**82.20**	Yes	0.05	89	Yes
16/3/2009	13:14	Entrance Barrett	688	0.11	**95.40**	Yes	0.15	101	Yes
16/3/2009	13:18	Waterfill IPG	708	0.02	**98.50**	Yes	0.06	111.3	Yes
17/3/2009	13:01	South Cut S11-1 Liddell	693	0.18	**79.00**	Yes	0.1	89.6	Yes
18/3/2009	13:05	South Cut S11-1 Liddell	706	0.03	**99.80**	Yes	0.02	89.4	Yes
19/3/2009	13:09	South Cut S11-1 Liddell	694	0.07	**87.50**	Yes	0.04	99.7	Yes
20/3/2009	13:05	South Cut S12-1 Arties	695	0.06	**104.60**	Yes	0.02	100.3	Yes
23/3/2009	12:10	South Cut S13-1 Liddell	707	0.04	**82.80**	Yes	0.02	88.1	Yes
23/3/2009	12:23	South Cut S11-3 Arties	695	0.02	**77.80**	Yes	0.01	86.2	Yes
24/3/2009	13:04	South Cut S11-2 Liddell	694	0.10	**86.40**	Yes	0.06	90.2	Yes
25/3/2009	13:10	South Cut S12-1 Arties	696	0.07	**97.90**	Yes	0.03	101.4	Yes
27/3/2009	13:05	South Cut S11-1 Liddell	691	0.07	**100.60**	Yes	0.03	111.8	Yes
28/3/2009	11:38	South Cut S12-2 Arties	697	0.01	**101.80**	Yes	0.01	95.2	Yes
28/3/2009	12:18	Entrance E02-1 Dyke	717	0.10	**96.70**	Yes	0.07	103.8	Yes
30/3/2009	13:31	South Cut S11-1 Liddell	711	0.06	**102.40**	Yes	0.04	114.1	Yes
31/3/2009	10:14	South Cut S11 Ramp	701	0.08	**102.10**	Yes	0.04	109.2	Yes

Appendix 4 – Liddell Colliery Blast Monitoring Results 2008 to 2009 Reporting Period
Burlings and Scriven Blast Monitors

Date	Time	Location	Blast ID	Burlings			Scrivens		
				Ground Vibration (mm/s)	**Over pressure (dBL)**	**Waveform Capture**	**Ground Vibration (mm/s)**	**Over pressure (dBL)**	**Waveform Capture**
6/4/2009	13:18	South Cut S12-1 Arties	695	0.03	**98.50**	Yes	0.02	101.7	Yes
7/4/2009	12:08	SouthCut S11-1	716	0.03	**103.50**	Yes	0.01	106.9	Yes
9/4/2009	13:02	Entrance EO1_1Barrett	710	0.12	**91.40**	Yes	0.19	101.4	Yes
16/4/2009	12:57	Entrance EO1_1Barrett	713	0.14	**90.90**	Yes	0.16	101.5	Yes
17/4/2009	13:12	South Cut S12-1 Arties	695/696	0.06	**91.60**	Yes	0.03	97.6	Yes
17/4/2009	13:15	South Cut S12-B Lemingtons	725	0.02	**92.70**	Yes	0.01	101.9	Yes
22/4/2009	13:15	Waterfill W01-1 LMPG	718/710	0.07	**97.20**	Yes	0.07	104.1	Yes
24/4/2009	13:10	South Cut S11-3	709	0.55	**106.80**	Yes	0.26	106.1	Yes
27/4/2009	13:19	Southcut S11_1 Lid	B730	0.04	**99.10**	Yes	0.03	122.4	Yes
30/4/2009	13:03	SouthCut S13-1 Arties	720	0.21	**88.60**	Yes	0.1	93.2	Yes
1/5/2009	13:09	Southcut	714/715	0.15	**88.40**	Yes	0.06	97.6	Yes
5/5/2009	13:17	SouthCut S011_2 Liddell	724/721	0.22	**112.70**	Yes	0.11	108	Yes
7/5/2009	13:12	Southcut S12_3 UPG	728	0.10	**91.00**	Yes	0.05	93	Yes
8/5/2009	13:09	Waterfill W01_1 Arties	726	0.11	**95.30**	Yes	0.07	98	Yes
11/5/2009	13:13	Waterfill W01_1 Arties	726m	0.05	**95.90**	Yes	0.07	92.3	Yes
13/5/2009	13:09	SouthCut S11-1 Liddell	723	0.18	**98.30**	Yes	0.1	101	Yes
18/5/2009	12:41	Southcut S12 Arties	720/727	0.11	**93.20**	Yes	0.06	100.1	Yes
18/5/2009	13:07	Waterfill W01_1 Liddell	B729_ramp	0.09	**93.30**	Yes	0.11	97.3	Yes
20/5/2009	13:10	Waterfill W01_1 Liddell	B729_Hot	0.05	**102.80**	Yes	0.05	100.4	Yes
21/5/2009	12:46	Waterfill W01_1_1 Liddell	B712	0.10	**104.30**	Yes	0.14	111.3	Yes
25/5/2009	13:07	Southcut S12_3 UPG	B733	0.01	**80.30**	Yes	0.01	90.1	Yes
26/5/2009	13:19	Waterfill W01_1 Liddell	B731_hot	0.04	**88.40**	Yes	0.06	102.2	Yes
28/5/2009	13:12	Waterfill W01_1 Liddell	B729	0.11	**93.20**	Yes	0.09	96.9	Yes
3/6/209	13:13	Southcut S10_1Barrett	B732	0.15	**89.60**	Yes	0.08	93.9	Yes
9/6/2009	13:05	Waterfill W01_1 Liddell	B734	0.25	**105.00**	Yes	0.12	96.1	Yes
11/6/2009	13:23	Waterfill W01_1 Liddell	B712p2	0.03	**106.80**	Yes	0.03	114	Yes
11/6/2009	13:27	Southcut S11_1 Barrett	B731_hot	0.08	**95.00**	Yes	0.11	118.6	Yes
12/6/2009	13:04	Southcut S11_1 Barrett	B732b	0.12	**84.30**	Yes	0.07	96.6	Yes
15/6/2009	13:07	Waterfill W01_1 LMPG	B746	0.02	**86.90**	Yes	0.02	95.9	Yes
17/6/2009	13:12	Southcut S12_3 LMPG	B736	0.30	**93.20**	Yes	0.17	101.5	Yes
18/6/2009	13:21	Southcut S11_1 Lid	B748	0.02	**103.60**	Yes	0.01	106.8	Yes
26/6/2009	13:09	Southcut S12_2 Arties	B735	0.27	**87.40**	Yes	0.13	89.3	Yes
26/6/2009	13:37	Waterfill W01_1 Liddell	B731	0.14	**87.10**	Yes	0.14	92.3	Yes
29/6/2009	13:14	Southcut S12_1 Liddell	B742	0.08	**109.90**	Yes	0.04	112.8	Yes
30/6/02009	13:16	Waterfill W01_1 Lid	B737	0.05	**99.90**	Yes	0.05	103.8	Yes

NA = Not Applicable
ND = No data available due to communication failure
NT = No trigger on monitor
NM = Not monitored

Limits for Burlings and Scrivens:
115 dB overpressure allowable 5% of total blasts and >120 not allowable at any time
5 mm/s ground vibration allowable 5% of total blasts and 100 mm/s not allowable at any time

Blast Monitoring Statistical Summary
July 2008 - June 2009

YTD	Number of Blasts Requiring Monitoring	Monitored Blasts		>115 db(L)		>120 db(L)		>5 mm/s		>10 mm/s	
		Number	%	Number	%	Number	%	Number	%	Number	%
Total	136										
Scrivens	136	136	100	4	3	1	0.7	0	0	0	0
Burlings	136	136	100	0	0	0	0	0	0	0	0

Note: Result at Scrivens on 27 April 2009, 122.4 dB (L)was found to be caused from wind and not as a result of blasting at Liddell Coal.

Appendix 6

Monitoring Data Comparisons

Appendix 6 – Liddell Colliery Three Year Monitoring Data Comparison

Annual Average Dust Deposition (g/m^2/month) Comparisons

Monitoring Location	July 2006 to June 2007	July2007 to June2008	July2008 to June2009
D53	3.1	2.5	3.1
D54	3.6	4.4	4.8
D55	2.6	1.8	2.4
D56	2.1	1.7	2.0
D57	3.9	3.3	5.4
D58	2.8	1.8	2.0
D59	3.0	1.6	1.5
D60	2.0	3.3	2.2
D61	2.6	2.8	3.7
D62	1.8	2.8	2.2

Annual Average TSP (ug/m^3) Monitoring Results Comparison

	July 2006 to June 2007	July 2007 to June 2008	July 2008 to June 2009
HVAS 13	77.1	64.7	90.7
HVAS 11	42.2	38.7	50.7

Annual Average PM_{10} (ug/m^3) Monitoring Results Comparison

	July 2006 to June 2007	July 2007 to June 2008	July 2008 to June 2009
HVAS 6	23.5	24.2	27.7
HVAS 12	16.9	14	18.9

Appendix 6 – Liddell Colliery Three Year Monitoring Data Comparison

Liddell Colliery Annual Average Surface Water Comparisons of Bayswater Creek for pH, EC, TSS and TDS

	Bayswater Ck Upstream				Bayswater Ck Midstream				Bayswater Ck Downstream			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
July 2006 to June 2007	7.8	3470	24	2108	8.2	5503	18	3378	7.2*	258*	42*	166*
July 2007 to June 2008	7.7	3763	17	2351	8.2	5474	40	3611	7.7	4651	31	3218
July 2008 to June 2009	7.7	3786	19	2730	8.1	4948	5	3428	7.8	5875	16	4392

*Bayswater Creek Downstream dry for 11 of the 12 months. Results denote single reading only

Liddell Colliery Annual Average Surface Water Comparisons of Bowmans Creek for pH, EC, TSS and TDS

	BCK1 (Bowmans Creek Upstream)				BCK6 (Bowmans Creek Downstream)			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
July 2006 to June 2007	7.6	1374	39	849	7.6	1824	38	1093
July 2007 to June 2008	7.8	730	6	540	7.8	861	11	504
July 2008 to June 2009	8.1	755	4	422	7.9	892	7	781

Appendix 6 – Liddell Colliery Three Year Monitoring Data Comparison

Liddell Colliery Annual Average Surface Water Comparisons of Bowmans Creek for pH, EC, TSS and TDS

	BCK1				BCK 1A				BCK2				BCK2A			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
July 2006 to June 2007	7.1*	1217	62	682	7.2	3463	10	2362	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
July 2007 to June 2008	7.7	843	4	564	7.8	1044	5	730	7.9	888	5	477	7.9	949	5	678
July 2008 to June 2009	8.1	748	3	410	7.9	1381	5	856	8.1	879	22	476	7.8	899	5	518
	BCK3				**BCK4**				**BCK5**				**BCK6**			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
July 2006 to June 2007	7.6	2588	74	1644	7.6	2250	6	1468	Dry	Dry	Dry	Dry	7.5	2000	60	1277
July 2007 to June 2008	7.8	930	11	621	7.9	1084	6	559	7.9	1097	6	658	7.7	1032	9	557
July 2008 to June 2009	7.9	967	9	496	7.9	931	8	517	7.9	927	10	1042	8.1	878	10	1182

Appendix 6 – Liddell Colliery Three Year Monitoring Data Comparison

Liddell Colliery Annual Average Surface Water Comparisons of On-Site Dams for pH, EC, TSS and TDS

	Dam 1				Dam 4				Dam 7			
	pH	**Conductivity (µS/cm)**	**TSS (mg/L)**	**TDS (mg/L)**	**pH**	**Conductivity (µS/cm)**	**TSS (mg/L)**	**TDS (mg/L)**	**pH**	**Conductivity (µS/cm)**	**TSS (mg/L)**	**TDS (mg/L)**
July 2006 to June 2007	8.0	1121	5	724	8.7	4125	6	2679	9.1	4144	16	2688
July 2007 to June 2008	8.8	3334	30	2036	8.8	5028	19	2916	9.4	6994	41	4321
July 2008 to June 2009	8.6	1061	2	615	8.7	4210	5	2775	8.0	5722	10	4609

	Dam 13				Dam 17				Tailings Supernatant at Void				Mt Owen Transfer Dam			
	pH	**Conductivity (µS/cm)**	**TSS (mg/L)**	**TDS (mg/L)**	**pH**	**Conductivity (µS/cm)**	**TSS (mg/L)**	**TDS (mg/L)**	**pH**	**Conductivity (µS/cm)**	**TSS (mg/L)**	**TDS (mg/L)**	**pH**	**Conductivity (µS/cm)**	**TSS (mg/L)**	**TDS (mg/L)**
July 2006 to June 2007	8.2	5894	38	3455	9.0	5817	25	3459	9.2	6611	39	3966	8.5	6327	25	3508
July 2007 to June 2008	8.8	4918	11	3070	8.7	4682	12	3156	8.9	4868	43	3192	9.2	4370	6	2586
July 2008 to June 2009	8.8	5649	13	3468	8.8	4671	10	3063	8.9	5944	26	3758	8.4	5194	7	3178

Appendix 7

Statutory Plans:

Plan 3 – Topsoil Stripping

Plan 4 – AEMR June 2009

Plan 5 –12 Month Synoptic

E 311 000 E 312 000 E 313 000 E 314 000 E 315 000 E 316 000 E 317 000

N 6 420 000 N 6 419 000 N 6 418 000 N 6 417 000 N 6 416 000 N 6 415 000 N 6 414 000 N 6 413 000 N 6 412 000

N

W E

S

ML 1597

LAKE

LIDDELL

ML 1597

0 250 500 750 1000m

LEGEND

- Liddell Colliery Holding Boundary
- Mining Lease ML 1597 Boundary
- Development Application Area
- Soil Observation Site
- 26 Soil Profile Site
- Area Stripped July 2008 to June 2009
- Topsoil Removed July 2008 to June 2009

SOIL STRIPPING DEPTHS

- 0 - 10cm Suitable
- 0 - 15cm Suitable
- 0 - 20cm Suitable
- 0 - 25cm Suitable
- Nil Suitable
- SMU1 Soil Mapping Unit

Drawn:	J.Dunlop
Date:	30.06.2009
Scale:	1 : 25,000
Checked:	MH

LIDDELL OPEN CUT

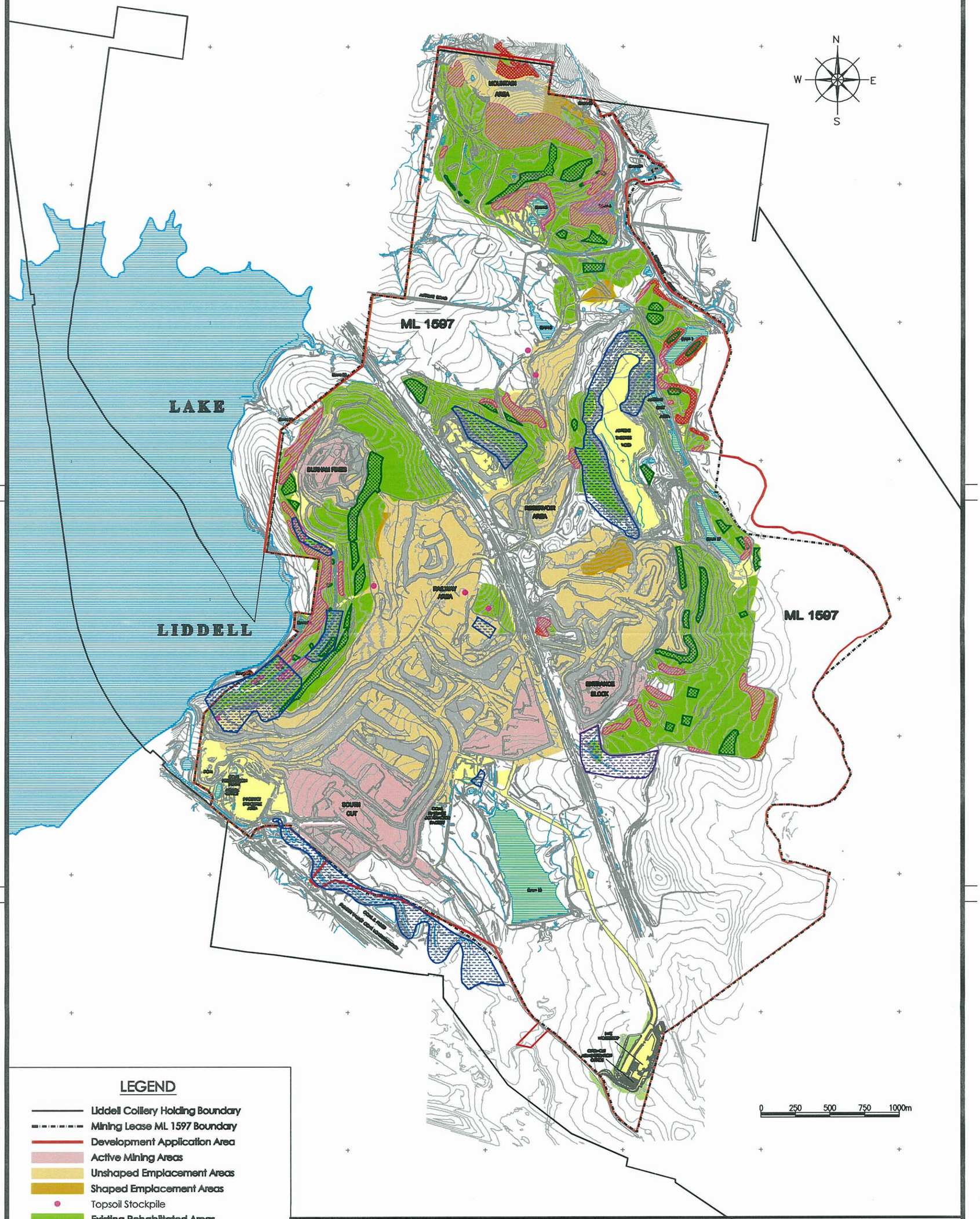
Annual Rehabilitation Report
TOPSOIL STRIPPING
PERIOD ENDING JUNE 2009

liddell coal operations

Managed by xstrata coal

Drg No: RHB-136

Plan No. JTD/A3/002



LEGEND

- Liddell Colliery Holding Boundary
- Mining Lease ML 1597 Boundary
- Development Application Area
- Active Mining Areas
- Unshaped Emplacement Areas
- Shaped Emplacement Areas
- Topsoil Stockpile
- Existing Rehabilitated Areas
- Current Period Rehabilitated Areas
- Steep Slopes (10-18°)
- Steep Slopes (>18°)
- Infrastructure Areas
- Treed Areas
- Weed Spraying

Drawn:	J.Dunlop
Date:	30.06.2009
Scale:	1 : 25,000
Checked:	MH

LIDDELL OPEN CUT

Annual Environmental Report JUNE 2009

liddell coal operations

Managed by xstrata coal

Drg No:	RHB-135
Plan No.	JTD/A3/001

E 311 000 E 312 000 E 313 000 E 314 000 E 315 000 E 316 000 E 317 000

N 6 420 000 N 6 419 000 N 6 418 000 N 6 417 000 N 6 416 000 N 6 415 000 N 6 414 000 N 6 413 000 N 6 412 000

N

W E

S

LAKE

LIDDELL

ML 1597

MOUNTAIN AREA

DAM 6

DAM 5

DAM 4

DAM 3

DAM 2

DAM 1

DAM 7

DAM 8

DAM 9

DAM 10

DAM 11

DAM 12

DAM 13

ANTIENE ROAD

DURHAM FINES

RESERVOIR AREA

ANTIENE EAST AREA

ANTIENE TAILINGS VOID

RAILWAY AREA

ENTRANCE BLOCK

SOUTH CUT

ROM

COAL PREPARATION PLANT

ADMIN OFFICE

PRODUCT STOCKPILE AREA

COAL HAULAGE CONTRACTOR FACILITY

FRONTIER VALLEY COAL LOADING FACILITY

COAL & ALLIED

HVE WORKSHOP

OPEN CUT ADMINISTRATION OFFICE

0 250 500 750 1000m

LEGEND

- Liddell Colliery Holding Boundary
- Mining Lease ML 1597 Boundary
- Development Application Area
- Approved Mining Area
- Active Mining Area
- Unshaped Spoil Dump
- Shaped Spoil Dump
- Infrastructure
- Topsoil Stockpile as at June 2009
- Current Period Rehabiltated Areas
- Proposed Revegetated Area
- Revegetated Trees - Previous
- Revegetated Areas - Previous
- Revegetated Areas 10° - 18°
- Revegetated Areas > 18°

Drawn: J.Dunlop

Date: 30.06.2009

Scale: 1 : 25,000

Checked: MH

LIDDELL OPEN CUT

Annual Rehabilitation Report 12 MONTH SYNOPTIC TO JUNE 2009

liddell coal operations

Managed by xstrata coal

Drg No: RHB-137

Plan No. JTD/A3/003

Appendix 8

Liddell Coal Community Newsletter February

2009,

Issue No. 4

Liddell Coal Update

Liddell Coal Community Newsletter February 2009, Issue No. 4

Message from the Operations Manager

I am pleased to welcome you to the fourth edition of the ***Liddell Coal Update***, which provides information on what has been happening at Liddell Coal over the last twelve months and what will be happening in 2009.

First I'd like to introduce myself, I'm Tony Galvin and I have only recently moved into the role of Operations Manager at Liddell Coal. Before moving to Liddell Coal, I was the Operations Manager at the nearby Ravensworth Operations.

Coal mining has been undertaken at Liddell Coal since the 1950's and the new Development Consent modification provides the opportunity for an exciting future that I'm keen to share. I commend the work already undertaken on the various upgrades to the plant and facilities, some of which is detailed in this newsletter, and look forward to working with all stakeholders to keep our focus on safety and the environment in 2009.

I'd also like to take this opportunity to wish everyone a safe and prosperous 2009.

Tony Galvin
Operations Manager

Tony Galvin, Operations Manager, Liddell Coal

Development Consent Update

The 2007 modification to Liddell Colliery's development consent (DA 305-11-01) allowed the construction of several important infrastructure items on the site. These are now completed and will lead to improved site performance and environmental management.

New Coal Handling and Preparation Plant

The new Coal Handling and Preparation Plant (CHPP) and an upgrade to the existing ROM and product coal facilities was completed in June 2008. The construction of the new CHPP has allowed an increased production throughput from 700 tonnes/hour to 1,000 tonnes/hour and has more efficient screening, cyclone and spiral components than the previous plant. The old preparation plant was decommissioned following the new plants commissioning.

Liddell Coal's new Coal Handling and Preparation Plant

New Access and Services Corridor

Another major feature of the modification to Liddell Coal's development consent is the realignment of the main access and services corridor. The corridor was constructed in 2008 and includes the installation of new electricity transmission lines, telecommunications, pipelines, and an access road. The new access and services corridor was constructed to retain access to Pikes Gully road from the old New England highway as the alignment of the old highway is located within the approved mining area.

The construction of the access and services corridor required the completion of an extensive sub surface testing and salvage program for aboriginal heritage. The project was managed with local aboriginal stakeholder consultation and in accordance to the Liddell Coal Aboriginal Cultural Heritage Management Plan and approvals from the Department of Environment and Climate Change.

New Office and Workshop Facilities

The new Open Cut office and workshop facilities were completed in late 2008 and were constructed to replace those located in the approved mine disturbance area.

The new office and workshop facilities include:

- relocatable administration buildings including amenities, training rooms, crib-rooms, bath house and first aid room;
- waste water treatment plant;
- ambulance access and helipad;
- covered walkways connecting buildings;
- machinery workshop;
- water storage tanks;
- fuel farm;
- light and heavy vehicle washbays;
- hardstand areas and sealed parking areas;
- sediment and erosion control works.

The office and workshop facilities are connected with all utilities including power, potable and raw water, sewage, fire detection and fire fighting systems and telecommunications.

Access to the new facilities is gained from a new intersection with the old New England Highway.

TOP: Liddell Coal's new offices and workshop. RIGHT: Realigned access road and services corridor

LiddellCoalUpdate

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Community Update

Community Consultative Committee

Liddell Coal's Community Consultative Committee (CCC) provides a forum for our local community and mine management to meet and discuss key issues. CCC meetings are held every six months in accordance with Liddell Coal's development consent. Our CCC currently consists of one community representative and two representatives from Muswellbrook Shire Council and Singleton Shire Council.

Liddell Coal is actively seeking additional community representatives to join its CCC. Becoming a community representative on the Liddell CCC affords you the opportunity to meet regularly with the management of Liddell Coal, learn of developments at the site, be regularly updated on Liddell's environmental performance and provide advice on improved environmental management and community relations at the site.

Our meetings are scheduled at times to suit the participants, with the last meeting being held on 28 October 2008 at the new Liddell Coal office facilities.

If you are interested in becoming a member of the Liddell CCC or would like to make an enquiry, please call Mark Howes on (02) 6570 9923 for further information.

Donations and Sponsorships for 2007-2008

Liddell Coal has made donations and sponsorships to the following organisations and charities since November 2007:

- End of year presentations funding for 16 local schools
- Sponsorship of the "Movember" appeal assisting the Beyond Blue and Prostate Cancer Association
- Lake Liddell Trust
- Hebden Wild Dog Association
- Singleton Amateur Theatrical Society
- Sponsorship of the Muswellbrook Shire Council "Upper Hunter Youth Forum"
- Mercy Nursing Home
- Singleton Community Health Centre
- Singleton Legacy
- Sponsorship of the "Special Children's Christmas Party"

Liddell Coal aims to provide support for local projects relating to the community, health, education and the environment. If you know of a worthwhile project, we encourage you to contact Mark Howes on (02) 6570 9923 for further information.

Website

Liddell Coal is online! The Liddell Coal website is up and running and currently under development. Keep an eye on the site as we update useful information on Liddell Coal's operations, including environmental, community and operational issues. Check us out at: *http://www.liddellcoal.com.au*

Employee Profile: Mark Howes

Environment and Community Coordinator

When did you start working at Liddell?
October 2008

Where did you come from? I recently came from consulting in the mining industry, and have held other environment and earth science positions in the mining industry and NSW government.

What do you enjoy about working at Liddell? I like the dynamic nature of the mining industry, and as Liddell increases in production there are various associated challenges. The varied interactions with such a diverse number of people makes every day interesting and different.

Mining Update

Last year, our mining contractor Hunter Valley Earthmoving and Liddell Coal produced approximately 4.16 million tonnes of run-of-mine (ROM) coal and of that, approximately 2.7 million tonnes of coal were exported. Approximately 4.5 million tonnes of product coal is scheduled in 2009.

Environment Update

Liddell Coal is committed to striving towards best practice environmental management and to constantly improving its environmental performance.

Flora and Fauna Monitoring Program

Liddell Coal's flora and fauna monitoring program continued this year with surveys conducted during March and April 2008.

The flora survey revealed a diverse range of species on site, notably, a large, healthy specimen of tiger orchid (*Cymbidium canaliculatum*) which is listed as an endangered population in the Hunter Catchment under the NSW *Threatened Species Conservation Act* (TSC Act). Similarly, the fauna surveys recorded five fauna species listed under the NSW TSC Act, two of which have not previously been recorded on site – the spotted-tail quoll (*Dasyurus maculatus*) and the large-footed myotis (*Myotis adversus*).

The next flora and fauna monitoring surveys are scheduled to be undertaken in Autumn 2009.

Blue-Billed Duck Habitat Enhancement

The blue-billed duck (*Oxyura australis*), a species listed as 'vulnerable' under the NSW TSC Act, has been identified at Liddell Coal's dams 7 and 13 during fauna monitoring surveys. In accordance with the modification to the development consent in 2007, Liddell Coal has committed to undertaking habitat enhancement measures at Dam 3 and Mountain Block Dam to offset impacts on the blue-billed duck as a result of mining operations.

A Blue-Billed Duck Management Strategy was developed during 2008 to guide the creation and maintenance of habitat for the blue-billed duck at each of the dams. In line with recommendations outlined in this strategy, Liddell Coal is currently undertaking an assessment of Dam 3 to determine the scope of enhancement activities required. Habitat enhancement works at Dam 3 are expected to commence early in 2009.

Profile survey of Dam 3 leading up to habitat enhancement measures for the Blue-billed Duck – November 2008

Weed Management

A comprehensive Weed Management Plan was developed for Liddell Coal during 2008 to assist with the management of weed control across the site. A two day weed survey was conducted across the Liddell Colliery to assist in the development of the plan, and formed the basis of a detailed treatment schedule and action plan.

Weed management activities were undertaken at the CHPP, Open Cut and Antiene East Dam areas during 2008, with weed species targeted including pampas grass, castor oil tree, galenia and St John's wort. Further weed management actions are planned for early 2009.

Contact Details

For further information contact:

Mark Howes
Liddell Coal Environment & Community Coordinator
T: (02) 6570 9923 M: 0408 668 563
Email: mhowes@xstratacoal.com.au

Community Complaints Line
Ph: (02) 6570 9939

Company Contact Details:

Liddell Coal Operations Pty Ltd
Old New England Highway, Singleton NSW 2330
Ph: (02) 6570 9900 Fax: (02) 6570 9999

liddell coal operations

xstrata coal

Title Block

Name of Mine:	Liddell Colliery
Titles/Mining Leases:	ML 1597, CCL708, ML1313, ML1552
MOP Commencement Date:	January 2008
MOP Completion Date:	January 2015
AEMR Commencement Date:	July 2008
AEMR Completion Date:	June 2009
Name of Leaseholder:	Liddell Coal Operations Pty Ltd
Name of Mine Operator:	Liddell Coal Operations Pty Ltd
Reporting Officer:	Tony Galvin
Title:	Operations Manager
Signature:	
Date:	26.11.09