Liddell Coal Operations Pty Ltd

Liddell Coal
Annual Environmental Management Report
Year Ending June 2010

2009/10 AEMR

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Annual Environmental Management Report
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Prepared by

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on behalf of

Liddell Coal Operations Pty Limited

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1.0 Introduction

Liddell Coal, located in the Upper Hunter Valley, is operated by Liddell Coal Operations (LCO) Pty Limited under the conditions of development consent DA 305-11-01. Schedule 5, condition 3 of DA 305-11-01 requires LCO to prepare and submit an AEMR to the Department of Planning (DoP) and Industry and Investment NSW (IINSW, formerly the Department of Primary Industries) 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 2009 to June 2010.

Liddell Coal is an open cut coal mine located approximately 25 kilometres north-west of Singleton, NSW (**Figure 1.1**). LCO 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 LCO 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 2009 and April 2010 Hunter Valley Earthmoving (HVE) carried out mining activities at LCO as the principle mining contractor. In April 2010 HVE ceased operations and LCO became a fully owner operated facility. During the reporting period mining operations were undertaken using the truck and excavator method of operation. LCO 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 LCO. The status of these approvals is discussed in **Sections 1.1.1** to **1.1.3**.

1.1.1 Development Consent Conditions

Operations at LCO are undertaken in accordance with development consent DA 305-11-01. On 27 October 2009, 7 May 2008 and 18 July 2007 LCO was granted modifications to its development consent. Operations during the reporting period were undertaken in accordance with the development consent granted on 27 October 2009 and 7 May 2008 and as such this AEMR assesses LCO'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

LCO operates primarily under one consolidated mining lease, ML 1597, refer to **Figure 1.2**. The approval for ML 1597 was granted by the IINSW on 5 November 2007. Small parts of other leases as detailed in **Table 1.1** are also applicable to LCO operations.

Table 1.1 - Leases and Licences

Instrument	Authority	Approval/Expiry
Mining Lease 1597	IINSW	Expires 5 November 2028
Consolidated Coal Lease No. 708	IINSW	30 December 2023
Mining Lease No. 1313	IINSW	13 October 2023
Cumnock Sublease Mining lease No. 1552	IINSW	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. LCO currently holds the following EPL:

- Licence Number: 2094
- File Number: 27051
- Licence Anniversary: 30 June
- Review Due Date: 07 September 2014

Three variations to the Liddell Coal EPL were made during the reporting period. Minor variations to the EPL were made on 26 November 2009 as an outcome of a Licence review conducted by the Environment Protection Authority (EPA). Another variation was made to the EPL on 10 July 2009 requiring LCO to investigate and report on actions available to reduce dust emissions relating to spontaneous combustion. The third variation to the EPL during the reporting period on 4 January 2010 was to remove the condition, relating to dust emission practices, as the requirement of the condition were met.

Compliance with the EPL is reported annually to the Department of Environment and Climate Change (DECC) in the EPL Annual Return. LCO's compliance with the EPL is also discussed in **Section 3.0** of this report.

1.1.3.2 **Surface Water Licences**

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

Figure 1.1 Locality Map

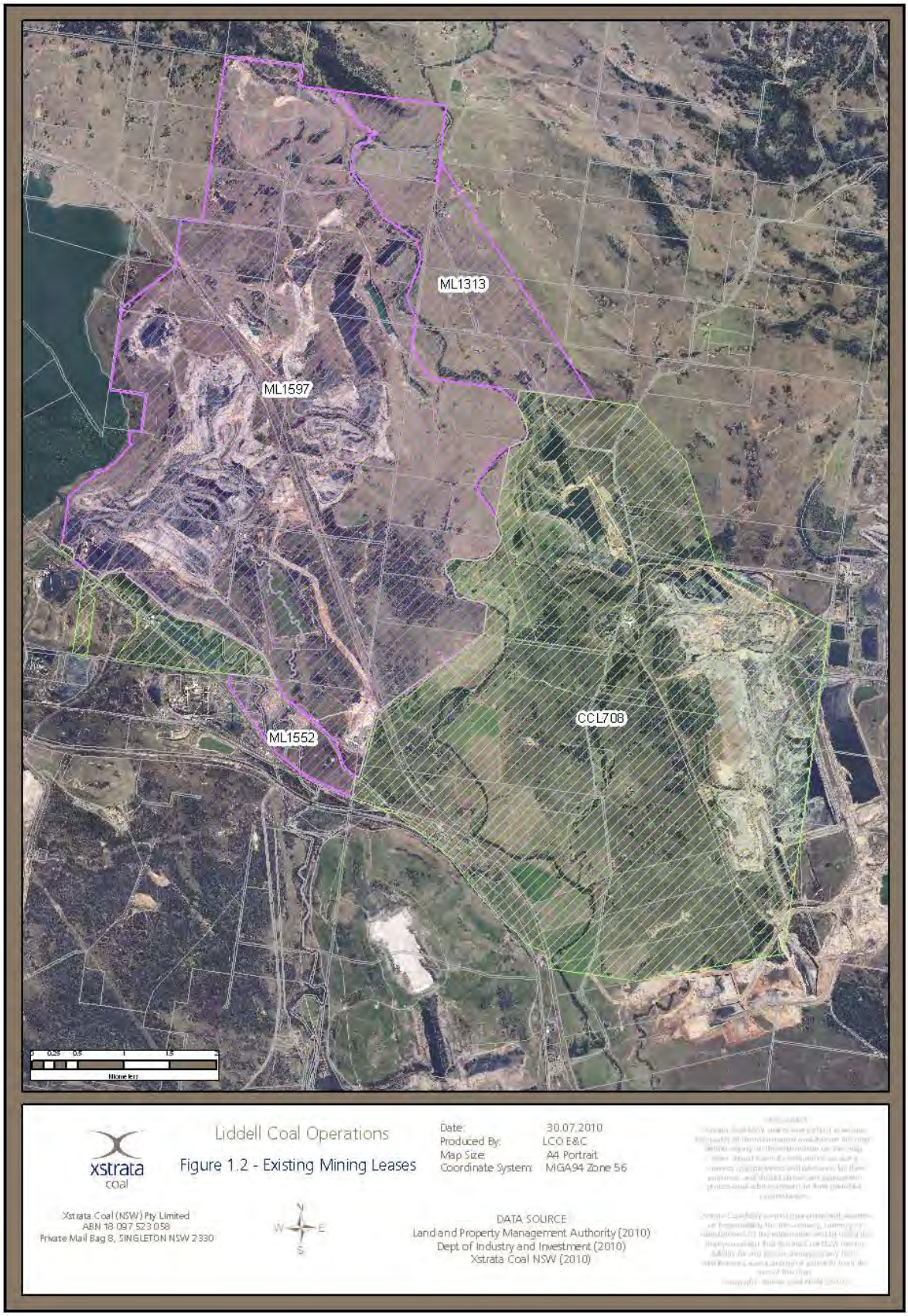


Figure 1.2 Mining Leases

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

1.1.3.3 Groundwater Licences

LCO currently holds ten groundwater extraction and monitoring licences. **Table 1.3** outlines the current groundwater licences and the annual usage for 2009/10. Liddell Tenements Pty Ltd, Liddell Southern Tenements Pty Ltd and Enex Foydell Limited are all part of the Liddell Joint Venture.

Table 1.3 - Groundwater Licences

Locality	Licence No.	Holder	Lot/DP	Purpose	Annual Extraction 2009/10 (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	Industrial	0	6000
8 South 3 & 4	20BL168062	Liddell Tenements Pty Ltd	32/870789	Industrial	2297	6000
Durham 2 & 4	20BL168061	Liddell Tenements Pty Ltd	3/237654	Industrial	0	1000 Durham 4 redundant
Haz 2	20BL168060	Liddell Tenements Pty Ltd	81/607296	Industrial	0	5500

Table 1.3 - Groundwater Licences (continued)

Locality	Licence No.	Holder	Lot/DP	Purpose	Annual Extraction 2009/10 (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	20BL172293	Liddell Southern Tenements Pty Ltd	32/545601	Dewatering Groundwater	N/A	2500

Replacement of monitoring licence 20BL171092 with dewatering licence 20BL172293 for bore M49 occurred on 15 June 2010 and is valid until 12 February 2012. The licence is linked to licence 20BL168209 (Mt Owen Bore). The 2500 ML annual extraction allocation applies to both licences. Pumping from bore M49 did not occur during the reporting period however a total of 701 ML was extracted from the Mt Owen Bore during the reporting period.

Bore licences 20BL168060, 20BL168061, 20BL168062 and 20BL168063 were renewed during the reporting period and expire on 21 September 2014.

LCO also utilises a groundwater bore (20BL169544) operating under a Part 5 licence held by Hunter Valley Coal Corporation on behalf of LCO. LCO 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. The extraction volume of this bore is reported by the licence holder.

1.1.3.4 **Archaeological Permits**

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

Table 1.4 - Aboriginal Heritage Permits

Site	Permit No.	Salvage Date
Chain of Ponds Site Area (LID 28, 29, 30, 31, 32)	#2348 (dated 7 August 2007) Consent expires 3 October 2016	21, 22, 23 November 2006
Bayswater Creek	s87 #2883, s90 #2896 Permit #2883 expired 18 February 2010, Permit #2896 expires 18 March 2020	March/April 2008

There were no Section 90 approvals obtained during the reporting period.

1.1.3.5 Density Gauge Licences

Five radiation density gauges are operational at LCO. 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
Am-241	1259	12 GBq
Cs-137	1260	370 MBq
Cs-137	20148	370 MBq
Cs-137	20152	7.4GBq
Cs-137	20153	7.4GBq

In addition LCO holds a current licence (Licence No. 28136) to sell or possess radioactive substances.

1.1.4 Mining Operations Plan

As a result of the modification to DA 305-11-01 LCO was required to prepare a new Mining Operations Plan (MOP). The MOP was prepared in accordance with the IINSW Guidelines to the Mining, Rehabilitation and Environmental Management Process 2006. An amendment was made to the MOP and was approved by IINSW on the 20th May 2010 and is valid up to January 2015.

1.2 Mine Contacts

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

Table 1.6 - Mine Contacts

Name	Position	Company	Contact Numbers
Tony Galvin	Operations Manager	Liddell Coal Operations	(02) 6570 9919 (M) 0409 841 161
Dave Foster	Mining Engineering Manager	Liddell Coal Operations	(02) 6570 9900 (M) 0459 168 589
Mark Howes	Environment and Community Co-ordinator	Liddell Coal Operations	(02) 6570 9923 (M) 0419 436 991

1.3 Actions Requested at Previous AEMR Review

A site inspection was conducted at LCO on 1 October 2009 by an officer from the DII in relation to the 2008-2009 AEMR, which resulted in no reported actions.

1.4 Key Performance Indicators for Liddell Coal Operations

The following **Table 1.7** provides an overview of the key performance indicators for LCO during the reporting period.

Table 1.7 - Key Performance Indicators for Liddell Coal Operations

Economic Indicators	
Coal ROM (t)	5,762,621
Employees	338
Environmental Indicators	
Land area rehabilitated during reporting period	92.9 ha
Potable water consumed	6.688 ML
Average annual depositional dust range	1.4 to 5.7 g/m^2/month
Total Suspended Particulate exceedances	Nil
PM_{10} dust exceedances due to LCO activities	Nil
Percentage of noise samples exceeding criteria	Nil
Number of blasts exceeding residential criteria	2[1]
Social Indicators	
Complaints	2

[1]*There were two blasting non-compliances reported in the EPL Return. These are summarised in Section 3.11 Blasting*.

1.5 Independent Environmental Audit

In accordance with Schedule 5, Clause 4 of the DA 305-11-01, an Independent Environmental Audit was undertaken by Hansen Bailey Environmental Consultants in July 2010, and the Audit Report was submitted to the Department of Planning on the 11th August 2009. There was a recommendation in the Audit Report to *"Update the Rehabilitation Management Plan for and implementation of recommendations as proposed by GSS in Section 4 and report against the same in the AEMR."*

These recommendations are summarised in **Table 1.8**.

Table 1.8 – Recommendations from GSS Rehabilitation Audit Report

Recommendation	Section in AEMR where this is addressed
Where limited topsoil is available, overburden amelioration should be undertaken. This should include the application of a high rate of biosolids together with gypsum (10t/Ha) in order to improve soil structure, vegetation success and long term sustainability.	Refer to **Section 5.1.4 Revegetation**
A fertilizer regime applied at ages 2, 4 and 6 years would significantly improve the quality of most existing revegetated areas	Refer to **Section 5.1.4 Revegetation**
The weed program should be continued and expanded in order to reduce the presence of key weed species across the site	Refer to **Section 3.17.1 Weeds**
Expansion of rehabilitated monitoring areas	Refer to **Section 5.3 Rehabilitation Monitoring**

2.0 Summary of Operations During 2009-2010

An aerial photograph of the Liddell Coal Operations as at June 2010 is shown in **Figure 2.1**.

2.1 Exploration

Liddell Coal Operations did not undertake any explorations activities during the 2009-2010 reporting period.

2.2 Land Preparation

Land preparation at LCO is undertaken generally in accordance with the LCO 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 Coal Development Consent (EA).

2.2.2 Topsoil Stripping and Handling

Approximately 38.6 hectares equal to approximately 38,600 m^3 of topsoil was removed ahead of open cut mining during the reporting period. The topsoil was stockpiled and a portion was recovered and used in rehabilitation during the reporting period.

To ensure topsoil is managed effectively at LCO:

- soils are stripped as much as practicable 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, minor modifications were made to the open cut office and workshop complex.

Dismantling of the old CHPP took place gradually during the reporting period and is progressively being converted to a new stores compound for Liddell Coal Operations.

Figure 2.1 Liddell Coal Operations

2.4 Mining

2.4.1 Mining Operations during 2009-2010

Open cut mining is undertaken at LCO using hydraulic excavators, shovel and trucks.

During the reporting period, active mining areas included South Cut, Waterfill Pit, Entrance Block and Reservoir Pit (**Figure 2.1**). Mining activities were carried out generally in accordance with the Liddell Coal MOP. Changes to mining operations during the reporting period include owner operator takeover in addition to the acquisition of a new mobile mining fleet.

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 2010

TYPE	MODEL	CAPACITY	No Units	FUNCTION
Hydraulic Shovel	Hitachi EX8000	38 cu m	1	Overburden
Hydraulic Excavator	Liebherr R996	36 cu m	2	Overburden
Hydraulic Excavator	Liebherr R9400	22 cu m	3	Coal & Partings
Rear Dump Truck	Hitachi EH5000	300t	17	Overburden
Rear Dump Truck	Caterpillar 789C	180t	12	Overburden
Overburden Drill	Bucyrus SKF50	250mm	3	Coal & Partings
Water Truck	Caterpillar 777F	70,000 litre	3	Ancillary
Service Truck	Caterpillar 775	25,000 litre	2	Ancillary
Track Dozer	Caterpillar D10T		10	Ancillary
Track Dozer	Caterpillar D11T		1	Ancillary
Rubber Tyred Dozer	Caterpillar 854K		1	Ancillary
Grader	Caterpillar 16M		2	Ancillary
Grader	Caterpillar 24M		1	Ancillary

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 2009	Current Reporting Period to June 2010	Next Reporting Period to June 2011 (estimated)
Topsoil stripped (m^3)	10,050	38,600	37,000
Topsoil used/spread (m^3)	6,000	92,900	26,300
Waste rock (m^3)	60,543,472	33,661,000	39,745,000
ROM Coal (tonnes)	4,851,400	5,762,621	6,753,000
Processing waste (reject) (tonnes)	972,585	1,084,718	1,220,000
Product coal (tonnes)	3,508,871	4,123,528	4,440,000

The total ROM coal mined during the reporting period was 5,762,621 tonnes. No ROM coal was received from Cumnock No. 1 Coal during this reporting period. ROM coal processed during the reporting period totalled 5,762,621 tonnes. As per development consent DA 305-11-01 LCO have approval for production of 8.0 Mt of coal per year. Total Tailings Produced was 571 063 tonnes.

2.4.2 Forecast Production for 2010-2011

Open cut operations in the 2010-2011 reporting period are expected to produce 6,753,000 tonnes of ROM coal, producing 1,220,000 tonnes of reject and 4,440,000 tonnes of product coal with a yield of approximately 66 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 LCO 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 7 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 5,762,621 tonnes. The total product coal produced was 4,123,528 tonnes with 1,084,718 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 Coal is restricted to internal mine haul roads, Pikes Gully Road and Liddell Station Road. No ROM coal was received from or transported to Cumnock No. 1 Coal during this reporting period.

During the reporting period, 4,123,528 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, LCO monitored coal haulage movements as part of standard operations. LCO generated 469 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 Coal 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. 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 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 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 as required. All storage of fuels and chemicals is conducted in accordance with LCO'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.

2.6.4 Rubbish Disposal

The main sources of waste at LCO include:

- fuel and fuel filters;
- tyres;
- batteries;
- scrap metal;
- paper and cardboard; and
- domestic waste.

All waste generated by LCO's operations is stored onsite and removed for recycling or disposal by licensed contractors.

2.7 Water Management

2.7.1 Water Management System

Water management is one of the key operational constraints at Liddell Coal Operations. The current integrated water management system at LCO 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 LCO 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 LCO (refer to **Figure 2.2**) 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 LCO CHPP and from time to time the Howick, Newdell and the Cumnock CHPPs as well as other allied operations;

- excess mine water from Liddell Coal Operations can be transferred to Mt Owen complex;

- 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 LCO CHPP are pumped to Antiene Void and Reservoir Tailings Dam;

- 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 LCO CHPP area is contained in a local sump and then recycled into the CHPP for use as process water in a closed operating loop.

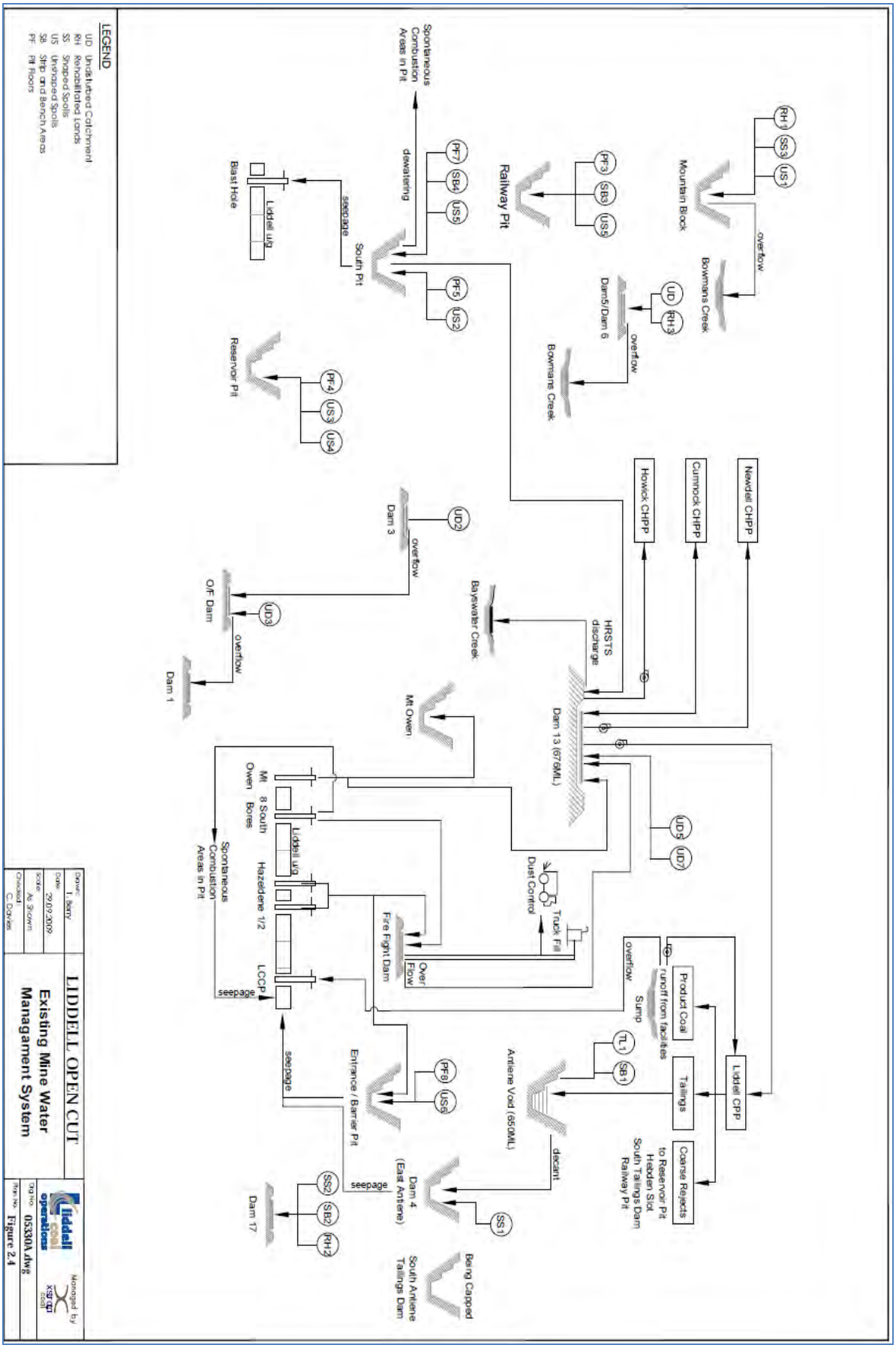


Figure 2.2 Liddell Coal Water Management System

2.7.2 Water Consumption

The water uses at LCO 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;
- rainwater is stored on site and reused in the toilet system;
- reduced flow showerheads are used in the bathhouse;
- 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 4.394 ML of potable water and 1685.5 ML of raw water were used during the reporting period. Nil discharge events occurred during the reporting period.

Table 2.3 - Water Consumption at Liddell Coal Operations for the 2009 - 2010 Reporting Period

	2009						2010						Total
	Jul	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	
Raw Water (ML)	121.4	173.2	133.9	107.6	173.9	173.8	164.9	98.7	86.8	114.7	131.9	177.7	**1658.5**
Export (ML)	0	0	181	159	155	56	151.2	99.4	112.3	30.2	137.6	105.6	**1187.3**
Potable (ML)	0.364	0.379	0.396	0.365	0.381	0.409	0.354	0.356	0.389	0.322	0.352	0.327	**4.394**
Discharge (ML)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

The raw water use at LCO has decreased from 2920.17 ML in the 2008-2009 reporting period to 1658.5 ML during the 2009-2010 reporting period.

During the 2009-2010 reporting period, LCO exported 1187.3 ML to other mining operations. This is an increase compared to 0 ML exported during the 2008-2009 reporting period.

2.8 Hazard Material Management

The Liddell Coal Operations Explosives Management Plan (EMP) defines a system to ensure the safe handling and use of explosives.

2.8.1 Inventory of Material Data Sheets

Hazardous materials at LCO are managed by the site's ChemAlert data management system. 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 LCO which is not included in the management of the CPP or Open Cut.

2.10 Modification to Development Consent

A modification to the development consent approved on 27 October 2009 allows for minor changes to infrastructure at Liddell Coal Operations.

3.0 Environmental Management and Performance

3.1 Environmental Risk Identification

Xstrata Coal utilises a common methodology in accordance with ISO 31000:2009 to ensure that business associated risks are identified, analysed and evaluated, treated as appropriate, and then monitored and reviewed. The standard ensures an appropriate risk assessment is performed for all business activities identifying controls critical to the achievement of the overall objectives of the relevant activity.

Once risks have been identified the expected consequences can be determined by referring to a consequence criteria as outlined in **Table 3.1**. This is followed by the determination of a likelihood category on the basis of the probability of the occurrence of the expected consequence (refer **Table 3.2**). The risk matrix in **Table 3.3** is then used to determine the relative magnitude of the risk by taking the combination of expected consequence and its likelihood of occurrence.

The risk assessment is monitored and reviewed on a regular basis to ensure it continually reflects the existing situation with respect to the specific activity and if necessary updated to ensure current controls are adequate and effective.

In June 2009 a Broad Brush Risk Assessment was completed by Umwelt Australia. On 21 July 2010 a review of the 2009 risk assessment was conducted to bring the assessment into line with owner operated changes and to also reflect the new Xstrata Coal risk matrix. The Risk Assessment Review is presented in **Appendix 2.**

Table 3.1 - Consequence Criteria

Rating	Health and Safety	Environment	Community / Reputation	Legal and Compliance
5	– Multiple fatalities and/or – Significant irreversible effects to 10's of people	– Category 5 – an incident that has caused disastrous environmental impact with long term effect requiring major remediation	– Prominent negative International media coverage over several days. – Significant negative impact on share price for months.	– Major litigation or prosecution with damages of $50m+ plus significant costs. – Custodial sentence for company Executive – Prolonged closure of operations by authorities.
4	– Single fatality and/or – Severe irreversible disability (Permanent Disabling Injury) or illness to one or more persons	– Category 4 – an incident that has caused serious environmental impact with medium term effect requiring significant remediation	– National media coverage over several days. – Significant negative impact on share price for weeks – Community / NGO legal actions. – Impact on local economy	– Major litigation costing $10m+ and – Investigation by regulatory body resulting in long term interruption to operations. – Possibility of custodial sentence.
3	– Serious bodily injury or illness (eg fractures) and/or Lost Time Injury > 2 weeks	– Category 3 – an incident that has caused moderate reversible environmental impact with short term effect requiring moderate remediation	– Local media coverage over several days – Negative impact on local economy. – Persistent community complaints.	– Major breach of regulation with punitive fine. – Significant litigation involving many weeks of senior management time.
2	– Medium term largely reversible injury or illness to one or more persons – Restricted Work Injury – Lost Time Injury < 2 weeks	– Category 2 – an incident that has caused minor reversible environmental impact requiring minor remediation	– Local media coverage. – Complaint to site and/or regulator.	– Breach of regulation with investigation or report to authority with prosecution and/or moderate fine possible.
1	– First aid treatment or medical treatment	– Category 1 – an incident that has caused negligible reversible environmental impact requiring very minor or no remediation	– No media coverage. – No community complaints.	– Minor legal issues, non-compliances and breaches of regulation.

Table 3.2 – Likelihood Criteria

Category	Criteria
E	– 99% probability, or – impact is occurring now, or – could occur within months
D	– >50% and <99% probability, or – balance of probability will occur, or – could occur annually
C	– >20% and <50% probability, or – may occur shortly but a distinct probability it won't, or – could occur in 2 to 5 years
B	– >1% and <20% probability, or – may occur but not anticipated, or – could occur within 5 to 20 years
A	– <1% probability – occurrence requires exceptional circumstances – exceptionally unlikely, even in the long term future – occurs less than once every 20 years

Table 3.3 - Risk Matrix

Likelihood Rating						
	E	11	16	20	23	25
	D	7	12	17	21	24
	C	4	8	13	18	22
	B	2	5	9	14	19
	A	1	3	6	10	15
		1	2	3	4	5
		Consequence Rating				

Table 3.4 - Risk Classification

Classification	
High Risk	
Medium Risk	
Low Risk	

3.2 Environmental Management System

LCO has developed and implemented an EMS generally in accordance with ISO 14001. The principle focus of LCO'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 LCO EMS.

The Environmental Management Strategy provides the framework for environmental management during the construction and operation of LCO 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. The Strategy applies to all components of LCO's operations.

Implementation of the Environmental Management Strategy assists in minimising the environmental impacts of LCO 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 Noise Monitoring Program and the Environmental Monitoring Program were revised and approved by DoP.

3.3 Meteorological Monitoring

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 Coal Modification to Development Consent.

Meteorological conditions at LCO are continuously monitored on site.

Rainfall

During the 2009-2010 monitoring period the total annual rainfall was 528.6 millimetres. The highest rainfall of 79.4 millimetres was recorded in January. The driest month was August, recording only 2.2 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 station varied from 1.6°C to 43.3°C during the reporting period. The minimum value of 1.6°C was recorded in August 2009 and the

maximum value of 43.3°C was recorded in November 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 LCO. 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. Wind directions are referenced to magnetic north.

The wind speed and wind direction 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 Coal Air Quality Monitoring Program. In addition, the Liddell Coal 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.

In addition, during the reporting period, LCO has installed two Tapered Element Oscillating Microbalance's (TEOM) for Fine Particulates (PM_{10}). The TEOM's were installed for the purpose of providing continuous real time dust monitoring results to determine possible offsite impacts from dust emissions.

3.4.1 Air Quality Criteria

Schedule 3, Condition 16, of DA 305-11-01 requires that LCO 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 ($\mu g/m^3$).

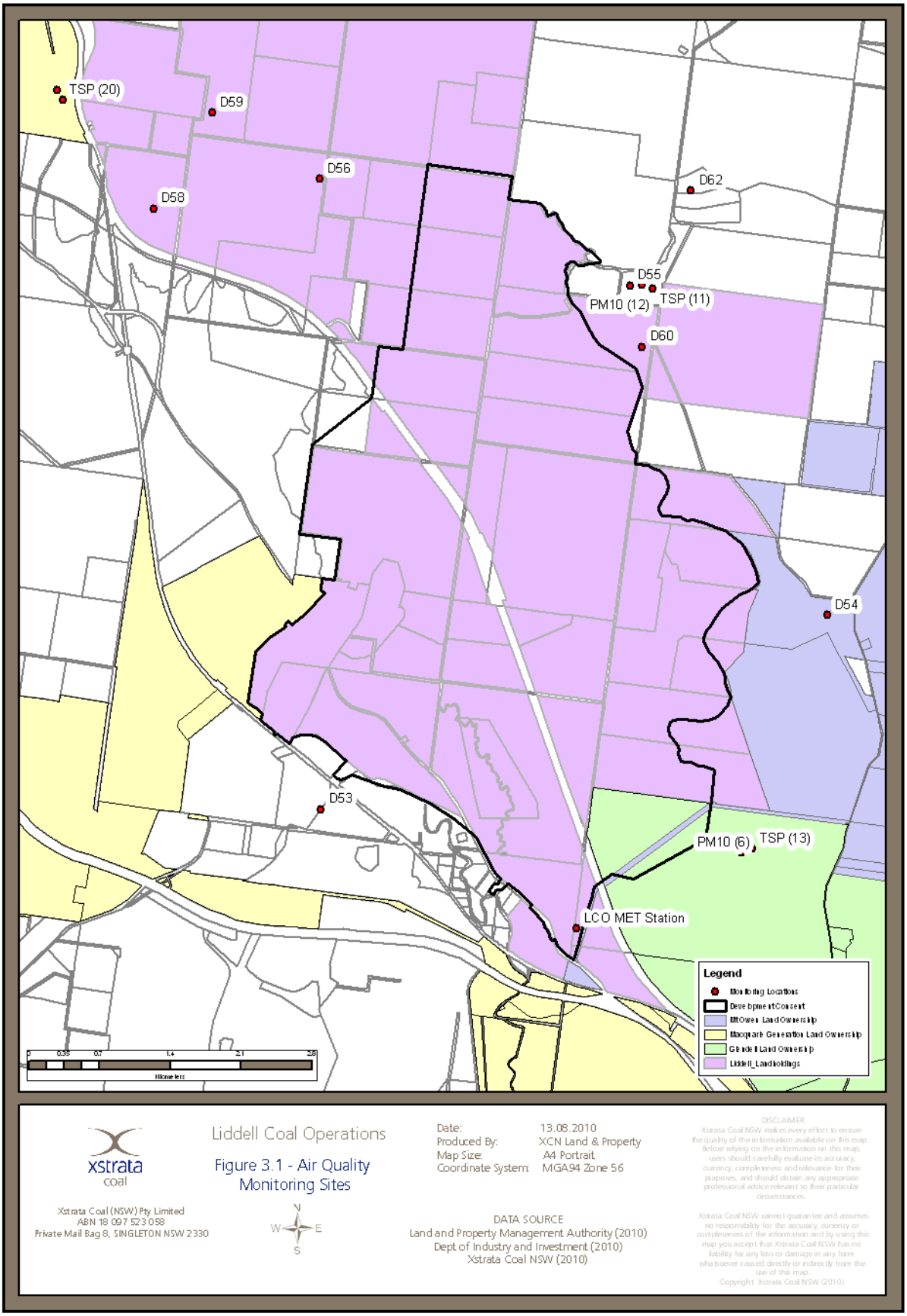
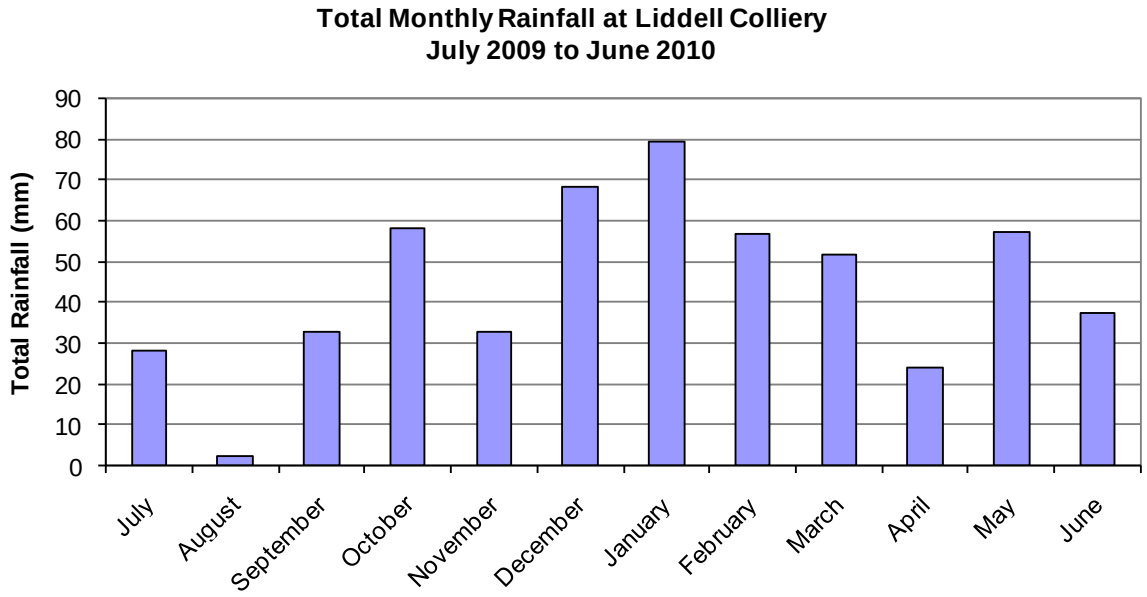


Figure 3.1 Environmental Monitoring Locations: Dust and Meteorological



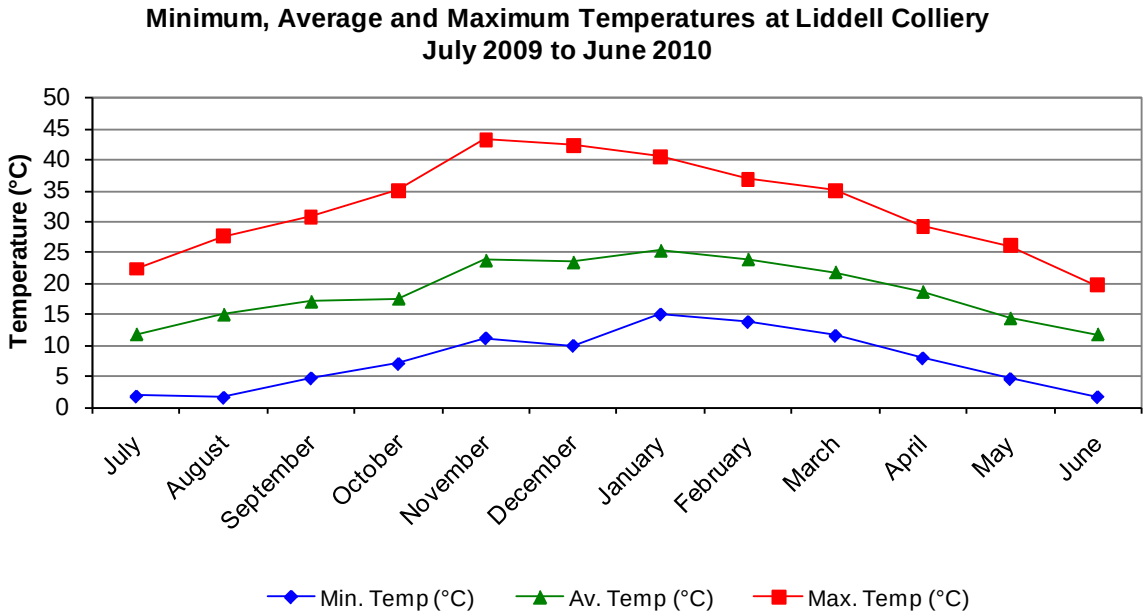
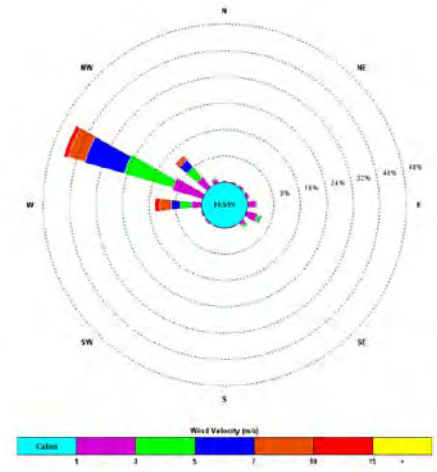


Figure 3.2 Liddell Coal Rainfall and Temperature 2009-2010

JULY 2009



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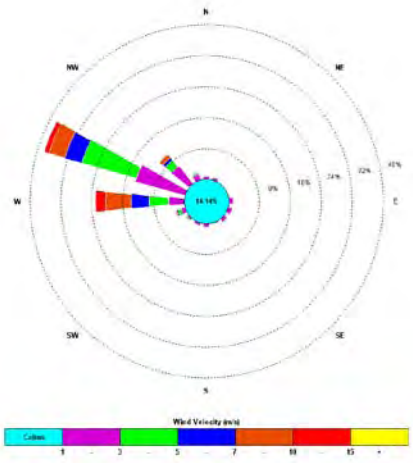
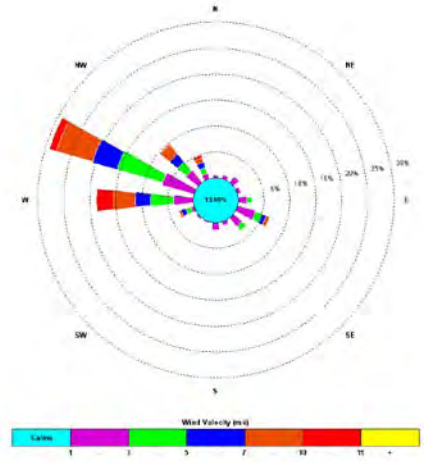
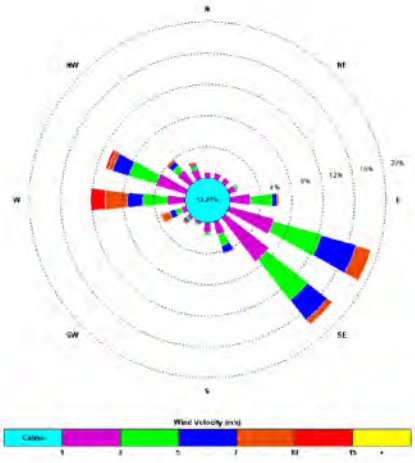


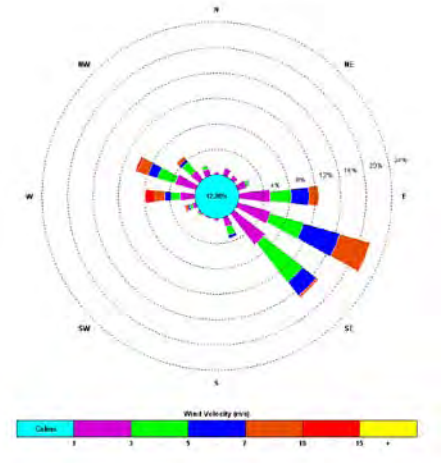
SEPTEMBER 2009



OCTOBER 2009



NOVEMBER 2009



DECEMBER 2009

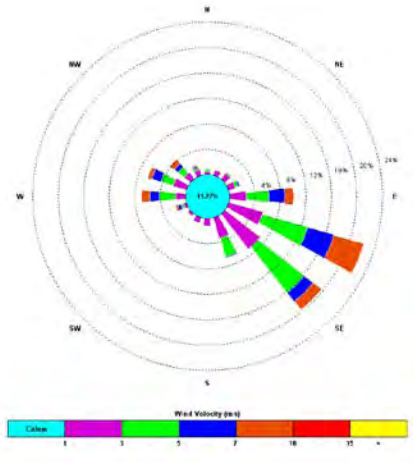
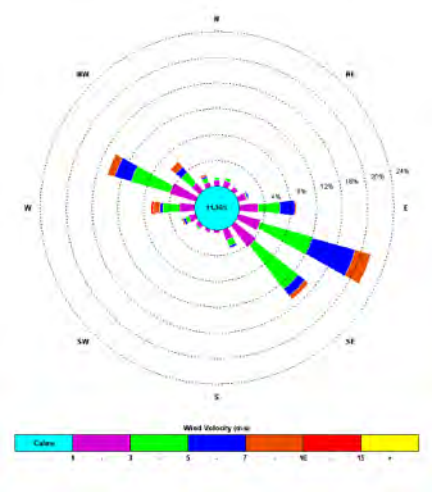
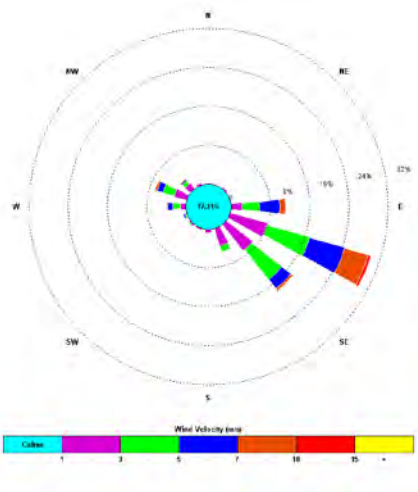


Figure 3.3 Monthly Wind Roses 2009

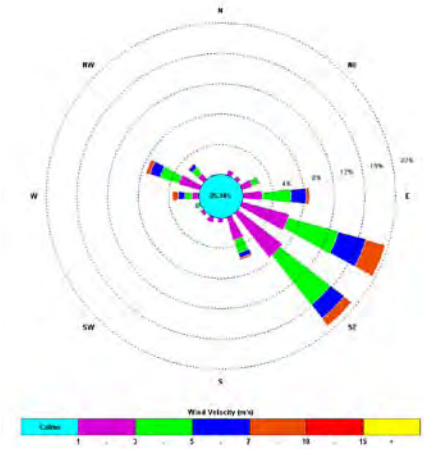
JANUARY 2010



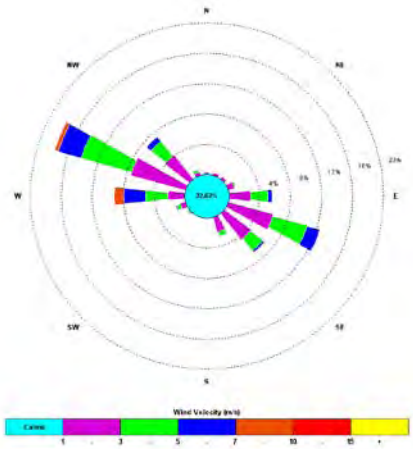
FEBRUARY 2010



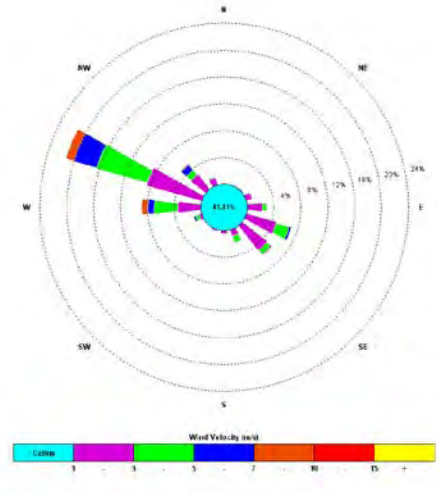
MARCH 2010



APRIL 2010



MAY 2010



JUNE 2010

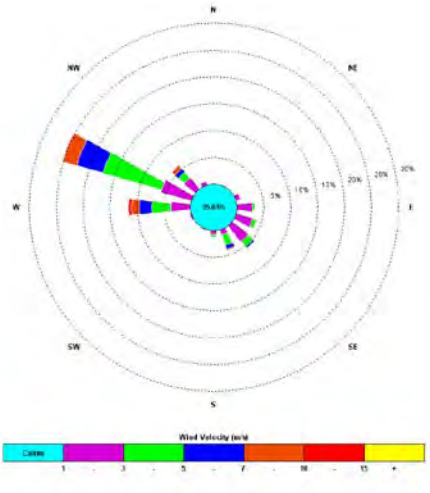


Figure 3.4 Monthly Wind Roses 2010

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 Coal 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

LCO'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 Coal 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 LCO'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 3.10a** and **Table 3.10b**. Two dust gauges (D55 and D62) are located on privately owned property, whilst the remaining dust gauges are located on mine owned land.

Two dust gauges maintained by LCO are representative of private residences (D55, and D62) and the results at these sites range from 0.7 g/m^2/month at D55 (July 2009) to 5.2 g/m^2/month at D62 (February 2010). During the reporting period both sites met the annual average criteria.

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.

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 land locations. Levels at private residences have remained below the annual average criteria while some mined owned land are above the criteria.

Locations D53, D56, D57 and D61 (all mine owned land) showed an increase in annual average dust deposition in the 2008-2009 reporting period and again in the 2009-2010 reporting period. Two of these results (D57 & D61) are above the annual average dust deposition criteria of 4 g/m^2/month. D57 and D61 are not representative of residential properties, are located on mine owned land and are heavily impacted by the nearby mining operation. The results are used for internal management purposes only.

Annual average dust deposition at location D54 (mine owned land) increased during the 2008-2009 reporting period and decreased during the following (2009-2010) reporting period, to a level below the annual average dust deposition criteria of 4 g/m^2/month.

Comparison to EA Predictions

The Liddell Coal 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 private 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

LCO operates three 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**). HVAS 20 is located at Antienne and has only been in operation since May 2010, so results for a full reporting period will be reported in the next AEMR. In accordance with the Air Quality Monitoring Program and EPL requirements, all samplers collect data every six days.

Results from the HVAS at Scrivens, Ravensworth Farm and Antienne are presented in **Figures 3.5** and **3.6** and provided in **Appendix 3**.

During the reporting period LCO complied with the TSP annual average goal (90 μg/m^3) at the Scrivens property (HVAS 11). Ravensworth Farm, located on mine owned land (HVAS 13) has a private Licence Agreement with alternative air quality criteria. During the reporting period LCO complied with the TSP annual average goal (100μg/m^3) at Ravensworth Farm. The Scrivens property is located on privately owned land and Ravensworth Farm is owned by LCO. The annual average TSP at HVAS 13 and HVAS 11 were 97μg/m^3 and 44 μg/m^3 respectively.

Three Year Comparison

Comparison of annual average TSP levels to the previous two reporting periods is presented in **Appendix 7**. HVAS 13 showed an increase in TSP from 2007-2008 to 2008-2009 followed by another increase in the 2009-2010 reporting period, where the annual average is slightly above the 90 ug/m^3 criteria but is less than the criteria specified in the private Licence Agreement. HVAS 11 also showed an increase in TSP in the 2008-2009 reporting period but decreased in the 2009-2010 reporting period. All HVAS annual averages prior to 2008/09 were below the 90 ug/m^3 criteria. No comparison of TSP levels can be made for HVAS 20 as 2010 is the first year of operation for this sampler.

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 residence predicted to be affected. Monitoring results during the reporting period confirm these predictions.

PM_{10} Monitoring Results

Liddell also operates three 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 LCO), HVAS 12 is located at the Scrivens Property (privately owned) and HVAS 20, which has only been in operation since May 2010, is located at Antienne (owned by LCO). In accordance with the Air Quality Monitoring Program and EPL requirements, PM_{10} is measured by the samplers every six days. Ravensworth Farm has a private Licence Agreement with alternative air quality criteria.

Results from HVAS 6, HVAS 12 and HVAS 20 are presented in **Figures 3.5** and **3.6** and provided in **Appendix 3**. 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 2009-2010 reporting period, LCO complied with the PM_{10} long term (annual average) goal (30µg/m^3) at all monitoring locations. There was one elevated short term (24 hour) PM_{10} result that was higher than the short term goal of 50 µg/m^3. **Table 3.11** outlines this occurrence with an explanation for the elevated result. An investigation based on a review of the meteorological data indicates the elevated result is most likely due to sources other than Liddell Coal Operations due to the predominant east-south-east wind direction on this day.

Table 3.10a - Dust Depositional Results for Privately Owned Residences 2009-2010

Monitoring Location	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Annual Average
D55	0.7	1.0	2.6	2.0	1.9	1.8	2.2	1.6	1.6	2.1	1.3	1.2	1.7
D62	1.3	1.2	6.2c	5.2	10.0c	5.5c	3.8	4.5	2.3	3.5	1.5	0.9	2.7

Notes: c = contaminated result (Bird droppings, vegetation or insects)
All samples are reported as g/m^2/month
NR = No Reading Obtained

Table 3.10b - Dust Depositional Results for Mine Owned Land* 2009-2010

Monitoring Location	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Annual Average
D53	2.6	3.6	5.4	4.4	3.8	4.7	3.4	3.4	3.8	3.2	4.1	3.0	3.8
D54	1.8	2.2	4.3	3.9	5.0	5.6	4.0	3.5	3.9	4.2	3.7	3.3	3.7
D56	1.0c	1.3	2.7	3.0	2.1	4.2	2.6	1.5	1.8	2.0	1.4	2.5	2.3
D57	4.7	7.3	9.0	7.9	4.5	6.6	4.5	3.3	3.2	3.9	9.0	4.7	5.7
D58	0.8	0.8	2.2	2.2	2.9	2.9	2.6	2.1	2.4	2.5	2.0	1.3	2.1
D59	0.7	1.2	2.7	2.2	1.9	1.3	1.7	1.7	1.3	1.2	1.0	0.8	1.4
D60	1.1	0.6	2.6	2.6	3.2	4.1	2.7	2.1	2.4	3.1	1.8	1.4	2.3
D61	4.8	9.5	7.8	3.0	5.8	5.2	4.0	2.7	3.6	3.5	7.4	1.9	4.9

Notes: c = contaminated result (Bird droppings, vegetation or insects)
All samples are reported as g/m^2/month
NR = No Reading Obtained
D57 and D61 are not representative of residential properties and are heavily impacted by the mining operation. The results are used for internal management purposes only. D57 and D61 are not included in Figure 3.1 Environmental Monitoring Locations.

Three Year Comparison

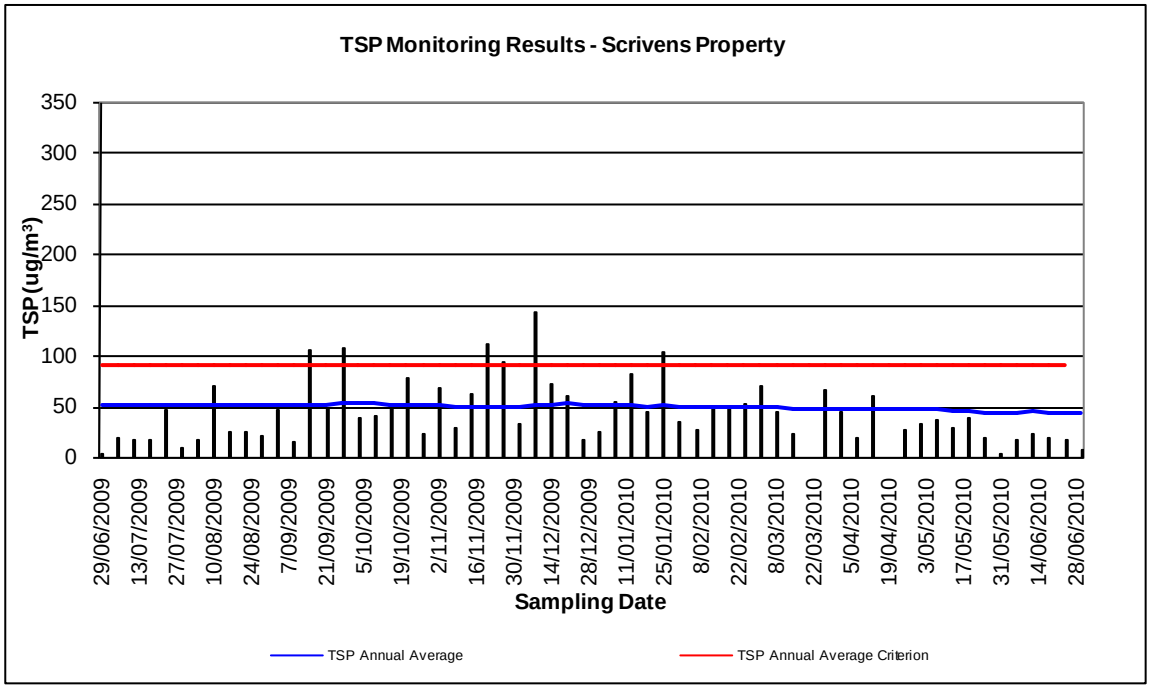
Comparison of annual average PM_{10} levels to the previous two reporting periods is presented in **Appendix 7**. Results show slight fluctuations in PM_{10} over the three year period. HVAS 6 showed a steady increase in 2007-2009 but remained relatively steady during 2009-2010. HVAS 12 remained relatively steady, and the annual average for both HVAS 6 and HVAS 12 is below the 30µg/m^3 annual average criteria.

Comparison to EA Predictions

The Liddell Coal 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 50 µg/m^3 are identified with mine owned properties 23 and 25 most affected. HVAS 6 is located at mine owned property 23 (Ravensworth Farm) which has a private Licence Agreement with alternative air quality criteria. The PM_{10} monitoring results for the reporting period generally confirm these predictions with no exceedance at the monitor located on privately owned land.

Table 3.11 - Elevated Short Term PM_{10} Result During the Reporting Period (at Private Residence)

Station	Result (µg/m^3)	Criteria (µg/m^3)	Explanation
HVAS 12 (8-Dec-09)	62	50	Based on a review of the meteorological data, the elevated level is most likely due to sources other than Liddell Coal Operations due to the predominant east-south-east wind direction on this day.



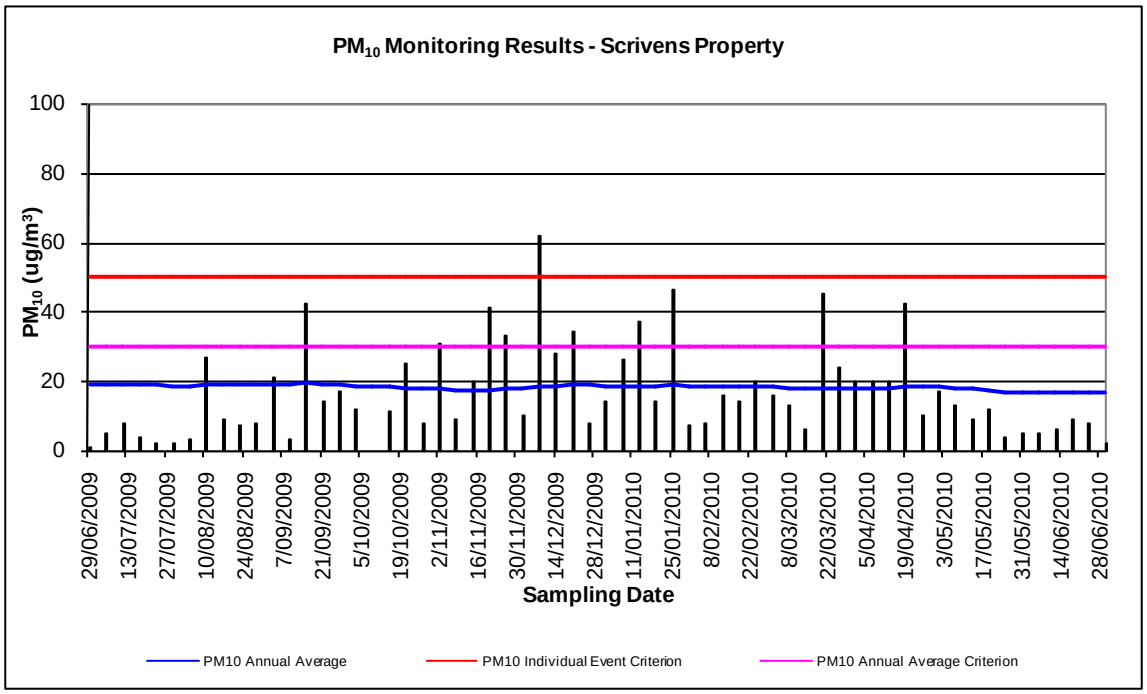
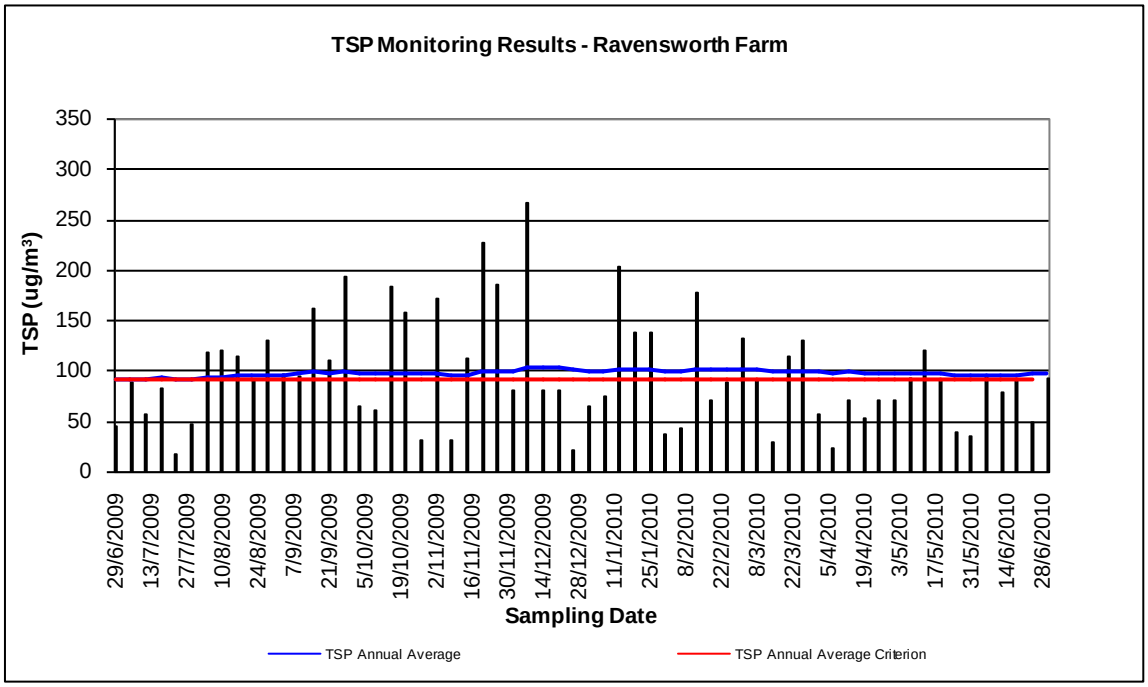


Figure 3.5 LCO HVAS Results Scrivens Property 2009 - 2010



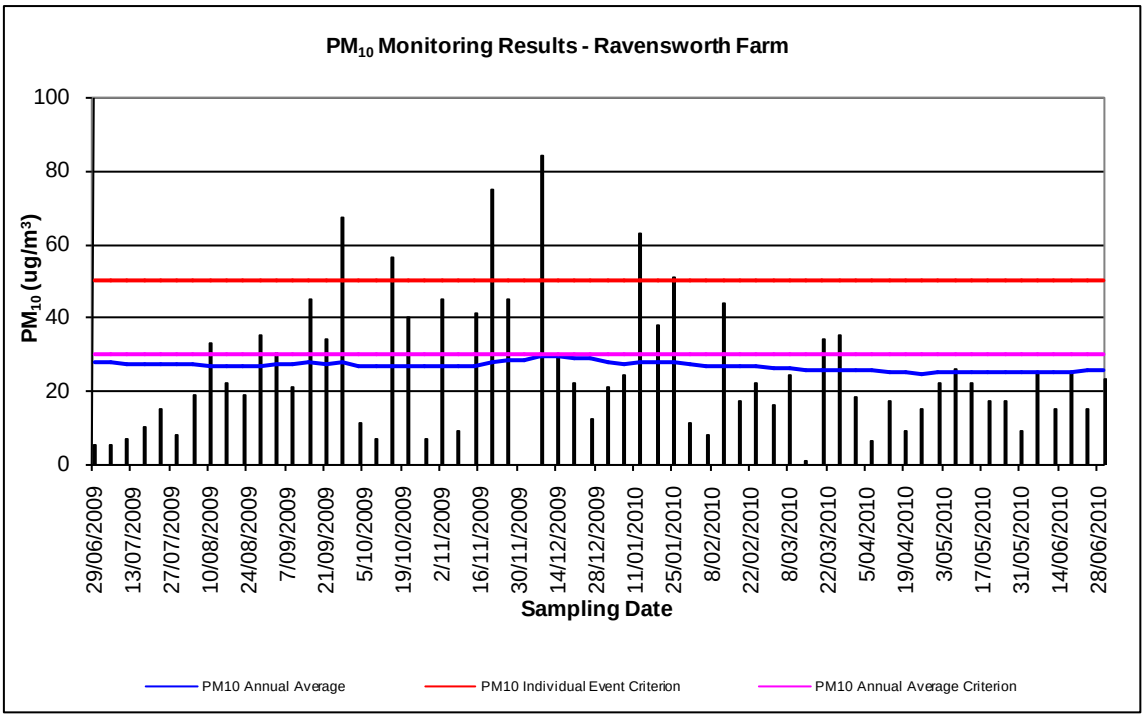


Figure 3.6 LCO HVAS Results Ravensworth Farm 2009 - 2010

3.4.3 Control Measures and Monitoring Performance

Control measures undertaken to minimise potential impact on air quality at LCO 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 assist with the management of dust on-site;
- disturbance of the minimum area necessary for construction and prompt rehabilitation of construction areas;
- watering of 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

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

Furthermore, in accordance with schedule 3, condition 25, LCO 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 LCO 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 LCO is managed in accordance with the Liddell Coal Water Management Plan (WMP) which was developed to satisfy Schedule 3, Condition 23 to Condition 27 of DA 305-11-01.

LCO 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 Coal Surface Water Monitoring Program which is a part of the WMP (see **Figure 3.7).**

The water management practices at LCO 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 and 6 and (if clean, i.e. from undisturbed or rehabilitated catchment areas), or captured and stored in Dam 13 (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 Coal Water Management System (refer **Figure 3.7**).

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 LCO);
- Bowmans Creek (upstream and downstream of LCO);
- Dam 1;
- Dam 4;
- Dam 6;
- Dam 13;
- Dam 17;
- Supernatant (tailings supernatant at Antiene Void); and
- Mt Owen Transfer Dam
- MIA Sediment Dam

During the reporting period the Supernatant tailings dam was decommissioned and three new dams were commissioned. The new dams are Reservoir tailings dam, Dam 3 and Dam 7. Monitoring commenced on the tailings dam in January 2010 and Dam 3 and 7 during April 2010.

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 LCO 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 Coal 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 Coal 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.

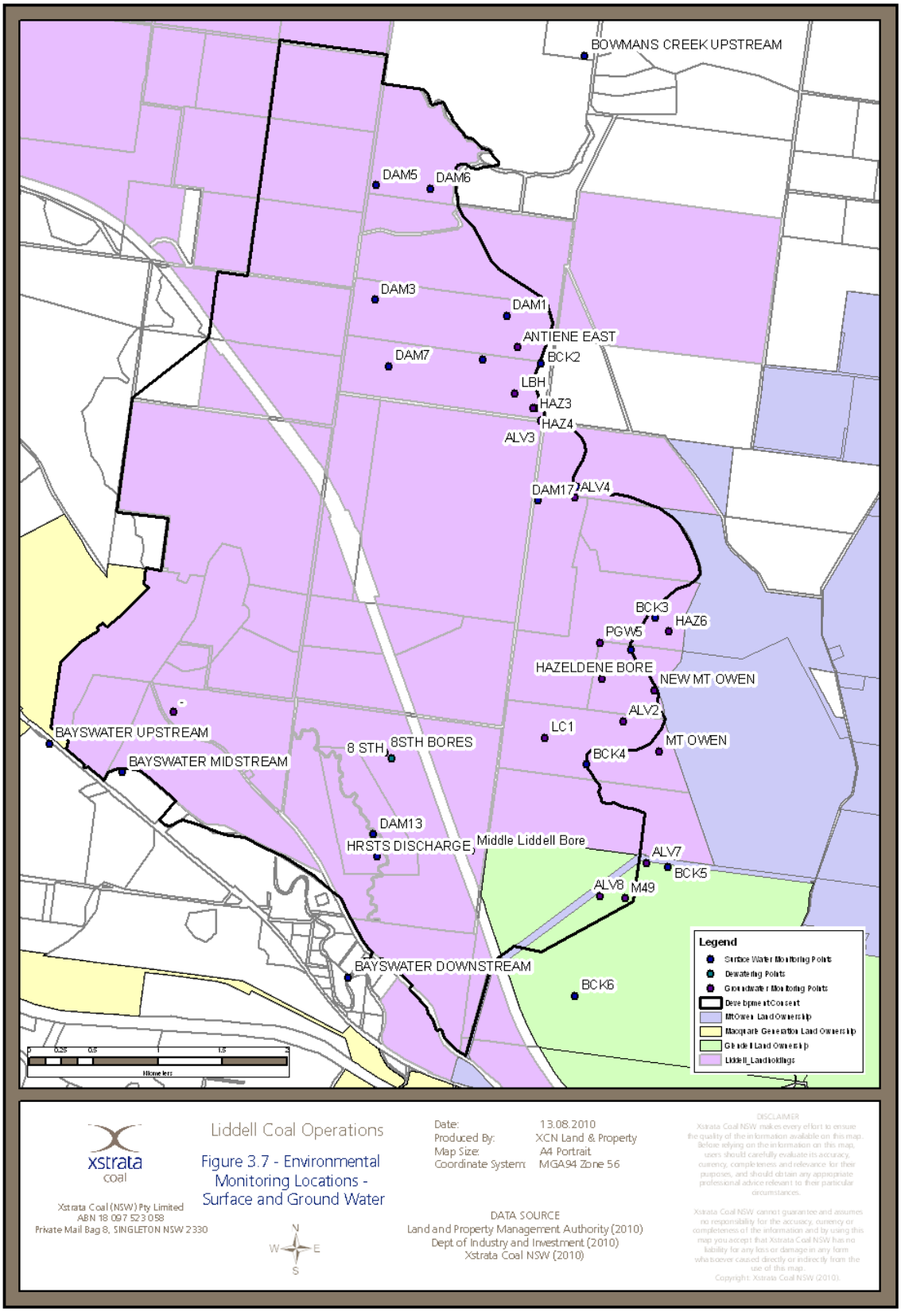


Figure 3.7 Environmental Monitoring Locations Surface Water and Groundwater

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 October, November and December 2009 sampling periods as well as January, March, April and May 2010. 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 **Figures 3.8** and **3.9**. Full surface water monitoring results are presented in **Appendix 4**.

pH

Monthly pH testing of Bayswater Creek indicates that pH levels ranged from 7.1 (upstream & downstream) to 8.5 (midstream). All except three of the pH level readings lie within the defined 80th percentile trigger values (6.5 - 8.3) as outlined in the Liddell Coal Water Management Plan (refer to **Table 3.11**). However, the three 80th percentile exceedances lie beneath the maximum trigger value (pH 8.7) and were not successive therefore additional investigation was not considered necessary. 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 727 µS/cm to 12130 µS/cm.

The highest recorded value of 12130 µS/cm (September 2009) was above the maximum trigger values assigned in the WMP (refer to **Table 3.12**). The assigned maximum trigger value for Bayswater Creek EC was also exceeded in July 2009. The midstream sampling location also exceeded the 80th percentile trigger value several times during the reporting period. Five successive exceedances occur from September 2009 to January 2010 and three other exceedances in July 2009, March 2010 and May 2010. The most likely cause of these exceedences is 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 July 2009 (5180 mg/L), August 2009 (4300 mg/L) and September 2009 (9600 mg/L). The midstream TDS results showed four successive 80th percentile exceedances from October 2009 to January 2010 and three further successive 80th percentile exceedances from March 2010 to May 2010. 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). The most likely cause of these exceedences is due to stagnant water being sampled from ponds that have partially evaporated, thus concentrating salts and giving higher TDS levels.

Total Suspended Solids

Monitoring results for monthly Total Suspended Solids (TSS) for Bayswater Creek show a maximum TSS reading of 250 mg/L for the downstream sampling location during the September 2009 sampling period. This reading is above the maximum TSS trigger value of 235 mg/L and is attributed to sediment disturbance during sampling due to very low water levels. One other reading was above the 80th percentile trigger value for TSS at the downstream location but below the maximum. This 80th percentile exceedance (69 mg/L) occurred during February 2010. The upstream and midstream sampling locations 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

Chemical speciation results are compared against the ANZECC Water Quality Guidelines (ANZECC, 2000) 95 percent trigger values for fresh water. The chemical speciation of surface water samples for July 2009 and January 2010 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 Coal 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 upstream & midstream 0.004 mg/L downstream) in addition to slightly elevated zinc levels upstream and downstream (0.006 mg/L and 0.008 mg/L respectively) in July 2009. Results also showed elevated levels of lithium at Bayswater Creek upstream, midstream and downstream locations (0.17 mg/l, 0.114 mg/L and 0.127 mg/L respectively). Speciation testing in January 2010 showed all results below the ANZECC Water Quality Guidelines (ANZECC, 2000) 95 percent trigger values for fresh water. LCO 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 the upstream location and decreased at the midstream monitoring location over the three year reporting periods. The downstream monitoring location showed an increases in EC in the 2008-2009 reporting period followed by a decrease during the 2009-2010 reporting year. Annual average TSS fluctuated up and down at all monitoring locations. Annual average TDS showed a steady increase from 2007-2008 to 2008-2009 at the upstream and downstream locations followed by decreases in the 2009-2010 reporting year at both locations. TDS at the midstream location has remained relatively steady over the three year comparison period.

No long term trends were detailed in the Environmental Assessment, so 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 monitoring results for pH, EC, TDS and TSS for Bowmans Creek are shown on **Figures 3.10** and **3.11.** Quarterly results are shown on **Figures 3.12** and **3.13**.

pH

Monthly pH testing in Bowmans Creek shows pH levels ranging from 7.2 (downstream) to 8.5 (upstream). Nine readings lie outside the maximum percentile trigger value (pH 8.0, refer to **Table 3.12**) as defined in the SWMP. The maximum trigger value (pH 8.0) was exceeded six times at the upstream monitoring location and three times at the downstream monitoring location during the annual monitoring period.

The analysis also indicates that three readings lie outside of the 80th percentile trigger value (pH 7.9). Two readings were taken from the upstream monitoring site during February 2010 and March 2010. One reading was taken from the d ownstream monitoring site during September 2009.

The high pH levels occurred at both the upstream and downstream sites indicating that Liddell Coal was not having an impact on the pH levels. The trends in pH and influence of rainfall and associated creek flows on pH readings in Bowmans Creek will continue to be monitored by LCO.

Electrical Conductivity

Monthly EC results vary between 719 µS/cm and 1820 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.

Total Dissolved Solids

Monitoring results for the Total Dissolved Solids (TDS) for Bowmans Creek generally correlate with the EC results. All results below the 80th percentile trigger values for TDS.

Total Suspended Solids

Monitoring results for the Total Suspended Solids (TSS) range between <1 mg/L and 18 mg/L for the July 2009 to June 2010 monitoring period. All of the monitoring results lie below the maximum and 80th percentile trigger values set in the WMP (refer to **Table 3.12**).

Quarterly Monitoring Results for pH, EC, TSS and TDS

Quarterly monitoring is undertaken at six locations along Bowmans Creek which are shown in **Figure 3.7**. All results for the 12 month reporting period lie below the 80th percentile trigger values for EC with the exception of two results which exceeded the EC maximum trigger value (2450 µS/cm). The EC result for BCK1A (October 2009) had a reading of 3050 µS/cm and 4270 µS/cm in April 2010. There were no TSS trigger value exceedances during the reporting period. Seven TDS maximum trigger value exceedances occurred during the reporting period. Exceedances occurred at BCK1A and BCK4 in October 2009 (1900 mg/L and 1800mg/L respectively) and January 2010 (1400 mg/L and 2140 mg/L respectively). In April 2010 BCK1A (3052 mg/L), BCK4 (2250 mg/L) and BCK 5 (1176 mg/L) exceeded the maximum trigger value of 1420 mg/L. Results from the reporting period show nine pH maximum trigger value exceedances. BCK1, BCK1A, BCK2, BCK2A and BCK 6 recorded pH maximum trigger value exceedances in July 2009. BCK1 and BCK3 recorded exceedances in January 2010. BCK2 and BCK5 recorded exceedances in April 2010. The high pH and EC levels occurred at both upstream and downstream sites indicating that Liddell Coal was not having a significant impact on the pH, EC and TDS levels.

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

Chemical Speciation

Chemical speciation results are compared against the ANZECC Water Quality Guidelines (ANZECC, 2000) 95 percent trigger values for fresh water. The results from the biannual speciation testing showed that Bowmans Creek had slightly elevated levels of lithium both upstream (0.005 mg/L) and downstream (0.005 mg/L) in July 2009. The January 2010 results all lie below the ANZECC 2000 Guidelines 95 percent trigger values for fresh water. All other results lie below the ANZECC 2000 Guidelines 95 percent trigger values for fresh water. LCO 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 7.** Annual average pH results at Bowmans Creek Upstream and Downstream locations remained relatively steady over the three year reporting periods. Electrical conductivity remained steady from 2007-2008 to 2008-2009 and increased into 2009-2010, at both locations. TSS decreased slightly during 2008-2009 and then remained steady during 2009-2010 at the upstream monitoring locations with a steady decrease over the three year comparison period at the downstream location. TDS decreased during 2009-2009 and again in 2009-2010 at the upstream location. TDS has shown some increase over the three year comparison period at the downstream location.
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

The Reservoir tailings dam and Dam 7 are newly built dams. Sampling commenced in January 2010 at Reservoir tailings dam and April 2010 at Dam 7. The Supernatant tailings dam was decommissioned during the reporting period and as such was only sampled up until September 2009.

HFSD2 and HFSD3 were both dry for the entire 2009 to 2010 reporting period. As such no data is available for these sites.

The monthly monitoring results for pH, EC, TDS and TSS for the on-site dams are shown on **Figures 3.14, 3.15, 3.16** and **3.17.**

pH

Monthly pH testing for the annual reporting period shows variations between pH 8.2 (Dam 6) and pH 9.5 (HFSD1). There were three 80th percentile trigger value (pH 6.5-9.2) exceedances during the reporting period. In April 2010 a pH value of 9.5 and in May 2010 a value of 9.4 were recorded at HFSD1. ISD had a pH reading of 9.3 in October 2010. LCO 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 6950 µS/cm (Reservoir tailings) to 1297 µS/cm (Dam 1). The Reservoir tailings dam showed four 80th percentile trigger limit (6180 µS/cm) exceedances for EC with readings of 6800 µS/cm in January 2010, 7150 µS/cm in February 2010, 6950 µS/cm in May 2010 and 6880 µS/cm in June 2010. Dam 6 showed three 80th percentile trigger limit exceedances. Two were in October 2009 and November 2009 (6220 µS/cm and 6560 µS/cm respectively) and February 2010 showed a reading of 6220 µS/cm. Dam 13 showed six successive exceedances of the 80th percentile trigger limit from January 2010 to June 2010 with readings ranging from 6260 µS/cm in February to 6790 µS/cm in May 2010. No EC result for on-site dams exceeded the maximum trigger value for EC (12000 µS/cm). Readings remained below the 80th percentile trigger limit for all other on-site dams during the reporting period.

Three EC results for MIA sediment dam also exceeded the 80th percentile trigger value (6180 mg/L) however these result did not exceed the maximum trigger value (12000 mg/L).

Total Dissolved Solids

Monitoring results for the Total Dissolved Solids (TDS) for the on-site dams correlate well with the EC readings. One result for Supernatant tailings dam, two results for Dam 4 and five results for Dam 6 exceed the 80th percentile trigger value (3880 mg/L). Dam 13 showed one exceedance in September 2009 (3900 mg/L) and seven successive exceedances from December 2009 to June 2010. Reservoir tailings Dam showed exceedances of the 80th percentile trigger value continuously since monitoring began in January 2010 ranging from 4100 mg/L in March 2010 to 4900 mg/L in February 2010. No result exceeded the maximum trigger value for TDS (10500 mg/L).

Five TDS results for MIA sediment dam 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 Reservoir tailings dam. The Reservoir tailings dam exceeded the 80th percentile trigger value on two occasions in February 2010 and June 2010 with readings of 380 mg/L and 66 mg/L respectively. However, both readings lie below the maximum trigger value for TSS (386 mg/L).

Chemical Speciation

Chemical speciation results are measured against the ANZECC 2000 Guidelines long term trigger values for irrigation use. Results for chemical speciation testing (excluding those analysis listed above) in July 2009 showed Dams 4, 13 and 17 all to have slightly elevated levels of copper and lithium. Dam 1 also showed a slightly elevated level of lithium. Dam 13 and Supernatant showed slightly elevated levels of nickel and rubidium with the Supernatant also showing slightly elevated levels of selenium. Dam 13 results also showed slightly elevated levels of zinc.

Results for chemical speciation testing during January 2010 showed Dam 4, Dam 17, Supernatant and MIA sediment Dam all to have slightly elevated levels of copper, lithium and zinc. Dam 13 also showed a slight elevation in zinc levels with Dam 1, Dam 13 and Mt Owen transfer dam also showing slightly elevated levels of lithium. Dam 4, Dam 13, Supernatant and Mt Owen transfer dam all showed slightly elevated levels of rubidium.

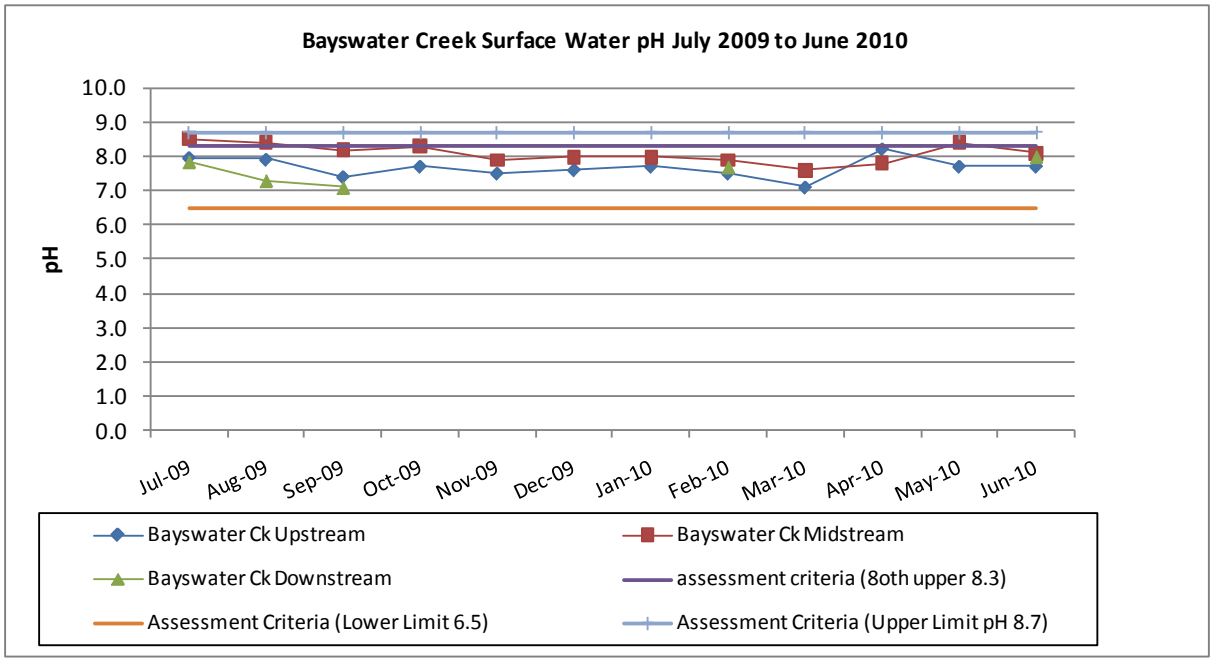
Three Year Comparison

Comparison of annual average pH, EC, TSS and TDS levels to the previous two reporting periods is presented in **Appendix 7.** 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 except Dam 13 and Dam 17 which remained steady. TDS levels vary at Dams 1, 4, 13 and Mt Owen Transfer Dam. Annual average TDS remained consistent at Dams 6,17, 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 LCO must be undertaken in accordance with the Hunter River Salinity Trading Scheme (HRSTS). There were no discharge events during the reporting period.



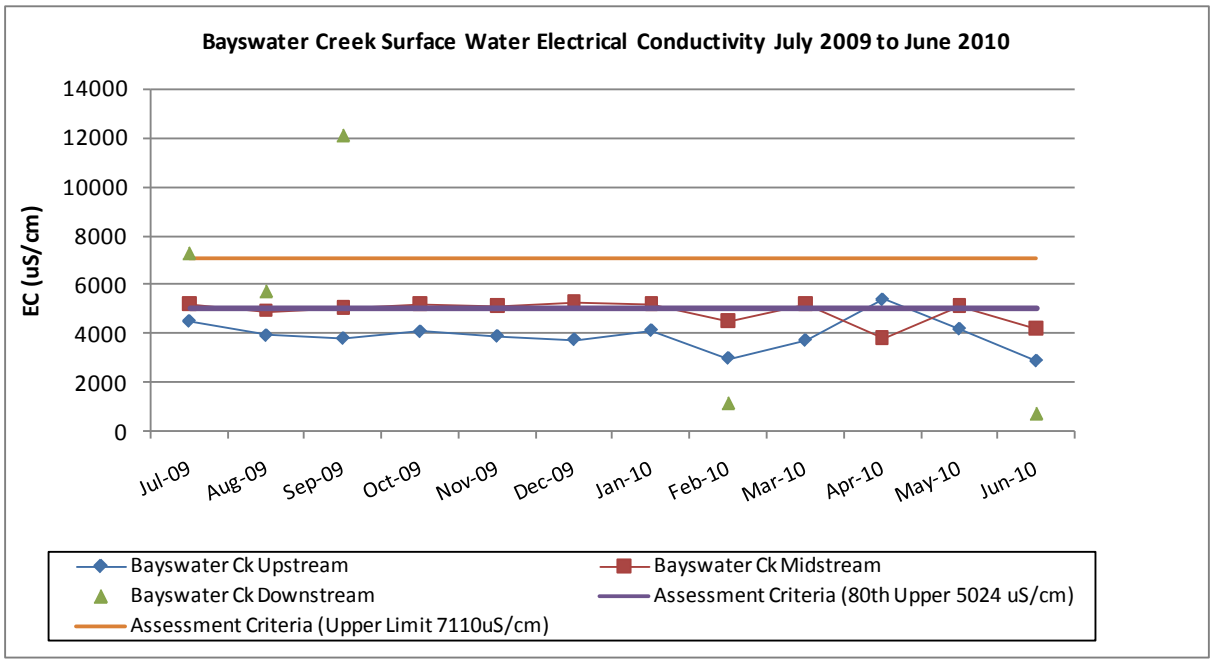
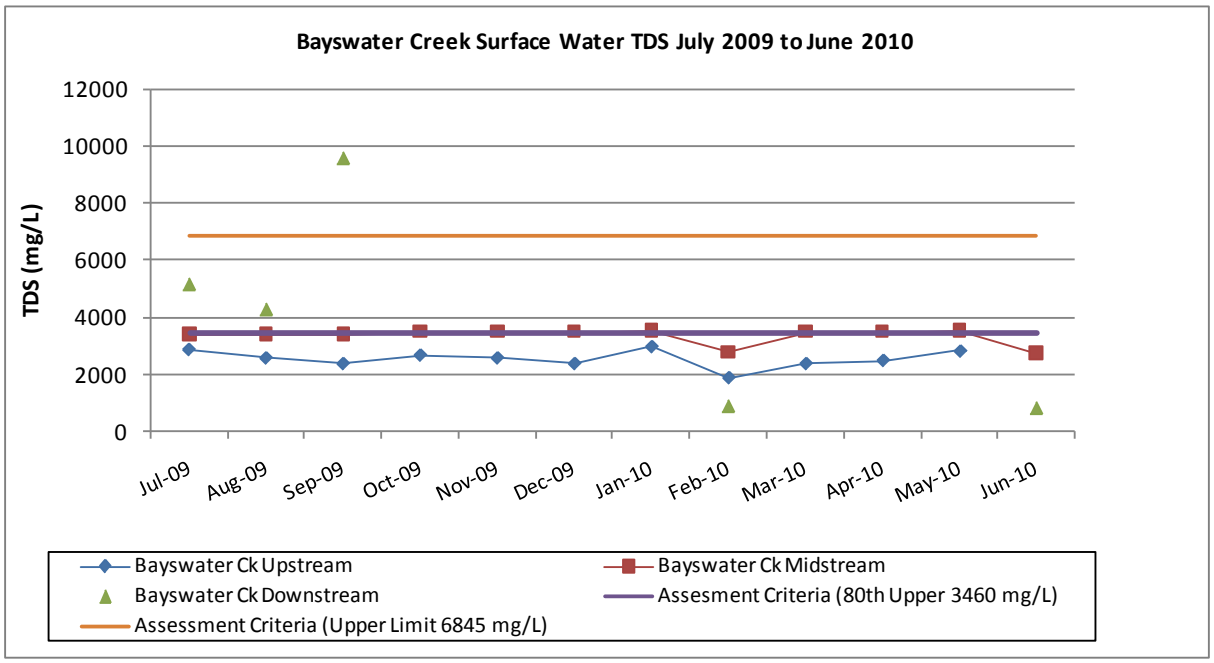


Figure 3.8 Water Quality Bayswater Creek 2009 - 2010



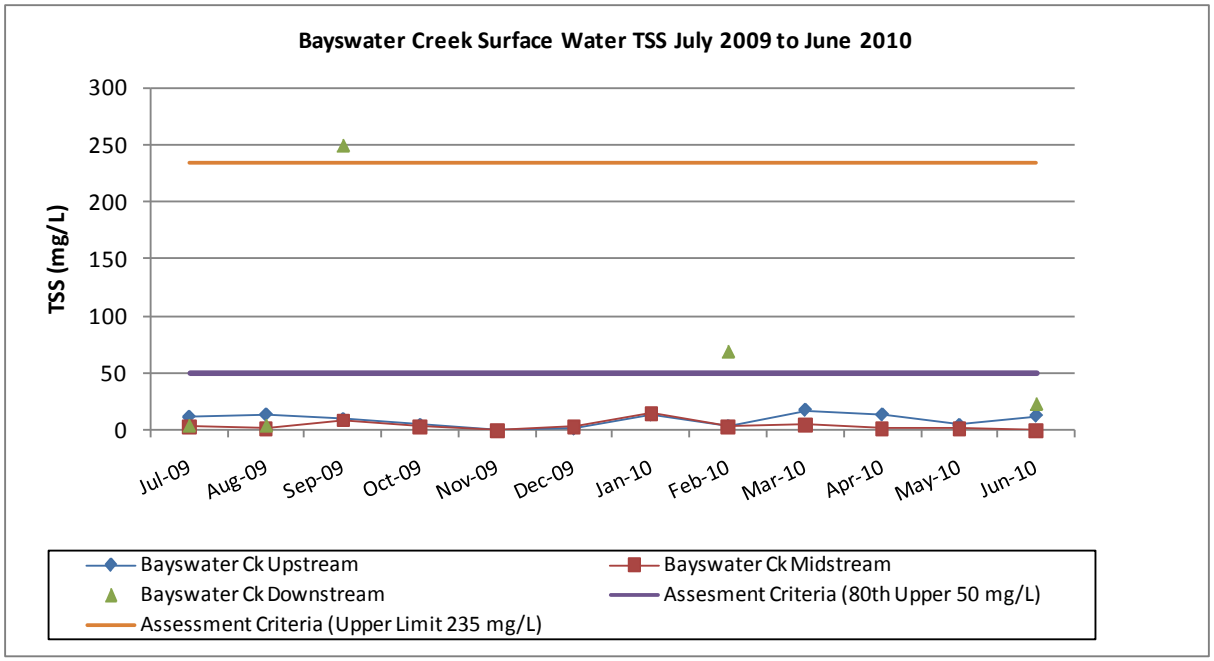
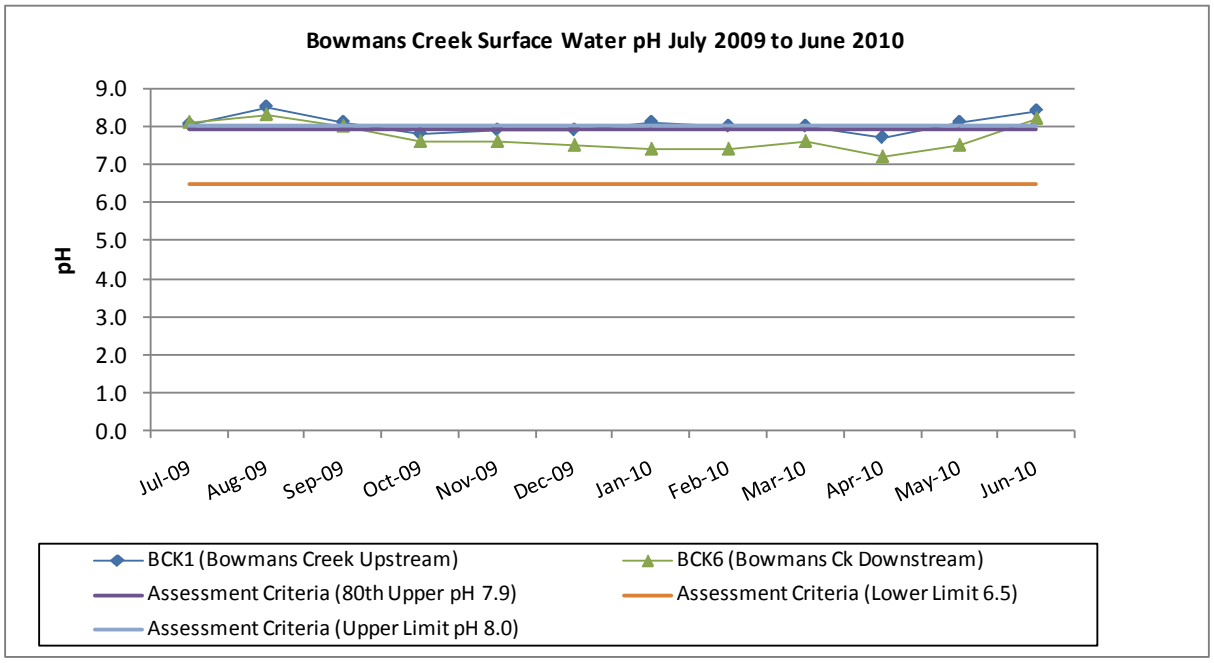


Figure 3.9 Water Quality Bayswater Creek 2009 - 2010



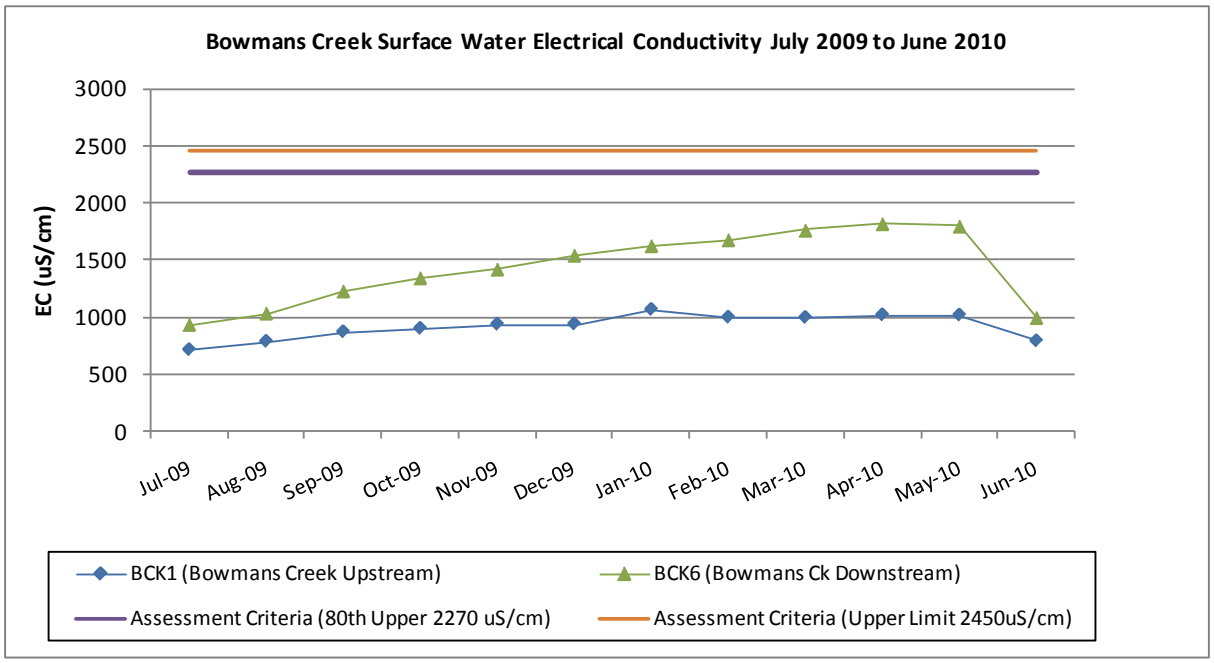
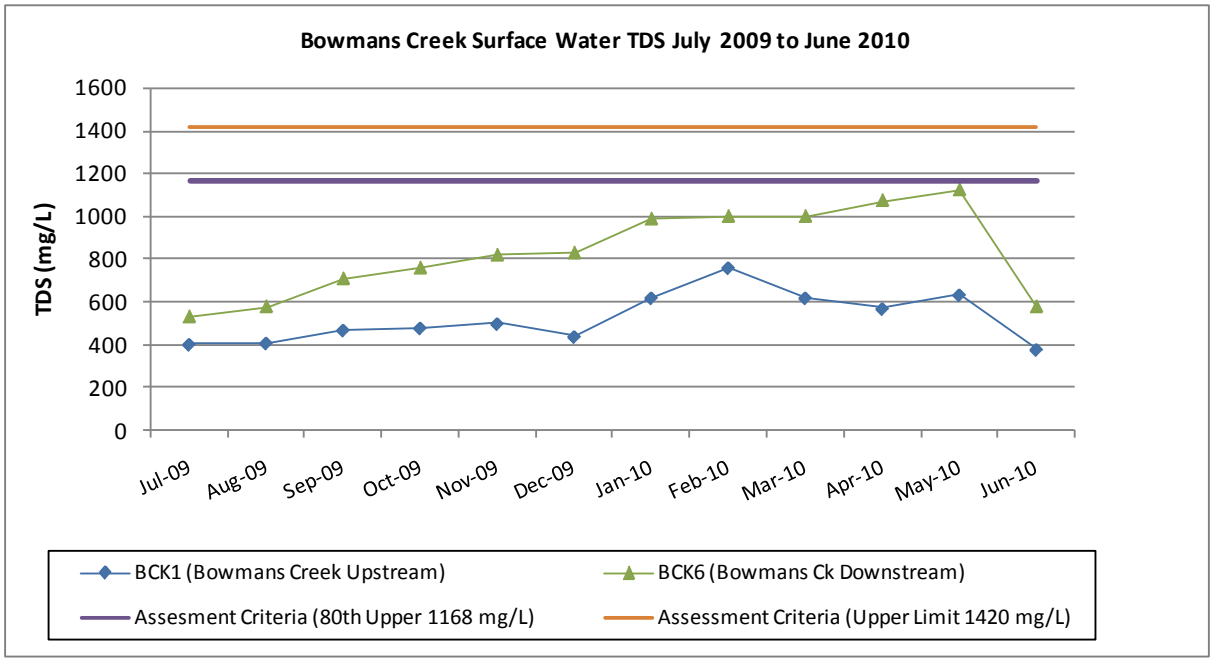


Figure 3.10 Water Quality Bowmans Creek 2009 - 2010



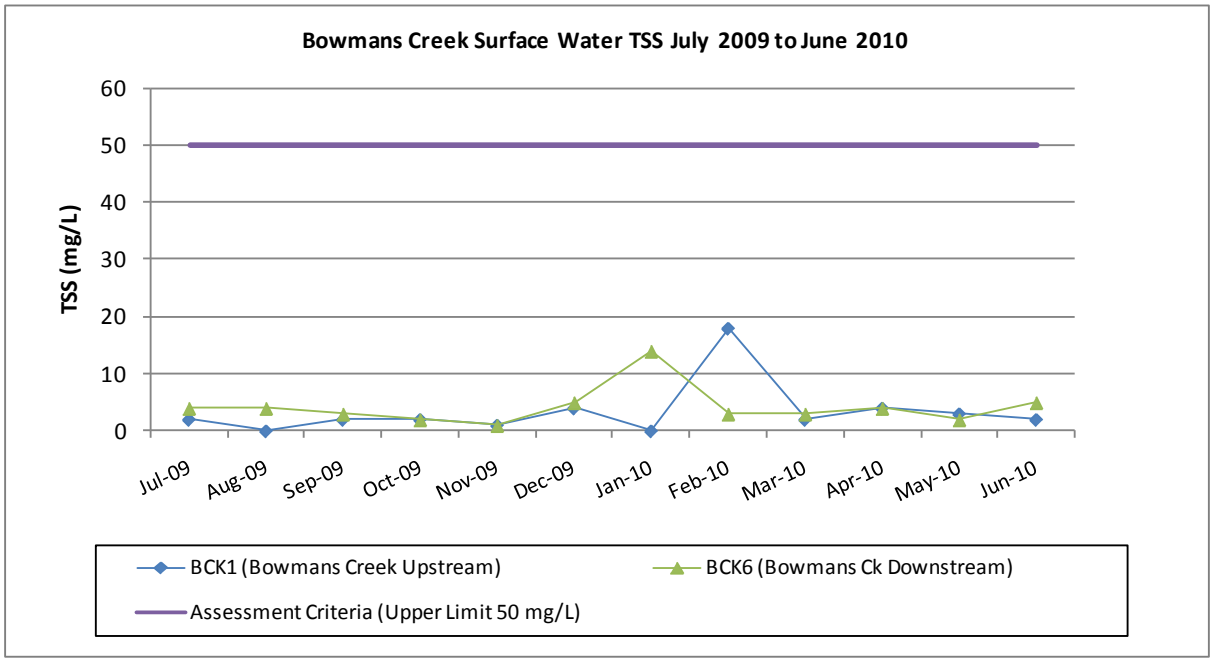
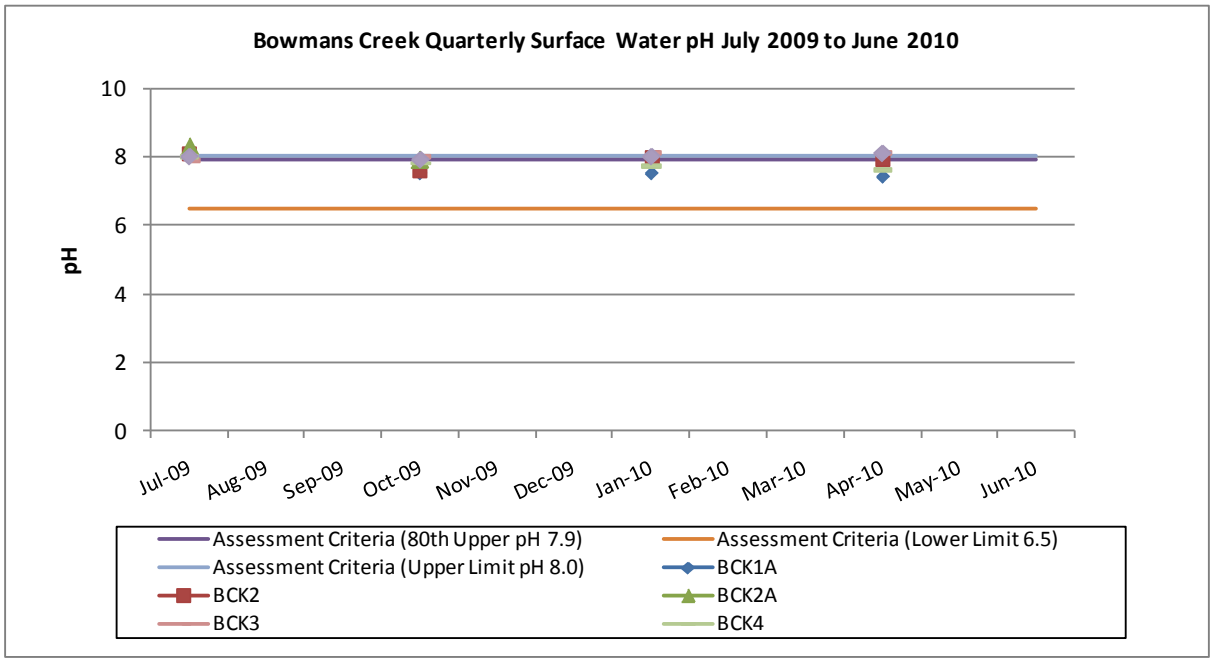


Figure 3.11 Water Quality Bowmans Creek 2009 - 2010



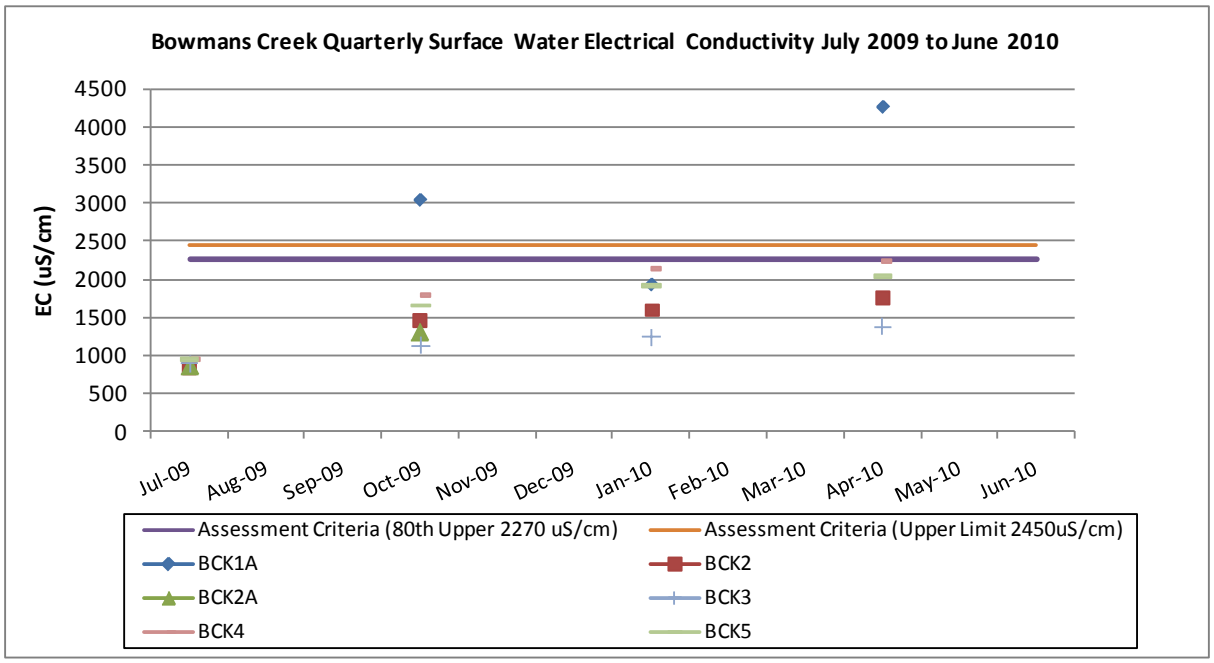
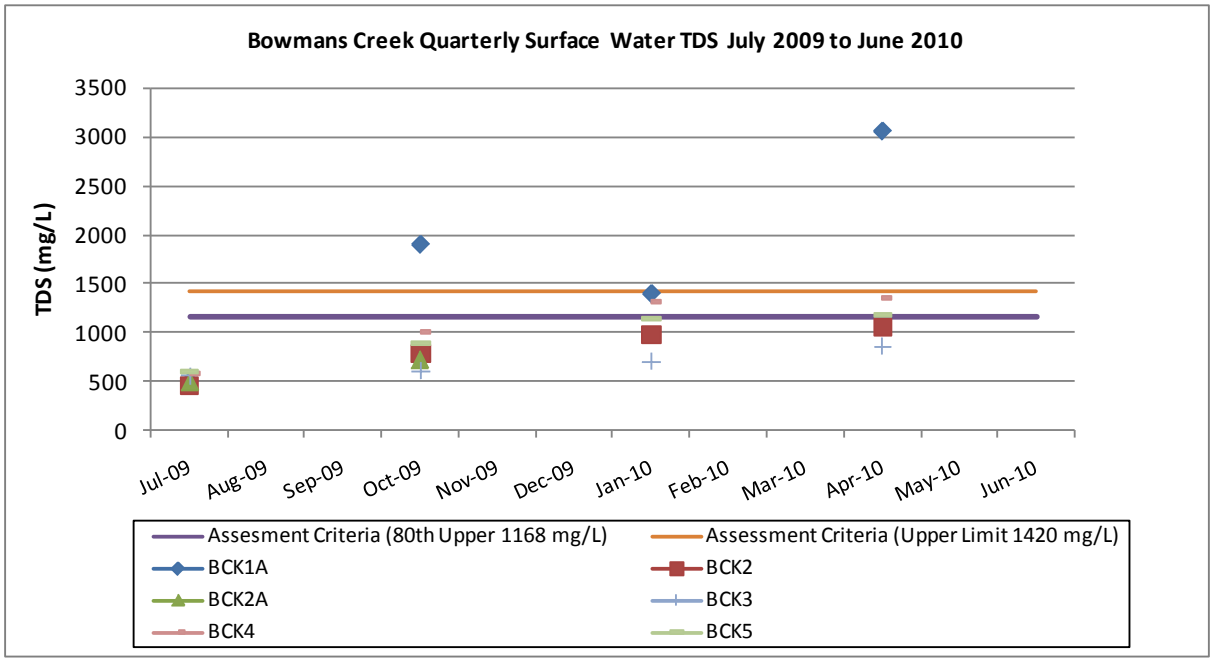


Figure 3.12 Water Quality Bowmans Creek 2009 - 2010 (Quarterly)



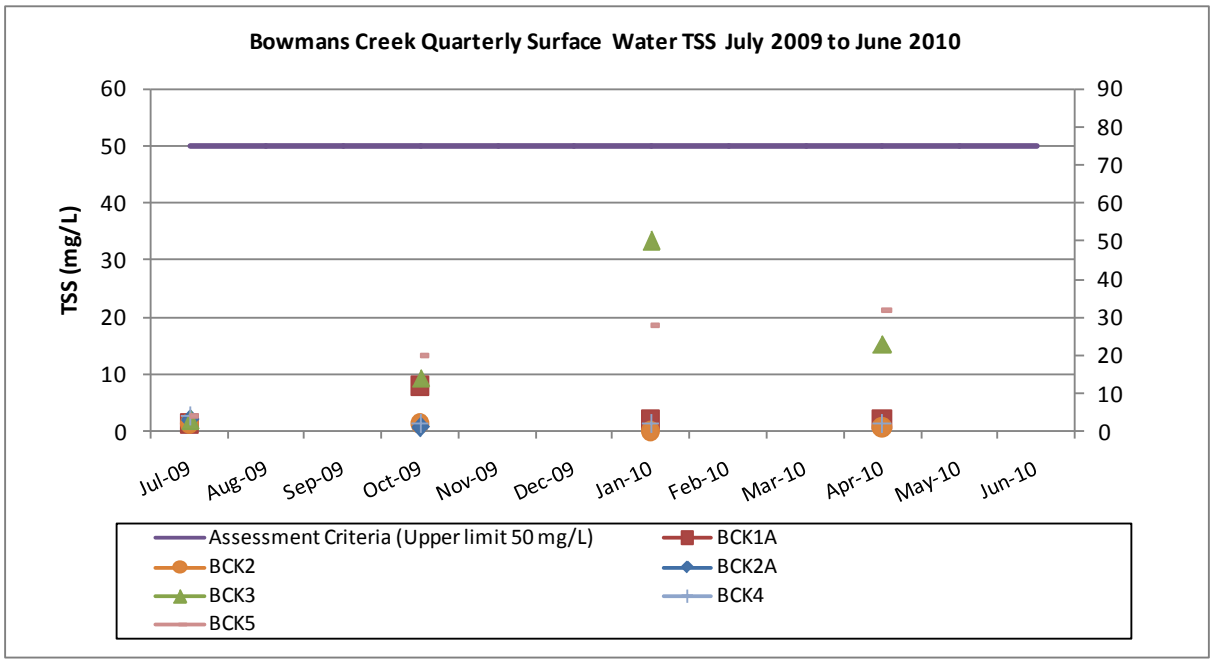
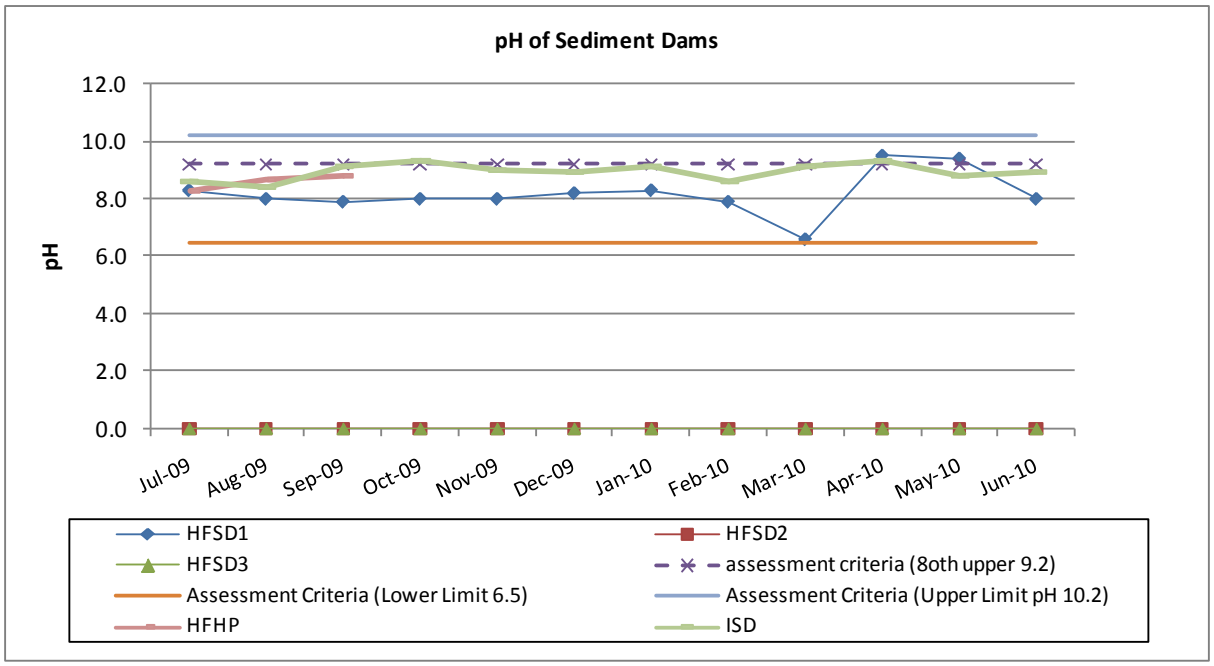


Figure 3.13 Water Quality Bowmans Creek 2009 - 2010 (Quarterly)



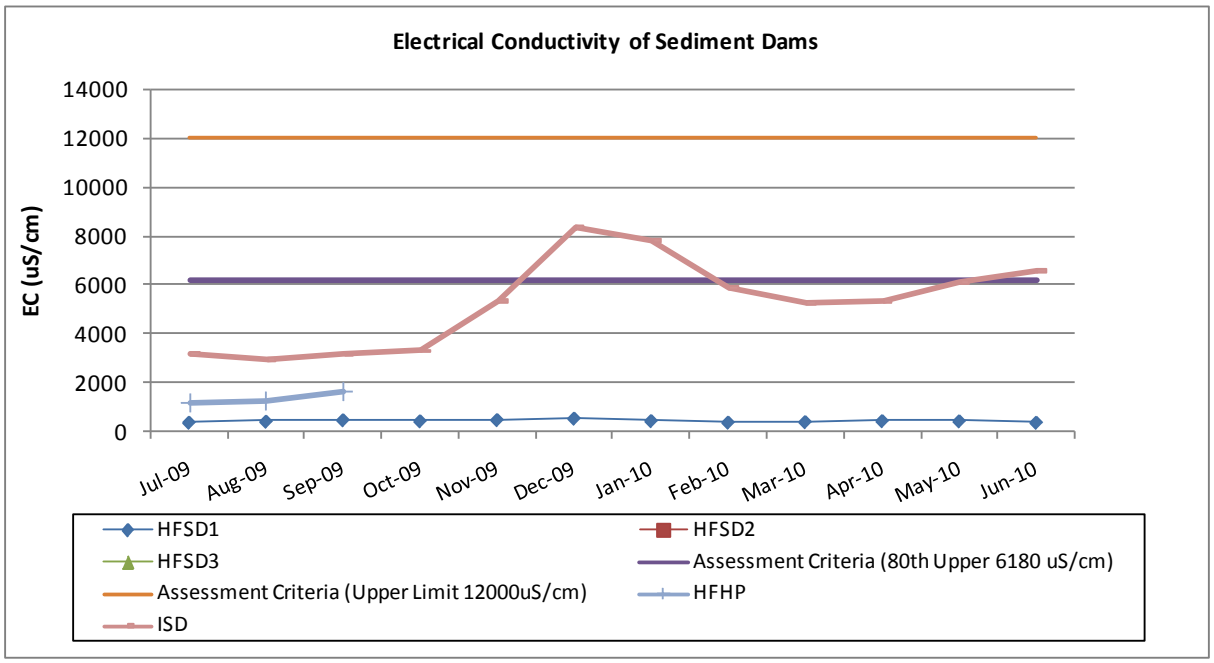
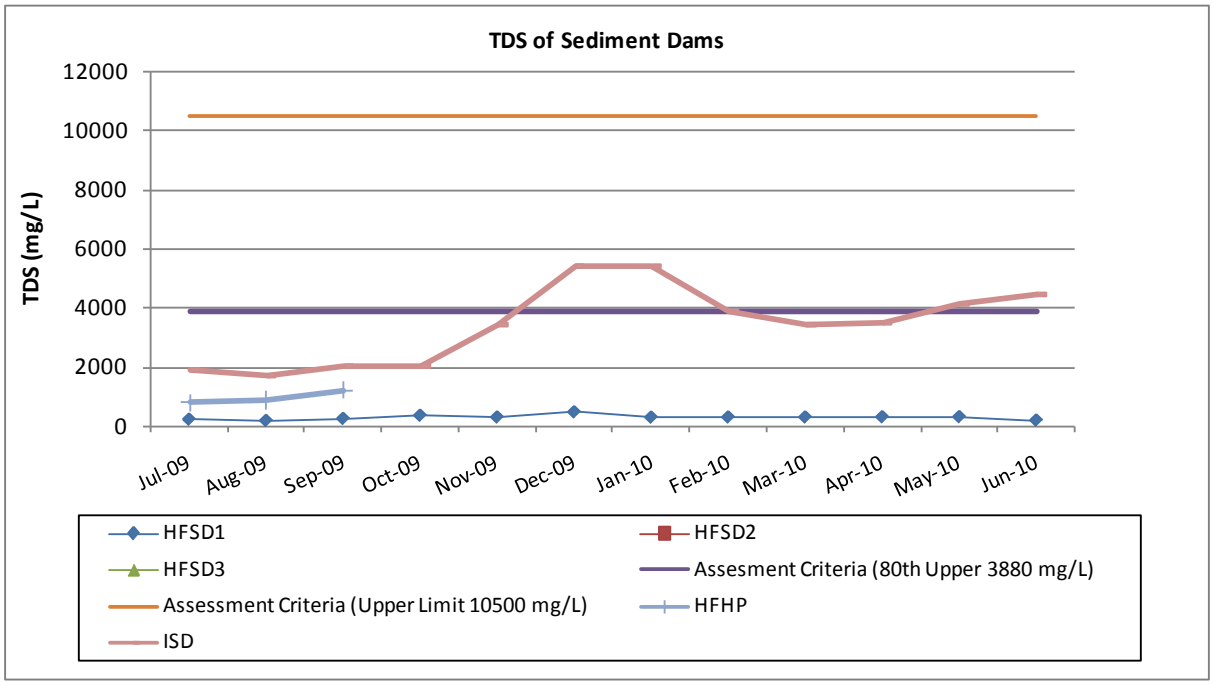


Figure 3.14 Water Quality On-Site Dams 2009 - 2010



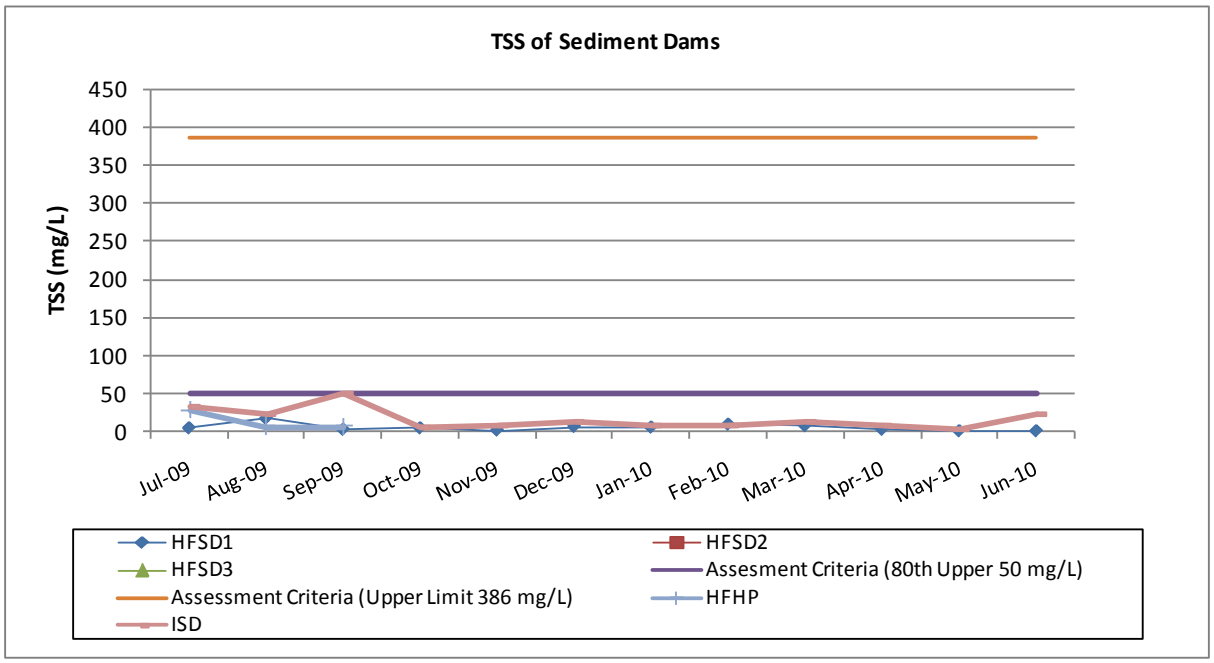
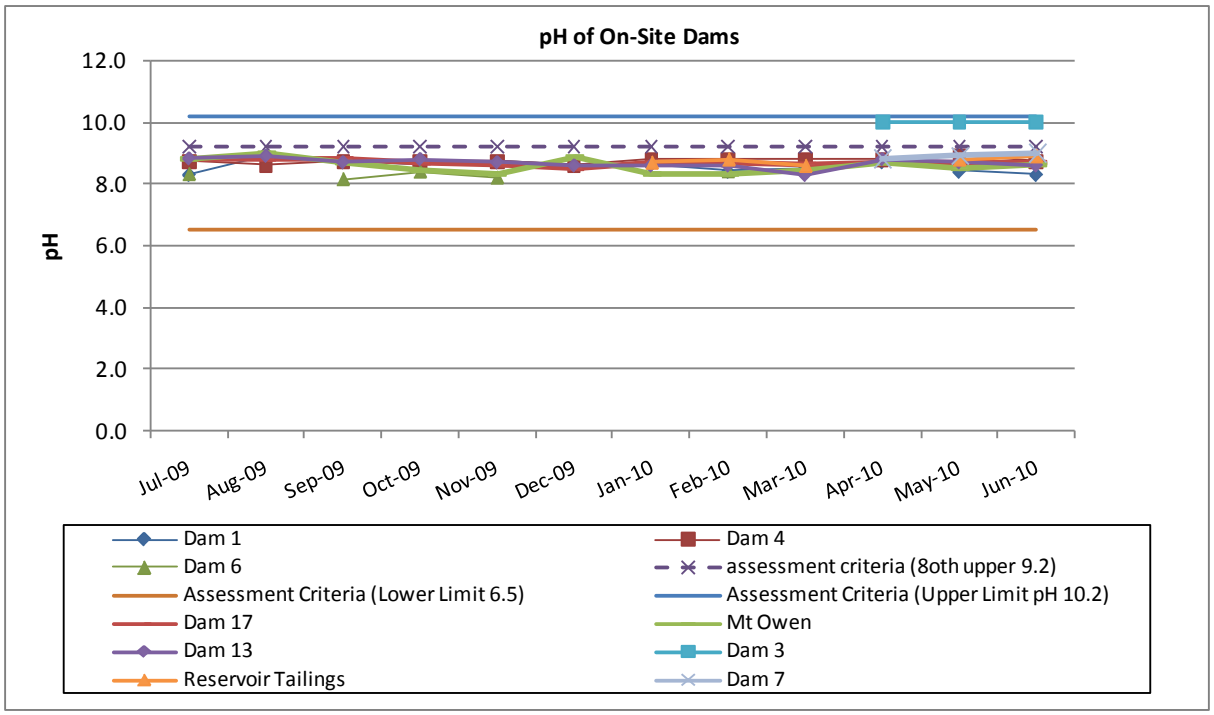


Figure 3.15 Water Quality On-Site Dams 2009 - 2010



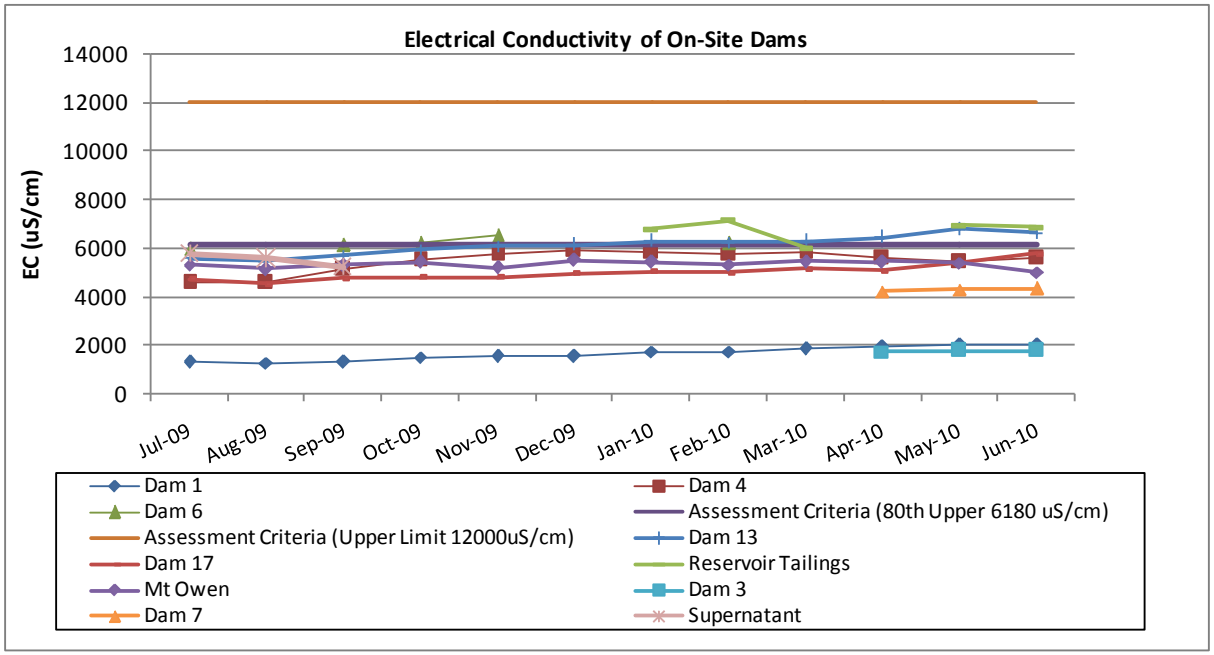
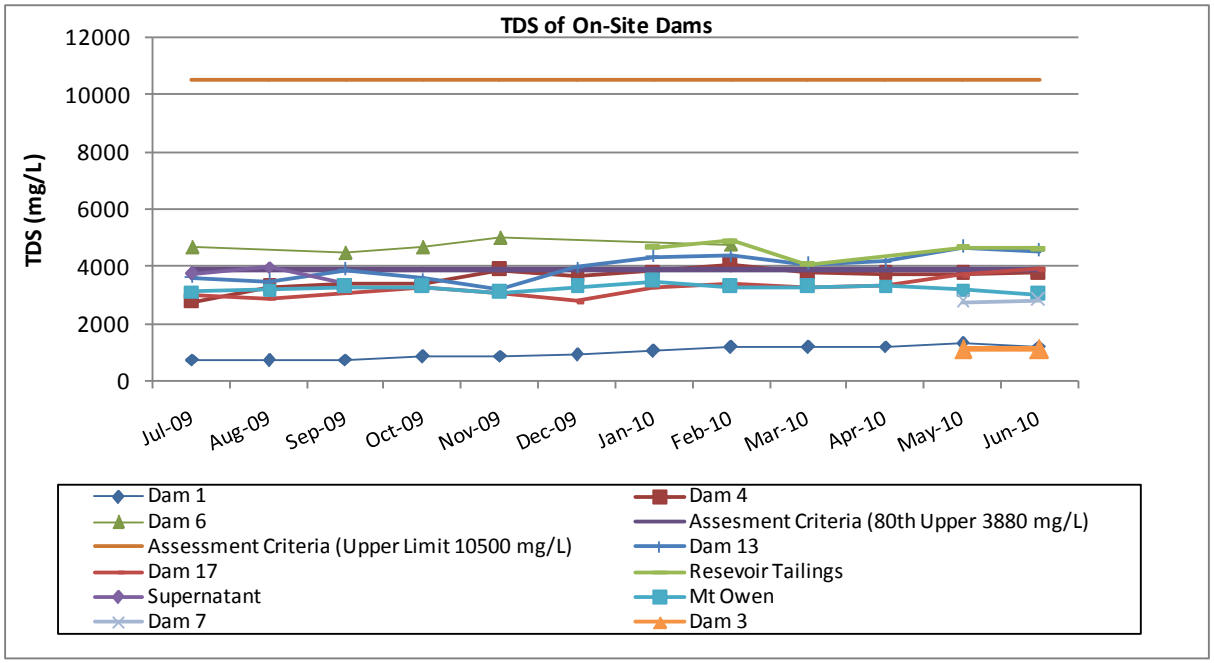


Figure 3.16 Water Quality On-Site Dams 2009 - 2010



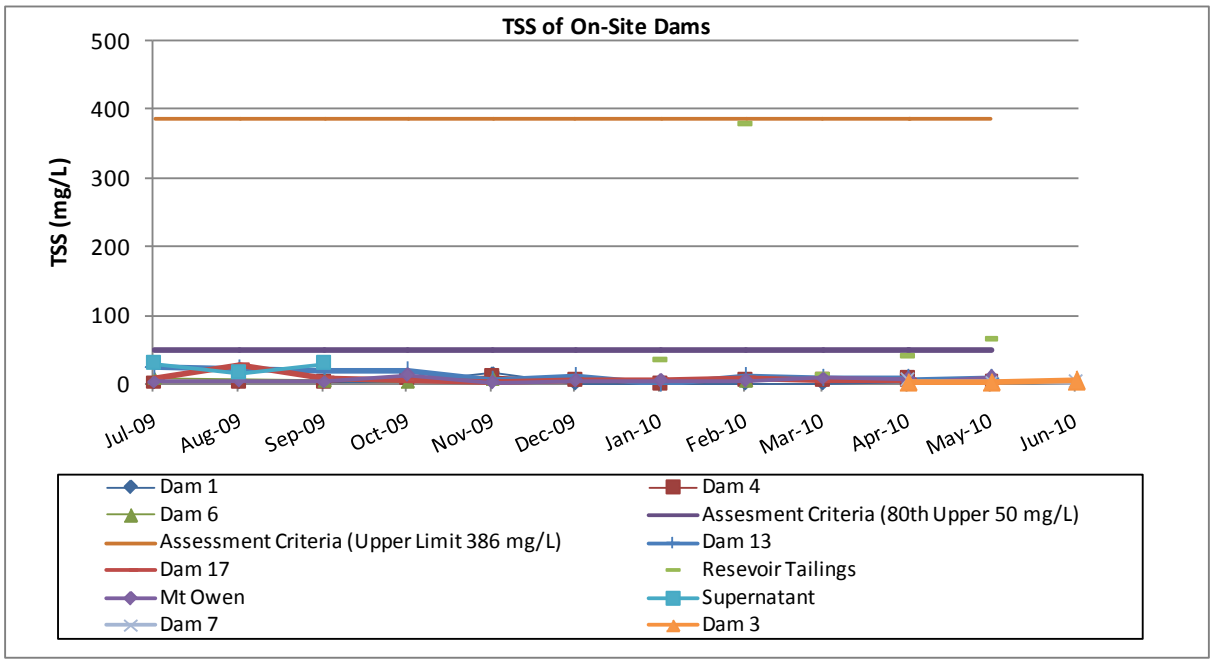


Figure 3.17 Water Quality On-Site Dams 2009 - 2010

3.7 Groundwater

There are two general aquifer types within the region of LCO:

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

- the underground workings in 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 due to the underground workings. 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 Coal 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.

LCO has an established groundwater monitoring program consisting of a network of 19 piezometers installed in 2002 (refer to **Figure 3.7**). 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 LCO 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 LCO 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 LCO. 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 Coal Groundwater Monitoring Program (Umwelt, 2008)

The groundwater 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 exists.

3.7.2 Regional Groundwater Quality Monitoring Results

The regional groundwater quality monitoring results for the reporting period are shown on **Figures 3.18, 3.19, 3.20, 3.21, 3.22** and in **Appendix 5.**

3.7.2.1 **Alluvial Aquifers**

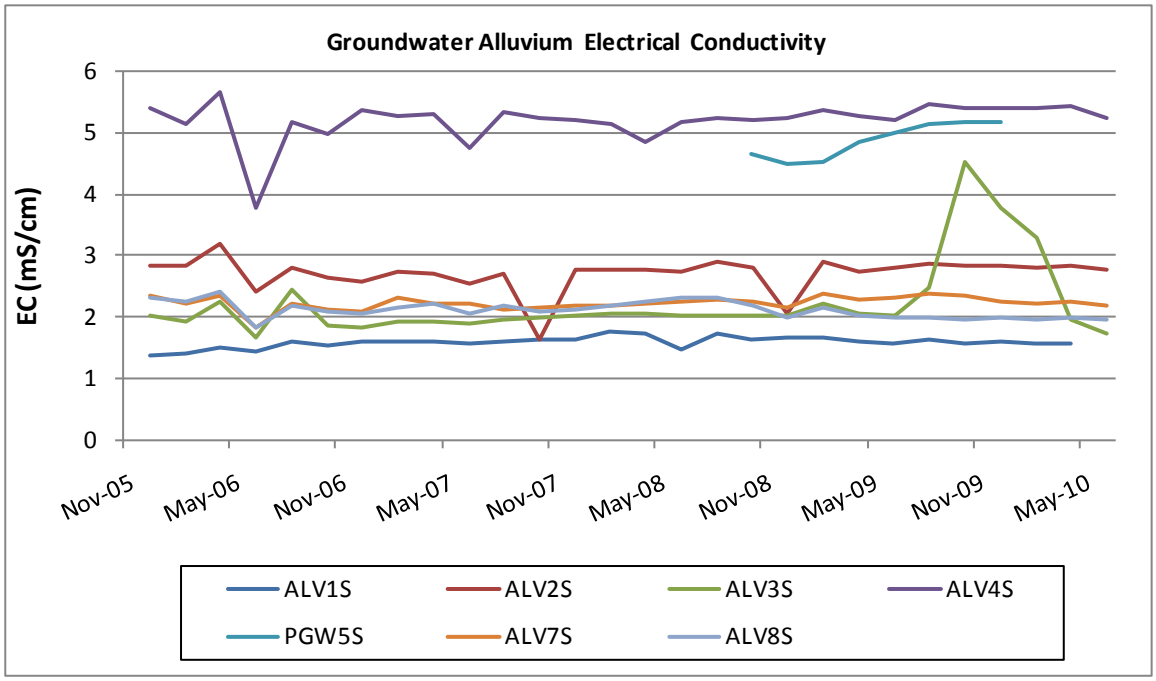
During the reporting period, the pH 80th percentile trigger value (pH 6.5 - 7.8) was exceeded on one occasion at ALV1S in August 2009 (pH 7.9) and twice at ALV2S during August 2009 (pH 7.9) and October 2009 (pH 7.9). Results for ALV2S, ALV3S, ALV4S, PGW5S and PGW5L all show numerous exceedances of the EC 80th percentile and maximum trigger values for EC, however the EC did not increase in comparison to the baseline range over the last year in Bowmans Creek alluvium. In addition, no pH or EC trigger values were exceeded in the shallow basement piezometers during the reporting period.

The Bowmans Creek alluvium pH has been generally unchanged since late November 2005, with all bores ranging from pH 7 to pH 8, apart from a one reading in June 2006 when the pH showed a reading of 9.6.

Groundwater EC within the Bowmans Creek alluvium has not changed significantly since 2005 with the exception of ALV3S which showed an increase in EC during October 2009, December 2009 and February 2010. During April 2010 EC results at ALV3S returned to a level consistent with the previous five years results. EC results at ALV3S remained within the ranges seen of other alluvial bores.

Groundwater EC within the shallow basement beneath the Bowmans Creek alluvium has not changed significantly since 2005 however similar to the alluvium, ALV3L showed a significant increase in EC during October 2009, December 2009 and February 2010. During April 2010 EC results at ALV3L returned to a level consistent with the previous five years results.

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.



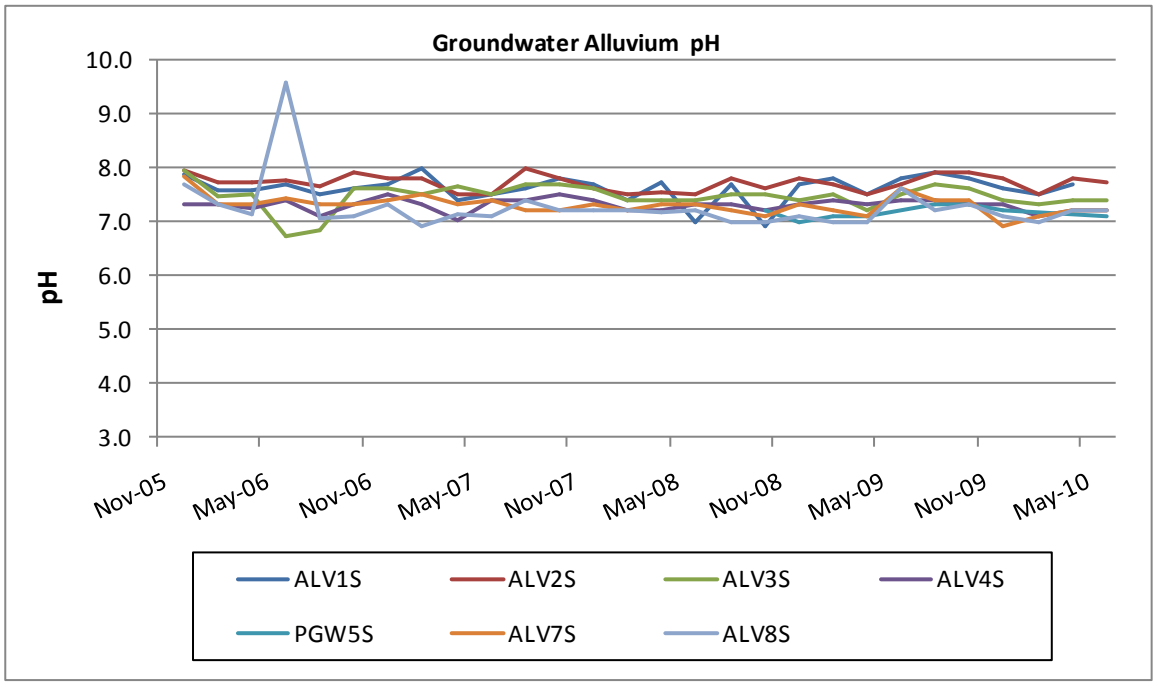
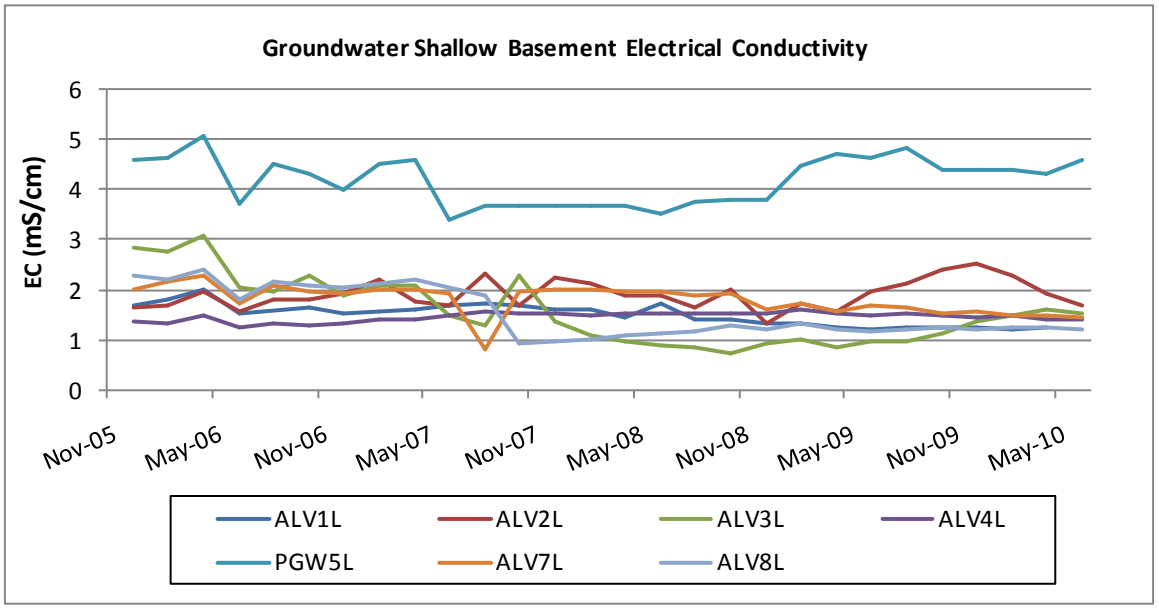


Figure 3.18 Groundwater Quality Trends Alluvium Salinity and pH



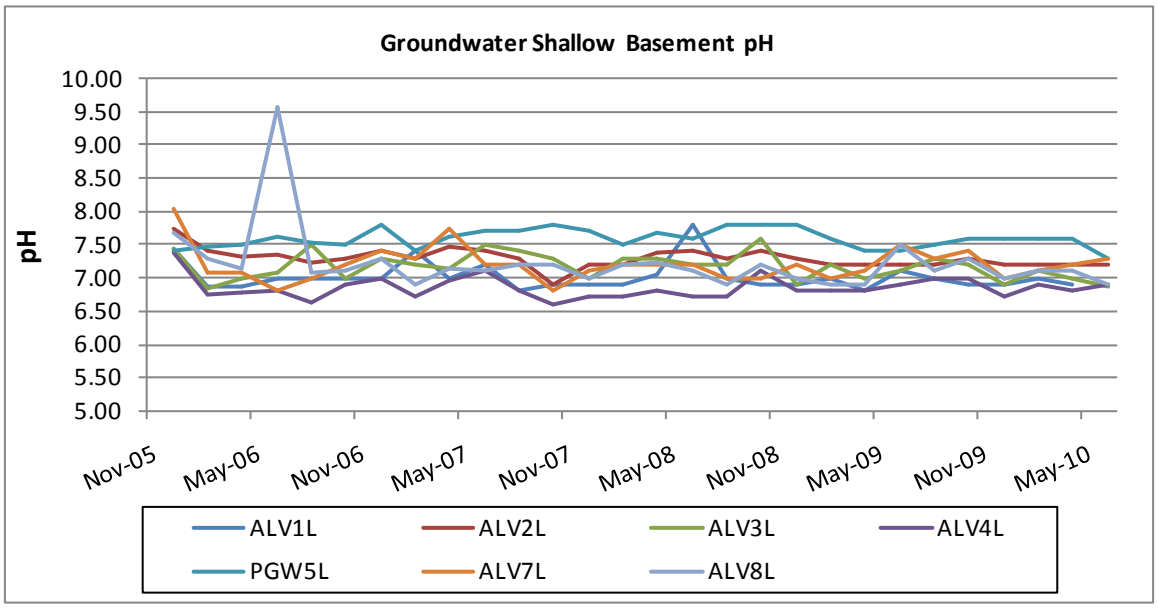
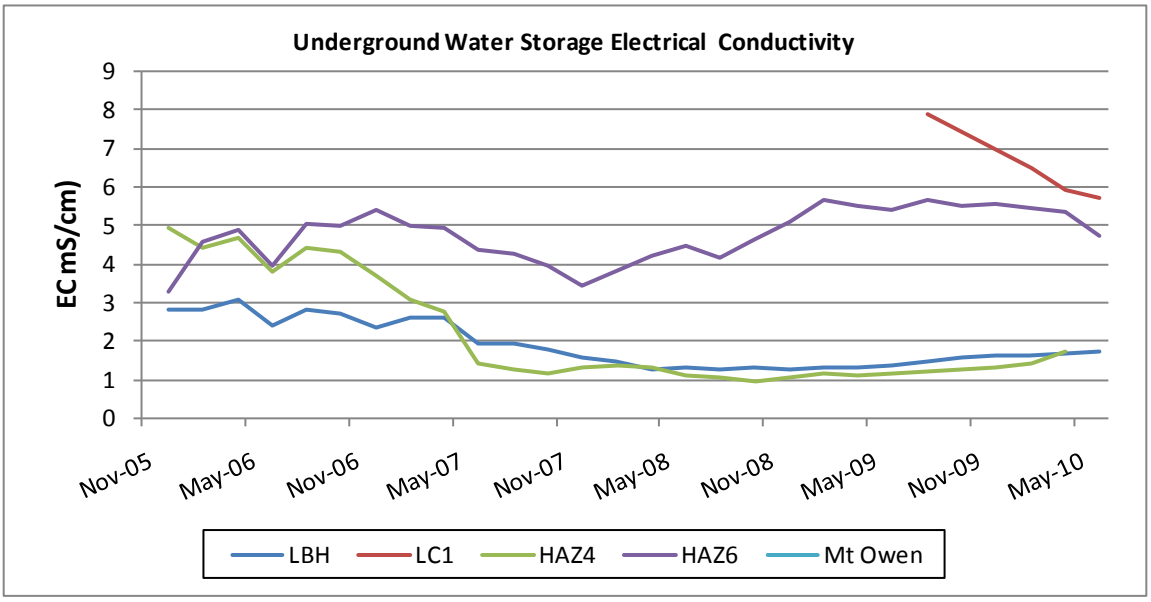


Figure 3.19 Groundwater Quality Trends Shallow Basement Salinity and pH



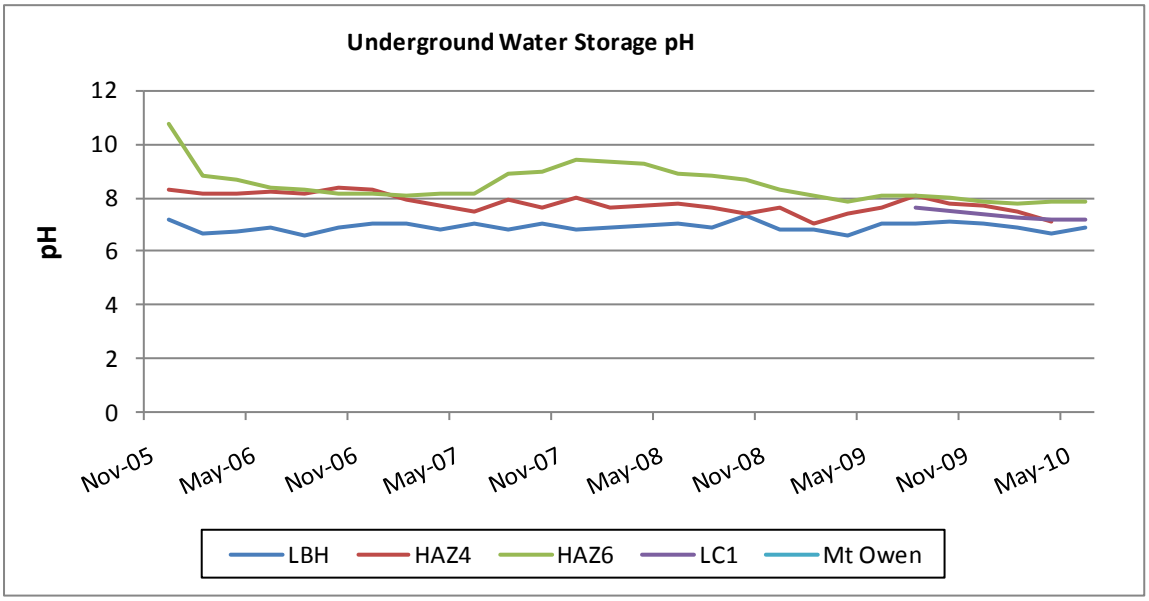
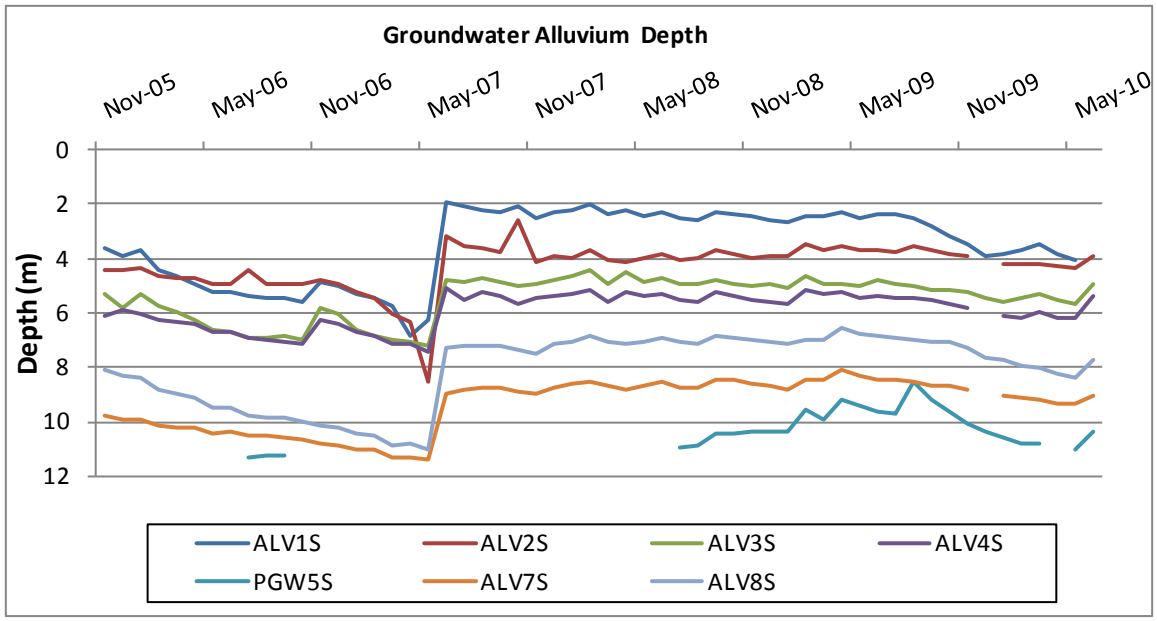


Figure 3.20 Groundwater Quality Trends Underground Water Storage Salinity and pH



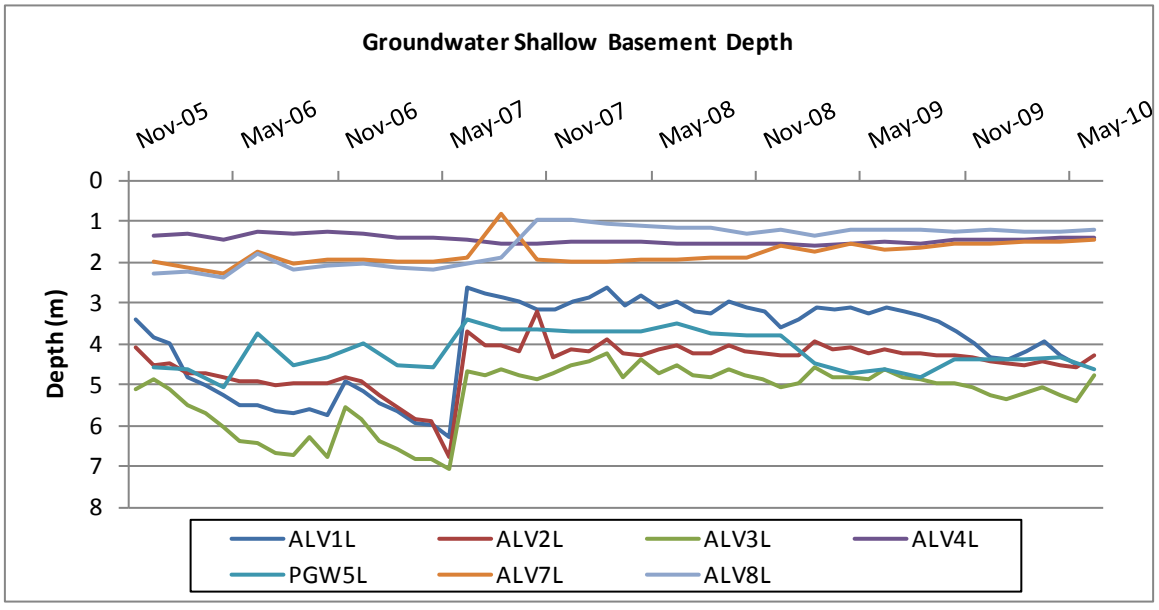


Figure 3.21 Groundwater Level Trends Paired Alluvium and Shallow Basement Standing Water Levels

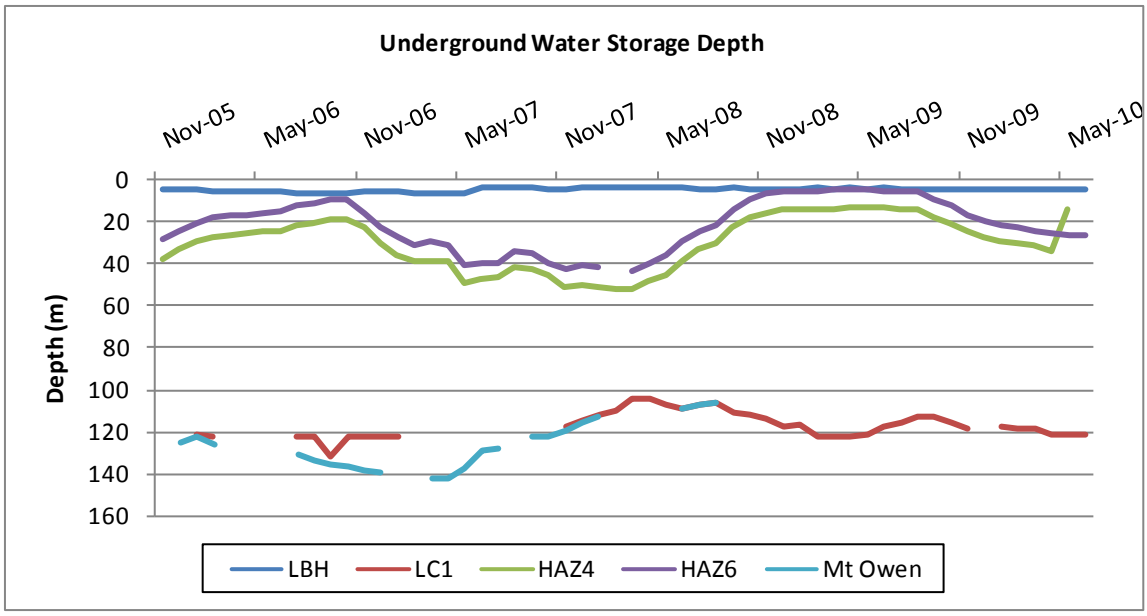


Figure 3.22 Groundwater Level Trends Underground Water Storage Standing Water Level

3.7.2.2 **Underground Water Storage**

During the reporting period, monitoring results showed multiple exceedances of the EC maximum trigger value at LC1 and HAZ6. No pH trigger value was exceeded at any underground water storage piezometer during the reporting period.

Groundwater salinity within the underground water storages is more variable than the Bowmans Creek alluvium or shallow basement piezometers. The long term trend in HAZ6 shows it to be similar as the baseline salinity in early 2006. HAZ4 has significantly reduced from 4930µS/cm in late 2005 to 1730µS/cm in 2010, whilst LBH has reduced its long term salinity from 2830µS/cm to 1730µS/cm.

Salinity and pH monitoring in LC1 and Mt Owen was discontinued during 2005 and as such no data is available.

The pH levels at the underground water storages are more variable than the Bowmans Creek alluvium or shallow basement, although have been essentially unchanged in the long term. The only bore that has changed to some degree is HAZ6, which has become slightly less alkaline, with a change from around pH 10.7 in late 2005 to pH 7.9 in June 2010.

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 and underground storage levels are shown in **Figures 3.21 and 3.22** for all of the LCO alluvial and underground water storage 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.

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.

Groundwater level trend charts of the paired alluvium and shallow basement indicate that standing water levels decreased steadily in the alluvium and shallow basement from late 2005 up until the flooding rains in June 2007 where a sharp significant increase in water level is shown. Following the June 2007 floods the paired alluvium and shallow basement water levels decreased gradually, up to 2010, to levels generally consistent with levels prior to the June 2007 floods. Current water levels are essentially the same as levels from 2005.

In a report prepared by Geoterra during 2009, a comprehensive groundwater depth analysis found that “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 **Underground Water Storage Standing Water Levels**

An underground water storage level increase of approximately 19m in HAZ4 and HAZ6 occurred between November 2005 and October 2006 followed by a decrease of approximately 34m between October 2006 and March 2008. After March 2008, water levels in HAZ4 and HAZ6 fully recovered to levels similar to those during October. Current reporting

period groundwater levels for HAZ4 and HAZ6 show gradually decreasing standing water levels.

The drop in water levels correlates to water leakage through the coal barrier into the 8 South area.

The 2009 groundwater analysis report found that no long term distinctive depressurisation in HAZ4 and HAZ6 due to operation of the current open cut pits is apparent.

The level in the Mt Owen bore decreased by 20.6m between January 2006 and April 2007 associated with pumping from Mt Owen bore, and recovered by approximately 36m 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 LC1 has fallen by approximately 16 m to levels similar to those in 2006. Mt Owen bore has not been sampled since August 2008.

The depressurisation in both LC1 and Mt Owen may be due to dewatering effects from operation of the current Open Cut pits underground water storage.

To date, the underground water storage monitoring data shows that the LC1 and Mt Owen levels are consistent with the predictions in the environmental assessment, however the LC1 and Mt Owen underground water storage 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 which is expected due to the connection between the underground workings.

3.7.3.3 **Mine Dewatering**

Minimal groundwater is observed in the open cut pit due to dewatering ahead of mining from 8 South underground workings, 20BL168062. An annual volume of 2297 ML was extracted from 8 South bore which is well within the 6000 ML annual extraction allocation limit.

3.8 Contaminated Land

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

LCO operates an onsite 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 a Phase 1 Contamination Assessment was conducted by Parsons Brinckerhoff and no significant issues were identified.

3.9 Threatened Flora

Flora monitoring surveys were undertaken during August 2009 at LCO. A total of seven permanent flora monitoring plots have been established using three of four sites established during baseline studies in addition to four new sites. There has been an expansion of the

rehabilitated monitoring areas, with three of the new sites in existing rehabilitation. Three of the sites are located in remnant woodland and four sites are located in rehabilitated areas. Site locations are shown in **Figure 3.23**

A combined total of 172 flora species have been recorded across the seven monitoring plots. Greater species diversity was recorded at remnant vegetation sites rather than at rehabilitation sites. To date flora monitoring surveys have been undertaken over three different seasons and therefore strong conclusions cannot be drawn in relation to any changes in floristic diversity experienced over the five years of monitoring. In order to measure patterns in diversity, three successive years of monitoring in the one season will be required to eliminate seasonal variation.

Of the 172 flora species identified 34 of these were found to be introduced species. The golden wreath wattle (*Acacia saligna*), galenia (*Galenia pubescens*) and the *Opuntia* species cause the greatest concern as they require active management for their control. Recommendations are provided in the Liddell Coal 2009 Flora and Fauna Monitoring Report.

No threatened flora species were identified in any of the flora sites during the 2009 monitoring surveys. 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. Plot 4 was removed from the 2009 flora surveys and was therefore not recorded during this monitoring period. 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 LCO development consent area to date.

3.10 Threatened Fauna

Fauna monitoring surveys were undertaken during August 2009 and September 2009 at LCO. Eight permanent fauna monitoring sites and four blue-billed duck dam assessments were surveyed during the 2009 monitoring program (refer to **Figure 3.24**). The area for fauna survey has been clearly defined in the 2009 ecological monitoring program and constitutes a 2 hectare area from the central point of the fauna monitoring sites allowing for accurate comparisons between remnant and rehabilitated sites. At each of the eight fauna monitoring locations a range of monitoring techniques were used to determine the faunal utilisation of LCO, including the identification of threatened species.

A total of 167 fauna species have been recorded across all the monitoring sites to date, including 113 bird species, 30 mammals, 17 reptiles and 7 species of amphibians.

To date fauna monitoring surveys have been undertaken over a variety of seasons and therefore direct comparisons of species diversity between 2005 to 2009 monitoring surveys cannot be undertaken. However, broad conclusions can be drawn in relation to diversity and abundance of fauna species. No significant decreases in fauna species diversity have been observed at the monitoring sites that were established prior to 2009 and current mining related activities are not likely to be affecting fauna species diversity at the monitoring sites.

Seven threatened fauna species were recorded during the 2009 monitoring surveys, comprising four bird species and three mammal species. These included the blue-billed duck (*Oxyurus australis*), grey-crowned babbler (*Pomatostomus temporalis temporalis*), hooded robin (*Melanodryas cucullata cucullata*), speckled warbler (*Chthonicola sagittata*), eastern freetail-bat (*Mormopterus norfolkensis*), eastern bentwing-bat (*Miniopterus schreibersii oceanensis*) and the large-footed myotis (*Myotis adversus)*.

The blue-billed duck (*Oxyurus australis*) continues to be recorded at Dam 13. The species has been recorded previously at Dam 7 however this site has since been disturbed. The speckled warbler (*Chthonicola sagittata*) was only recorded at one site during the 2009 surveys and records of this species throughout the study area are sparse. The hooded robin (*Melanodryas cucullata cucullata*) was recorded for the first time in the study area in 2009. The grey-crowned babbler (*Pomatostomus temporalis temporalis*) was recorded at two sites during the 2009 monitoring surveys and was previously recorded in 2005, 2006, 2007 and 2008 and is therefore considered to be a resident of the area. The grey-crowned babbler (*Pomatostomus temporalis temporalis*) is also a relatively commonly recorded species. The eastern freetail-bat (*Mormopterus norfolkensis*), was recorded at five sites during 2009 and has also been recorded during previous surveys. The eastern bentwing-bat (*Miniopterus schreibersii oceanensis*) was recorded at all sites except for one indicating a population presence in the local area. The large-footed myotis (*Myotis adversus)* was recorded at two sites in 2009.

3.10.1 Blue Billed Duck Habitat Enhancement

In accordance with DA 305-11-01 LCO 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. LCO 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 3.23 Flora Plot Monitoring Locations

Figure 3.24 Fauna Monitoring Locations

3.11 Blasting

3.11.1 Blast Criteria and Control Procedures

Blasting criteria for LCO 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. Limits for blast overpressure and ground vibration at the Chain of Ponds Hotel is 133 dB(L) 10 mm/s respectively.

Blasting activities can only be undertaken at LCO 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.

Liddell Coal Operations continues to operate a blasting information telephone line on 1800 037 317. LCO also operate a 24 hour contact line on 0265 709 900 in addition to a complaints line on 0265 709 939.

3.11.2 **Blast Results**

Blast monitoring was undertaken at two privately owned residences and the Chain of Ponds Hotel throughout the 2009-2010 reporting period. Blast monitoring locations are presented in **Figure 3.25**. There were 104 blasts undertaken throughout the 2009-2010 reporting period and no levels above the vibration limit (5 mm/s) were recorded at privately owned residences. One blast (116.4 dB(L)) was recorded above the air blast overpressure threshold limit (115 dB(L)) at the Scrivens privately. The one exceedance of the air blast overpressure threshold limit (115 dB(L)) totals 1% of the total number of blasts. No levels above the maximum limit for air blast overpressure (133 dB(L)) and vibration limit (10 mm/s) were recorded at the Chain of Ponds Hotel.

All blasts were conducted within the hours of 09:00 and 17:00 and on Monday to Saturday with the exception of one blast on 28 August 2009 which was fired at 19:19. A misfired blast from 16:14 on the 28 August 2009 was refired due to safety concerns of uncontrolled detonation which resulted in re-firing after 17:00. The blast results were within blasting limits at both Burlings and Scrivens monitors and no complaints were received in relation to the blast. The blast was reported by LCO as a non-compliance to DECCW. LCO intends to report this blast as a non-compliance in the 2009-2010 EPL Annual Return. No blasts were undertaken on Public Holidays.

Blast monitoring results for the reporting period are provided in **Appendix 6**.

During the reporting period the Burlings unit recorded a wind affected result on the 9 of June 2010, which was reported to DECCW by email on the 11 of June 2010. Liddell Coal Operations arranged for an independent investigation into the correct non-wind affected result which was determined to be 113.9 dB.

The blast monitoring system recorded 100% blast data at all locations except Scrivens which recorded 99% capture during the 2009-2010 reporting period. An independent consulting firm was engaged to undertake vibration and overpressure monitoring estimates for a blast fired

on 23 April 2010 where results were not captured at the Scrivens monitor. Estimated results were found to be 0.61 mm/s ground vibration and 102.6 dB(L) overpressure. The failure to collect blast monitoring data at Scrivens was reported, by LCO, as an EPL non-compliance and included the EPL annual return. 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 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))
July 2009 to June 2010	104	One blast (1%) above 115dB(L) (within 5% criteria) at 'Scrivens'	1 (blast outside licence condition timeframe) 1 (blast monitoring data not collected)

Comparison to EA Predictions

The Liddell Coal 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 conform to these predictions.

3.12 Operational Noise

3.12.1 Noise Criteria and Control Procedures

Noise criteria for LCO are prescribed in schedule 3, condition 1 of DA 305-11-01. LCO 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 3.25**. The criteria do not apply to mine owned residences.

3.12.2 Noise Monitoring Program

The Noise Monitoring Program (NMP) outlines the noise monitoring required to be undertaken by LCO to ensure compliance with statutory requirements at LCO. 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. An amendment to the NMP was approved by the Department of Planning on the 14th December 2009 which withdrew the requirement to undertake unattended noise monitoring. Unattended noise monitoring was not undertaken during the February 2010 noise monitoring program in accordance with the revised NMP but was conducted in August 2009, prior to the NMP amendment.

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

Regular attended noise monitoring is undertaken at representative locations surrounding LCO, refer to **Figure 3.25**. Monitoring of unattended continuous noise logging was conducted over a 72 hour period in August 2009, during mining operations at LCO. 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.

During the reporting period LCO purchased a Sentinex trailer mounted Continuous Real Time Noise Monitor to assist in the management of operational noise.

3.12.3 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 2009 and February 2010. Both long term and short term noise measurements were conducted in August 2009 and short term noise measurements conducted at six residences surrounding LCO, noise monitoring sites are shown on **Figure 3.26**. Results of attended noise monitoring events are presented in **Tables 3.18 and 3.19**.

Table 3.18 - Attended Noise Monitoring Results August 2009

Location	Period	Total dB(A), Leq (15min)	Wind Speed (m/s)/ Direction (degrees)	LCO's Operational Noise Contribution dB(A), Leq (15 min)
2	Day	42	4.7/210	30
	Evening	39	1.3/302	36
	Night	34	1.4/249	31
3*	Day	42	4.5/171	35
	Evening	41	1.5/318	38
	Night	36	1.5/245	Inaudible
6	Day	42	4.4/252	Inaudible
	Evening	44	2.3/335	Inaudible
	Night	41	1.6/231	Inaudible
17*	Day	41	4.5/209	36
	Evening	42	1.5/311	38
	Night	39	1.9/241	32
23*	Day	43	4.6/166	35
	Evening	41	1.5/313	35
	Night	39	1.8/322	36
Liddell Recreation Area	Day	43	4.3/242	inaudible
	Evening	40	1.6/306	inaudible
	Night	40	1.6/231	inaudible

*Mine owned residences

Noise monitoring results for August 2009 show that noise emissions from LCO were in excess of the applicable dB(A) Leq (15 min) noise criteria at locations 2, 3 and 17 during the evening measuring period and location 17 during the day time period. Locations 3 and 17 are mine owned properties. All noise emissions complied during the night time period.

Data from the Liddell Coal weather station showed a temperature inversion of greater than +3°C/100m active throughout the evening monitoring period. Therefore the elevated noise levels during the evening period were measured under non-compliant atmospheric conditions.

At the time of the day time elevated measured noise level at location 17 the wind speed was greater than 3m/s and therefore a non-compliant atmospheric condition.

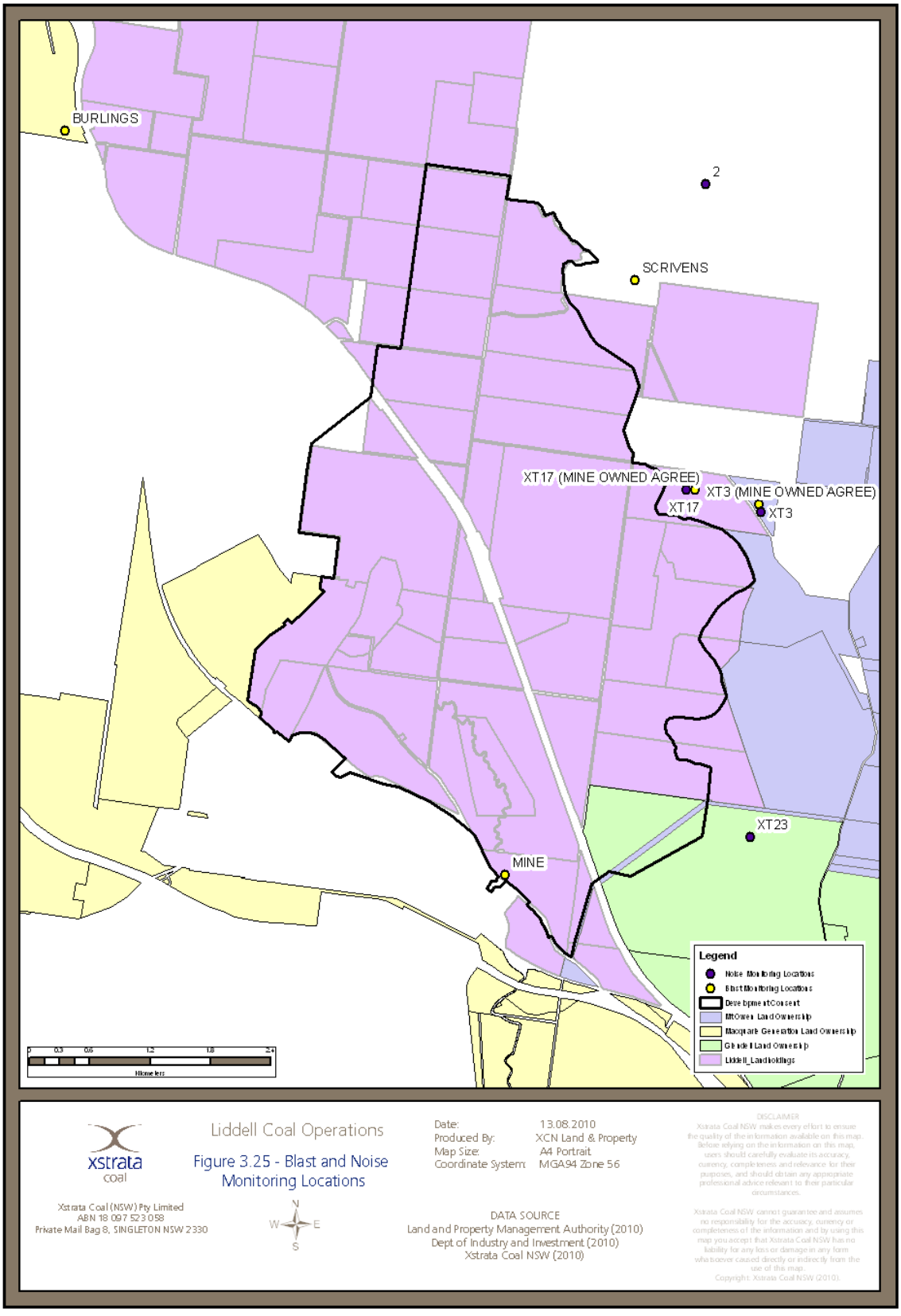


Figure 3.25 Environmental Monitoring Locations Blast and Noise

Table 3.19 - Attended Noise Monitoring Results February 2010

Location	Period	Total dB(A), Leq (15min)	Wind Speed (m/s)/ Direction	LCO's Operational Noise Contribution dB(A), Leq (15min)
14	Day	45	3.0/78	Inaudible
	Evening	43	3.4/77	Inaudible
	Night	35	2.6/74	Inaudible
3*	Day	56	3.6/7.0	Inaudible
	Evening	39	3.3/84	Inaudible
	Night	35	2.6/74	31
6	Day	40	3.5/73	Inaudible
	Evening	38	4.7/79	Inaudible
	Night	42	1.5/54	Inaudible
17*	Day	52	3.6/68	Inaudible
	Evening	43	3.5/80	Inaudible
	Night	42	2.4/84	Inaudible
23*	Day	42	2.5/67	Inaudible
	Evening	38	3.2/77	Inaudible
	Night	36	1.8/83	Inaudible
Liddell Recreation Area	Day	51	3.1/67	Inaudible
	Evening	45	4.3/77	Inaudible
	Night	41	2.7/60	31

*Mine owned Residences

Noise monitoring results for February 2010 show that noise emissions did not exceed the relevant noise criteria at any monitoring location during the monitoring periods.

The results indicated that LCO's mining activities were generally inaudible at all locations and time periods with the exception of location 3 and Liddell Recreation Area during the night time monitoring periods.

A review of operational noise results for the previous two reporting periods indicates that in the 2007 to 2008 and 2008 to 2009 reporting periods all results were below the noise criteria with LCO operational noise rarely audible.

Comparison to EA Predictions

The Liddell Coal EA (2006) proposes that modifications to the development consent will not produce an exceedance of the LCO 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.

3.13 Visual and Stray Light

Visual impact management is undertaken in accordance with the practices outlined in the Liddell Coal 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 minimise direct light emitted 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 are undertaken by the Open Cut Examiner and mobile lighting plants are located to reduce the offsite impact of lighting where ever possible.

3.14 Aboriginal Heritage

The LCO 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 LCO development consent area, consisting of 27 artefact scatters and 13 isolated finds. A description of the sites has been provided previously. The remaining sites are shown in **Figure 3.26.**

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 3.26**), the Bowmans Creek site area (containing sites PL1, Davies' Site 5) and the Chain of Ponds site area (containing LID29, LID31 and LID32).

During the reporting period an Aboriginal cultural assessment in relation to the proposed M49 Bore Electricity Supply was undertaken. This assessment was completed in accordance with the Department of Environment, Climate Change and Water (DECCW) *Interim Community Consultation Requirements* and in consultation with relevant Aboriginal stakeholder groups. An on-site meeting and inspection of the proposed M49 Bore electricity supply route was conducted on 28 August 2009.

Three sites were identified during the inspection and it was also noted that the route involved impacts to the Bowmans Creek terrace, which has previously been identified as an archaeological sensitive area, as specified in the Liddell Coal Aboriginal Cultural Management Plan. Following the inspection and in consultation with the relevant Aboriginal stakeholders, the Aboriginal Cultural Heritage Assessment recommended that impacts to the recorded sites could be avoided by demarcating access to pole locations and utilising existing areas of disturbance for pole locations within site boundaries. In addition, it was recommended that ground surface disturbance within the Bowmans Creek terrace should be limited to augering and should be subject to geomorphic investigation.

Demarcation works and geomorphic investigations (in the form of monitoring of three auger holes) were conducted on 18 November 2009 with the participation of Aboriginal stakeholder representatives. In addition, monitoring of excavations for a fence and cabling for the M49 Bore Pump was undertaken on the 25 May 2010 with three Aboriginal Stakeholder representatives.

During the reporting period expressions of interest in the Aboriginal Stakeholder Reference Group were invited as a requirement of the Liddell Coal Aboriginal Cultural Heritage Management Plan (ACHMP). Further reporting on the ACHMP will occur next reporting period.

Figure 3.26 Archaeological Sites within the LCO Consent Area

3.15 Historic Heritage

3.15.1 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 LCO 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.

3.15.2 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.

3.16 Spontaneous Combustion

During the reporting period, mining operations were undertaken in accordance with the LCO 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.

3.17 Land Management

3.17.1 Weeds

LCO has a comprehensive Weed Management Plan in place 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. LCO undertakes the weed control program in accordance with the site Landscape Management Plan and in accordance with schedule 3, condition 30, of the development consent.

The findings of a site inspection in June 2009 were used to identify and prioritise target weed species and their locations to be included in the Weed Management Program for the 2009-2010 reporting period. This program was expanded to include other weed species (including Coolatai Grass) identified by the Weeds Authority in buffer areas surrounding Liddell.

During the reporting period a total of 212 hours over a total period of 14 non-consecutive days was spent on weed control. The primary focus of activities during this time consisted of spraying *Rubus fruiticosis* (Blackberry) with a non-selective herbicide within the Hillcrest area, which had been highlighted as a priority area at the beginning of the year. Other noxious weeds such as *Cortaderia selloana* (Pampas grass) and *Lantana camara* (Lanatana) were also treated throughout weed spraying activities when encountered. A follow up treatment of *Hyparrhenia hirta* (Coolatai grass) along a section of Antienne Road adjacent to Liddell owned non-operational lands was undertaken in June 2010 in an attempt to prevent future seed spreading into paddocks where similar control efforts had previously taken place.

Weed species detected at LCO during a site inspection in June 2009 are listed in **Table 3.15**

Table 3.15 - **Weeds detected at LCO 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

Table 3.15 - **Weeds detected at LCO 2009 (continued)**

St Johns Wort	*Hypericum perforatum*	Noxious Weed - Class 4	High

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

Weed control practices undertaken at LCO 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.

3.17.2 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, LCO will seek expert advice on the management and control options for that species and endeavour to minimise its impact on native flora and fauna.

A Vertebrate Pest Control Program was carried out by Hunter Land Management Pty Ltd during autumn 2010. 1080 baiting was conducted to control wild dog and fox populations within the area. Pig traps were used to control feral pigs in the area. LCO also contributed to the Hebden Wild Dog Association during the reporting period.

3.17.3 Bushfire

Bushfire management is undertaken in accordance with the Liddell Coal Landscape Management Plan. There were no incidents of bushfire at LCO during the reporting period.

3.18 Greenhouse Gas and Energy

LCO 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.

LCO 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, LCO 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.

3.19 Public Safety

LCO is has perimeter fencing to exclude unauthorised personnel entry. All visitors to LCO 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. LCO also has a standard in place to ensure the safe storage of blast materials in magazines that are kept safe and secure at all times.

4.0 Community Relations

4.1 Community Consultative Committee

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

- two representatives from LCO, 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 community consultative committee (CCC) met on two occasions during the reporting period. The first meeting was held on 20 October 2009 and the second meeting was held on 20 April 2010. Both meetings were attended by representatives of LCO, Singleton Shire Council, Muswellbrook Shire Council, a community representative and a representative from Carbon Based Environmental.

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

- safety performance;
- production performance;
- mining operations;
- environmental performance, including;
  - community complaints;
  - air quality;
  - spontaneous combustion management;
  - environmental incidents
  - blasting;
  - noise;
  - water;
  - weed management;
  - 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 LCO (02) 6570 9939 and is advertised in the community newsletter and on the LCO website.

There were two complaints received during the reporting period. The complaints received were in relation to dust and odour. Details of complaints received during the reporting period are presented **Table 4.1.**

Table 4.1 - Summary of Complaints July 2009 to June 2010

Date	Source	Management
21/08/09	Dust	Anonymous dust complaint received from DECCW. An investigation was undertaken and a report was prepared that stated real time dust monitoring offsite showed compliance with dust criteria.
9/12/09	Odour	Odour complaint from use of biosolids from nearby resident. An investigation was undertaken and it was found that the contractor spreading biosolids was not incorporating the product in accordance with procedures. Contractor was instructed to ensure spreading procedures were adhered to for all future work. A review of future biosolid application was undertaken. Complainant was contacted and informed of this.

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 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)
July 2009 – June 2010	2	Dust (1), Odour (1)

4.3 Community Liaison

LCO 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.

LCO personnel regularly engage with the community in person and over the phone regarding a range of issues. LCO met with eight community members during the reporting period as a part of the LCO face to face consultation program.

In January 2010, a LCO Community Newsletter was distributed to the local community and other stakeholders. The newsletter provided an update on the decommissioning and deconstruction of old infrastructure and construction of a new bioremediation area in addition to environment and community news and an update on mining production. A copy of the newsletter is provided in **Appendix 9**.

LCO sponsor a range of organisations in the local community including the Hebden Wild Dog Association, Lake Liddell Recreation Area, the Singleton Theatrical Society, local school academic awards, Cancer Council and Mercy's Nursing home.

4.3.1 Liddell Coal Operations Website

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

LCO 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 LCO website accordingly. As such, data is uploaded to the website quarterly.
The website is located at www.liddellcoal.com.au.

5.0 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 generally in accordance with the Liddell MOP. Further details regarding Liddell's rehabilitation progress are outlined in **Section 5.2.4**.

During the reporting period, gradual conversion of the old CHPP to a new stores compound took place.

5.1 Rehabilitation Methods

5.1.1 Landform Design

The post-mining landform design of LCO has been generally undertaken in accordance with the DPI's 'Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of NSW'.

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 LCO 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.

5.1.2 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.

5.1.3 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 LCO 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.);
- where limited topsoil is available, overburden amelioration will be undertaken.
- 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.

5.1.4 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. A fertilizer maintenance program may be applied if required at rehabilitation ages of 2, 4 and 6 years to improve the quality of existing revegetated areas.

5.2 Rehabilitation Inspections and Audits

A Rehabilitation Inspection was undertaken by Umwelt Australia during April 2009. The main objectives of the inspection were to assess LCO's performance against its rehabilitation commitments and identify opportunities to:

- reduce overall site disturbance footprint through progressive rehabilitation, with a particular focus on reducing the overall area of site disturbance in the short to medium term; and
- enhance the quality of any older rehabilitation areas or legacy issues on site to ensure that rehabilitation objectives are met and a sustainable post-mining land use is achieved.

The main comments and recommendations from the rehabilitation inspection included:

- Trial grazing is recommended in selected areas.

- Investigate and implement where practical potential opportunity to accelerate the rehabilitation schedule of the overburden dump above the ROM stockpile area;

- Investigate and implement where practical opportunities to address rehabilitation legacy areas;

- Formalise the process for the design and verification of rehabilitated drainage systems;

- Revise and update rehabilitation strategy across the site with the aim to fulfil the rehabilitation objective as outlined in the EA. The process should include a constraints and opportunities analysis to confirm land use objectives and necessary measures to provide that the rehabilitation meets the respective close-out criteria;

- Review Liddell Coal Landscape Management Plan and update in regards to revised rehabilitation strategy;

- Review MOP to reflect changes to rehabilitation strategy and schedule.

A Rehabilitation Audit was undertaken by Global Soil Systems in July 2009 as part of Development Compliance Audit. Recommendations and actions completed from this Audit are detailed in **Section 1.5**.

5.3 Rehabilitation Monitoring

During this reporting period, the number of rehabilitation monitoring sites expanded from one site to four sites. The location of these sites are shown as Sites 6, 7 and 8 on Figure 3.24.

The methodology of the flora monitoring is outlined below

During the 2005 monitoring survey, four permanent flora monitoring plots were established (three remnant and one rehabilitation). The same plots have been monitored annually using the following methods. Each plot is 400m², a size which is widely used and recommended by DECCW. At each plot, 45 to 60 minutes is spent searching for all vascular flora species present within the plot. Species opportunistically located outside the plot are marked as present but were not assigned a cover- abundance value. Species within the plot are assigned a cover abundance value to reflect their relative cover and abundance in the plot. Information is also gathered on the condition of the remnant vegetation at each of the monitoring sites. Features indicating the general health of the vegetation within the plot are recorded, including: evidence of natural regeneration; occurrence and abundance of weeds; evidence of disturbance and feral animals; and observable impacts associated with mining. Standardised photo monitoring points were also established by Umwelt during the 2006 monitoring and have been used in following monitoring surveys.

The 2009 survey established additional monitoring sites in rehabilitation, so now there are seven permanent flora monitoring plots established in strategic locations to monitor remnant and rehabilitated vegetation throughout Liddell Colliery (**Figures 3.23 and 3.24**), the locations of which are identified in **Table 5.1**. Three sites are located in stands of remnant woodland and four sites are located in rehabilitated areas. The flora monitoring surveys were undertaken from 25 to 28 August 2009, during late winter.

Table 5.1 - Coordinates of the Seven Permanent Flora Monitoring Plots

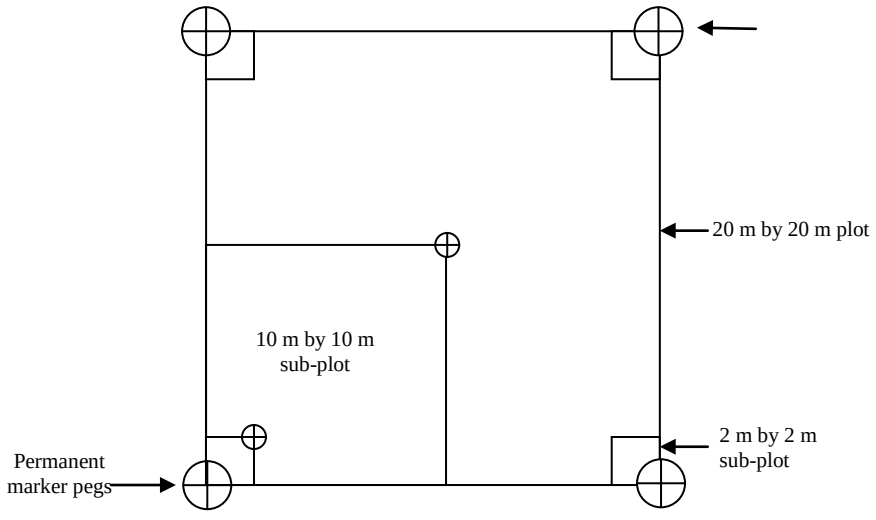
Quadrat Number	Vegetation Type	Easting	Northing
Plot 1	Remnant	314925	6414799
Plot 2	Remnant	315309	6414813
Plot 3	Rehabilitation	314266	6419028
Plot 6	Rehabilitation	312609	6415200
Plot 7	Rehabilitation	313460	6417587
Plot 8	Rehabilitation	315749	6414936
Plot 9	Remnant	312815	6420130

Note: Eastings and northings are recorded in MGA format

5.3.1 Survey Techniques

Vegetation monitoring was conducted within a 400 m² plot at each site; this size is widely used and recommended by the Royal Botanic Gardens Sydney and the Department of Environment, Climate Change and Water (DECCW), allowing for comparative analyses where required. A 20 m by 20 m plot was established at Sites 1, 2 and 6 to 9; and a 10 m by 40 m plot was established at Site 3 (these dimensions were selected as they were more appropriate for the narrow shape of the rehabilitated vegetation of the site). The four corners of the plots were marked with metal stakes and labelled with metal tags to show the plots number and corner location

Within each of these 400 m² plots, five sub-plots were established as indicated in **Figures 3.23 and 3.24** (however the layout of the design for Site 3 was slightly different due to the different dimensions of the site). The sub-plots established had dimensions 10 m by 10 m, and 2 m by 2 m respectively. The existing marker pegs from the 400 m² plots were used where possible to mark out these internal plots, and additional marker pegs were added as required. These smaller plots will be used to more readily quantify the success and progression of the rehabilitation sites towards the state of the remnant sites.



Vegetation Monitoring Plot Design

In order to survey for flora within these plots, approximately 60 minutes was spent within each 400 m² plot. The following methods were used for individual plot sizes for each site:

- **20 m by 20 m or 400 m² plots:** all vascular flora species present were searched for and recorded. Flora species were either identified on-site or samples taken for further identification at a later date. All species were assigned cover-abundance values as a reflection of their relative cover and abundance in the plot. A modified Braun-Blanquet 6-point scale (Braun-Blanquet 1927, with selected modifications sourced from Poore 1955 and Austin et al. 2000) was used to estimate cover-abundances of the plant species identified within each plot. **Table 5.2** shows the cover-abundance categories used. Additionally, the number of individual plants of each species over 5 m in height occurring within the plot were recorded.

- **10 m by 10 m sub-plots:** the number of individual plants of each species between 1 and 5 m in height occurring within the plot were recorded.

- **2 m by 2 m sub-plots:** the number of individual plants of each species less than 1 m in height occurring within the plot were recorded and/or estimated where they were numerous.

Table 5.2 - Modified Braun-Blanquet Crown Cover-Abundance Scale

Class	Cover-abundance Scale*	Growth Form Dependent
1	Few individuals (less than 5% cover)	Herbs, sedges and grasses: <5 individuals
		Shrubs and small trees: <5 individuals
2	Many individuals (less than 5% cover)	Herbs, sedges and grasses: ≥ 5 individuals
		Shrubs and small trees: ≥ 5 individuals
		Medium-large overhanging tree
3	5 – less than 20% cover	
4	20 – less than 50% cover	
5	50 – less than 75% cover	
6	75 – 100% cover	

Note:* Modified Braun-Blanquet scale (Poore 1955; Austin et al. 2000)

5.4 Rehabilitation Progress

The 2008/09 AEMR stated that 42.2 ha was planned to be rehabilitated in 2009/10. The area rehabilitated in 2009/10 was 92.9 ha. The additional rehabilitation was carried out in an attempt to catch up on a disrupted rehabilitation program during 2007/08. A large portion of rehabilitation planned for the Mountain Block area during 2008 was disrupted due to geotechnical issues, and as discussed in the previous AEMR the 2007/08 rehabilitation program was also disrupted due to the time required to gain approvals for the modified mining operations and the preparation and approval of a new MOP.

During the reporting period rehabilitation works occurred at the Mountain Block, Reservoir Block and along the main northern railway line from the Waterfill Pit. LCO have also been

working towards seeding cleared, unmined areas in an attempt to control dust. Temporary seeding rehabilitation works were carried out near the ROM pad to assist in dust control and visual enhancement along Pikes Gully Road.

As recommended by GSS in the Rehabilitation Audit, biosolids were applied (at the rate of 50-100 t/Ha) to 17 Ha of overburded/subsoil bare areas in the Reservoir Block during Q4 2009 and Q1 2010, along with gypsum applied at the rate of 10 t/Ha. This area was seeded with the typical Liddell seed mix and fertilizer, with successful results. Other areas in the Reservoir Block and along the railway line were topdressed with topsoil, gypsum and the typical Liddell seed mix and fertilizer.

It is proposed to undertake a maintenance fertilizer program on selected existing rehabilitated areas in the next reporting period if required.

Table 5.3 presents a summary of the rehabilitation undertaken by Liddell during the reporting period.

Table 5.3 - Summary of Disturbed and Rehabilitation areas 2009-2010 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)	128.1	113.9	128.1
B2 Active mining area (excluding items B3-B5 below)	193.1	112.9	258.2
B3 Waste emplacements (active/unshaped/uncapped)	209.9	394.6	123
B4 Tailings emplacements (active/unshaped/uncapped)	55.8	55.8	55.8
B5 Shaped waste emplacement (awaits final vegetation	8.9	14.7	0
TOTAL DISTURBED AREA	**595.8**	**691.9**	**565.1**
C: REHABILITATION PROGRESS			
C1 Total rehabilitated area (except for maintenance)	**564.7**	**471.8**	**591**
D: REHABILITATION ON SLOPES			
D1 10 to 18 degrees	60.4	60.4	60.4
D2 Greater than 18 degrees	10	10	10
E: SURFACE OF REHABILITATED LAND			
E1 Pasture and grasses	528.7	435.8	555.7
E2 Native forest/ecosystems	34.3	34.3	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 5.4**.

Table 5.4 – Maintenance Activities on Rehabilitated Land

Treatment	Area Treated (ha)		Comment/ Control Strategies/ Treatment Detail
	2009-2010	2010-2011	
Additional erosion control works (drains re-contouring, rock protection)	2	5	Erosion and sediment control structures as detailed in the Rehabilitation Audit by Global Soils in 2009
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)	-	10	Re-seeding as detailed in the Rehabilitation Audit by Global Soils in 2009
Adversely affected by weeds (detail – type and treatment)	68	68	Detailed in the Weed Management and Control Plan
Feral animal control (detail – additional fencing, trapping, baiting, etc)	200	200	Wild Dog baiting and Pig trapping as per the Vertebrate Pest Control Programme

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 Coal Environmental Assessment (2006) identified the nominated end land use for LCO 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 LCO 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 LCO 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 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 8**.

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

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

- Further improvement works on dust monitoring and management;

- Commission remainder of full Liddell Coal Operations mining fleet;
- Grazing trial on rehabilitated land;
- Establish an environmental monitoring database;
- Improvements to internal mine water flow monitoring;
- Blue Billed Duck habitat offset dam;
- Construct new mine water storage (raw water transfer void) and infrastructure;
- Construct heavy vehicle haul brigde over main northern railway line;
- Continue redevelopment of the redundant CHPP into stores area.

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 LCO community newsletters as scheduled;
- implement recommendations from environmental inspections and audits; and
- continue to support community initiatives in accordance with LCO 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

AECOM (2010) *Liddell Coal Operations Weed Management Summary*

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.*

Hunter Land Management (2010) *Vertebrate Pest Control Report Xstrata Liddell Coal*

Liddell Coal (2010) *HSEC Explosives Management Plan*

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

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

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

Liddell Coal (2008c) *Environmental Monitoring Program*

Spectrum Acoustics (2008) *Liddell Coal Operations August 2009 Attended Noise Monitoring Results*

Spectrum Acoustics (2009) *Liddell Coal Operations February 2010 Attended Noise Monitoring Results*

Umwelt (2010) *Liddell Coal 2009 Flora and Fauna Monitoring Report*

Umwelt (2009) *Liddell Coal Rehabilitation Inspection Report*

Appendix 1

Daily Train Haulage Movements

Train Loading Report

Date: 1/07/2009 to 31/12/2009

Site: Liddell Coal Marketing Pty Limited

Train No	Vessel Name	Arrival Time	Load Start	Load End Time	Qty	Duration (min	Load Rate (T/Hr)
LD218	KUMANO MARU	1/7/2009	06:30 p	08:45 p	8,060	135	3,582
LD286	LADY MARIA LUISA	3/7/2009	03:35 a	05:53 a	8,414	138	3,658
LD262	LOXANDRA	3/7/2009	10:31 p	12:31 a	8,088	120	4,044
LD110	LADY MARIA LUISA	4/7/2009	03:21 a	05:31 a	8,423	130	3,887
LD182	LADY MARIA LUISA	4/7/2009	02:27 p	04:28 p	8,581	121	4,255
LD216	LOXANDRA	4/7/2009	07:15 p	09:25 p	8,446	130	3,898
LD254	LOXANDRA	4/7/2009	12:15 a	02:24 a	8,292	129	3,857
LD210	LOXANDRA	5/7/2009	04:53 p	07:13 p	8,412	140	3,605
LD270	ETERNAL WIND	5/7/2009	11:42 p	01:46 a	8,435	124	4,081
LD122	F.D. CRIS DE ANGELIS	6/7/2009	05:44 a	08:12 a	8,633	148	3,500
LD150	F.D. CRIS DE ANGELIS	6/7/2009	09:18 a	11:52 a	8,601	154	3,351
LD128	F.D. CRIS DE ANGELIS	7/7/2009	06:38 a	10:33 a	8,393	235	2,143
LD202	F.D. CRIS DE ANGELIS	7/7/2009	03:47 p	06:35 p	8,478	168	3,028
LD264	F.D. CRIS DE ANGELIS	7/7/2009	11:45 p	02:14 a	8,387	149	3,377
LD244	ETERNAL WIND	9/7/2009	08:33 p	11:17 p	8,385	164	3,068
LD138	ETERNAL WIND	10/7/2009	08:20 a	11:07 a	8,273	167	2,972
LD202	HANJIN PORT KEMBLA	10/7/2009	05:15 p	08:27 p	8,587	192	2,684
LD152	NSS FORTUNE	11/7/2009	09:34 a	11:53 a	8,550	139	3,691
LD246	NSS FORTUNE	11/7/2009	09:15 p	12:01 a	8,514	166	3,077
LD266	HANJIN PORT KEMBLA	12/7/2009	12:31 a	03:12 a	8,356	161	3,114
LD270	KWK PROVIDENCE	12/7/2009	11:35 p	02:26 a	8,665	171	3,040
LD174	KWK PROVIDENCE	13/7/2009	12:29 p	03:33 p	8,524	184	2,780
LD230	KWK PROVIDENCE	13/7/2009	10:13 p	12:56 a	7,971	163	2,934
LD104	KWK PROVIDENCE	14/7/2009	03:01 a	05:48 a	8,455	167	3,038
LD262	BULK MONACO	16/7/2009	11:04 p	01:28 a	8,580	144	3,575
LD146	BULK MONACO	17/7/2009	08:19 a	10:23 a	8,016	124	3,879
LD208	BULK MONACO	17/7/2009	04:08 p	08:16 p	8,469	248	2,049
LD224	NEW JOY	17/7/2009	08:44 p	11:23 p	8,616	159	3,251
LD120	GH POWER	18/7/2009	05:05 a	08:42 a	8,053	217	2,227
LD138	GH POWER	18/7/2009	09:06 a	12:06 p	8,305	180	2,768
LD242	GH POWER	19/7/2009	06:52 p	09:31 p	8,237	159	3,108
LD270	YURITAMOU	23/7/2009	12:07 a	02:21 a	8,250	134	3,694
LD170	OCEAN EMPEROR	24/7/2009	12:28 p	03:30 p	8,524	182	2,810
LD216	OCEAN EMPEROR	24/7/2009	05:00 p	08:24 p	8,369	204	2,462
LD252	YURITAMOU	26/7/2009	10:19 p	12:33 a	8,180	134	3,663
LD184	IKAN KEDEWAS	27/7/2009	01:36 p	04:16 p	8,407	160	3,152
LD256	NSS GRANDEUR	28/7/2009	11:28 p	01:45 a	8,850	137	3,876
LD114	NSS GRANDEUR	29/7/2009	05:51 a	08:11 a	8,658	140	3,711
LD130	NSS GRANDEUR	29/7/2009	08:49 a	11:38 a	8,546	169	3,034
LD134	NSS GRANDEUR	30/7/2009	06:49 a	09:20 a	8,343	151	3,315
LD124	IKAN KEDEWAS	2/8/2009	05:46 a	08:32 a	8,150	166	2,946
LD170	IKAN KEDEWAS	3/8/2009	12:56 p	04:05 p	8,473	189	2,690
LD222	ATAGOSAN MARU	4/8/2009	07:26 p	09:46 p	8,647	140	3,706
LD234	ATAGOSAN MARU	5/8/2009	08:17 p	10:36 p	8,513	139	3,675
LD218	TATSUKI MARU	6/8/2009	05:47 p	08:38 p	8,472	171	2,973
LD290	POS GLORY	7/8/2009	01:45 a	04:14 a	8,504	149	3,424
LD138	TATSUKI MARU	7/8/2009	08:01 a	10:42 a	8,426	161	3,140
LD180	ATAGOSAN MARU	7/8/2009	01:23 p	03:45 p	8,278	142	3,498
LD270	NORDRHINE	8/8/2009	01:17 a	03:59 a	8,532	162	3,160
LD116	ATAGOSAN MARU	8/8/2009	07:02 a	09:15 a	8,381	133	3,781
LD166	ATAGOSAN MARU	8/8/2009	10:49 a	12:57 p	8,168	128	3,829
LD234	ATAGOSAN MARU	8/8/2009	07:48 p	10:20 p	8,348	152	3,295
LD112	NORDRHINE	9/8/2009	04:32 a	07:27 a	8,322	175	2,853
LD150	NORDRHINE	9/8/2009	09:13 a	11:57 a	8,211	164	3,004
LD270	NORDRHINE	10/8/2009	12:59 a	03:15 a	8,532	136	3,764
LD128	CAPE VANGUARD	14/8/2009	04:27 a	07:29 a	8,256	182	2,722
LD124	CAPE TREASURE	15/8/2009	05:11 a	07:49 a	8,308	158	3,155
LD234	CAPE VANGUARD	15/8/2009	08:12 p	10:32 p	8,599	140	3,685
LD180	CAPE TREASURE	18/8/2009	12:13 p	02:36 p	8,372	143	3,513
LD160	CORONA FRONTIER	20/8/2009	10:23 a	01:26 p	8,316	183	2,727
LD192	CORONA FRONTIER	20/8/2009	03:42 p	06:35 p	8,463	173	2,935
LD226	CORONA FRONTIER	20/8/2009	06:46 p	01:22 a	8,589	396	1,301
LD208	QUESA UNO	21/8/2009	04:37 p	07:11 p	8,548	154	3,330
LD292	QUESA UNO	22/8/2009	02:48 a	05:36 a	8,412	168	3,004
LD258	YORK	22/8/2009	10:25 p	12:54 a	8,554	149	3,445
LD112	OCEAN BREEZE	23/8/2009	04:26 a	07:21 a	8,690	175	2,979
LD186	OCEAN BREEZE	23/8/2009	01:08 p	03:46 p	8,385	158	3,184
LD194	SHIN-REI	25/8/2009	03:08 p	05:27 p	7,838	139	3,383
LD236	SHIN-REI	25/8/2009	07:36 p	09:49 p	8,445	133	3,810
LD288	SHIN-REI	26/8/2009	02:33 a	05:22 a	8,330	169	2,957

Train Loading Report

Date: 1/07/2009 to 31/12/2009

Site: Liddell Coal Marketing Pty Limited

Train No	Vessel Name	Arrival Time	Load Start	Load End Time	Qty	Duration (min	Load Rate (T/Hr)
LD210	CAPSTONE	26/8/2009	05:34 p	08:33 p	8,588	179	2,879
LD254	SUZAKU	27/8/2009	12:00 a	01:00 a	8,428	60	8,428
LD114	ROYAL BREEZE	29/8/2009	04:38 a	07:01 a	8,362	143	3,508
LD272	ROYAL BREEZE	30/8/2009	02:42 a	05:00 a	8,361	138	3,635
LD126	MAPLE WAVE	30/8/2009	06:02 a	08:26 a	8,506	144	3,544
LD164	ROYAL BREEZE	30/8/2009	12:04 p	02:23 p	8,491	139	3,665
LD200	ROYAL BREEZE	30/8/2009	03:18 p	05:46 p	8,555	148	3,468
LD140	MAPLE WAVE	31/8/2009	09:38 a	11:56 a	8,505	138	3,698
LD128	MAPLE WAVE	1/9/2009	06:53 a	10:21 a	8,626	208	2,488
LD192	MAPLE WAVE	1/9/2009	03:09 p	05:39 p	8,318	150	3,327
LD262	KOYO MARU	3/9/2009	12:37 a	02:49 a	8,215	132	3,734
LD232	KOYO MARU	4/9/2009	06:57 p	09:33 p	8,530	156	3,281
LD124	KOYO MARU	5/9/2009	05:45 a	08:38 a	8,592	173	2,980
LD230	KOYO MARU	5/9/2009	10:29 p	01:51 a	8,488	202	2,521
LD182	DIAS	6/9/2009	01:13 p	03:52 p	8,423	159	3,178
LD180	CHINA STEEL EXPRESS	8/9/2009	12:00 a	01:00 a	8,540	60	8,540
LD140	CHINA STEEL EXPRESS	8/9/2009	09:12 a	11:36 a	8,048	144	3,354
LD142	POS HARVESTER	10/9/2009	07:54 a	11:26 a	8,555	212	2,421
LD226	MANASOTA	15/9/2009	06:30 p	09:33 p	8,397	183	2,753
LD208	MANASOTA	16/9/2009	04:11 p	06:24 p	8,456	133	3,815
LD258	SEAKOH	16/9/2009	12:26 a	02:46 a	8,398	140	3,599
LD132	MANASOTA	18/9/2009	07:24 a	10:10 a	8,355	166	3,020
LD262	MANASOTA	18/9/2009	10:45 p	01:41 a	8,349	176	2,846
LD124	MANASOTA	19/9/2009	07:38 a	10:20 a	8,562	162	3,171
LD174	HYUNDAI PROSPERITY	19/9/2009	11:39 a	01:59 p	8,230	140	3,527
LD206	MANASOTA	19/9/2009	06:09 p	09:03 p	8,561	174	2,952
LD290	MANASOTA	20/9/2009	02:18 a	04:53 a	8,543	155	3,307
LD292	ENERGY PROMETHEUS	22/9/2009	02:44 a	05:05 a	8,509	141	3,621
LD250	BRILLIANT TRADER	25/9/2009	09:37 p	12:01 a	8,553	144	3,564
LD108	STELLAR FORTUNE	26/9/2009	05:19 a	07:56 a	7,570	157	2,893
LD216	BRILLIANT TRADER	26/9/2009	05:17 p	07:35 p	8,073	138	3,510
LD244	BRILLIANT TRADER	26/9/2009	10:05 p	12:20 a	8,430	135	3,747
LD280	STELLAR FORTUNE	27/9/2009	01:32 a	04:02 a	8,268	150	3,307
LD128	HANJIN MADRAS	29/9/2009	06:09 a	09:24 a	8,456	195	2,602
LD170	FRANCESCO CORRADO	1/10/2009	12:51 p	03:20 p	8,632	149	3,476
LD248	KAMISHIMA	1/10/2009	10:04 p	12:39 a	8,454	155	3,272
LD270	FRANCESCO CORRADO	2/10/2009	01:10 a	03:42 a	8,553	152	3,376
LD118	FRANCESCO CORRADO	2/10/2009	05:03 a	07:34 a	8,566	151	3,404
LD226	FRANCESCO CORRADO	2/10/2009	06:41 p	09:09 p	8,418	148	3,413
LD288	SANTA LUCIA	3/10/2009	04:05 a	06:43 a	8,628	158	3,276
LD200	UNITED SERENITY	3/10/2009	03:04 p	06:38 p	8,496	214	2,382
LD254	SANTA LUCIA	3/10/2009	11:20 p	01:35 a	7,499	135	3,333
LD140	QUESA UNO	4/10/2009	12:00 a	01:00 a	8,271	60	8,271
LD234	UNITED SERENITY	4/10/2009	07:02 p	09:38 p	8,501	156	3,270
LD288	UNITED SERENITY	5/10/2009	02:49 a	05:33 a	8,648	164	3,164
LD128	QUESA UNO	5/10/2009	06:21 a	11:56 a	8,350	335	1,496
LD246	GENYO	5/10/2009	09:58 p	12:32 a	8,949	154	3,487
LD106	GENYO	6/10/2009	06:07 a	07:45 a	8,726	98	5,343
LD156	MATSUURA	10/10/2009	10:22 a	12:38 p	7,712	136	3,402
LD188	MATSUURA	10/10/2009	04:12 p	06:36 p	8,416	144	3,506
LD246	KINKO MARU	10/10/2009	11:03 p	01:48 a	8,334	165	3,031
LD114	MATSUURA	11/10/2009	05:07 a	08:04 a	8,610	177	2,919
LD230	KINKO MARU	11/10/2009	06:43 p	09:53 p	8,669	190	2,738
LD288	CRYSTAL WIND	12/10/2009	03:21 a	05:49 a	8,497	148	3,445
LD192	KINKO MARU	12/10/2009	03:13 p	05:39 p	7,495	146	3,080
LD270	CRYSTAL WIND	13/10/2009	01:00 a	03:26 a	8,554	146	3,515
LD122	CRYSTAL WIND	13/10/2009	05:54 a	08:35 a	8,547	161	3,185
LD172	CRYSTAL WIND	13/10/2009	12:15 p	02:35 p	8,323	140	3,567
LD118	MAPLE WAVE	14/10/2009	06:17 a	09:14 a	8,654	177	2,934
LD208	MAPLE WAVE	14/10/2009	04:35 p	07:49 p	8,410	194	2,601
LD232	MAPLE WAVE	14/10/2009	08:27 p	10:59 p	8,604	152	3,396
LD106	ENERGY STAR	15/10/2009	12:00 a	01:00 a	7,363	60	7,363
LD138	ENERGY STAR	15/10/2009	08:22 a	10:54 a	8,589	152	3,390
LD120	KWK PROVIDENCE	16/10/2009	04:41 a	07:00 a	8,367	139	3,612
LD234	KWK PROVIDENCE	17/10/2009	08:11 p	10:24 p	8,254	133	3,724
LD144	KWK PROVIDENCE	18/10/2009	08:26 a	10:49 a	8,502	143	3,567
LD190	KWK PROVIDENCE	18/10/2009	03:03 p	05:16 p	8,470	133	3,821
LD226	KWK PROVIDENCE	19/10/2009	12:00 a	01:00 a	8,422	60	8,422
LD126	KWK PROVIDENCE	19/10/2009	05:53 a	08:47 a	8,684	174	2,994
LD172	KWK PROVIDENCE	19/10/2009	02:46 p	05:03 p	8,235	137	3,607

Train Loading Report

Date: 1/07/2009 to 31/12/2009

Site: Liddell Coal Marketing Pty Limited

Train No	Vessel Name	Arrival Time	Load Start	Load End Time	Qty	Duration (min	Load Rate (T/Hr)
LD176	KWK PROVIDENCE	21/10/2009	12:23 p	03:17 p	8,848	174	3,051
LD204	ANEMONE	21/10/2009	03:45 p	08:39 p	8,472	294	1,729
LD126	SOUTHERN EXPLORER	22/10/2009	05:55 a	08:29 a	8,735	154	3,403
LD176	SOUTHERN EXPLORER	22/10/2009	11:39 a	02:00 p	8,566	141	3,645
LD132	SOUTHERN EXPLORER	23/10/2009	06:55 a	09:47 a	8,262	172	2,882
LD232	MANASOTA	23/10/2009	06:58 p	09:51 p	8,054	173	2,793
LD126	MANASOTA	24/10/2009	06:32 a	09:43 a	8,393	191	2,637
LD164	MANASOTA	26/10/2009	11:24 a	01:49 p	8,448	145	3,496
LD128	CALADIUM	27/10/2009	06:37 a	09:33 a	8,352	176	2,847
LD170	CECILIA	27/10/2009	12:17 p	02:36 p	8,202	139	3,541
LD130	CECILIA	28/10/2009	06:45 a	09:23 a	8,995	158	3,416
LD212	CALADIUM	28/10/2009	05:50 p	08:43 p	8,555	173	2,967
LD214	SAGE SAGITTARIUS	31/10/2009	05:38 p	08:35 p	8,681	177	2,943
LD226	SAGE SAGITTARIUS	1/11/2009	07:00 p	10:08 p	8,522	188	2,720
LD206	SAGE SAGITTARIUS	2/11/2009	04:51 p	07:41 p	9,003	170	3,178
LD184	NORTH FORTUNE III	4/11/2009	01:56 p	04:13 p	8,893	137	3,895
LD150	NORTH FORTUNE III	5/11/2009	09:20 a	11:56 a	8,612	156	3,312
LD186	NORTH FORTUNE III	5/11/2009	03:02 p	05:21 p	8,734	139	3,770
LD152	NORTH FORTUNE III	6/11/2009	09:40 a	12:11 p	8,468	151	3,365
LD280	ORIENT VENUS	7/11/2009	02:21 a	04:46 a	8,667	145	3,586
LD272	NORTH FORTUNE III	7/11/2009	12:21 a	02:35 a	8,417	134	3,769
LD142	NORTH FORTUNE III	8/11/2009	08:11 a	10:26 a	8,444	135	3,753
LD204	ORIENT VENUS	8/11/2009	04:21 p	06:52 p	8,381	151	3,330
LD278	ORIENT VENUS	8/11/2009	12:56 a	03:30 a	8,590	154	3,347
LD192	ORIENT VENUS	9/11/2009	12:00 a	01:00 a	8,334	60	8,334
LD138	SPRING SAMCHEONPO	9/11/2009	08:37 a	11:13 a	8,640	156	3,323
LD250	IRON YANDI	10/11/2009	10:03 p	12:32 a	8,473	149	3,412
LD230	IRON YANDI	11/11/2009	07:11 p	11:26 p	8,359	255	1,967
LD188	UNIQUE BRILLIANCE	12/11/2009	02:35 p	03:00 p	8,510	25	20,423
LD242	UNIQUE BRILLIANCE	12/11/2009	09:28 p	11:40 p	8,508	132	3,867
LD114	UNIQUE BRILLIANCE	13/11/2009	12:00 a	01:00 a	8,273	60	8,273
LD276	UNIQUE BRILLIANCE	13/11/2009	01:53 a	04:21 a	8,609	148	3,490
LD184	CORAL TOPAZ	15/11/2009	02:59 p	05:14 p	8,831	135	3,925
LD270	CORAL TOPAZ	15/11/2009	12:05 a	02:35 a	8,585	150	3,434
LD130	BET COMMANDER	16/11/2009	06:35 a	09:16 a	8,703	161	3,243
LD150	CORAL TOPAZ	16/11/2009	09:45 a	12:28 p	8,459	163	3,114
LD250	CAPSTONE	26/11/2009	10:21 p	12:46 a	8,480	145	3,509
LD126	SHIN SANYO MARU	27/11/2009	06:37 a	09:57 a	8,443	200	2,533
LD148	SHIN SANYO MARU	28/11/2009	09:48 a	12:34 p	8,577	166	3,100
LD178	SHIN SANYO MARU	28/11/2009	01:51 p	04:07 p	8,364	136	3,690
LD224	SHIN SANYO MARU	28/11/2009	07:07 p	09:32 p	8,617	145	3,566
LD136	CORONA DYNAMIC	29/11/2009	08:33 a	11:01 a	8,583	148	3,480
LD196	MAPLE WAVE	1/12/2009	02:51 p	05:37 p	8,656	166	3,129
LD246	MAPLE WAVE	1/12/2009	09:33 p	12:10 a	8,598	157	3,286
LD260	BULK MONACO	3/12/2009	10:52 p	01:38 a	8,599	166	3,108
LD216	UNITED JOURNEY	4/12/2009	07:51 p	10:26 p	8,462	155	3,276
LD240	UNITED JOURNEY	4/12/2009	10:45 p	01:20 a	8,400	155	3,252
LD142	UNITED JOURNEY	5/12/2009	08:09 a	10:25 a	8,606	136	3,797
LD172	CAPE TREASURE	5/12/2009	12:04 p	02:31 p	8,768	147	3,579
LD194	BULK MONACO	5/12/2009	03:29 p	07:23 p	8,248	234	2,115
LD286	BULK MONACO	6/12/2009	02:12 a	04:50 a	8,736	158	3,317
LD142	CAPE TREASURE	6/12/2009	07:48 a	10:29 a	8,684	161	3,236
LD264	CAPE TREASURE	6/12/2009	12:12 a	02:31 a	8,585	139	3,706
LD120	CAPE TREASURE	7/12/2009	06:53 a	10:16 a	8,309	203	2,456
LD186	CAPE TREASURE	7/12/2009	01:31 p	03:54 p	8,541	143	3,584
LD230	CAPE TREASURE	7/12/2009	08:28 p	11:16 p	8,277	168	2,956
LD126	KOYO MARU	8/12/2009	07:14 a	10:56 a	8,283	222	2,239
LD200	BONAFIDE	8/12/2009	03:24 p	05:59 p	8,384	155	3,245
LD270	KOYO MARU	9/12/2009	01:00 a	03:43 a	8,335	163	3,068
LD186	KOYO MARU	9/12/2009	03:35 p	06:36 p	8,393	181	2,782
LD254	CMB SAKURA	11/12/2009	10:14 p	01:20 a	8,510	186	2,745
LD128	CMB SAKURA	12/12/2009	06:34 a	09:38 a	8,176	184	2,666
LD164	CMB SAKURA	12/12/2009	10:50 a	01:18 p	8,106	148	3,286
LD196	CMB SAKURA	12/12/2009	03:03 p	05:25 p	8,341	142	3,524
LD122	CMB SAKURA	13/12/2009	06:42 a	09:19 a	8,276	157	3,163
LD182	CMB SAKURA	13/12/2009	01:55 p	04:49 p	8,309	174	2,865
LD112	HERMES ISLAND	14/12/2009	05:56 a	09:03 a	7,924	187	2,542
LD194	JAPAN PLATANUS	16/12/2009	02:23 p	04:48 p	8,267	145	3,421
LD196	MINERAL NOBLE	18/12/2009	05:23 p	07:56 p	7,981	153	3,130
LD224	ORIENTAL PIONEER	18/12/2009	08:07 p	10:29 p	8,018	142	3,388

Train Loading Report

Date: 1/07/2009 to 31/12/2009

Site: Liddell Coal Marketing Pty Limited

Train No	Vessel Name	Arrival Time	Load Start	Load End Time	Qty	Duration (min	Load Rate (T/Hr)
LD270	ORIENTAL PIONEER	18/12/2009	12:01 a	02:42 a	8,524	161	3,177
LD144	ORIENTAL PIONEER	19/12/2009	08:51 a	11:13 a	7,579	142	3,203
LD206	DUHALLOW	19/12/2009	04:13 p	07:00 p	8,408	167	3,021
LD254	DUHALLOW	19/12/2009	09:28 p	11:46 p	7,961	138	3,462
LD126	DUHALLOW	20/12/2009	06:37 a	09:03 a	8,206	146	3,372
LD164	JAPAN PLATANUS	20/12/2009	10:37 a	12:59 p	8,407	142	3,552
LD254	DUHALLOW	20/12/2009	10:54 p	01:32 a	7,766	158	2,949
LD120	JAPAN PLATANUS	21/12/2009	05:28 a	07:47 a	8,300	139	3,583
LD268	DUHALLOW	21/12/2009	12:40 a	03:00 a	8,348	140	3,578
LD222	ASAHI MARU	22/12/2009	06:34 p	09:16 p	8,366	162	3,099
LD196	JAPAN PLATANUS	23/12/2009	05:05 p	07:34 p	8,280	149	3,334
LD128	YA TAI 1	24/12/2009	06:45 a	09:35 a	8,517	170	3,006
LD196	YA TAI 1	24/12/2009	03:09 p	05:35 p	8,503	146	3,494
LD258	YA TAI 1	27/12/2009	12:24 a	02:45 a	8,095	141	3,445
LD284	YA TAI 1	27/12/2009	03:40 a	06:08 a	8,109	148	3,287
LD142	YA TAI 1	27/12/2009	07:50 a	10:23 a	8,346	153	3,273
LD172	MATSUURA	27/12/2009	11:45 a	02:27 p	8,867	162	3,284
LD222	MATSUURA	27/12/2009	05:36 p	07:55 p	8,349	139	3,604
LD120	YA TAI 1	27/12/2009	10:56 p	01:18 a	8,252	142	3,487
LD126	K PHOENIX	29/12/2009	07:49 a	10:23 a	8,633	154	3,363
LD226	K PHOENIX	29/12/2009	06:26 p	09:07 p	8,587	161	3,200
LD232	DIAMOND STREAM	30/12/2009	07:16 p	09:54 p	8,255	158	3,135

Summary

Number of Trains: 232

Total Nett Weight: 1,952,704.1

Average Nett Weight: 8,416.8

Average Load Rate: 3,229.4

Average Load Duration: 156.4

Total Tonnes Railed

LID10	303,757
LID11	204,465
LID12	540,033
LID14	325,212
LID35	785
LID8	366,172
LID9	212,280

Stockpile (t's) **31/12/2009**

LID9	30,235
LID12	0
LID14	5,138
LID10	136,884
LID11	21,477
LID8	-1,278
LID35	0

Train Loading Report

Date: 1/01/2010 to 30/06/2010

Site: Liddell Coal Marketing Pty Limited

Train No	Vessel Name	Arrival Time	Load Start	Load End Time	Qty	Duration (min	Load Rate (T/Hr)
LD286	SANTA LUCIA	1/1/2010	01:47 a	04:28 a	8,603	161	3,206
LD126	SANTA LUCIA	1/1/2010	06:33 a	09:03 a	8,683	150	3,473
LD238	STELLAR FORTUNE	1/1/2010	10:17 p	12:48 a	8,396	151	3,336
LD152	STELLAR FORTUNE	2/1/2010	11:32 a	02:01 p	8,750	149	3,524
LD286	STELLAR FORTUNE	2/1/2010	02:22 a	05:05 a	8,680	163	3,195
LD122	STELLAR FORTUNE	6/1/2010	05:03 a	07:37 a	8,469	154	3,299
LD210	VENTURA	6/1/2010	04:45 p	07:03 p	8,608	138	3,742
LD228	VENTURA	7/1/2010	07:21 p	09:45 p	8,489	144	3,537
LD132	VENTURA	8/1/2010	08:45 a	11:42 a	8,542	177	2,895
LD208	VENTURA	10/1/2010	04:46 p	07:48 p	8,775	182	2,893
LD172	KAIEN	11/1/2010	12:29 p	02:56 p	8,656	147	3,533
LD192	UNITED JOURNEY	12/1/2010	03:06 p	05:30 p	8,295	144	3,456
LD146	UNITED JOURNEY	13/1/2010	11:02 a	03:11 p	8,423	249	2,030
LD194	BOSPORUS	14/1/2010	04:01 p	06:32 p	8,558	151	3,401
LD242	UNITED JOURNEY	14/1/2010	08:59 p	11:37 p	8,700	158	3,304
LD278	CORONA GARLAND	15/1/2010	01:20 a	04:41 a	8,989	201	2,683
LD160	CORONA GARLAND	16/1/2010	10:25 a	01:03 p	8,839	158	3,357
LD194	CORONA GARLAND	16/1/2010	03:25 p	06:24 p	8,762	179	2,937
LD252	CORONA GARLAND	16/1/2010	09:45 p	12:01 a	8,552	136	3,773
LD208	CORONA GARLAND	17/1/2010	05:10 p	07:47 p	8,777	157	3,354
LD170	LILY FORTUNE	18/1/2010	12:23 p	07:05 p	8,295	402	1,238
LD236	LILY FORTUNE	18/1/2010	10:16 p	12:43 a	8,837	147	3,607
LD166	LILY FORTUNE	19/1/2010	01:14 p	03:39 p	8,575	145	3,548
LD254	SHIN SANYO MARU	21/1/2010	11:57 p	02:30 a	8,444	153	3,311
LD276	SANSHU MARU	22/1/2010	02:46 a	05:28 a	8,384	162	3,105
LD250	SANSHU MARU	22/1/2010	11:20 p	01:43 a	8,469	143	3,553
LD292	TARUMAESAN MARU	23/1/2010	05:09 a	08:05 a	8,716	176	2,971
LD176	SANSHU MARU	23/1/2010	12:23 p	02:40 p	8,460	137	3,705
LD204	CATALINA	23/1/2010	06:20 p	08:51 p	8,607	151	3,420
LD264	TARUMAESAN MARU	24/1/2010	01:20 a	03:49 a	8,038	149	3,237
LD210	SHIN SANYO MARU	24/1/2010	05:44 p	07:54 p	8,387	130	3,871
LD244	BULK EUROPE	24/1/2010	09:14 p	11:46 p	8,769	152	3,462
LD284	SHIN SANYO MARU	25/1/2010	02:43 a	05:26 a	8,472	163	3,119
LD126	TARUMAESAN MARU	25/1/2010	05:59 a	08:42 a	8,373	163	3,082
LD164	BULK EUROPE	25/1/2010	10:47 a	01:05 p	8,676	138	3,772
LD104	OCEAN CELEBRITY	26/1/2010	03:59 a	07:26 a	8,580	207	2,487
LD168	OCEAN CELEBRITY	27/1/2010	12:49 p	11:59 p	8,419	670	754
LD284	OCEAN CELEBRITY	28/1/2010	02:35 a	05:14 a	8,453	159	3,190
LD170	TARUMAESAN MARU	28/1/2010	12:53 p	03:11 p	8,501	138	3,696
LD226	ELENI	28/1/2010	08:47 p	11:29 p	8,650	162	3,204
LD266	ELENI	29/1/2010	12:59 a	03:28 a	7,915	149	3,187
LD140	ELENI	29/1/2010	08:55 a	11:20 a	8,086	145	3,346
LD240	ELENI	29/1/2010	09:33 p	12:34 a	8,599	181	2,850
LD122	OCEAN CELEBRITY	30/1/2010	05:03 a	07:23 a	8,486	140	3,637
LD176	ELENI	30/1/2010	01:20 p	03:49 p	8,665	149	3,489
LD226	CHINA STEEL TRADER	30/1/2010	07:05 p	09:42 p	8,531	157	3,260
LD286	CHINA STEEL TRADER	1/2/2010	02:35 a	05:09 a	8,809	154	3,432
LD148	SHIRAMIZU	1/2/2010	08:50 a	11:24 a	8,396	154	3,271
LD202	MEDI GENOVA	1/2/2010	03:48 p	06:10 p	8,236	142	3,480
LD252	KOYO MARU	4/2/2010	10:09 p	12:28 a	8,199	139	3,539
LD278	MONEMVASIA	5/2/2010	01:04 a	03:30 a	8,511	146	3,498
LD172	SHIN NICHIHO	6/2/2010	11:12 a	01:45 p	8,615	153	3,378
LD226	MONEMVASIA	6/2/2010	07:49 p	10:05 p	7,933	136	3,500
LD276	CHINA STEEL ENTREPR	7/2/2010	12:57 a	03:25 a	8,988	148	3,644
LD118	CHINA STEEL ENTREPR	7/2/2010	05:08 a	07:43 a	8,751	155	3,388
LD180	CHINA STEEL ENTREPR	7/2/2010	01:57 p	04:21 p	8,609	144	3,587
LD260	CHINA STEEL ENTREPR	7/2/2010	11:31 p	01:42 a	8,182	131	3,747
LD252	CHINA STEEL ENTREPR	9/2/2010	10:15 p	12:37 a	8,346	142	3,527
LD280	GENCO WARRIOR	10/2/2010	12:57 a	03:23 a	8,421	146	3,461
LD190	GENCO WARRIOR	10/2/2010	02:35 p	04:55 p	8,386	140	3,594
LD262	NORTH FORTUNE III	11/2/2010	11:17 p	01:39 a	8,621	142	3,643
LD176	NORTH FORTUNE III	12/2/2010	12:00 a	01:00 a	8,757	60	8,757
LD126	TONG YING	12/2/2010	05:47 a	08:31 a	8,226	164	3,009
LD272	OCEAN CAMELOT	12/2/2010	01:10 a	03:48 a	8,672	158	3,293
LD286	IRIS FRONTIER	13/2/2010	04:13 a	06:34 a	7,941	141	3,379
LD136	MICHELE BOTTIGLIERI	13/2/2010	07:29 a	09:59 a	8,417	150	3,367
LD232	IRIS FRONTIER	13/2/2010	08:16 p	10:34 p	8,553	138	3,719
LD260	IRIS FRONTIER	13/2/2010	11:21 p	01:47 a	8,662	146	3,560
LD294	IRIS FRONTIER	14/2/2010	04:20 a	06:47 a	8,797	147	3,591
LD132	AGIOS NIKOLAS	14/2/2010	08:53 a	11:01 a	8,213	128	3,850

Train Loading Report

Date: 1/01/2010 to 30/06/2010

Site: Liddell Coal Marketing Pty Limited

Train No	Vessel Name	Arrival Time	Load Start	Load End Time	Qty	Duration (min	Load Rate (T/Hr)
LD264	AGIOS NIKOLAS	14/2/2010	11:31 p	02:00 a	8,543	149	3,440
LD286	BULK MONACO	15/2/2010	02:51 a	05:32 a	8,328	161	3,104
LD112	RUBIN CAMELLIA	16/2/2010	03:56 a	06:31 a	8,286	155	3,208
LD268	OCEAN CAMELOT	16/2/2010	12:25 a	08:21 a	8,493	476	1,071
LD272	RUBIN CAMELLIA	17/2/2010	12:29 a	02:51 a	8,087	142	3,417
LD110	RUBIN CAMELLIA	18/2/2010	05:38 a	08:13 a	8,642	155	3,345
LD188	RUBIN CAMELLIA	18/2/2010	02:44 p	04:57 p	8,257	133	3,725
LD240	BANZAI	18/2/2010	08:37 p	11:05 p	8,398	148	3,405
LD122	PACIFIC CARRIER	19/2/2010	06:11 a	09:06 a	8,606	175	2,951
LD216	BANZAI	19/2/2010	04:46 p	07:18 p	8,211	152	3,241
LD256	PACIFIC CARRIER	19/2/2010	10:24 p	01:05 a	8,760	161	3,265
LD110	PACIFIC CARRIER	20/2/2010	04:26 a	06:37 a	8,022	131	3,674
LD136	BRILLIANT SUNRISE	20/2/2010	09:07 a	11:09 a	7,822	122	3,847
LD194	KWK PROVIDENCE	20/2/2010	04:05 p	06:23 p	8,418	138	3,660
LD218	MEDI SALERNO	20/2/2010	07:00 p	09:41 p	8,514	161	3,173
LD114	KWK PROVIDENCE	21/2/2010	04:59 a	07:37 a	8,501	158	3,228
LD138	GENCO LONDON	21/2/2010	08:11 a	11:20 a	8,754	189	2,779
LD182	GENCO LONDON	21/2/2010	02:39 p	05:10 p	8,763	151	3,482
LD222	MEDI SALERNO	21/2/2010	07:22 p	09:44 p	8,017	142	3,387
LD118	JAPAN PLATANUS	22/2/2010	04:54 a	07:23 a	8,601	149	3,463
LD194	GENCO LONDON	22/2/2010	02:41 p	05:00 p	8,133	139	3,511
LD232	CORONA MAJESTY	22/2/2010	07:11 p	09:41 p	8,402	150	3,361
LD106	CORONA MAJESTY	23/2/2010	04:06 a	06:28 a	8,102	142	3,423
LD200	SETO	24/2/2010	12:00 a	01:00 a	8,497	60	8,497
LD130	SETO	24/2/2010	07:16 a	10:23 a	8,235	187	2,642
LD226	IRON YANDI	25/2/2010	06:46 p	09:29 p	8,294	163	3,053
LD206	VENTURA	26/2/2010	12:00 a	01:00 a	8,557	60	8,557
LD268	VENTURA	26/2/2010	04:52 a	07:31 a	7,746	159	2,923
LD290	VENTURA	27/2/2010	03:36 a	05:57 a	8,662	141	3,686
LD168	VENTURA	27/2/2010	12:47 p	03:24 p	8,952	157	3,421
LD244	VENTURA	27/2/2010	08:48 p	11:22 p	9,072	154	3,535
LD266	VENTURA	27/2/2010	11:36 p	02:07 a	8,685	151	3,451
LD118	VENTURA	28/2/2010	06:31 a	09:19 a	8,550	168	3,054
LD164	VENTURA	28/2/2010	11:54 a	03:04 p	8,650	190	2,732
LD162	IRON YANDI	1/3/2010	10:56 a	01:16 p	7,926	140	3,397
LD108	DUHALLOW	8/3/2010	05:40 a	08:22 a	8,706	162	3,225
LD250	DUHALLOW	12/3/2010	05:46 p	08:51 p	8,741	185	2,835
LD166	FAIR WIND	16/3/2010	12:24 p	02:37 p	8,195	133	3,697
LD138	SHIN SAPPORO MARU	18/3/2010	07:52 a	10:19 a	8,012	147	3,270
LD114	DUHALLOW	19/3/2010	05:51 a	08:35 a	8,677	164	3,175
LD198	SHIN SAPPORO MARU	19/3/2010	04:15 p	06:54 p	7,993	159	3,016
LD154	C S OLIVE	20/3/2010	10:11 a	12:49 p	8,516	158	3,234
LD218	C S OLIVE	21/3/2010	12:00 a	01:00 a	8,524	60	8,524
LD160	C S OLIVE	22/3/2010	09:35 a	12:30 p	8,821	175	3,024
LD274	C S OLIVE	22/3/2010	02:40 a	05:32 a	8,635	172	3,012
LD162	C S OLIVE	23/3/2010	01:31 p	04:06 p	8,290	155	3,209
LD222	C S OLIVE	23/3/2010	06:31 p	09:03 p	8,420	152	3,324
LD120	ANANGEL ETERNITY	24/3/2010	06:25 a	08:36 a	7,839	131	3,590
LD154	ANANGEL ETERNITY	24/3/2010	10:17 a	12:27 p	8,627	130	3,982
LD118	C S OLIVE	25/3/2010	05:27 a	07:35 a	7,945	128	3,724
LD168	ANANGEL ETERNITY	25/3/2010	02:37 p	05:08 p	8,630	151	3,429
LD258	ANANGEL ETERNITY	25/3/2010	12:28 a	02:50 a	8,522	142	3,601
LD120	MEDI HONG KONG	26/3/2010	06:04 a	08:28 a	8,598	144	3,583
LD218	MEDI HONG KONG	26/3/2010	05:29 p	08:23 p	8,143	174	2,808
LD250	ANANGEL ETERNITY	26/3/2010	10:08 p	12:32 a	8,542	144	3,559
LD128	MEDI HONG KONG	27/3/2010	06:35 a	09:30 a	8,338	175	2,859
LD270	MEDI HONG KONG	27/3/2010	12:08 a	02:53 a	8,321	165	3,026
LD122	YAHAGI MARU	29/3/2010	05:37 a	08:16 a	8,632	159	3,258
LD154	YAHAGI MARU	29/3/2010	10:39 a	12:58 p	8,765	139	3,783
LD192	YAHAGI MARU	29/3/2010	02:52 p	05:16 p	8,616	144	3,590
LD106	CAPE PIONEER	30/3/2010	04:05 a	06:17 a	7,979	132	3,627
LD142	CAPE PIONEER	30/3/2010	08:41 a	11:00 a	8,588	139	3,707
LD254	OCEAN CELEBRITY	30/3/2010	12:11 a	02:33 a	8,717	142	3,683
LD120	OCEAN CELEBRITY	31/3/2010	05:49 a	09:00 a	8,620	191	2,708
LD286	OCEAN CELEBRITY	3/4/2010	03:58 a	06:16 a	8,370	138	3,639
LD226	OCEAN CELEBRITY	3/4/2010	08:23 p	10:41 p	8,423	138	3,662
LD264	OCEAN CELEBRITY	3/4/2010	11:45 p	02:13 a	8,647	148	3,505
LD126	OCEAN CELEBRITY	4/4/2010	06:31 a	09:13 a	8,742	162	3,238
LD186	KOYO MARU	5/4/2010	01:55 p	04:10 p	8,655	135	3,847
LD228	KWK PROVIDENCE	10/4/2010	09:54 p	12:12 a	8,460	138	3,678

Train Loading Report

Date: 1/01/2010 to 30/06/2010

Site: Liddell Coal Marketing Pty Limited

Train No	Vessel Name	Arrival Time	Load Start	Load End Time	Qty	Duration (min	Load Rate (T/Hr)
LD136	KWK PROVIDENCE	11/4/2010	08:01 a	10:11 a	8,221	130	3,794
LD242	KWK PROVIDENCE	11/4/2010	10:15 p	12:38 a	8,543	143	3,584
LD174	KWK PROVIDENCE	12/4/2010	12:07 p	02:32 p	8,682	145	3,593
LD218	KWK PROVIDENCE	12/4/2010	05:27 p	08:27 p	8,333	180	2,778
LD214	HOKURIKU MARU	13/4/2010	06:45 p	09:20 p	8,505	155	3,292
LD176	HOKURIKU MARU	14/4/2010	01:22 p	03:50 p	8,352	148	3,386
LD252	HOKURIKU MARU	14/4/2010	09:46 p	12:13 a	8,525	147	3,480
LD180	HOKURIKU MARU	15/4/2010	12:38 p	03:06 p	8,224	148	3,334
LD274	HOKURIKU MARU	16/4/2010	01:04 a	03:26 a	8,323	142	3,517
LD130	RBD CAPRI	16/4/2010	04:36 a	06:55 a	8,236	139	3,555
LD146	JAPAN PLATANUS	20/4/2010	09:41 a	11:56 a	8,083	135	3,593
LD198	JAPAN PLATANUS	20/4/2010	06:26 p	08:42 p	8,120	136	3,582
LD190	JAPAN PLATANUS	21/4/2010	04:33 p	07:09 p	7,855	156	3,021
LD220	MARIVICTORIA	21/4/2010	07:47 p	10:22 p	8,583	155	3,322
LD112	MARIVICTORIA	22/4/2010	04:37 a	06:48 a	8,568	131	3,924
LD128	SEA BREEZE	23/4/2010	07:31 a	10:06 a	8,624	155	3,338
LD228	MANASOTA	23/4/2010	06:45 p	09:14 p	8,480	149	3,415
LD252	SEA BREEZE	23/4/2010	11:23 p	02:20 a	7,830	177	2,654
LD128	MANASOTA	24/4/2010	06:42 a	09:18 a	8,604	156	3,309
LD246	SEA BREEZE	24/4/2010	10:39 p	12:47 a	7,997	128	3,749
LD288	MANASOTA	25/4/2010	02:18 a	04:55 a	8,431	157	3,222
LD120	SEA BREEZE	25/4/2010	05:49 a	08:27 a	8,119	158	3,083
LD166	SEA BREEZE	25/4/2010	11:38 a	01:51 p	8,336	133	3,761
LD230	MANASOTA	25/4/2010	07:23 p	10:08 p	8,436	165	3,068
LD266	SEA BREEZE	26/4/2010	12:38 a	02:55 a	8,436	137	3,695
LD116	SEA BREEZE	26/4/2010	05:23 a	07:59 a	8,282	156	3,185
LD218	C S PEGASUS	27/4/2010	07:00 p	09:28 p	8,550	148	3,466
LD242	C S PEGASUS	27/4/2010	09:40 p	12:11 a	8,085	151	3,213
LD120	C S PEGASUS	28/4/2010	06:01 a	08:18 a	8,450	137	3,701
LD154	ASAHI MARU	28/4/2010	10:33 a	12:49 p	8,423	136	3,716
LD240	C S PEGASUS	28/4/2010	08:39 p	11:01 p	8,503	142	3,593
LD192	ASAHI MARU	29/4/2010	03:07 p	05:54 p	8,445	167	3,034
LD218	ASAHI MARU	29/4/2010	06:44 p	09:33 p	8,362	169	2,969
LD278	OCEAN PARK	1/5/2010	02:15 a	04:41 a	8,146	146	3,348
LD158	OCEAN PARK	1/5/2010	10:29 a	01:03 p	8,567	154	3,338
LD218	SAGE SAGITTARIUS	1/5/2010	05:00 p	07:12 p	8,425	132	3,830
LD258	SAGE SAGITTARIUS	1/5/2010	11:40 p	02:03 a	8,410	143	3,529
LD132	MARITIME NEWANDA	2/5/2010	07:07 a	09:51 a	8,702	164	3,184
LD160	SAGE SAGITTARIUS	2/5/2010	10:59 a	01:22 p	8,635	143	3,623
LD126	MARITIME NEWANDA	3/5/2010	08:18 a	11:11 a	8,271	173	2,869
LD266	SAGE SAGITTARIUS	3/5/2010	11:56 p	02:04 a	8,202	128	3,845
LD104	SAGE SAGITTARIUS	4/5/2010	05:54 a	09:28 a	8,361	214	2,344
LD164	CAPE TREASURE	5/5/2010	10:37 a	01:10 p	8,276	153	3,246
LD122	SAGE SAGITTARIUS	6/5/2010	07:19 a	09:50 a	8,251	151	3,278
LD152	SAGE SAGITTARIUS	6/5/2010	12:41 p	02:56 p	8,524	135	3,788
LD256	SANTA ISABEL	6/5/2010	11:36 p	02:06 a	8,415	150	3,366
LD282	SANTA ISABEL	7/5/2010	02:53 a	04:45 a	7,335	112	3,929
LD172	SU-OH	7/5/2010	12:06 p	02:21 p	8,368	135	3,719
LD222	SU-OH	7/5/2010	07:32 p	09:41 p	8,340	129	3,879
LD270	CAPE TREASURE	8/5/2010	01:30 a	03:50 a	7,596	140	3,255
LD114	SU-OH	8/5/2010	04:32 a	07:23 a	8,428	171	2,957
LD252	SU-OH	8/5/2010	12:09 a	02:29 a	8,233	140	3,529
LD292	EMERALD STREAM	9/5/2010	04:07 a	06:31 a	8,481	144	3,534
LD156	EMERALD STREAM	9/5/2010	10:03 a	01:33 p	8,369	210	2,391
LD236	IRON YANDI	12/5/2010	07:50 p	10:29 p	8,083	159	3,050
LD262	YONG JIA	13/5/2010	11:28 p	01:36 a	7,966	128	3,734
LD238	YONG JIA	14/5/2010	12:00 a	01:00 a	8,396	60	8,396
LD210	MAPLE WAVE	15/5/2010	04:52 p	07:02 p	8,185	130	3,778
LD126	TARUMAESAN MARU	16/5/2010	06:48 a	09:04 a	8,634	136	3,809
LD256	TARUMAESAN MARU	16/5/2010	10:08 p	12:12 a	7,724	124	3,737
LD226	TARUMAESAN MARU	17/5/2010	06:47 p	08:46 p	7,408	119	3,735
LD256	IRON YANDI	20/5/2010	04:57 p	07:11 p	7,546	134	3,379
LD198	IRON YANDI	21/5/2010	03:49 p	05:50 p	7,495	121	3,716
LD124	NSS FORTUNE	22/5/2010	08:05 a	10:43 a	7,430	158	2,822
LD234	NSS FORTUNE	22/5/2010	08:14 p	10:48 p	8,449	154	3,292
LD264	NSS FORTUNE	23/5/2010	11:21 p	01:26 a	7,984	125	3,832
LD102	NSS FORTUNE	24/5/2010	03:10 a	05:17 a	7,635	127	3,607
LD146	NSS FORTUNE	24/5/2010	10:25 a	12:57 p	8,423	152	3,325
LD196	NSS FORTUNE	24/5/2010	03:41 p	05:51 p	7,717	130	3,562
LD130	NSS FORTUNE	25/5/2010	07:17 a	09:45 a	8,671	148	3,515

Train Loading Report

Date: 1/01/2010 to 30/06/2010

Site: Liddell Coal Marketing Pty Limited

Train No	Vessel Name	Arrival Time	Load Start	Load End Time	Qty	Duration (min	Load Rate (T/Hr)
LD270	DYNA CAMELLIA	26/5/2010	02:15 a	04:33 a	8,388	138	3,647
LD224	DYNA CAMELLIA	26/5/2010	08:29 p	10:33 p	8,602	124	4,162
LD290	DYNA CAMELLIA	27/5/2010	03:03 a	05:39 a	8,491	156	3,266
LD262	SAKURA WAVE	27/5/2010	11:57 p	03:08 a	7,866	191	2,471
LD134	LEGATO	28/5/2010	12:00 a	01:00 a	8,765	60	8,765
LD206	SAKURA WAVE		12:00 a	01:00 a	8,239	60	8,239
LD292	LEGATO		12:00 a	01:00 a	8,645	60	8,645
LD192	LEGATO	29/5/2010	03:27 p	05:52 p	8,514	145	3,523
LD172	SAKURA WAVE	30/5/2010	12:00 a	01:00 a	8,555	60	8,555
LD288	LEGATO	30/5/2010	02:40 a	04:56 a	8,495	136	3,748
LD124	GLOBAL GALAXY	30/5/2010	06:29 a	08:41 a	8,372	132	3,805
LD200	SOPHIA	30/5/2010	03:55 p	06:04 p	7,865	129	3,658
LD236	SAKURA WAVE	30/5/2010	10:33 p	12:50 a	8,140	137	3,565
LD142	SOPHIA	31/5/2010	09:20 a	11:41 a	8,470	141	3,604
LD194	DOUBLE HAPPINESS	31/5/2010	04:43 p	07:36 p	8,656	173	3,002
LD230	TIARE	31/5/2010	08:04 p	10:22 p	8,527	138	3,707
LD194	PITSA D	1/6/2010	03:58 p	06:05 p	8,317	127	3,929
LD224	PITSA D	2/6/2010	08:09 p	10:39 p	8,695	150	3,478
LD284	KOMATSUSHIMA STAR	10/6/2010	03:25 a	05:48 a	8,364	143	3,509
LD154	DONG-A HERMES	10/6/2010	11:50 a	02:29 p	8,933	159	3,371
LD106	KOMATSUSHIMA STAR	10/6/2010	04:03 a	06:51 a	8,375	168	2,991
LD246	SANTA LUCIA	13/6/2010	10:08 p	12:19 a	8,117	131	3,718
LD134	SANTA LUCIA	14/6/2010	07:07 a	09:54 a	7,475	167	2,685
LD176	SAFE VOYAGER	14/6/2010	01:54 p	04:26 p	8,639	152	3,410
LD256	SAFE VOYAGER	15/6/2010	01:01 a	03:28 a	8,387	147	3,423
LD226	SAFE VOYAGER	15/6/2010	09:04 p	11:30 p	8,366	146	3,438
LD258	SAFE VOYAGER	15/6/2010	12:07 a	02:36 a	8,305	149	3,344
LD112	SHIRANE	17/6/2010	04:12 a	07:04 a	8,395	172	2,928
LD216	SHIRANE	17/6/2010	05:46 p	08:24 p	8,693	158	3,301
LD286	SHIRANE	18/6/2010	02:52 a	04:59 a	8,390	127	3,964
LD150	SHIRANE	18/6/2010	08:50 a	11:10 a	8,774	140	3,760
LD228	SHIRANE	18/6/2010	08:21 p	10:52 p	8,383	151	3,331
LD128	RZS HARMONY	19/6/2010	06:40 a	09:01 a	8,081	141	3,439
LD242	ANEMONE	19/6/2010	09:09 p	11:41 p	8,122	152	3,206
LD112	ANEMONE	20/6/2010	04:51 a	07:21 a	7,704	150	3,082
LD238	ANEMONE	20/6/2010	09:41 p	11:59 p	8,280	138	3,600
LD110	GLOBAL SPLENDOUR	21/6/2010	04:03 a	07:54 a	8,777	231	2,280
LD218	GLOBAL SPLENDOUR	21/6/2010	06:31 p	11:05 p	8,703	274	1,906
LD192	MAIZURU DAIKOKU	22/6/2010	02:19 p	04:31 p	8,119	132	3,691
LD216	MAIZURU DAIKOKU	22/6/2010	06:42 p	09:19 p	8,476	157	3,239
LD288	SINCERE PISCES	23/6/2010	03:54 a	09:47 a	966	353	164
LD166	MAIZURU DAIKOKU	23/6/2010	10:51 a	01:22 p	8,553	151	3,398
LD230	SINCERE PISCES	23/6/2010	09:10 p	11:31 p	8,503	141	3,618
LD264	SINCERE PISCES	23/6/2010	12:37 a	03:00 a	8,343	143	3,501
LD268	AUSTIN	24/6/2010	12:00 a	01:00 a	8,483	60	8,483
LD126	AUSTIN	24/6/2010	07:07 a	09:18 a	8,352	131	3,825
LD112A	MARITIME HARMONY	25/6/2010	12:00 a	01:00 a	673	60	673
LD208	MAIZURU DAIKOKU	25/6/2010	04:10 p	06:34 p	8,389	144	3,496
LD142	PRABHU YUVIKA	27/6/2010	07:54 a	10:21 a	8,730	147	3,563
LD188	PRABHU YUVIKA	27/6/2010	01:59 p	04:22 p	8,556	143	3,590
LD216	MARITIME HARMONY	27/6/2010	05:05 p	08:16 p	8,250	191	2,592
LD292	PRABHU YUVIKA	28/6/2010	03:06 a	05:35 a	8,416	149	3,389
LD120	CAPE TREASURE	28/6/2010	06:18 a	08:47 a	8,387	149	3,377
LD288	CAPE TREASURE	29/6/2010	03:38 a	05:46 a	8,259	128	3,871
LD134	SPRING PRIDE	29/6/2010	06:33 a	09:26 a	8,530	173	2,958
LD168	SPRING PRIDE	29/6/2010	12:04 p	02:36 p	8,435	152	3,330

Summary

Number of Trains:	266
Total Nett Weight:	2,219,818.1
Average Nett Weight:	8,345.2
Average Load Rate:	3,290.2
Average Load Duration:	152.2

Total Tonnes Railed

Train Loading Report

Date: 1/01/2010 to 30/06/2010

Site: Liddell Coal Marketing Pty Limited

LID10	588,883
LID11	18,516
LID12	619,347
LID14	484,269
LID8	43,107
LID9	168,412
LID9.5	297,283

Stockpile (t's)	**30/6/2010**
LID9	19,423
LID12	28,019
LID14	13,548
LID10	8,766
LID11	0
LID8	0
LID35	0
LID9.5	6,194

Appendix 2

Risk Assessment Review

Aspect	Impact	Activity	Current Controls	Heirarchy of Control	Consequence	Likelihood	Risk Ranking	Further Controls		
Vegetation Removal - Disturbance of natural habitat	Loss of threatened native flora and fauna	Exploration and clearing	Clearing permits EMS Landscape Management Plan Drilling procedure/inspections	Administrative	2	B	5			
Vegetation removal - Distrubance of Arch sites without permit	Distrubance of aboriginal sites	Exploration and clearing	Clearing permits EMS Landscape Management Plan Drilling procedure/inspections Aboriginal Cultural Heritage Management Plan		2	B	5			
Ground disturbance	Sedimentation of streams	Exploration, clearing, Topsoil management	Silt Fencing Clearing permits Water Management Plan Landscape Management Plan EMS		2	C	8			
Water Management	Unecessary capture of clean water	Clearing, Mining, Rehabilitation	EMS Water Management Plan Erosion and Sediment Control Plan Ground Disturbance Permit		1	B	2			
	Water pollution (Uncontrolled Discharge - pipe or dam failure)	Mining, Coal Handling and Processing			2	C	8	Old pipe infrasturcture over creek corssings requires further environmental controls (flow meters, citech). Capital works planned for 2011.	M. Howes	
Drilling	Noise pollution	Exploration and clearing, blasting	EMS Noise Management Plan and Procedure Ground Disturbance Permit Drilling Procedure / Inspections Proximity to residences / Elevation		2	B	5			
	Air quality impact	Exploration and clearing, blasting	EMS Air Quality Monitoring Program Dust suppression on drills Drilling Procedure / Inspections		2	D	12			
Storage and use of Hazardous materials	Land contamination	Exploration and clearing, Coal Handling and processing, Blasting, Mining, Maintenance	MSDS Chemalert Spill Kits Spill response training Drilling Procedures / Inspections / Maintenance Spill response procedure		2	C	8			
	Offsite Water Pollution	Exploration and clearing, Coal Handling and processing, Blasting, Mining, Maintenance	MSDS Chemalert Spill Kits Spill response training Drilling Procedures / Inspections / Maintenance Spill response procedure		3	B	9			
Rehabilitation of drill sites	Failure of revegetation, sump rehabilitation	Exploration	MOP EMS Post drilling inspections Landscape Management Plan		1	B	2			
Topsoil removal	Air quality impact	Topsoil, clearing	EMS Land Clearing and Topsoil Stripping Procedure (LCO SD PRO 0007) Erosion and Sediment Control Plan Air Quality Monitoring Program Real-time dust monitoring network Participation		2	D	12			
Topsoil/subsoil stockpiling	Poor quality topsoil for reuse on Rehabilitation areas (loss of organic material, weed infestations, etc)	Topsoil, clearing	MOP Weed Management Program Landscape Management Plan Mine Closure Plan Land Clearing and Topsoil Stripping Procedure		1	D	7			

Blasting vibration and overpressure	Exceed criteria	Blasting	Blast Management Plan Blast Monitoring Blasting in Sensitive Areas Procedure Communication of Blasting Procedure Blasting, design and loading procedures (mining)		2	D	12			
	Damage to heritage listed buildings (CoP)	Blasting	Blast Management Plan Blast Monitoring Blasting in Sensitive Areas Procedure Communication of Blasting Procedure Blasting, design and loading procedures (mining)		2	B	5			
	Damage to other infrastructure (roads, conveyors, railway)	Blasting	Blast Management Plan Blast Monitoring Blasting in Sensitive Areas Procedure Communication of Blasting Procedure Blasting, design and loading procedures (mining)		2	A	3			
Blasting - dust/fume emissions from blasting	Air quality impact	Blasting	Blast Management Plan Blast Monitoring Blasting in Sensitive Areas Procedure Communication of Blasting Procedure Blasting, design and loading procedures (mining) Air Quality Monitoring Program		2	D	12			
Excavation, Transport and emplacement of material	Air quality impact	Mining, Coaling	Dumping Procedures EMS MOP Air Quality monitoring Program Inspections Dust Suppression and Road Watering (LCO MIN PRO 0003) ROM stockpile Management Procedure (LCO CHP PRO		2	D	12			
	Noise pollution	Mining, Coaling	Noise Monitoring Program EMS Proximity to Residence Real-time noise monitoring network (alarms) Noise Management Procedure		2	D	12			
	Visual Amenity (lighting)	Mining, Coaling	Lighting Management Plan (LCO SD EXT 0061) Lighting Plants (LCO MIN PRO 0007) Workplace Lighting (LCO ENG GDL 0013) Planned task observations		2	B	5			
	Spontaneous Combustion	Mining, Coaling	Spontaneous Combustion (LCO CHP GDL 0001) Spontaneous Combustion (LCO MIN PLN 0007) Loading in Sponstaneous Combustion and Reactive Sulphide Areas (LCO MIN PRO 0013) Spontaneous Combustion Management Plan (LCO SD EXT 0062)		2	D	12			
	Non-compliance with final landform design	Mining, Coaling	MOP Landscape Management Plan Mine Closure Plan EMS Survey control		1	C	4			

Coal Handling and Processing	Air quality impact	Coaling	CHPP Stockpile Inspection Checklist (LCO CHP FRM 0004) EMS MOP Air Quality monitoring Program Inspections ROM stockpile Management Procedure (LCO CHP PRO		2	B	5			
	Noise pollution	Coaling	Noise Monitoring Program EMS Proximity to Residence Real-time noise monitoring network (alarms) Noise Management Procedure Wall sheet on the CHPP Building		1	A	1			
	Land contamination	Coaling	Underpans Inspections Cleanup / Maintenance Activities Sumps Dirty Water management system		1	B	2			
	Water pollution	Coaling	Underpans Inspections Cleanup / Maintenance Activities Sumps Dirty Water management system		2	C	8	Bellypan installation on the section over Bayswater Creek (Maintenance process)	N. Arnold	
Tailings & Reject Disposal	Land pollution (leakage)	Coaling	EMS MOP Reservoir Tailings Emplacement Area Operations Manual (LCO MIN GDL 0002) Signage Inspections Differential flow meters - citec		2	B	5			
	Dam Failure	Coaling	EMS MOP Perscribed Dam - DSC		3	A	6	Tailings / emplacement management strategy (including approvals) to be investigated and published on the intranet		
	Groundwater contamination	Coaling	Piezometers Water Management Plan Water Monitoring Program		2	B	5			

Rehabilitation of Mined areas	Rehabilitation failure to achieve completion criteria	Rehabilitation	MOP Landscape Management Plan Mine Closure Plan EMS Survey control Rehabilitation Management Procedure		1	B	2			
	Air quality impact	Rehabilitation	EMS MOP Air Quality monitoring Program Inspections Topsoil Stripping and Land Clearing Procedure		1	B	2			
	Noise pollution	Rehabilitation	Noise Monitoring Program EMS Proximity to Residence Real-time noise monitoring network (alarms) Noise Management Procedure		2	B	5			
	Water pollution (salinity and turbidity)	Rehabilitation, Land Management	Rehabilitation Procedure Landscape Management Plan Water Management Plan MOP		2	B	5			
	Spontaneous Combustion (landform stability)	Rehabilitation	Spontaneous Combustion (LCO MIN PLN 0007) Loading in Sponstaneous Combustion and Reactive Sulphide Areas (LCO MIN PRO 0013) Spontaneous Combustion Management Plan (LCO SD EXT 0063)		2	A	3			
	Bushfire	Land Management, Rehabilitation	Landscape Management Plan MOP EMS Rural Fire Service First Response Procedures		2	C	8			
	Weed infestation offsite impact	Land Management, Rehabilitation	Weed Management Program Landscape Management Plan Inspections MOP EMS Biodiversity and Land Management Plan		2	B	5			
	Feral Animal offsite impact	Land Management, Rehabilitation	Feral animal control program Flora & Fauna Management Plan Biodiversity and Land Management Plan Rural Lands Protection Board		2	C	8			
	Native animal control	Land Management, Rehabilitation	Flora & Fauna Management Plan Biodiversity and Land Management Plan Rural Lands Protection Board		2	B	5			
	Overgrazing	Land Management, Rehabilitation	Flora & Fauna Management Plan Biodiversity and Land Management Plan Rural Lands Protection Board		1	B	2			
Management of Waste	Water Pollution	Waste	Water Management Plan MOP EMS Dirty water management system		1	C	4			
	Land contamination	Waste	EMS MOP Certified Contractors engaged		1	C	4			
	Ineffective waste management	Waste	EMS MOP Certified Contractors engaged		1	C	4			
Energy & Greenhouse	Inefficient use of Electricity	Energy	Energy Savings Action Plan National Greenhouse and Energy Reporting Scheme Cost & Budget tracking		2	B	5			
	Excessive generation of fugitive emissions	Energy	ESAP GHG exploration program (emissions factor)		2	B	5			
	excessive use of diesel	Energy	Energy Savings Action Plan National Greenhouse and Energy Reporting Scheme Cost & Budget tracking		2	B	5			

Appendix 3

High Volume Air Sampler Dust Monitoring

Results

Appendix 3 – PM_{10} and TSP Monitoring Results for Ravensworth Farm, Scrivens Property and Antienne July 2009 to June 2010 Reporting Period

	Ravensworth Farm (HVAS 6)		Scrivens (HVAS 12)		Antienne (HVAS 21)	
Date	PM_{10} (ug/m^3)	Monthly Mean	PM_{10} (ug/m^3)	Monthly Mean	PM_{10} (ug/m^3)	Monthly Mean
5-Jul-09	5		5			
11-Jul-09	7		8			
17-Jul-09	10		4			
23-Jul-09	15		2			
29-Jul-09	8	**9**	2	**4**		
4-Aug-09	19		3			
10-Aug-09	33		27			
16-Aug-09	22		9			
22-Aug-09	19		7			
28-Aug-09	35	**26**	8	**11**		
3-Sep-09	30		21			
9-Sep-09	21		3			
15-Sep-09	45		42			
21-Sep-09	34		14			
27-Sep-09	67	**39**	17	**19**		
3-Oct-09	11		12			
9-Oct-09	7		131c			
15-Oct-09	56		11			
21-Oct-09	40		25			
27-Oct-09	7	**24**	8	**14**		
2-Nov-09	45		31			
8-Nov-09	9		9			
14-Nov-09	41		20			
20-Nov-09	75		41			
26-Nov-09	45	**43**	33	**27**		
2-Dec-09	16		10			
8-Dec-09	84		62			
14-Dec-09	29		28			
20-Dec-09	22		34			
26-Dec-09	12	**37**	8	**28**		
31-Dec-08	21		14			
1-Jan-10	24		26			
7-Jan-10	63		37			
13-Jan-10	38		14			
19-Jan-10	51		46			
25-Jan-10	11	**37**	7	**26**		
31-Jan-10	8		8			
6-Feb-10	44		16			
12-Feb-10	17		14			
18-Feb-10	22	**23**	20	**15**		
24-Feb-10	16		16			
2-Mar-10	24		13			
8-Mar-10	1		6			
14-Mar-10	34		45			
20-Mar-10	35	**22**	24	**21**		

	Ravensworth Farm (HVAS 6)		Scrivens (HVAS 12)		Antienne (HVAS 21)	
Date	**PM_{10} (ug/m^3)**	**Monthly Mean**	**PM_{10} (ug/m^3)**	**Monthly Mean**	**PM_{10} (ug/m^3)**	**Monthly Mean**
1-Apr-10	18		20		**New Location**	
7-Apr-10	6		20			
13-Apr-10	17		20			
19-Apr-10	9		42			
25-Apr-10	15	**13**	10	**22**		
1-May-10	22		17			
7-May-10	26		13		14	
13-May-10	22		9		16	
19-May-10	17		12		13	
25-May-10	17		4		8	
31-May-10	9	**19**	5	**10**	2	**11**
6-Jun-10	25		5		6	
12-Jun-10	15		6		9	
18-Jun-10	25		9		13	
24-Jun-10	15		8		25	
30-Jun-10	23	**21**	2	**6**	8	**12**
Annual Average	**26**		**17**		**11**	

Note: c – Result should be considered an estimate only. Make up run carried out on 13 October after HVAS failed to run on scheduled run day. Result not included in annual average calculation (AECOM).

	Ravensworth Farm (HVAS 13)		Scrivens (HVAS 11)		Antienne (HVAS 20)	
Date	TSP ($ug.m^{-3}$)	Monthly Mean	TSP ($ug.m^{-3}$)	Monthly Mean	TSP ($ug.m^{-3}$)	Monthly Mean
5-Jul-09	88		19			
11-Jul-09	57		17			
17-Jul-09	82		16			
23-Jul-09	16		46			
29-Jul-09	47	**58**	9	**21**		
4-Aug-09	118		16			
10-Aug-09	120		70			
16-Aug-09	113		24			
22-Aug-09	89		25			
28-Aug-09	130	**114**	21	**31**		
3-Sep-09	95		46			
9-Sep-09	93		14			
15-Sep-09	161		106			
21-Sep-09	109		48			
27-Sep-09	193	**130**	108	**64**		
3-Oct-09	64		39			
9-Oct-09	60		40			
15-Oct-09	182		49			
21-Oct-09	158		77			
27-Oct-09	31	**99**	22	**45**		
2-Nov-09	172		68			
8-Nov-09	30		28			
14-Nov-09	112		62			
20-Nov-09	226		111			
26-Nov-09	185	**145**	94	**73**		
2-Dec-09	80		33			
8-Dec-09	265		142			
14-Dec-09	80		71			
20-Dec-09	81		59			
26-Dec-09	21	**105**	16	**64**		
1-Jan-10	64		24			
7-Jan-10	75		55			
13-Jan-10	203		82			
19-Jan-10	137		45			
25-Jan-10	138		103			
31-Jan-10	36	**118**	35	**64**		
6-Feb-10	42		27			
12-Feb-10	177		50			
18-Feb-10	70		51			
24-Feb-10	88	**94**	53	**45**		
2-Mar-10	132		69			
8-Mar-10	89		45			
14-Mar-10	28		22			
20-Mar-10	113		est 322			
26-Mar-10	129	**98**	66	**51**		
1-Apr-10	56		45			
7-Apr-10	23		19			
13-Apr-10	71		59			
19-Apr-10	53		est 334			

	Ravensworth Farm (HVAS 13)		Scrivens (HVAS 11)		Antienne (HVAS 20)	
Date	**TSP ($ug.m^{-3}$)**	**Monthly Mean**	**TSP ($ug.m^{-3}$)**	**Monthly Mean**	**TSP ($ug.m^{-3}$)**	**Monthly Mean**
25-Apr-10	71	**55**	27	**38**	**New Location**	
1-May-10	71		33			
7-May-10	91		36		62	
13-May-10	120		28		38	
19-May-10	90		38		53	
25-May-10	39		18		28	
31-May-10	34	**74**	3	**26**	7	**38**
6-Jun-10	94		16		24	
12-Jun-10	79		22		29	
18-Jun-10	89		18		23	
24-Jun-10	48		17		71	
30-Jun-10	91	**80**	6	**16**	26	**35**
Annual Average	**97**		**44**		**36**	

Note: est – Results deemed to be influenced by nearby construction activity and is inconsistent with historical results from this site. Results not included in annual average calculation (AECOM).

Appendix 4

Surface Water Monitoring Results

Appendix 4 – Liddell Colliery Monthly Surface Water Results for Bayswater Creek for July 2009 to June 2010 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-09	8.0	4540	12	2900	8.5	5180	4	3430	7.9	7300	4	5180
Aug-09	7.9	3950	14	2600	8.4	4940	2	3400	7.3	5740	4	4300
Sep-09	7.4	3830	10	2400	8.3	5080	9	3400	7.1	12130	250	9600
Oct-09	7.7	4110	5	2700	8.2	5210	3	3500	Dry	Dry	Dry	Dry
Nov-09	7.5	3920	<1	2600	7.9	5110	<1	3500	Dry	Dry	Dry	Dry
Dec-09	7.6	3780	2	2400	8.0	5290	3	3500	Dry	Dry	Dry	Dry
Jan-10	7.7	4160	14	3000	8.0	5200	15	3540	Dry	Dry	Dry	Dry
Feb-10	7.5	3010	4	1900	7.9	4520	3	2800	7.7	1154	69	910
Mar-10	7.1	3750	18	2400	7.6	5190	5	3500	Dry	Dry	Dry	Dry
Apr-10	8.2	5430	14	2512	7.8	3840	2	3504	Dry	Dry	Dry	Dry
May-10	7.7	4220	5	2842	8.4	5130	2	3528	Dry	Dry	Dry	Dry
Jun-10	7.7	2900	13	1812	8.1	4200	0	2758	8.0	727	23	842
Average	**7.7**	**3967**	**10**	**2506**	**8.1**	**4908**	**4**	**3363**	**7.6**	**5410**	**70**	**4166**

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-09	8.1	719	2	404	8.1	938	4	533
Aug-09	8.5	792	0	410	8.3	1037	4	580
Sep-09	8.1	875	2	470	8.0	1231	3	710
Oct-09	7.8	905	2	480	7.6	1346	2	760
Nov-09	7.9	941	1	500	7.6	1422	1	820
Dec-09	7.9	943	4	440	7.5	1544	5	830
Jan-10	8.1	1070	<1	620	7.4	1627	14	988
Feb-10	8.0	1002	18	760	7.4	1679	3	1000
Mar-10	8.0	1000	2	620	7.6	1763	3	1000
Apr-10	7.7	1023	4	570	7.2	1820	4	1074
May-10	8.1	1021	3	634	7.5	1799	2	1124
Jun-10	8.4	796	2	380	8.2	998	5	580
Average	**8.0**	**924**	**4**	**524**	**7.7**	**1434**	**4**	**833**

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 (Bowmans Creek Upstream)				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-09	8.1	719	2	404	8.1	894	2	506	8.1	839	2	472	8.2	861	3	494
Oct-09	7.8	905	2	480	7.5	3050	12	1900	7.6	1457	2	790	7.9	1713	1	720
Jan-10	8.1	1070	<1	620	7.5	1940	3	1400	8.0	1600	<1	978	Dry	Dry	Dry	Dry
Apr-10	7.7	1023	4	570	7.4	4270	3	3052	7.9	1761	1	1050	Dry	Dry	Dry	Dry
Average	**7.9**	**929**	**3**	**519**	**7.6**	**2359**	**5**	**1715**	**7.9**	**1414**	**2**	**823**	**8.1**	**1089**	**2**	**607**

Month	BCK3				BCK4				BCK5				BCK6 (Bowmans Creek 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)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jul-09	7.9	882	3	566	8.0	956	4	580	8.0	945	4	600	8.1	938	4	533
Oct-09	8.0	1119	14	620	7.8	1800	2	1000	7.9	1659	20	880	7.6	1346	2	760
Jan-10	8.1	1230	50	716	7.8	2140	2	1310	8.0	1920	28	1130	7.4	1627	14	988
Apr-10	8.1	1374	23	868	7.6	2250	2	1350	8.1	2050	32	1176	7.2	1820	4	1074
Average	**8.0**	**1151**	**23**	**693**	**7.8**	**1787**	**3**	**1060**	**8.0**	**1644**	**21**	**947**	**7.6**	**1433**	**6**	**851**

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: 8 July 2009

ANALYSIS DESCRIPTION	ANZECC Guideline[1]	UNIT	Bowmans Creek Upstream	Bowmans Creek Downstream	Bayswater Creek Upstream	Bayswater Creek Midstream	Bayswater Creek Downstream
pH	-		8.05	8.1	7.95	8.52	7.85
Conductivity @ 25°C	-	uS/cm	719	938	4540	5180	7300
Total Dissolved Solids	-	mg/L	404	533	2900	3430	5180
Total Suspended Solids	-	mg/L	2	4	12	4	4
Chloride			104	130	843	932	1560
Sulfate - Filtered			38.4	85.4	900	1050	1540
Hydroxide as $CaCO_3$	-	mg/L	<1	<1	<1	<1	<1
Carbonate as $CaCO_3$	-	mg/L	<1	<1	<1	33	<1
Bicarbonate as $CaCO_3$	-	mg/L	172	192	394	521	609
Total Alkalinity as $CaCO_3$	-	mg/L	172	192	394	554	609
Silicon - Filtered	-	mg/L	10.4	9.25	4.11	5	4.12
Calcium - Filtered	-	mg/L	46	46	108	81	176
Magnesium - Filtered	-	mg/L	20	24	156	173	263
Sodium - Filtered	-	mg/L	67	112	679	873	1170
Potassium - Filtered	-	mg/L	2	2	12	12	13
Aluminium - Filtered	0.055	mg/L	<0.01	<0.01	<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	0.025	0.023	0.097	0.06	0.075
Cadmium - Filtered	-	mg/L	<0.0001	<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	0.003
Copper - Filtered	0.0014	mg/L	<0.001	<0.001	0.002	0.002	0.004
Lead - Filtered	0.0034	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium - Filtered	-	mg/L	0.005	0.005	0.17	0.114	0.127
Manganese - Filtered	1.9	mg/L	0.01	0.012	0.162	0.001	0.93
Nickel - Filtered	0.011	mg/L	<0.001	<0.001	0.002	0.002	0.006
Rubidium - Filtered	-	mg/L	<0.001	<0.001	0.004	0.003	0.003
Selenium - Filtered	0.0011	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium - Filtered	-	mg/L	0.317	0.278	3.03	2.43	6.18
Zinc - Filtered	0.008	mg/L	<0.005	<0.005	0.006	<0.005	0.008
Boron - Filtered	0.37	mg/L	0.06	0.05	0.78	0.48	0.46
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	7.15	9.29	50.4	59.3	88
Total Cations	-	meq/L	6.96	9.25	48	56.5	81.5
Actual (Anion/Cation) Difference	-	meq/L	1.4	0.25	2.41	2.42	3.87

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

Samples Collected: 27 January 2010

ANALYSIS DESCRIPTION	ANZECC Guideline[1]	UNIT	Bowmans Creek Upstream	Bowmans Creek Downstream	Bayswater Creek Upstream	Bayswater Creek Midstream
pH	-					
Conductivity @ 25°C	-	uS/cm				
Total Dissolved Solids	-	mg/L	620	988	3000	3540
Total Suspended Solids	-	mg/L	<1	14	14	15
Chloride	-	mg/L	35	175	781	963
Sulfate - Filtered	-	mg/L	192	259	827	964
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	187	234	311	549
Total Alkalinity as $CaCO_3$	-	mg/L	187	234	311	549
Silicon - Filtered	-	mg/L	13.2	11.3	4.12	4.77
Calcium - Filtered	-	mg/L	56	76	125	102
Magnesium - Filtered	-	mg/L	25	47	148	160
Sodium - Filtered	-	mg/L	104	178	596	878
Potassium - Filtered	-	mg/L	3	4	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	0.003
Beryllium - Filtered	0.024	mg/L	<0.001	<0.001	<0.001	<0.001
Barium - Filtered	0.37	mg/L	0.026	0.076	0.091	0.018
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	0.001
Lead - Filtered	-	mg/L	<0.001	<0.001	<0.001	<0.001
Lithium - Filtered	0.0014	mg/L	0.008	0.005	0.203	0.156
Manganese - Filtered	-	mg/L	0.058	1.13	0.26	0.042
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	0.004
Selenium - Filtered	0.0034	mg/L	<0.01	<0.01	<0.01	<0.01
Strontium - Filtered	-	mg/L	0.447	1.09	2.79	2.8
Zinc - Filtered	0.0011	mg/L	0.005	0.01	<0.005	0.008
Boron - Filtered	-	mg/L	0.12	0.09	0.97	0.66
Iron - Filtered	0.008	mg/L	0.06	0.33	<0.05	<0.05
Mercury - Filtered	0.0006	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Total Anions	-	meq/L	9.88	15.6	45.8	58.2
Total Cations	-	meq/L	9.52	15.5	44.7	56.8
Actual (Anion/Cation) Difference	-	meq/L	1.86	0.47	1.24	1.25

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

Month	Dam 1				Dam 4				Dam 6 (sample & field test by Liddell)				Dam 13				Dam 17			
	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jul 09	8.3	1310	3	782	8.7	4600	4	2790	8.3	5970	9	4700	8.8	5580	26	3640	8.8	4750	8	3030
Aug 09	8.9	1297	2	760	8.7	4580	3	3300	NS	NS	NS	NS	8.9	5480	22	3500	8.8	4530	29	2900
Sept 09	8.7	1331	4	780	8.6	5150	2	3400	8.2	6140	5	4500	8.7	5730	20	3900	8.8	4770	9	3100
Oct 09	8.6	1530	4	860	8.7	5540	9	3400	8.4	6220	4	4700	8.8	5940	20	3600	8.7	4830	5	3300
Nov 09	8.7	1551	18	900	8.7	5770	10	3900	8.2	6560	8	5000	8.7	6120	6	3200	8.6	4820	3	3100
Dec 09	8.6	1585	1	920	8.6	5950	6	3700	NS	NS	NS	NS	8.6	6130	11	4000	8.5	4960	7	2800
Jan 10	8.6	1768	<1	1050	8.8	5870	<1	3860	NS	NS	NS	NS	8.6	6300	1	4360	8.7	5060	6	3310
Feb 10	8.4	1767	1	1200	8.8	5790	5	4100	8.4	6220	6	4780	8.6	6260	11	4400	8.7	5020	8	3400
Mar 10	8.5	1880	1	1200	8.8	5850	5	3800	NS	NS	NS	NS	8.3	6310	9	4100	8.6	5150	6	3300
Apr 10	8.7	1930	2	1234	8.8	5610	8	3766	NS	NS	NS	NS	8.8	6460	8	4200	8.7	5100	5	3382
May 10	8.4	2050	3	1334	8.9	5450	5	3752	NS	NS	NS	NS	8.7	6790	7	4680	8.7	5390	4	3720
Jun 10	8.3	2030	0	1230	8.7	5610	3	3804	NS	NS	NS	NS	8.6	6630	8	4558	8.7	5790	3	3818
Average	**8.6**	**1669**	**4**	**1021**	**8.7**	**5481**	**5**	**3631**	**8.3**	**6222**	**6**	**4736**	**8.7**	**6144**	**12**	**4012**	**8.7**	**5014**	**8**	**3263**

Month	Mt Owen Transfer Dam				Tailings Supernatant at Void				Reservoir Tailings Dam				Dam 3				Dam 7			
	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC(µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC(µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jul 09	8.8	5320	4	3140	9.0	5800	30	3770	New Site				New Site				New Site			
Aug 09	9.0	5160	5	3200	9.2	5600	16	4000												
Sept 09	8.7	5310	4	3300	9.0	5260	30	3400												
Oct 09	8.4	5440	13	3300	Decommissioned															
Nov 09	8.3	5200	2	3100																
Dec 09	8.9	5530	5	3300																
Jan 10	8.3	5440	5	3510					8.7	6800	37	4700								
Feb 10	8.3	5330	5	3300					8.8	7150	380	4900								
Mar 10	8.4	5460	9	3300					8.6	6040	15	4100								
Apr 10	8.7	5460	8	3348					Dry	Dry	Dry	Dry	10.0	1790	4	1128	8.9	4330	5	2782
May 10	8.5	5420	2	3212					8.8	6950	42	4670	10.0	1790	4	1126	9.0	4360	4	2840
Jun 10	8.6	5010	11	3048					8.9	6880	66	4662	9.8	1651	5	988	8.9	3870	3	2402
Average	**8.6**	**5340**	**6**	**3255**	**9.1**	**5553**	**25**	**3723**	**8.8**	**6764**	**108**	**4606**	**10.0**	**1746**	**4**	**1080**	**8.9**	**4200**	**4**	**2675**

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

NS = not sampled

Samples Collected: 8 July 2009

ANALYSIS DESCRIPTION	UNIT	Dam 1	Dam 4	Dam 13	Dam 17	Tailings Supernatant	Mt Owen Transfer Dam
pH		8.34	8.74	8.82	8.81	8.97	8.84
Conductivity @ 25°C	uS/cm	1310	4600	5580	4750	5800	5320
Total Dissolved Solids	mg/L	782	2790	3640	3030	3770	3140
Total Suspended Solids	mg/L	3	4	26	8	30	4
Chloride	mg/L	185	740	857	791	909	950
Sulfate - Filtered	mg/L	190	915	1040	1030	1150	432
Hydroxide as $CaCO_3$	mg/L	<1	<1	<1	<1	<1	<1
Carbonate as $CaCO_3$	mg/L	<1	73	118	80	147	153
Bicarbonate as $CaCO_3$	mg/L	236	442	702	400	562	1030
Total Alkalinity as $CaCO_3$	mg/L	236	516	820	480	709	1180
Silicon - Filtered	mg/L	9.18	1.61	4.51	1.8	2.46	3.3
Calcium - Filtered	mg/L	46	51	15	44	41	19
Magnesium - Filtered	mg/L	35	148	103	154	128	37
Sodium - Filtered	mg/L	184	798	1140	838	1170	1190
Potassium - Filtered	mg/L	4	12	13	13	15	8
Aluminium - Filtered	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic - Filtered	mg/L	0.001	0.003	0.004	0.002	0.015	<0.001
Beryllium - Filtered	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium - Filtered	mg/L	0.039	0.052	0.07	0.048	0.05	0.032
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	<0.001
Cobalt - Filtered	mg/L	<0.001	<0.001	0.001	<0.001	0.004	<0.001
Copper - Filtered	mg/L	<0.001	0.002	0.002	0.003	0.003	<0.001
Lead - Filtered	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium - Filtered	mg/L	0.022	0.129	0.277	0.15	0.245	0.005
Manganese - Filtered	mg/L	0.001	0.004	0.002	0.004	0.018	0.033
Nickel - Filtered	mg/L	<0.001	0.002	0.002	0.002	0.005	<0.001
Rubidium - Filtered	mg/L	0.001	0.006	0.017	0.008	0.014	<0.001
Selenium - Filtered	mg/L	<0.01	<0.01	<0.01	<0.01	0.02	<0.01
Strontium - Filtered	mg/L	0.765	2.33	6.16	2.68	4.39	0.438
Zinc - Filtered	mg/L	<0.005	<0.005	0.006	<0.005	<0.005	<0.005
Boron - Filtered	mg/L	0.09	0.07	0.22	0.08	0.13	0.05
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	13.9	50.2	62.2	53.4	63.7	59.4
Total Cations	meq/L	13.3	49.8	59.1	51.7	63.8	55.8
Actual (Anion/Cation) Difference	meq/L	2.07	0.46	2.63	1.64	0.06	3.18

Samples Collected: 27 January 2010

ANALYSIS DESCRIPTION	UNIT	Dam 1	Dam 4	Dam 13	Dam 17	Tailings Supernatant	Mt Owen Transfer Dam	MIA Sediment Dam
pH								
Conductivity @ 25°C	uS/cm							
Total Dissolved Solids	mg/L	1050	3860	4360	3310	4700	3510	5370
Total Suspended Solids	mg/L	<1	<1	1	6	37	5	7
Chloride	mg/L	317	1360	1260	1080	1570	547	1610
Sulfate - Filtered	mg/L	239	975	1040	901	1200	1060	1470
Hydroxide as $CaCO_3$	mg/L	<1	<1	<1	<1	<1	<1	<1
Carbonate as $CaCO_3$	mg/L	13	139	272	93	123	48	226
Bicarbonate as $CaCO_3$	mg/L	205	450	665	377	520	1020	671
Total Alkalinity as $CaCO_3$	mg/L	218	590	937	471	643	1070	897
Silicon - Filtered	mg/L	7.89	3.84	5.56	3.06	4.69	6.06	3.38
Calcium - Filtered	mg/L	43	32	22	21	44	22	29
Magnesium - Filtered	mg/L	49	143	140	155	160	37	142
Sodium - Filtered	mg/L	266	1180	1340	951	1350	1220	1680
Potassium - Filtered	mg/L	5	19	18	16	26	8	22
Aluminium - Filtered	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Arsenic - Filtered	mg/L	0.001	0.011	0.009	0.003	0.011	<0.001	0.02
Beryllium - Filtered	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium - Filtered	mg/L	0.045	0.052	0.031	0.024	0.054	0.095	0.13
Cadmium - Filtered	mg/L	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001
Caesium - Filtered	mg/L	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Chromium - Filtered	mg/L	<0.001	<0.001	<0.005	0.004	<0.001	<0.005	0.001
Cobalt - Filtered	mg/L	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	0.001
Copper - Filtered	mg/L	<0.001	0.002	0.001	0.003	0.003	<0.001	0.005
Lead - Filtered	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium - Filtered	mg/L	0.022	0.269	0.354	0.178	0.309	0.292	0.396
Manganese - Filtered	mg/L	0.001	0.002	<0.001	0.001	0.026	0.004	0.026
Nickel - Filtered	mg/L	<0.001	0.004	0.002	0.003	0.007	0.001	0.004
Rubidium - Filtered	mg/L	0.001	0.014	0.017	0.007	0.027	0.02	0.008
Selenium - Filtered	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium - Filtered	mg/L	0.903	4.7	2.53	1.29	4.53	3.42	4.49
Zinc - Filtered	mg/L	<0.005	0.005	0.007	0.006	0.006	<0.005	0.013
Boron - Filtered	mg/L	0.08	0.18	0.27	0.1	0.21	0.18	0.5
Iron - Filtered	mg/L	<0.05	<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	<0.0001
Total Anions	me/L	17.7	67.6	74.3	57.4	79.2	62.8	92.8
Total Cations	me/L	17.9	65.4	71.4	55.6	74.8	57.4	87
Actual (Anion/Cation) Difference	me/L	0.52	1.66	2.02	1.61	2.9	4.53	3.25

Appendix 5

Groundwater Monitoring Results

Appendix 5 – Liddell Colliery Groundwater Monitoring Results July 2009 to June 2010 Reporting Period

Samples Collected December 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		6.9	7.6	7.2	7.8	6.9	7.4	6.7	7.3	7.6		7.0	6.9	7.0	7.1	7.7	7.9	7.0
Electrical Conductivity @ 25°C	uS/cm	1241	1582	2530	2830	1378	3760	1457	5390	4400		1560	2250	1201	1980	1295	5550	1610
Total Dissolved Solids @180°C	mg/L	760	970	1830	1890	878	2240	1220	3350	2830		1380	1490	768	1350	798	3650	1370
Suspended Solids (SS)	mg/L	112	73	176	42	63	20	1060	63	14		744	32	296	48	56	41	18
Hydroxide Alkalinity as CaCO3	mg/L	184	228	414	593	209	796	227	1300	611		272	485	187	330	240	901	232
Chloride	mg/L	151	230	360	151	188	263	194	274	698		187	114	136	124	144	767	232
Sulphate as SO4 2-	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1	<1	<1
Hydroxide Alkalinity as CaCO3	mg/L	15	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	181	243	408	474	211	556	254	677	806		279	417	180	381	190	867	248
Bicarbonate Alkalinity as CaCO3	mg/L	196	243	408	474	211	556	254	677	806		279	417	180	381	190	867	248
Total Alkalinity as CaCO3	mg/L	9.83	9.02	10.3	5.8	10.4	11.4	12	9.52	5.64		10.9	12.6	21.2	14.4	2.1	8.05	9.82
Silicon	mg/L	54	65	82	26	47	16	40	9	5		44	24	47	34	62	6	62
Calcium	mg/L	29	52	70	33	38	82	48	137	110		38	63	28	49	33	77	36
Magnesium	mg/L	156	216	352	606	184	710	191	968	876		211	352	169	310	145	1150	239
Sodium	mg/L	3	4	4	5	3	5	3	10	10		2	5	2	5	3	8	4
Potassium	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
Aluminium	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
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	0.079	0.15	0.109	0.044	0.045	0.079	0.086	0.085	0.049		0.042	0.055	0.029	0.07	0.097	0.062	0.051
Barium	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
Cadmium	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
Caesium	mg/L	<0.001	<0.001	0.002	0.003	<0.001	0.006	0.002	0.008	0.004		<0.001	<0.001	<0.001	0.005	<0.001	0.002	<0.001
Chromium	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
Cobalt	mg/L	<0.001	0.002	0.002	0.006	<0.001	0.004	0.001	0.005	0.01		0.004	0.001	0.001	0.012	0.004	0.002	<0.001
Copper	mg/L	<0.001	<0.001	<0.001	0.002	<0.001	0.004	<0.001	<0.001	0.001		<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001
Lead	mg/L	0.008	0.047	0.019	0.125	0.007	0.069	0.02	0.116	0.183		0.006	0.05	0.003	0.02	0.012	0.228	0.002
Lithium	mg/L	0.233	0.125	0.014	0.004	<0.001	0.067	0.246	0.246	0.061		0.021	0.041	0.003	0.046	0.004	0.049	0.027
Manganese	mg/L	<0.001	0.003	0.001	0.014	<0.001	0.008	<0.001	0.009	0.003		0.003	0.001	<0.001	0.016	0.002	0.003	<0.001
Nickel	mg/L	0.002	0.005	0.002	0.015	<0.001	0.007	0.003	0.009	0.015		0.001	0.009	<0.001	0.005	0.003	0.016	<0.001
Rubidium	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
Selenium	mg/L	0.842	5.09	2.35	2.58	0.793	5.59	1.16	8.44	7.61		0.827	3.29	0.47	1.23	2.84	7.79	0.688
Strontium	mg/L	0.021	0.013	0.09	0.15	0.011	0.112	0.024	0.077	0.15		0.059	0.034	0.042	0.158	0.498	0.021	0.031
Zinc	mg/L	<0.05	0.08	0.06	0.09	0.07	0.09	<0.05	0.16	0.09		0.05	0.05	<0.05	<0.05	0.07	0.12	0.07
Boron	mg/L	2.03	0.13	<0.05	<0.05	<0.05	0.08	0.55	0.3	<0.05		<0.05	0.18	<0.05	<0.05	<0.05	<0.05	<0.05
Iron	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
Mercury	mg/L	12.2	16.4	24	30.1	13.9	37.5	15.7	54.1	45.9		16	22.7	11.7	19.8	13.4	57.3	16.3
Total Anions	meq/L	12	17	25.3	30.5	13.6	38.6	14.3	54.1	47.6		14.5	21.8	12	19.3	12.2	56.9	16.6
Total Cations	meq/L	1.22	2.03	2.54	0.59	1.19	1.41	4.58	0.06	1.75		4.7	2.1	1.24	1.11	4.66	0.33	0.82
Ionic Balance	%	6.9	7.6	7.2	7.8	6.9	7.4	6.7	7.3	7.6		7	6.9	7	7.1	7.7	7.9	7

Samples Collected June 2010

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		7.0	7.8	7.2	7.7	6.9	7.4	6.9	7.2	7.3	7.1	7.3	7.2	6.9	7.2		7.9	6.9
Electrical Conductivity @ 25°C	uS/cm	1238	1524	1680	2760	1550	1725	1435	5243	4617	4540	1475	2187	1204	1960		4753	1732
Total Dissolved Solids @180°C	mg/L	794	970	990	1440	950	884	1100	3200	3060	3140	698	1220	718	1100		3200	1070
Suspended Solids (SS)	mg/L	22	16	48	54	4	50	264	26	47	7170	88	24	58	74		6	2
Chloride	mg/L	178	217	280	700	253	295	237	1300	636	912	237	429	193	356		836	297
Sulphate as SO4 2-	mg/L	156	216	208	201	260	206	210	310	853	472	165	111	144	126		754	319
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	223	261	311	490	215	312	257	714	913	824	147	405	121	403		780	251
Total Alkalinity as CaCO3	mg/L	223	261	311	490	215	312	257	714	913	824	147	405	121	403		780	251
Silicon	mg/L	11.6	8.62	11.8	6.46	12.1	14.7	14.6	11.1	6.8	14.2	12.4	15	22.4	14.1		8.86	11.6
Calcium	mg/L	80	62	72	23	71	45	64	79	69	136	66	78	44	70		53	75
Magnesium	mg/L	31	51	42	32	41	49	50	147	134	155	32	62	27	48		72	45
Sodium	mg/L	152	216	277	632	212	298	207	1020	995	833	189	328	171	309		1150	270
Potassium	mg/L	3	4	3	4	3	3	3	8	10	4	2	4	2	5		8	3
Aluminium	mg/L	<0.01	0.02	<0.01	<0.01	<0.01	0.02	<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	0.159	0.064	0.047	0.056	0.036	0.094	0.09	0.049	0.077	0.045	0.069	0.033	0.081		0.065	0.066
Cadmium	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	No Sample	<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	<0.001	0.002	0.001	<0.001	<0.001	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	0.018	0.001	0.003	0.007	0.015	<0.001	0.003	0.003	0.005	0.002	0.01	<0.001	0.008		0.002	0.001
Lead	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
Lithium	mg/L	0.009	0.048	0.011	0.133	0.008	0.036	0.02	0.135	0.227	0.113	0.006	0.046	0.003	0.022		0.25	0.003
Manganese	mg/L	0.25	0.005	0.038	0.034	<0.001	0.06	0.263	0.247	0.065	0.119	0.214	0.063	<0.001	0.098		0.05	0.003
Nickel	mg/L	<0.001	0.013	0.002	0.005	0.001	0.003	<0.001	0.007	0.001	0.004	0.006	0.002	<0.001	0.009		0.002	<0.001
Rubidium	mg/L	0.002	0.006	0.002	0.016	<0.001	0.006	0.003	0.01	0.017	0.003	0.001	0.01	<0.001	0.006		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	0.922	5.2	1.24	2.6	0.919	2.7	1.22	8.62	8.14	5.84	0.785	2.8	0.54	1.29		7.7	0.828
Zinc	mg/L	0.011	0.106	0.01	0.008	0.007	0.036	0.012	0.015	0.007	0.058	0.043	0.048	0.009	0.047		<0.05	<0.05
Boron	mg/L	0.05	0.1	0.07	0.11	0.08	0.08	0.06	0.2	0.11	0.08	0.07	0.06	0.06	0.06		0.15	0.08
Iron	mg/L	2.1	0.08	<0.05	0.38	0.05	<0.05	0.84	1.42	0.88	<0.05	<0.05	<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
Total Anions	meq/L	12.7	15.8	18.4	33.7	16.8	18.8	16.2	57.5	54	52	13	22.5	10.9	20.7		54.9	19.5
Total Cations	meq/L	13.2	16.8	19.2	31.4	16.2	19.3	16.4	60.6	58	55.9	14.2	23.4	11.9	21		58.9	19.3
Ionic Balance	%	1.85	3.07	1.96	3.61	1.98	1.21	0.55	2.62	3.56	3.61	4.2	1.93	4.59	0.73		3.47	0.58

Appendix 6

Blast Monitoring Results

Appendix 6 – Liddell Colliery Blast Monitoring Results 2009 to 2010 Reporting Period
Chain of Ponds Hotel

Date	Time	Location	Blast ID	Chain of Ponds Hotel		
				Ground Vibration (mm/s)	Over pressure (dBL)	Waveform Capture
6/7/2009	13:10	Waterfill W01_1 Liddell	B737_m	0.04	95.70	Yes
6/7/2009	14:49	Southcut S12_1 Liddell	B743_4	1.76	109.30	Yes
7/7/2009	13:15	Southcut S12-2 Arties	B740	1.62	97.10	Yes
10/07/2009	13:15	Southcut S12_1 liddell	B747	0.38	96.60	Yes
14/07/2009	12:52	Waterfill W02_1 Arties	B749	1.81	112.40	Yes
14/07/2009	12:54	Waterfill W01_1 Liddel	B739	0.53	113.00	Yes
15/07/2009	16:31	Southcut S11_2	B752	1.37	104.70	Yes
20/07/2009	13:08	Southcut S11_2 Barrett	B745	1.08	105.20	Yes
24/07/2009	12:43	Southcut S12-1 Liddell	B741	0.28	95.70	Yes
24/07/2009	13:12	Waterfill Wo1_1 Arties	B751	2.33	105.1	Yes
29/07/2009	12:19	Southcut S12_1 Barrett	B753_745b	2.19	108.40	Yes
4/08/2009	13:11	Waterfill W02_1 Arties	B750	1.83	112.10	Yes
6/08/2009	13:01	Southcut S11-3 Barrett	B754	3.00	102.70	Yes
7/08/2009	12:43	Waterfill W01_1 Liddell	B738	0.36	110.00	Yes
11/08/2009	12:34	Waterfill W01_1 Arties	B755	1.33	102.10	Yes
12/08/2009	13:16	Waterfill W01_1 Liddell	B757	0.73	108.40	Yes
18/08/2009	13:14	Waterfill W01_1 Liddell	B758	0.59	107.30	Yes
19/08/2009	16:11	Southcut S12_2 Arties	B756	0.98	107.00	Yes
27/8/2009	13:06	Waterfill Liddell	B759_B762	1.07	105.50	Yes
28/8/2009	16:14	Southcut S12_3 Arties	B761	1.35	106.40	Yes
28/08/2009	19:19	Southcut S12_3 Arties	B761	2.51	109.60	Yes
2/09/2009	16:18	Waterfill W03_1 UPG	B766_7	1.78	110.40	Yes
9/09/2009	12:57	Southcut S12_2 Arties	B763	2.31	110.00	Yes
9/09/2009	16:25	Southcut S12_2 Arties	B763	0.95	104.70	Yes
10/09/2009	16:11	Waterfill W01_1 UPG	B770	1.14	109.90	Yes
11/09/2009	13:02	Southcut S12_2 Liddell	B764	1.03	101.00	Yes
14/09/2009	12:54	Waterfill W01_1 Arties	B775	0.24	101.10	Yes
15/09/2009	13:04	Southcut S12_2 Liddell	B769	1.22	97.50	Yes
17/09/2009	13:12	Waterfill W02_1 Liddell	B774	0.47	106.10	Yes
17/09/2009	13:15	Waterfill W03_1 UPG	B772	0.93	112.60	Yes
18/09/2009	13:06	Southcut S12_2 Liddell	B769_hot	1.16	99.60	Yes
22/09/2009	16:35	Southcut S12_2 Liddell	B769	1.38	109.10	Yes
24/09/2009	13:05	Waterfill W02_1 Liddell	B773hot	0.67	113.20	Yes
25/09/2009	11:37	Southcut S12_2 Liddell	B776	1.27	104.00	Yes
30/09/2009	16:05	Southcut S12-2 Liddell	B777	2.00	106.00	Yes
2/10/2009	13:17	Waterfill W02 Liddell	B773	1.12	110.70	Yes
7/10/2009	13:01	Waterfill W01_1 Arties	B783	0.14	111.20	Yes
9/10/2009	13:20	Southcut S12 -1 Liddell	B784 & B785	0.55	99.60	Yes
12/10/2009	13:05	Southcut S12-2 Liddell	B788	1.82	103.90	Yes
15/10/2009	12:44	Waterfill W02_1 Liddell	B771_786	1.49	104.50	Yes
21/10/2009	13:06	Waterfill W02_1 Liddell	B780	1.29	102.70	Yes
29/10/2009	13:09	Waterfill W01-1 Liddell	B781	0.18	108.30	Yes
2/11/2009	13:11	Waterfill W01_1 Liddell	B782	0.50	97.70	Yes
5/11/2009	13:10	Waterfill W02_1 Liddell	B779_790	1.44	110.30	Yes
17/11/2009	13:06	Southcut S12-3	B788	1.71	104.50	Yes
25/11/2009	13:13	Southcut S13-1	B791	1.23	99.20	Yes
26/11/2009	13:14	Waterfill W03-1 Upper Pikes	B797	0.99	108.90	Yes
30/11/2009	13:14	Waterfill W03-1 Upper Pikes	B798	0.64	100.40	Yes
4/12/2009	13:39	Southcut S13-1 Liddell	B796_B793	1.29	102.40	Yes
11/12/2009	12:38	Southcut S12-3 Liddell	B795	2.80	111.60	Yes

Appendix 6 – Liddell Colliery Blast Monitoring Results 2009 to 2010 Reporting Period
Chain of Ponds Hotel

Date	Time	Location	Blast ID	Chain of Ponds Hotel		
				Ground Vibration (mm/s)	Over pressure (dBL)	Waveform Capture
14/12/2009	12:47	Waterfill W03-1 Upper Pikes Gully	B800	0.42	113.90	Yes
18/12/2009	12:09	Southcut S13-1 Liddell	B792	0.98	106.90	Yes
23/12/2009	13:12	Waterfill W03-1 Upper Pikes Gully	B799	0.96	102.40	Yes
24/12/2009	12:10	Waterfill W02-1 Liddell	B801	1.17	103.60	Yes
8/01/2010	13:06	Waterfill W02-1 Liddell	B802	1.90	108.20	Yes
14/01/2010	13:23	Waterfill W02-1 Liddell	B803_789	1.56	107.90	Yes
15/01/2010	12:39	Waterfill W03-1 Liddell	B808	0.14	95.80	Yes
20/01/2010	12:44	Waterfill W03-1 LMPG	B806	1.24	115.80	Yes
22/01/2010	12:46	Waterfill W03-1 LMPG	B807	1.02	116.00	Yes
27/01/2010	13:35	Southcut S12-1 Barrett	B804	1.39	103.50	Yes
1/02/2010	12:58	Waterfill W02-1 Liddell	B810	0.60	105.30	Yes
4/02/2010	11:34	Waterfill W02-1 Liddell	B811	0.55	105.50	Yes
8/02/2010	13:27	Waterfill W02-1 Liddell_W03-1 LMPG	B809_816	0.68	104.90	Yes
9/02/2010	12:57	Waterfill W02-1 Liddell	B809	0.99	106.70	Yes
11/02/2010	12:16	Southcut S12-1 Barrett	B815_hot	1.01	106.90	Yes
12/02/2010	12:48	Waterfill W02-1 Liddell	B812_814	1.51	113.80	Yes
16/02/2010	13:10	Waterfill W02-1 Liddell	B813	0.64	110.90	Yes
17/02/2010	13:26	Southcut S12-1 Barrett	B815_818	1.69	102.40	Yes
19/02/2010	12:04	Southcut S12-1 Barrett	B817	0.75	101.10	Yes
25/02/2010	12:11	Waterfill W03-1 LMPG	B822	0.33	106.90	Yes
2/03/2010	12:19	Entrance E02-1 Arties	B805	2.69	113.10	Yes
4/03/2010	13:08	Waterfill W03-1 Arties	B819	3.17	109.10	Yes
9/03/2010	13:43	Waterfill W03-1 Arties	B820	1.55	117.10	Yes
16/03/2010	13:07	Southcut S14-1 Lemingtons	B821	2.85	112.00	Yes
17/03/2010	16:03	Southcut S12-2 Barrett	B824	1.51	100.80	Yes
25/03/2010	12:40	Waterfill W02-1 Liddell_W01-1 Barrett	B787_828	8.80	105.50	Yes
25/03/2010	13:11	Waterfill W01-1 Barrett	B787_misfire	2.20	93.60	Yes
30/03/2010	13:10	Southcut S12-3 Barrett	B825	2.68	106.60	Yes
9/04/2010	13:33	South Pit strip 13 block 1	B830_S13-1	0.21	99.90	Yes
13/04/2010	12:56	Waterfill Pit, block 2	B831_W02_1	0.66	105.30	Yes
15/04/2010	12:25	Waterfill Pit, block 2	B832_W02_1	0.68	102.00	Yes
16/04/2010	13:10	South Cut, strip 12, block 3	S1203_BAR_03.	2.33	104.10	Yes
23/04/2010	13:06	South Cut, Strip 13, block 1	B829_S1301_1	1.04	105.60	Yes
27/04/2010	12:50	Waterfill Pit, block 2	B833_W02_1	0.77	110.20	Yes
30/04/2010	12:54	Waterfill Pit, block 2.	B834_W02_1	1.06	119.00	Yes
4/05/2010	12:29	South Cut, Strip 12 Block 1.	S1301_BAR_04	0.66	108.10	Yes
6/05/2010	12:36	Waterfill Pit, Block 3	W03_ART_02	1.36	110.40	Yes
7/05/2010	13:06	South Cut, Strip 14 Block 2	B823_S14_LEMd_LEMC	1.14	113.50	Yes
13/05/2010	13:06	Waterfill Pit, Block 3	W03_ART_02_B	1.05	111.20	Yes
14/05/2010	15:56	South Cut, Strip 12	S1202_BAR_06	0.43	95.10	Yes
18/05/2010	13:02	Waterfill Pit, Block 02	W02_LID_09_A	1.23	102.20	Yes
20/05/2010	12:41	Water fill Pit, Block 2.	W02_BAR_014	1.59	110.60	Yes
21/05/2010	13:17	Water fill Pit, Block 2	W02_LID_09B	1.01	104.80	Yes
21/05/2010	16:18	South Cut, Strip 14, block 4	S1404_LEM_05	2.08	123.50	Yes
24/05/2010	12:32	Waterfill Pit, Block 2	W02_LID_09c	1.62	106.30	Yes
28/05/2010	15:25	South Cut, Strip 13 Block 1	S1301_LID_08	0.28	97.30	Yes
31/05/2010	12:46	Waterfill Pit, Block 2	W02_LID_09d	1.01	114.40	Yes
2/06/2010	12:43	Waterfill Pit, Block 02	W02_LID_09E	1.02	106.50	Yes
9/06/2010	13:09	Waterfill Pit,	W02_LID_13A	0.73	114.78	Yes

Appendix 6 – Liddell Colliery Blast Monitoring Results 2009 to 2010 Reporting Period
Chain of Ponds Hotel

Date	Time	Location	Blast ID	Chain of Ponds Hotel		
				Ground Vibration (mm/s)	Over pressure (dBL)	Waveform Capture
15/06/2010	13:06	Waterfill Pit, Block 3	W02_LID_07	1.20	104.50	Yes
16/06/2010	12:50	Waterfill Pit, Block 2	W02_BAR_019	1.58	107.00	Yes
18/06/2010	12;56	Waterfill Pit, Block 2.	W02_BAR_018 , W02_LID_013b	1.19	106.70	Yes
23/06/2010	15:31	South Cut, Strip 14, Block 4	S1404_LEM_10+11+12	1.80	116.80	Yes
29/06/2010	12:07	South Cut, Strip 13 Block 1	S1301_BAR_020	1.44	109.50	Yes

Appendix 6 – Liddell Colliery Blast Monitoring Results 2009 to 2010 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
6/7/2009	13:10	Southcut S11_2	B752	0.23	85.50	Yes	0.05	87.9	Yes
6/7/2009	14:49	Southcut S11_2 Barrett	B745	0.09	96.30	Yes	0.06	99.4	Yes
7/7/2009	13:15	Southcut S12-1 Liddell	B741	0.03	94.80	Yes	0.02	90.5	Yes
10/07/2009	13:15	Waterfill Wo1_1 Arties	B751	0.16	91.6	Yes	0.15	92.5	Yes
14/07/2009	12:52	Southcut S12_1 Barrett	B753_745b	0.25	98.40	Yes	0.09	95	Yes
14/07/2009	12:54	Waterfill W02_1 Arties	B750	0.11	101.60	Yes	0.09	103.6	Yes
15/07/2009	16:31	Southcut S11-3 Barrett	B754	0.42	85.40	Yes	0.11	91.3	Yes
20/07/2009	13:08	Waterfill W01_1 Liddell	B738	0.06	114.80	Yes	0.02	**116.4**	Yes
24/07/2009	12:43	Waterfill W01_1 Arties	B755	0.14	99.40	Yes	0.06	91.1	Yes
24/07/2009	13:12	Waterfill W01_1 Liddell	B757	0.08	106.20	Yes	0.06	96.2	Yes
29/07/2009	12:19	Waterfill W01_1 Liddell	B758	0.06	92.40	Yes	0.05	92.4	Yes
4/08/2009	13:11	Southcut S12_2 Arties	B756	0.09	82.00	Yes	0.04	93.5	Yes
6/08/2009	13:01	Waterfill Liddell	B759_B762	0.10	98.40	Yes	0.09	91.4	Yes
7/08/2009	12:43	Southcut S12_3 Arties	B761	0.11	90.10	Yes	0.07	96	Yes
11/08/2009	12:34	Southcut S12_3 Arties	B761	0.19	90.30	Yes	0.09	101.5	Yes
12/08/2009	13:16	Waterfill W03_1 UPG	B766_7	0.09	97.30	Yes	0.08	98.2	Yes
18/08/2009	13:14	Southcut S12_2 Arties	B763	0.13	105.20	Yes	0.08	114.3	Yes
19/08/2009	16:11	Southcut S12_2 Arties	B763	0.08	105.40	Yes	0.03	110.6	Yes
27/8/2009	13:06	Waterfill W01_1 UPG	B770	0.05	97.40	Yes	0.05	101.5	Yes
28/8/2009	16:14	Southcut S12_2 Liddell	B764	0.07	83.80	Yes	0.02	90.1	Yes
28/08/2009	19:19	Waterfill W01_1 Arties	B775	0.03	87.30	Yes	0.02	87.7	Yes
2/09/2009	16:18	Southcut S12_2 Liddell	B769	0.12	84.10	Yes	0.02	85.4	Yes
9/09/2009	12:57	Waterfill W02_1 Liddell	B774	0.05	112.20	Yes	0.03	106.9	Yes
9/09/2009	16:25	Waterfill W03_1 UPG	B772	0.07	108.20	Yes	0.04	111.8	Yes
10/09/2009	16:11	Southcut S12_2 Liddell	B769_hot	0.13	87.30	Yes	0.03	88.8	Yes
11/09/2009	13:02	Southcut S12_2 Liddell	B769	0.15	106.30	Yes	0.06	112.3	Yes
14/09/2009	12:54	Waterfill W02_1 Liddell	B773hot	0.04	112.80	Yes	0.02	109.9	Yes
15/09/2009	13:04	Southcut S12_2 Liddell	B776	0.14	95.80	Yes	0.05	98.2	Yes
17/09/2009	13:12	Southcut S12-2 Liddell	B777	0.21	99.80	Yes	0.05	102.1	Yes
17/09/2009	13:15	Waterfill W02 Liddell	B773	0.14	92.10	Yes	0.07	97.2	Yes
18/09/2009	13:06	Waterfill W01_1 Arties	B783	0.01	103.80	Yes	0.01	105.8	Yes
22/09/2009	16:35	Southcut S12 -1 Liddell	B784 & B785	0.05	96.00	Yes	0.02	102.4	Yes
24/09/2009	13:05	Southcut S12-2 Liddell	B788	0.20	90.00	Yes	0.07	89.9	Yes
25/09/2009	11:37	Waterfill W02_1 Liddell	B771_786	0.15	111.60	Yes	1.1	108.9	Yes
30/09/2009	16:05	Waterfill W02_1 Liddell	B780	0.07	91.90	Yes	0.05	97.2	Yes
2/10/2009	13:17	Waterfill W01-1 Liddell	B781	0.02	90.90	Yes	0.03	91.9	Yes
7/10/2009	13:01	Waterfill W01_1 Liddell	B782	0.08	81.20	Yes	0.05	88.8	Yes
9/10/2009	13:20	Waterfill W02_1 Liddell	B779_790	0.10	105.10	Yes	0.1	100.3	Yes
12/10/2009	13:05	Southcut S12-3	B788	0.19	95.70	Yes	0.08	104.5	Yes
15/10/2009	12:44	Southcut S13-1	B791	0.12	96.90	Yes	0.02	94.5	Yes
21/10/2009	13:06	Waterfill W03-1 Upper Pikes	B797	0.03	93.80	Yes	0.03	95.3	Yes
29/10/2009	13:09	Waterfill W03-1 Upper Pikes	B798	0.04	82.00	Yes	0.02	89.2	Yes
2/11/2009	13:11	Southcut S13-1 Liddell	B796_B793	0.16	108.40	Yes	0.04	90.9	Yes
5/11/2009	13:10	Southcut S12-3 Liddell	B795	0.15	110.30	Yes	0.06	106.5	Yes
17/11/2009	13:06	Waterfill W03-1 Upper Pikes Gully	B800	0.03	114.10	Yes	0.02	112.7	Yes
25/11/2009	13:13	Southcut S13-1 Liddell	B792	0.13	88.20	Yes	0.04	103.5	Yes
26/11/2009	13:14	Southcut S11_2	B752	0.23	85.50	Yes	0.05	87.9	Yes
30/11/2009	13:14	Southcut S11_2 Barrett	B745	0.09	96.30	Yes	0.06	99.4	Yes
4/12/2009	13:39	Southcut S12-1 Liddell	B741	0.03	94.80	Yes	0.02	90.5	Yes
11/12/2009	12:38	Waterfill Wo1_1 Arties	B751	0.16	91.6	Yes	0.15	92.5	Yes

Appendix 6 – Liddell Colliery Blast Monitoring Results 2009 to 2010 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
14/12/2009	12:47	Waterfill W03-1 Upper Pikes Gully	B800	0.03	114.10	Yes	0.02	112.7	Yes
18/12/2009	12:09	Southcut S13-1 Liddell	B792	0.13	88.20	Yes	0.04	103.5	Yes
23/12/2009	13:12	Waterfill W03-1 Upper Pikes Gully	B799	0.08	101.20	Yes	0.04	93.5	Yes
24/12/2009	12:10	Waterfill W02-1 Liddell	B801	0.08	97.50	Yes	0.06	96.7	Yes
8/01/2010	13:06	Waterfill W02-1 Liddell	B802	0.10	102.20	Yes	0.12	90.9	Yes
14/01/2010	13:23	Waterfill W02-1 Liddell	B803_789	0.12	103.90	Yes	0.08	95.7	Yes
15/01/2010	12:39	Waterfill W03-1 Liddell	B808	0.01	107.30	Yes	0.01	84.7	Yes
20/01/2010	12:44	Waterfill W03-1 LMPG	B806	0.06	108.70	Yes	0.04	97.9	Yes
22/01/2010	12:46	Waterfill W03-1 LMPG	B807	0.05	114.00	Yes	0.03	93.3	Yes
27/01/2010	13:35	Southcut S12-1 Barrett	B804	0.16	110.60	Yes	0.05	95.1	Yes
1/02/2010	12:58	Waterfill W02-1 Liddell	B810	0.05	96.40	Yes	0.03	109	Yes
4/02/2010	11:34	Waterfill W02-1 Liddell	B811	0.04	108.00	Yes	0.03	99.5	Yes
8/02/2010	13:27	Waterfill W02-1 Liddell_W03-1 LMPG	B809_816	0.07	94.20	Yes	0.04	95.8	Yes
9/02/2010	12:57	Waterfill W02-1 Liddell	B809	0.07	103.30	Yes	0.05	101.4	Yes
11/02/2010	12:16	Southcut S12-1 Barrett	B815_hot	0.08	93.50	Yes	0.04	88.9	Yes
12/02/2010	12:48	Waterfill W02-1 Liddell	B812_814	0.13	113.80	Yes	0.07	103.8	Yes
16/02/2010	13:10	Waterfill W02-1 Liddell	B813	0.04	95.70	Yes	0.03	100.8	Yes
17/02/2010	13:26	Southcut S12-1 Barrett	B815_818	0.21	93.80	Yes	0.06	97.9	Yes
19/02/2010	12:04	Southcut S12-1 Barrett	B817	0.09	104.00	Yes	0.04	95.6	Yes
25/02/2010	12:11	Waterfill W03-1 LMPG	B822	0.03	99.70	Yes	0.02	87.4	Yes
2/03/2010	12:19	Entrance E02-1 Arties	B805	0.19	113.10	Yes	0.13	104	Yes
4/03/2010	13:08	Waterfill W03-1 Arties	B819	0.17	94.10	Yes	0.1	98.7	Yes
9/03/2010	13:43	Waterfill W03-1 Arties	B820	0.09	113.60	Yes	0.08	105.5	Yes
16/03/2010	13:07	Southcut S14-1 Lemingtons	B821	0.11	105.80	Yes	0.07	105.5	Yes
17/03/2010	16:03	Southcut S12-2 Barrett	B824	0.12	95.60	Yes	0.05	92.1	Yes
25/03/2010	12:40	Waterfill W02-1 Liddell_W01-1 Barrett	B787_828	0.46	93.80	Yes	0.48	94.5	Yes
25/03/2010	13:11	Waterfill W01-1 Barrett	B787_misfire	0.08	100.70	Yes	0.15	82.2	Yes
30/03/2010	13:10	Southcut S12-3 Barrett	B825	0.21	97.60	Yes	0.08	103	Yes
9/04/2010	13:33	South Pit strip 13 block 1	B830_S13-1	0.04	97.70	Yes	0.01	97.5	Yes
13/04/2010	12:56	Waterfill Pit, block 2	B831_W02_1	0.06	97.40	Yes	0.04	93.3	Yes
15/04/2010	12:25	Waterfill Pit, block 2	B832_W02_1	0.05	88.20	Yes	0.03	90.8	Yes
16/04/2010	13:10	South Cut, strip 12, block 3	S1203_BAR_03.	0.25	96.70	Yes	0.11	93.2	Yes
23/04/2010	13:06	South Cut, Strip 13, block 1	B829_S1301_1	0.25	100.60	Yes	Est0.61	Est102.6	No
27/04/2010	12:50	Waterfill Pit, block 2	B833_W02_1	0.07	99.60	Yes	0.07	104.5	Yes
30/04/2010	12:54	Waterfill Pit, block 2.	B834_W02_1	0.03	104.60	Yes	0.03	106.6	Yes
4/05/2010	12:29	South Cut, Strip 12 Block 1.	S1301_BAR_04	0.06	84.30	Yes	0.03	94	Yes
6/05/2010	12:36	Waterfill Pit, Block 3	W03_ART_02	0.08	107.30	Yes	0.06	102.1	Yes
7/05/2010	13:06	South Cut, Strip 14 Block 2	B823_S14_LEMd_LEMC	0.06	88.70	Yes	0.03	92.9	Yes
13/05/2010	13:06	Waterfill Pit, Block 3	W03_ART_02_B	0.07	102.50	Yes	0.06	99.8	Yes
14/05/2010	15:56	South Cut, Strip 12	S1202_BAR_06	0.06	89.50	Yes	0.02	89.9	Yes
18/05/2010	13:02	Waterfill Pit, Block 02	W02_LID_09_A	0.04	111.20	Yes	0.04	100.4	Yes
20/05/2010	12:41	Water fill Pit, Block 2.	W02_BAR_014	0.09	106.80	Yes	0.16	95.2	Yes
21/05/2010	13:17	Water fill Pit, Block 2	W02_LID_09B	0.05	93.40	Yes	0.05	97.5	Yes
21/05/2010	16:18	South Cut, Strip 14, block 4	S1404_LEM_05	0.07	109.60	Yes	0.07	107.4	Yes
24/05/2010	12:32	Waterfill Pit, Block 2	W02_LID_09c	0.05	90.60	Yes	0.05	98.7	Yes
28/05/2010	15:25	South Cut, Strip 13 Block 1	S1301_LID_08	0.04	93.30	Yes	0.01	92.9	Yes
31/5/2010	12:46	Waterfill Pit, Block 2	W02_LID_09d	0.05	112.2	Yes	0.05	105.7	Yes
2/06/2010	12:43	Waterfill Pit, Block 02	W02_LID_09E	0.07	97.50	Yes	0.06	98.6	Yes

Appendix 6 – Liddell Colliery Blast Monitoring Results 2009 to 2010 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
9/06/2010	13:09	Waterfill Pit,	W02_LID_13A	0.09	113.90C	Yes	0.05	107.07	Yes
15/06/2010	13:06	South Cut, Strip 14, Block 4	S1404_LEM_10+11+12	0.09	101.50	Yes	0.05	105.6	Yes
16/06/2010	12:50	South Cut, Strip 13 Block 1	S1301_BAR_020	0.16	105.80	Yes	0.06	92.3	yes
18/06/2010	12;56	Waterfill Pit, Block 3	W03_LID+45_015	0.05	100.30	Yes	0.04	106	Yes
23/06/2010	15:31	South Cut, Strip 14 Block 5	S1405_LEM_021	0.06	100.50	Yes	0.04	97.6	Yes
29/06/2010	12:07	Raw Water Transfer Void	RWTV_LEM_016a	0.05	112.20	Yes	0.05	111.5	Yes

Note : Results in bold indicate exceedance of threshold limits.
Est = Estimated result due to non-capture of blast.
C = Calculated result, original result was wind affected.

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 >10 mm/s not allowable at any time

Limits for Chain of Ponds:
133 dB overpressure
10 mm/s ground vibration

Blast Monitoring Statistical Summary
July 2009 - June 2010

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	%
Scrivens	104	103	99	1	1	0	0	0	0	0	0
Burlings	104	104	100	0	0	0	0	0	0	0	0

Note: Result at Burlings on 9 June 2010, 123.27 dB (L) was found to be caused from wind and not as a result of blasting at Liddell Coal.

YTD	Number of Blasts Requiring Monitoring	Monitored Blasts		>133 db(L)	>10 mm/s
		Number	%	Number	Number
Chain of Ponds	104	104	100	0	0

Appendix 7

Monitoring Data Comparisons

Appendix 7 – Liddell Colliery Three Year Monitoring Data Comparison

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

Monitoring Location	July2007 to June2008	July2008 to June2009	July2009 to June2010
D53	2.5	3.1	3.8
D54	4.4	4.8	3.7
D55	1.8	2.4	1.7
D56	1.7	2.0	2.3
D57	3.3	5.4	5.7
D58	1.8	2.0	2.1
D59	1.6	1.5	1.4
D60	3.3	2.2	2.3
D61	2.8	3.7	4.9
D62	2.8	2.2	2.7

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

	July 2007 to June 2008	July 2008 to June 2009	July 2009 to June 2010
HVAS 13	64.7	90.7	97
HVAS 11	38.7	50.7	45

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

	July 2007 to June 2008	July 2008 to June 2009	July 2009 to June 2010
HVAS 6	24.2	27.7	26
HVAS 12	14	18.9	17

Appendix 7 – 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 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
July 2009 to June 2010	7.7	3967	10	2506	8.1	4908	4	3363	8.6	5410	70	4166

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 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
July 2009 to June 2010	8.0	924	4	524	7.7	1434	4	833

Appendix 7 – 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 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
July 2009 to June 2010	8.0	924	4	524	7.6	2539	5	1715	7.9	1414	2	823	8.1	1089	2	607
	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 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
July 2009 to June 2010	8.0	1151	23	693	7.8	1787	3	1060	8.0	1644	21	947	7.7	1434	4	833

Appendix 7 – 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 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)**
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
July 2009 to June 2010	8.6	1669	4	1021	8.7	5481	5	3631	8.3	6222	6	4736

	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 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
July 2009 to June 2010	8.7	6144	12	4012	8.7	5014	8	3263	9.1	5553	25	3723	8.6	5340	6	3255

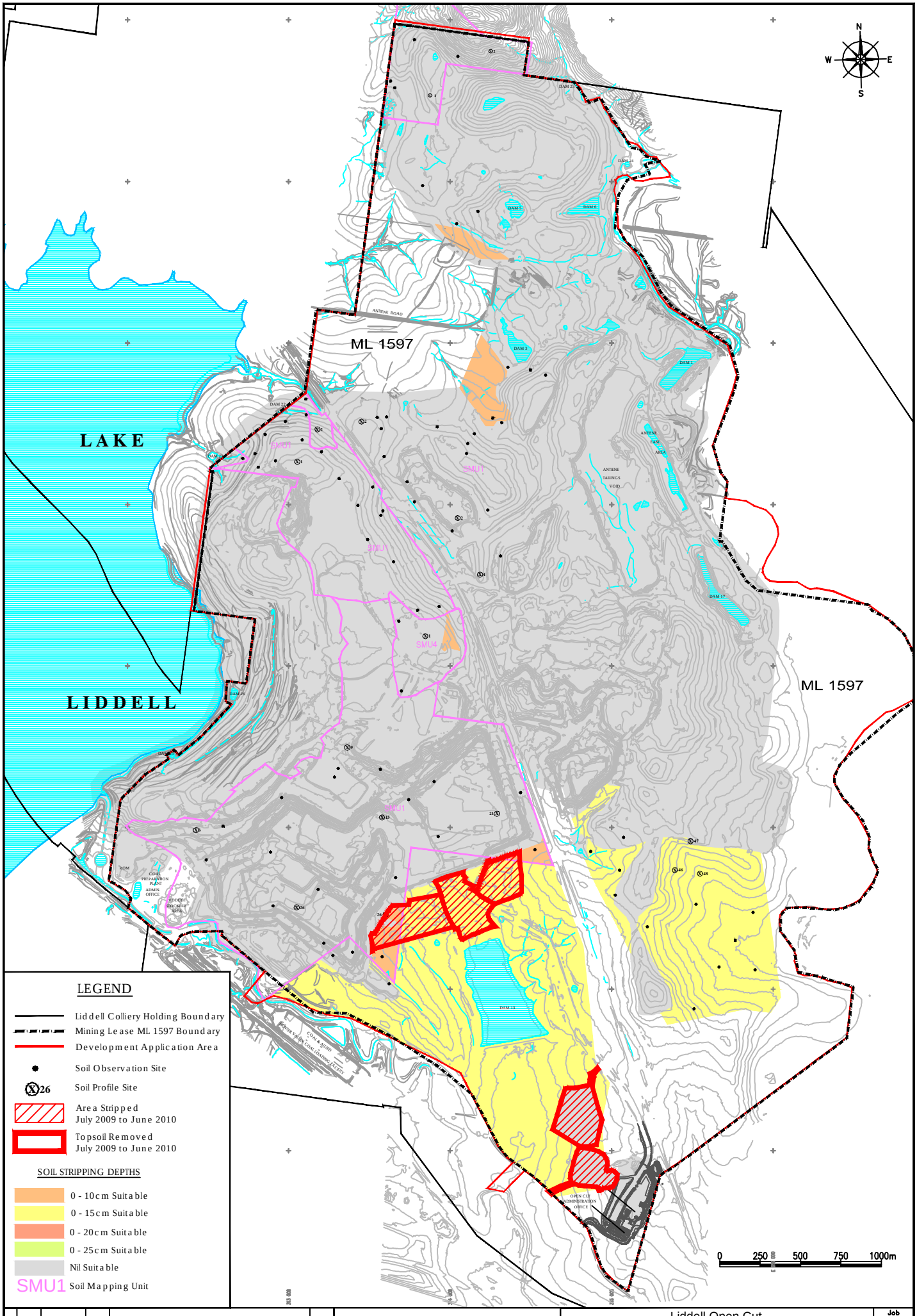
Appendix 8

Statutory Plans:

Plan 3 – Land Preparation

Plan 4 and Plan 5 combined

Proposed Mining Activities and Rehabilitation



LEGEND

- Liddell Colliery Holding Boundary
- Mining Lease ML 1597 Boundary
- Development Application Area
- Soil Observation Site
- X26 Soil Profile Site
- Area Stripped July 2009 to June 2010
- Topsoil Removed July 2009 to June 2010

SOIL STRIPPING DEPTHS

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

REVISIONS	REV.	DATE	BY	DESCRIPTION	CHK.

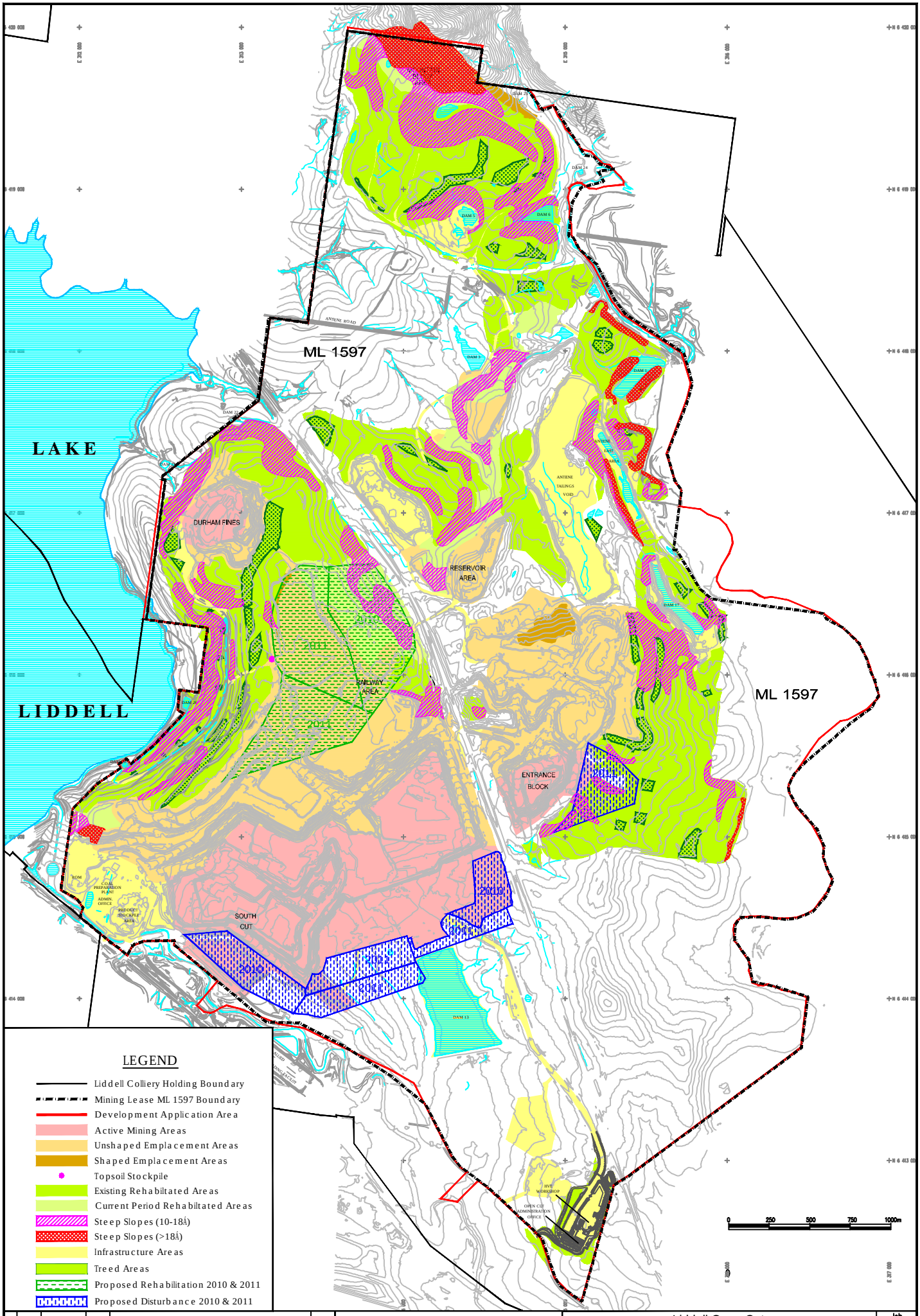
Pegasus Technical
St Patricks Commercial Centre
16 Cambridge Street
(P.O. Box 478) Singleton, NSW, 2330
Telephone: 02 65 718888
Fascimile: 02 65 718844
Website: www.pegasus.net.au

Liddell Open Cut

Land Preparation
Plan 3
June 2010

Job	Dwg No.	Rev.	Sheet
TEDJ10710	06588	B	A4

Date	Scale:	Drawn	Checked	Approved
02.09.10	1:30,000	CS		CD



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 Rehabiltated Areas
- Current Period Rehabiltated Areas
- Steep Slopes (10-18Å)
- Steep Slopes (>18Å)
- Infrastructure Areas
- Treed Areas
- Proposed Rehabilitation 2010 & 2011
- Proposed Disturbance 2010 & 2011

REVISIONS

REV.	DATE	BY	DESCRIPTION	CHK.

Pegasus Technical
St Patricks Commercial Centre
16 Cambridge Street
(P.O. Box 478) Singleton, NSW, 2330
Telephone: 02 65 718888
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Website: www.pegasus.net.au

Liddell Open Cut

Mining Activities and Rehabilitation
Plan 4 and 5
June 2011

Job	Dwg No.	Rev.
TEDJ10710	06589	C

Date	Scale:	Drawn	Checked	Approved	Sheet
02.09.10	1:30,000	CS		CD	A4

Appendix 9

Liddell Coal Community Newsletter January

2010,

Issue No. 5

Liddell News

Liddell Coal Operations Community Newsletter
February 2010, Issue no. 5

Message from the Operations Manager

I am pleased to welcome you to the fifth edition of our community newsletter, the *Liddell News*, which provides information on what has been happening at Liddell Coal recently and what will be happening into 2010.

It was a busy year for us here at Liddell in 2009 with a number of our major projects coming to fruition, including the rehabilitation at the Mountain Block and parts of the Reservoir Area, commissioning of the new coal preparation plant, decommissioning of the old Hunter Valley Earthmoving (HVE) facilities in preparation for mining the area, and deconstruction of the old coal preparation plant. We have also maintained many of our ongoing projects such as weed management, feral animal control and monitoring of flora and fauna.

This year will be another exciting one, with Liddell Coal becoming owner-operator of the Open Cut Operation in April 2010 and we are in the process of purchasing all new mining equipment and employing the new workforce. We look forward to welcoming the new faces and will endeavour to introduce them to you in future issues of the *Liddell News*.

Tony Galvin
Operations Manager

Tony Galvin.

Mining update

Mining statistics
In 2009, our mining contractor HVE mined approximately 5.1 million tonnes of raw coal and of that, approximately 3.9 million tonnes of product coal was exported. Approximately 4.2 million tonnes of product coal is scheduled in 2010.

New bioremediation area
Liddell completed the construction of a new bioremediation area in 2009 to replace the old one at HVE's previous infrastructure facilities. This area will be used to remediate hydrocarbon waste and spills to a level where the waste may be classified as inert and disposed of on site. This area proved critical during the decommissioning of the old infrastructure facilities and will play an important role during any significant hydrocarbon spills which may occur on site. This is a cost effective alternative to disposal of these wastes off site and ensures Liddell will remain compliant with the Contaminated Land Management Act 1997. Suspected contaminated material was stockpiled separately and removed to the bioremediation area. Initial mining operations in this area commenced in July 2009.

Deconstruction of the old Coal Preparation Plant.

Demolition of the mining contractor open cut bathhouse and crib facilities.

Old Coal Preparation Plant deconstruction
The final stages of deconstruction of the old Coal Preparation Plant (CPP) was completed mid-December 2009. Controlled collapse of various parts of the CPP has taken place since October and all waste taken off site and recycled where possible.

Open cut workshop decommissioning and remediation
HVE relocated into the new workshop facilities adjacent to the Liddell Coal Operations administration building in late 2008. The demolition of the redundant HVE facilities including administration building, bathhouse and crib room took place in May 2009. Controlled collapse of the workshop took place in early June 2009. Due to the potential for hydrocarbon contamination in the ground under and around the old workshop, Liddell Coal instigated a Hydrocarbon Remediation Action Plan (HRAP). The HRAP involved selective sampling of soil based on the potential for contamination, visual evidence and odour.

New Coal Preparation Plant.

Employee profile

Mark Turnbull.

Name – Mark Turnbull

Position at Liddell – Mine Accountant

When did you start working at Liddell? Sept 2009

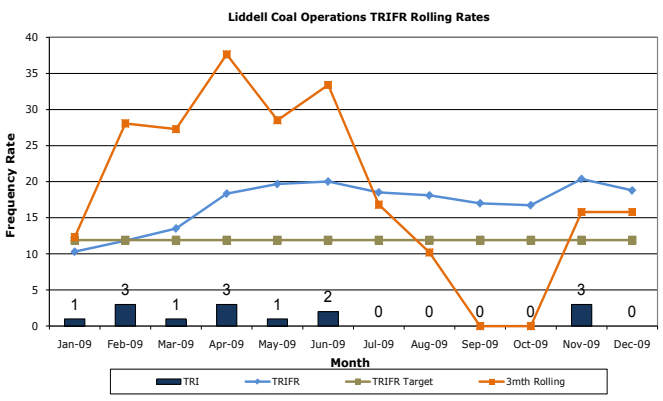
Where did you come from? I am from Newcastle and completed a Bachelor of Commerce at the University of Newcastle. I have worked within the Hunter Valley Coal Industry for the past six years at various operations while completing the Certified Practicing Accountant (CPA) qualification.

What do you enjoy about working at Liddell? Liddell offers an environment where you can be challenged to reach your full potential while amalgamating with work colleagues and stakeholders to achieve common goals.

OHS update

Health and Safety statistics (Total Recordable Injuries and Total Recordable Injuries Frequency Rate) for Liddell Coal Operations are displayed right. The number of total injuries improved towards the end of 2009 with the increased focus for employees in both the open cut and washery areas to complete pre-task risk assessments and task observations. Hazard awareness was also a focus during these periods.

2010 will see the review of the site Sustainable Development systems and will incorporate environment and community aspects as well as people, health and safety.



Liddell Coal Operations TRIFR Rolling Rates.

Environment update

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

Weed management

Since our last update, the following weeds have been targeted as part of Liddell Coal's Weed Management Plan:

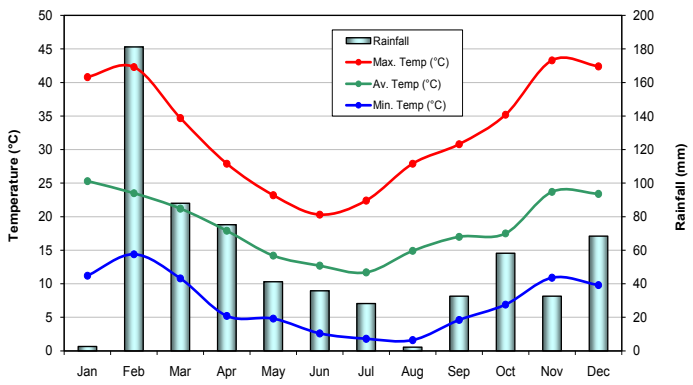
- African Olive, Blackberry and Lantana on the Hillcrest property north of the minesite;
- Galenia, Castor Oil Bush, Mother of Millions, Pampas Grass, Prickly Pear and African Boxthorn on the mine site and rehabilitated areas.

Mountain Block rehabilitation

Rehabilitation of the Mountain Block area, north of Antienne Road, commenced in early May 2009. The project involved earthworks to stabilise the slope, constructing graded contour banks and revegetating the slope to reduce the potential for erosion. The work was completed and aerial seeding undertaken in October 2009.

Liddell Coal weather station

A new weather station was installed on site in late December 2008 in accordance with Liddell Coal's development consent. The station measures meteorological conditions including temperature, humidity, wind speed and direction, atmospheric pressure, solar radiation and evapotranspiration. The data is used on site for daily operations such as blasting and dust management and for long term predictions, for example, rehabilitation planning.



Temperature and rainfall 2009.

Rehabilitation work at Mountain Block.

Community update

Community Consultative Committee

Liddell Coal's Community Consultative Committee (CCC) provides a forum for our local community, local government and mine management to meet and discuss key environmental issues. CCC meetings are held every six months in accordance with Liddell Coal's development consent.

We would like to take this opportunity to welcome our two new community representatives to the Liddell Coal CCC, Mr Michael Spiteri and Mr Stephen Oliver. Our CCC now consists of three community representatives, four representatives from Muswellbrook Shire Council and Singleton Shire Council, and two Liddell Coal representatives.

Our last meeting was held on 20th October 2009 at the Liddell Coal Operations Administration Building. Items discussed at the meeting included: mine safety, mine operations, environmental performance and community involvement. Please refer to our website for minutes of the meeting.

A list of Committee members and their telephone contact details are provided below. We encourage you to either contact your community representatives or us directly if there are any issues you would like addressed or raised at committee meetings.

- Community Representatives:

Julie Clydsdale	6576 1103
Michael Spiteri	6576 1786
Stephen Oliver	6576 1749

- Singleton Council Representatives:

Cr Val Scott	6571 1312
Brian Thomas	6578 7290

- Muswellbrook Council Representatives:

Cr Jennifer Lecky	6542 5792
Craig Flemming	6549 3775

- Liddell Coal Representatives:

Tony Galvin	6570 9900
Mark Howes	6570 9900

Donations and sponsorships for 2009

Liddell Coal has made donations and sponsorships to the following organisations and charities so far in 2009:

- Lake Liddell Trust
- Hebden Wild Dog Association
- Singleton Amateur Theatrical Society
- End of year presentation funding for local schools
- Cancer Council – Singleton Relay for Life
- Mercy Nursing Home
- Lifeline Muswellbrook

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 us for further information.

Blasting Information Line

A Blasting Information Line has been established on free call number 1800 037 317 to provide the public with access to information on proposed blast events at Liddell Coal Operations. This information line is updated on the morning of each blast with the location and the time proposed for each event.

Website

The recently approved Liddell Coal Environmental Management Plans and Monitoring Programs are now available on the website. Other useful information such as monthly environmental monitoring results, CCC minutes, and newsletters are also uploaded regularly, so keep an eye out!

For further information contact:

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

Community enquiries hotline:
(02) 6570 9939

Blasting Information Line:
1800 037 317

Company contact details:

Liddell Coal Operations Pty Ltd
Old New England Highway,
Singleton NSW 2330
T (02) 6570 9900
F (02) 6570 9999
W www.liddellcoal.com.au

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