2012

Liddell Coal Annual Environmental Management Report

CLIBBORN
ENVIRONMENTAL CONSULTING

Liddell Coal Annual Environmental Management Report

January - December 2012

Prepared for

Liddell Coal Operations Pty Ltd

Prepared by

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20 March 2013

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2012 AEMR

Name of mine:	Liddell Colliery		
Titles/Mining Leases	ML1597		
MOP Commencement Date	31/01/2008	**MOP Completion date**	31/01/2015
AEMR Commencement Date	01/01/2012	**AEMR End date**	31/12/2012
Name of leaseholder	Liddell Coal Operations Pty Ltd		
Name of mine operator (if different)			
Reporting Officer:	David Foster		
Title:	Operations Manager		

Signature:

Date: 20 March 2013

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1.0 Introduction

Liddell Coal, located in the Upper Hunter Valley, is operated by Liddell Coal Operations Pty Limited (LCO) under the conditions of development consent DA 305-11-01. This Annual Environmental Management Report (AEMR) has been prepared by Clibborn Environmental Consulting on behalf of LCO in accordance with the *Guidelines to the Mining, Rehabilitation and Environmental Management Process* (DPI, 2006) and Schedule 5, Condition 3 of the DA 305-11-01.

The AEMR is distributed to:

- the Department of Planning and Infrastructure (DP&I);
- Department of Trade and Investment (DTI);
- Environment Protection Agency (EPA);
- Heritage Branch, Office of Environment and Heritage;
- NSW Office of Water;
- Singleton Council;
- Muswellbrook Shire Council; and
- LCO Community Consultative Committee

The reporting period for this AEMR extends from 1 January 2012 to 31 December 2012.

1.1 Background

Liddell Coal is an open cut coal mine located approximately 25 kilometres north-west of Singleton, NSW (Figure 1). Liddell Coal is operated by Liddell Coal Operations Pty Ltd, on behalf of the Liddell Joint Venture between Xstrata Coal Australia Pty Ltd (67.5%) (Xstrata) and Mitsui Matsushima Australia Pty Ltd (32.5%) (MMA).

Mining operations at Liddell Coal 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.

An aerial photograph of the operation is shown in Figure 2.

During the reporting period mining operations were undertaken using the excavator and truck /shovel method of operation. LCO has consent to extract no more than eight 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.

1.2 Consents, Leases, Licences and Other Approvals

A number of consents, leases, licences and other approvals regulate mining operations at LCO. The status of development consents, licenses and relevant approvals are listed in Table 1.

LCO operates primarily under one consolidated mining lease, ML 1597, as shown in Figure 3.

Compliance with the EPL is reported annually to the Office of Environment and Heritage (OEH) in the EPL Annual Return. LCO's compliance with the EPL is also discussed in Section 3.0 of this report.

1.2.1 Mining Operations Plan

There were no changes to the current approved Mining Operations Plan during 2012.

Figure 1 **Locality Map**

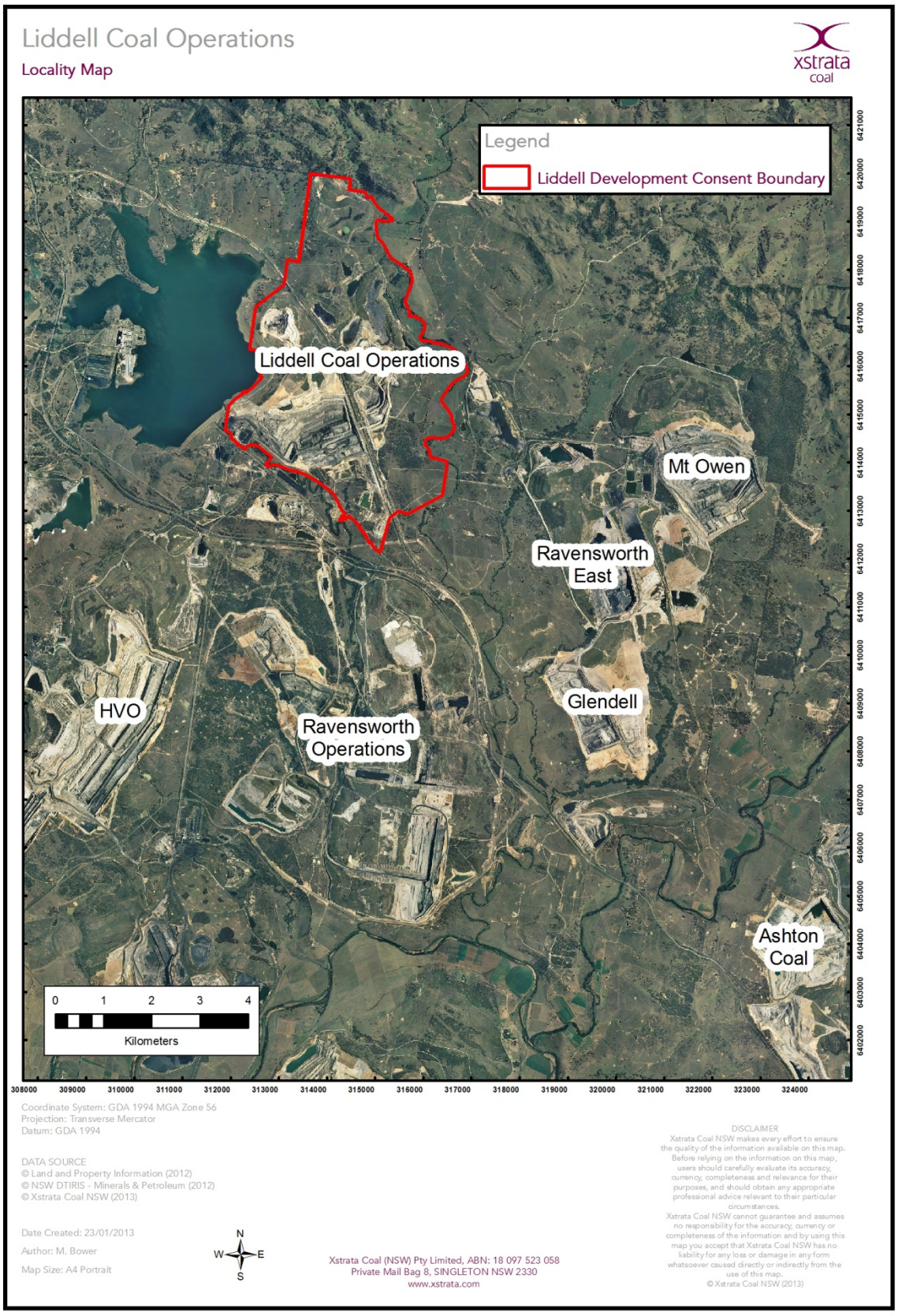

Figure 2 **Aerial Photograph LCO 2012**

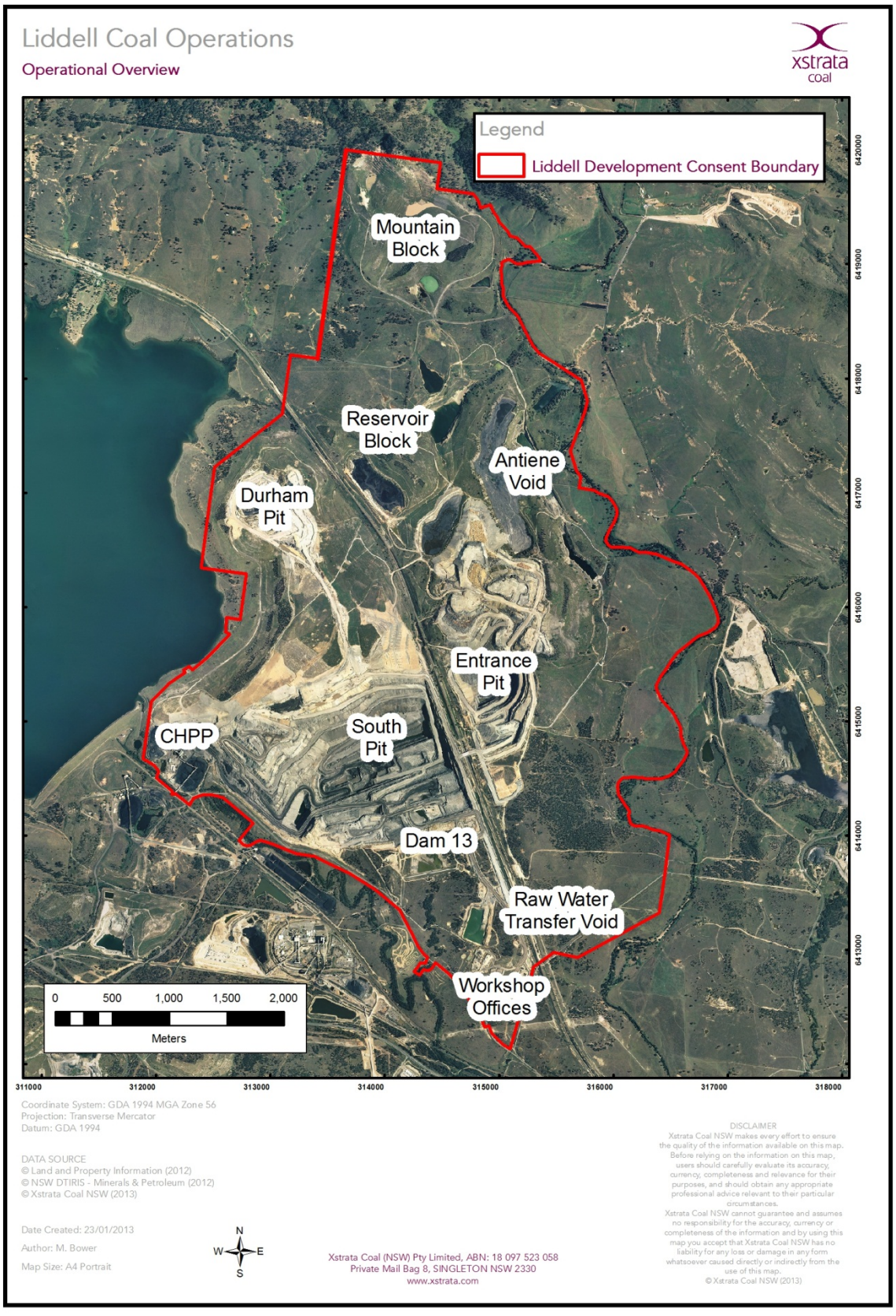

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Table 1 LCO development consents, leases, licences and other approvals

Development Consents		
Approval Number	**Description**	**Expiry Date**
DA 305-11-01	Continued operation of the Liddell Colliery	31 December 2023
DA 305-11-01 Modification	- Increase in the maximum total ROM coal production rate from 4.5 to 8 Mtpa tonnes per annum; - increase in the mining footprint within the approved South and Barrier Pits by a total of 47 hectares; - construction and operation of a new preparation section of the Coal Handling and Preparation Plant and minor upgrades to the ROM receival and product coal facility; - establishment of a new supplementary coal stockpile; - receival and delivery of up to 1.5 Mtpa of coal to and from Cumnock No. 1 Colliery; - increase in the maximum transportation rate of reclaimed tailings from 0.3 to 0.5 Mtpa to Macquarie Generation; - realignment of an already approved access road and services corridor relocation of part of the Old New England Highway; - relocation and construction of the open cut mining offices, workshops and associated infrastructure to the south eastern portion of the Liddell development consent area; - construction of a bridge over the Main Northern Railway to provide for more efficient movement of coal and overburden between open cut pits; and - modifications to the footprint and size of the already approved Dam 13B.	31 December 2023
DA 305-11-01 MOD 3	- Alterations to the approved intersection layout for the Old New England Highway/mine access road intersection; - minor realignment of the development consent boundary to accommodate the road works; - reuse of treated effluent from the office/workshop complex; and - corrections to numbering in the development consent.	31 December 2023
DA 305-11-01 MOD 4	Additions to the Mining Infrastructure Area including: - two additional high machinery workshop bays; - additional relocatable admin & workshop offices; - fuel farm extension; - storage shed and compound.	31 December 2023

Mining Leases		
Title	**Authority**	**Expiry Date**
Mining Lease 1597	DTIRIS	5 November 2028
Consolidated Coal Lease No. 708	DTIRIS	30 December 2023
Mining Lease No. 1313	DTIRIS	13 October 2023
Cumnock Sublease Mining lease No. 1552	DTIRIS	10 March 2025
Environmental Protection Licence		
Licence	**Description**	**Expiry Date**
EPL 2094	Environmental Protection Licence (File number 27051)	30 June (Anniversary Date) 7 September 2014 (Review Due Date)
Mining Operation Plan		
Name	**Commencement Date**	**Expiry Date**
Liddell Colliery Mining Operations Plan 2008 – 2015 (MOP)	31 January 2008	31 January 2015

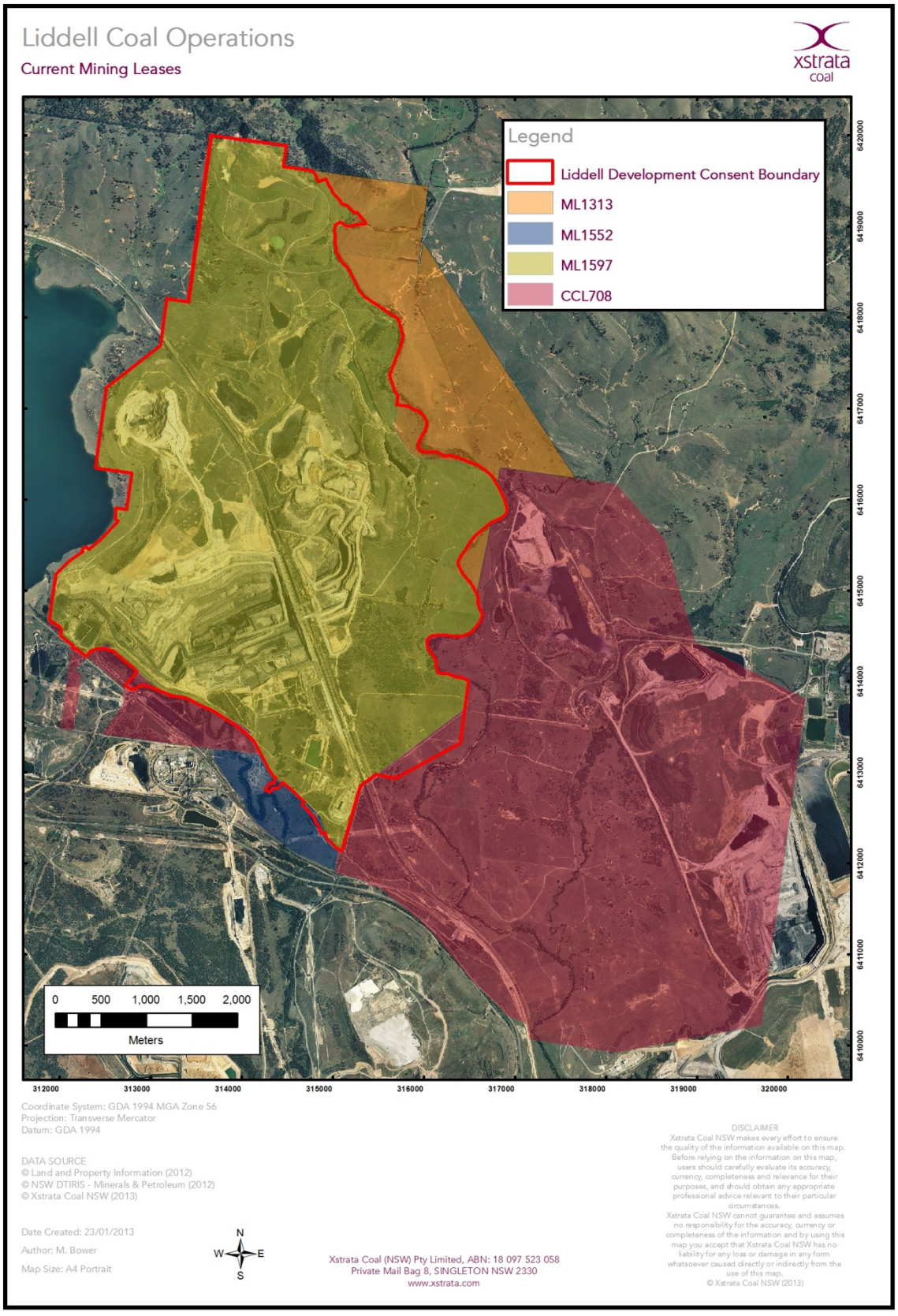
Surface Water Extraction Licences					
Locality	**Licence No.**	**Holder**	**Use**	**Annual usage (ML)**	**Annual Allocation (ML)**
Hunter River	WAL7815	Liddell Tenements Pty Ltd	Industrial	Nil	20 ML
Hunter River	WAL13387	Novacoal Australia Pty Ltd	Diversion works - pumps	Nil	20 ML
Bowmans Creek	WAL18304	Enex Foydell Pty Ltd	Irrigation	Nil	32 ML
Bayswater Creek	WAL18306	Mitsushima Australia Pty Ltd Enex Liddell Pyt Ltd Gabume Pty Ltd	Industrial (coal mining purposes)	Nil	100 ML
Bowmans Creek	WAL18318	Enex Foydell Pty Ltd	Irrigation	Nil	55 ML
Foy Brook/Bowmans Creek	WAL18320	Enex Foydell Pty Ltd	Irrigation	Nil	50 ML

Groundwater Licences						
Locality	**Licence No.**	**Holder**	**Lot/DP**	**Purpose**	**Annual Extraction 2012 (ML)**	**Annual Extraction Allocation (ML)**
Bowmans Creek Alluvial	WAL18302	Liddell Southern Tenements PL	32//545601	Irrigation	Nil	5 ML
ALV1, ALV2, ALV3, ALV4, ALV7, ALV8	20BL168053	Liddell Coal Operations PL	43/654013 201/848078 4/455403 81/607296 6/255403 31/545601	Test Bore/Monitoring	N/A	N/A
Haz 2	20BL168060	Liddell Tenements PL	81/607296	Industrial (2 bores)	0 ML	5500 ML
Durham 2 & 4	20BL168061	Liddell Tenements PL	3/237654	Industrial (2 bores)	0 ML	1000 ML
8 South 3 & 4	20BL168062	Liddell Tenements PL	82/870789	Industrial	0 ML	6000 ML
Durham 1	20BL168063	Liddell Tenements PL	33/862516	Industrial	0 ML	6000 ML
LC1	20BL168064	Liddell Tenements PL	353/867083	Monitoring	N/A	N/A
Dur 3	20BL168065	Liddell Tenements PL	31/837350	Monitoring	N/A	N/A
Haz 6	20BL168066	Liddell Tenements PL	81/607296	Monitoring	N/A	N/A
PGW5	20BL171092	Liddell Southern Tenements PL	81/607296	Monitoring	N/A	N/A
M49	20BL172293	Liddell Southern Tenements PL	32/545601	Dewatering	2077.22 ML	2500 ML (Combined with 20BL168209)
Mt Owen 1	20BL168209	Xstrata Mt Owen Pty Ltd	353/867083	Stock, domestic, farming and test purposes	39.81 ML	2500 ML (Combined with 20BL172293)
Mt Owen 2	20BL169544	Xstrata Mt Owen Pty Ltd	353/867083	Dewatering	0 ML	2500 ML
Middle Liddell	20BL172588	Liddell Coal Operations PL	1/237766	Dewatering	0 ML	6000 ML

Aboriginal Heritage Permits			
Licence	**Site**	**Salvage Date**	**Expiry Date**
#2348 (dated 7 August 2007)	Chain of Ponds Site Area (LID 28, 29, 30, 31, 32)	21, 22, 23 November 2006	3 October 2016
s87 #2883 s90 #2896	Bayswater Creek	March/April 2008	18 February 2010 18 March 2020

Radiation Density Gauge Licences				
Radionuclide	**EPA Registration Number**	**Nominal Activity**	**Serial Number**	**Expiry Date**
Am-241	RR1259	12 GBq	2338LG	23/06/2014
Cs-137	RR1260	370 MBq	FL542	23/06/2014
Cs-137	RR20148	370 MBq	PS838	1/12/2014
Cs-137	RR20152	7.4 GBq	PS837	1/12/2014
Cs-137	RR20153	7.4 GBq	PS836	1/12/2014
Licence # RL28136 (Possess Radioactive Apparatus & Substances)				24/06/2014

Figure 3 **Mining Leases**



1.3 Mine Contacts

The contact details for the personnel directly responsible for the environmental management of the LCO are shown in Table 2.

Table 2 Mine Contacts

Name	Position	Company	Contact Numbers
David Foster	Operations Manager	Liddell Coal Operations	(02) 6570 9919 (M) 0459 168 589
Murray Gregson	Mining Manager	Liddell Coal Operations	(02) 6570 9964 (M) 0447 886 810
Ben de Somer	Environment and Community Superintendent	Liddell Coal Operations	(02) 6570 9947 (M) 0427 936 734

1.4 Actions Required at Previous AEMR Review

DTI conducted a site inspection on 30 April 2012 following a review of the previous AEMR. In a follow up letter received from NSW Planning and Infrastructure dated 5 May 2012 regarding the 2011 AEMR and the pervious inspection, a number of issues were raised that required rectification in the 2012 AEMR. While general compliance was observed during the site inspection, the actions in Table 3 below were identified as requiring attention.

Table 3 Actions required at Previous AEMR Review

Action Number	Issue/Observation	Action	Action Achieved
1	Potential overflow area adjacent to drain near fuel farm	Form up the concrete bund to ensure any overflow is directed into the constructed drain as opposed to flowing unimpeded from the concrete area.	Formation of a concrete bund has been added to the work scope of a number of planned maintenance improvements for the workshop facility.
2	No freeboard in bunded pallets due to rainfall	Ensure oil/battery/grease bunded pallets are stored in a manner that ensures that pallets do not store rainwater.	Hydrocarbons are no longer stored on bunded pallets that are exposed to rainfall.
3	Lubricants on bunded pallets on dirt	Construct dedicated concrete lubricant storage area with managed drainage to reduce risk of hydrocarbon contamination.	A 20 foot shipping container is now used onsite as a storage facility with enough internal bunding to store up to 16 IBC pods in compliance with relevant Australian Standards.
4	The 2011 AEMR did not include an environmental incidents section	An environmental incidents section should be included in the next AEMR.	Environmental Incidents are reported in section 3.3 of this AEMR.
5	The 2011 AEMR did not include an annual windrose	An annual windrose should be included in the next AEMR.	An annual windrose has been included as Figure 9 of this AEMR.
6	It was unclear in the 2011 AEMR which air quality monitors were used for management purposes and which were compliance	Clarification of which air quality monitors are for compliance and which are for management purposes only, and also that omitted	Figure 10 has been updated to include all sites and text clarifies which monitors are used only for management

	monitors. Also, some monitors were not shown on the relevant figure	sites be added to the figure showing monitor locations.	purposes.
7	The trailer mounted noise monitor was placed at a residence without noise alarming being set up.	Investigate the introduction of SMS noise alarming and report on the progress of silent horn and quacker installation.	The trailer mounted noise monitor is now set up with SMS alarming for management purposes, with further work being conducted to determine suitable alarming levels. Silent horns have been fully implemented and are running effectively. Quackers were trialled successfully and are being implemented progressively across the fleet.
8	Several administrative errors were evident in the 2011 blasting data.	More diligent display of blast monitoring results.	Extra attention has been paid to the presentation of blasting results in this AEMR.

It was also noted that, in regard to rehabilitation, the AEMR document referred the reader to various plans and internal documents without stating their availability on the website. This has been rectified in this AEMR. The previous AEMR reported that the trigger values were exceeded in the Alluvial Aquifer monitoring data without referencing whether additional attention to this matter was required or undertaken. Information has been included that explains these trigger values and the actions taken when they are exceeded.

1.5 Compliance summary

This AEMR has been prepared to address all relevant conditions of the LCO Approval DA 305-11-01. The requirements relating to the AEMR as set out in DA 305-11-01 are summarised in Table 4, which also indicates where each condition is addressed in this AEMR.

Table 4 DA 305-11-01 Conditions relating to the AEMR

Condition	AEMR Section
Schedule 3, Condition 27 **Groundwater Monitoring** The Applicant shall regularly monitor: (a) the volume of groundwater seeping into the open cut mine workings; (b) regional groundwater levels and quality in the surrounding aquifers; (c) the groundwater pressure response in the surrounding coal measures; and (d) report the results of this monitoring in the AEMR, to the satisfaction of the Director-General.	3.8 Appendix F
Schedule 3, Condition 42 **Monitoring of Coal Transport** The Applicant shall: (a) keep records of the: • amount of coal transported from the site each year; and • number of coal haulage train movements generated by the development (on a daily basis); and (b) include these records in the AEMR.	Section 2.5 Appendix A

Condition	AEMR Section
Schedule 3, Condition 46 **GREENHOUSE GAS** **Monitoring and Reporting** The Applicant shall: (a) monitor the greenhouse gas emissions generated by the development; (b) investigate ways to reduce greenhouse gas emissions generated by the development; and (c) report on greenhouse gas monitoring and abatement measures in the AEMR, to the satisfaction of the Director-General.	Section 3.18
Schedule 3, Condition 47 **WASTE MINIMISATION** The Applicant shall: (a) monitor the amount of waste generated by the development; (b) investigate ways to minimise waste generated by the development; (c) implement reasonable and feasible measures to minimise waste generated by the development; (d) ensure irrigation of treated wastewater is undertaken in accordance with DECC's Environmental Guideline for the Utilisation of Treated Effluent; and (e) report on waste management and minimisation in the AEMR, to the satisfaction of the Director-General.	Section 2.6
Schedule 5, Condition 3 **ANNUAL REPORTING** Each year, the Applicant shall prepare an AEMR to the satisfaction of the Director-General. This report must:	This document
(a) identify the standards and performance measures that apply to the development;	Section 3.0
(b) describe the works carried out in the last 12 months;	Section 2.0
(c) describe the works that will be carried out in the next 12 months;	Section 6.0
(d) include a summary of the complaints received during the past year, and compare this to the complaints received in the previous 5 years;	Section 4.1
(e) include a summary of the monitoring results on the development during the past year,	Section 3.0
(f) include an analysis of these monitoring results against the relevant: • limits/criteria in this consent; • monitoring results from previous years; and • predictions in the EA noted in condition 2(i) of Schedule 3;	Section 3.0
(g) identify any trends in the monitoring over the life of the development;	Section 3.0
(h) identify and discuss any non-compliance during the previous year; and	Section 3.0
(i) describe what actions were, or are being, taken to ensure compliance	Section 3.0
Schedule 5, Condition 10 **ACCESS TO INFORMATION** Within 3 months of the approval of any plan/strategy/program required under this consent (or any subsequent revision of these plans/strategies/programs), or the completion of the audits or AEMRs required under this consent, the Applicant shall: (a) provide a copy of the relevant document/s to the relevant agencies; (b) ensure that a copy of the relevant document/s is made publicly available at the mine; and (c) put a copy of the relevant document/s on its website.	Section 4.0
Appendix 5 Statement of Commitment 1.45 **Annual Reporting** Details of the Liddell operations including compliance with the Conditions of Consent will continue to be reported annually in an Annual Environmental Management Report (AEMR)	This document

1.6 Key Performance Indicators for Liddell Coal Operations

Table 5 provides an overview of the key performance indicators for LCO during the reporting period.

Table 5 Key Performance Indicators for LCO for the reporting period

Economic Indicators	Target	Actual
Coal ROM (t)	7,417,000	6,868,258
Employees	356	368
Environmental Indicators		
Land area rehabilitated during reporting period (ha)	41	33.42
Potable water consumed (ML)	3.97	3.26
Average annual deposited dust range (private residence)	4 g/m^2/month	<2 g/m^2/month
Total Suspended Particulate (annual average) exceedances	Nil	Nil
PM_{10} dust exceedances (annual average) due to LCO activities	Nil	Nil
Percentage of noise samples exceeding criteria	Nil	Nil
Number of blasts exceeding criteria	Nil	Nil
Social Indicators		
Complaints	2	9

2.0 Summary of Operations during 2012

2.1 Exploration

During the reporting period, LCO undertook a drilling program across the LCO mining leases. Approximately 8 core holes, 5 open exploration holes and 5 open piezometer holes were drilled across the leases for exploration and groundwater management purposes. All drilling and exploration activities were carried out using LCO's exploration drilling and land clearing procedures.

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.

Erosion and sediment control measures are implemented in advance of, or in conjunction with clearing operations to control and manage dirty water.

Vegetation clearing is undertaken in accordance with the LCO 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 33.52 hectares of topsoil was removed ahead of open cut mining during the reporting period. The topsoil was stockpiled as per LCO *Landclearing and Topsoil Stripping Procedure* (May 2010) 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, a new water fill point was installed in the Entrance Pit, the Middle Liddell dewatering bore was installed and construction of the Durham Tailings Dam was commenced.

2.4 Mining

2.4.1 Mining Operations during 2012

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

Mining activities were carried out generally in accordance with the Liddell Coal MOP. During the reporting period active mining areas included South Cut, Entrance Block and Durham Pit. Modifications were made to the Durham Pit during the reporting period to allow it to be used for tailings storage.

Mining operations were undertaken with the mining equipment listed in Table 6.

Table 6 LCO Mining Equipment Fleet

TYPE	MODEL	CAPACITY	No Units	FUNCTION
Hydraulic Shovel	Hitachi EX8000	43m³	1	Overburden
Hydraulic Excavator	Liebherr R996	36m³	2	Overburden
Hydraulic Excavator	Liebherr R9400	22m³	3	Coal and Partings
Rear Dump Truck	Hitachi EH5000	300t	18	Overburden
Rear Dump Truck	Caterpillar 789C	180t	12	Coal and Partings
Loader	Caterpillar 992G	12m³	1	Coal Handling and Prep
Track Dozer	Caterpillar D11R	N/A	3	Coal Handling and Prep
Track Dozer	Caterpillar D11R	N/A	1	Ancillary
Track Dozer	Caterpillar D11R	N/A	1	Rehabilitation
Track Dozer	Caterpillar D10T	N/A	10	Ancillary
Rubber Tyred Dozer	Caterpillar 854K	N/A	1	Ancillary
Drill	Terex Reedrill SKF50	229mm	3	Overburden, Coal and Partings
Grader	Caterpillar 24M	N/A	1	Ancillary
Grader	Caterpillar 16M	N/A	2	Ancillary
Grader	Caterpillar 16G	N/A	1	Ancillary
Water Truck	Caterpillar 769	55kL	1	Ancillary
Water Truck	Caterpillar 777F	70kL	3	Ancillary
Service Truck	Caterpillar 775F	25kL	2	Ancillary
Service Truck	Volvo FM	24kL	1	Ancillary

LCO have approval for production of 8.0Mt of coal per year. A summary of coal production and waste material production for the previous, current and next reporting period is provided in Table 7.

Table 7 Production and Waste Summary

Material	DA 305-11-01	Previous Reporting Period		Current Reporting Period	Next Reporting Period (estimated)
	Approval limits	July 2010 – December 2010	January 2011 – December 2011	January 2012 – December 2012	January 2013 – December 2013
Topsoil stripped (m^3)	N/A	7,848	38,102	33,520	42,000
Topsoil used/spread (m^3)	N/A	0	53,000	33,420	51,000
Waste rock (m^3)	N/A	20,376,442	41,703,918	39,100,464	39,029,255
ROM Coal (tonnes)	8,000,000	2,739,056	6,824,944	6,868,258	7,121,830
Processing waste (coarse and fine reject) (tonnes)	N/A	870,698	2,232,414	2,227,300	2,410,000
Product coal (tonnes)	8,000,000	1,875,397	4,610,603	4,509,770	4,789,181

2.4.2 Forecast production for 2013

Open cut operations in the 2013 reporting period are expected to produce 7,121,830 tonnes of ROM coal, producing 2,410,000 tonnes of reject and 4,789,181 tonnes of product coal with a yield of approximately 66.5%.

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 second Tuesday when the CHPP is stopped for maintenance.

The total ROM coal processed at Liddell's CHPP during the 2012 reporting period was 6,868,098 tonnes (refer Table 7). The total product coal produced was 4,510,465 tonnes with 2,201,488 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, 4,510,465 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 536 loaded coal haulage train movements during the reporting period. Daily train haulage movements are presented in Appendix A. 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

LCO implement the waste management hierarchy established under the Waste Avoidance and Resource Recovery Act 2001. The hierarchy is recognised both nationally and internationally as the desired approach to waste management. The hierarchy focuses on developing resource management options against the following priorities, from most desirable to least desirable:

1. Avoidance - including actions and best practice environmental options to reduce the amount of waste generated by LCO.
2. Resource recovery - including best available techniques reuse, recycling, reprocessing and energy recovery, consistent with the most efficient use of the recovered resources.
3. Disposal - including management of all disposal options in the most environmentally responsible manner.

Reusable and recyclable material that can be found at LCO includes, but isn't limited to:

- Waste oil and grease;
- Comingled Recyclables (paper, cardboard, aluminium cans, plastic);
- Scrap steel and G.E.T. (Ground Engaging Tools);
- Timber pallets;
- Oil and Air filters;

- Tyres;
- Batteries; and
- Effluent.

LCO identified a recycling target of 81% of waste recycled for 2012, with an aim to increase this to 91% of waste recycled by 2014. During 2012 84.21% of waste was recycled.

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 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 (Raw Water Transfer Void) for re-use in the mine water system (see Section 2.7). The Liddell Coal Crib Huts are serviced on a weekly basis.

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.

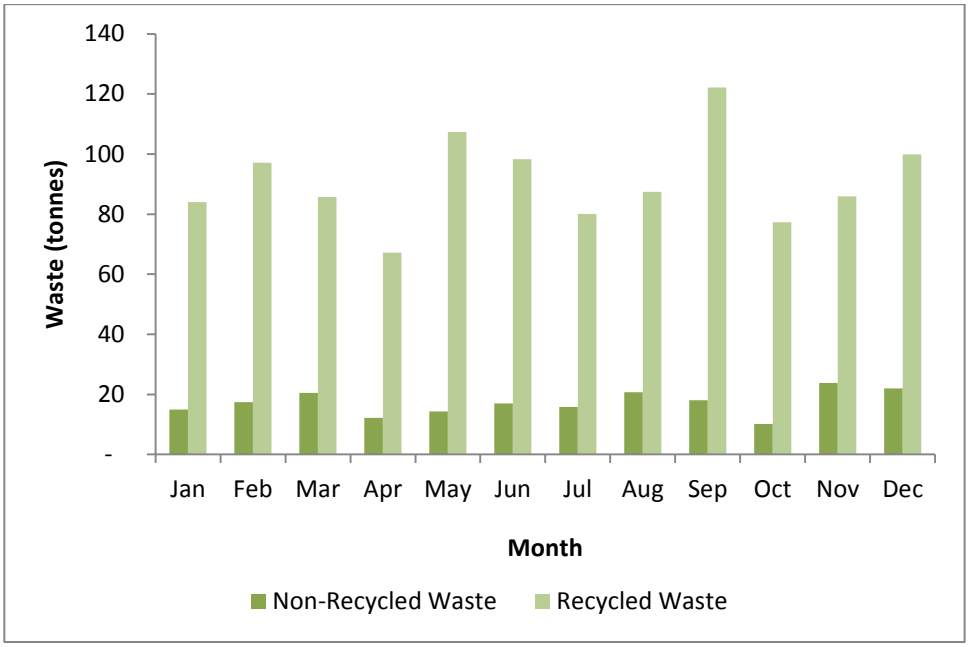
2.6.4 Rubbish Disposal

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 is stored onsite and removed for recycling or disposal by licensed contractors. During the reporting period, LCO sent 206 tonnes of non-recyclable waste to landfill and recycled 1,098 tonnes of waste. Figure 4 shows non-recycled waste versus recycled waste during 2012.

Figure 4 Total monthly non-recycled waste vs recycled waste 2012



2.7 Water Management

2.7.1 Water Management System

Water management is one of the key operational constraints at LCO and is managed through the LCO *Water Management Plan.* The current integrated water management system at LCO has been designed to address four main issues:

1) surface water runoff to existing pits and operational areas;

2) groundwater seepage in open cut and old underground workings;

3) provision of mine operation water for the coal handling and preparation plant (CHPP) and dust suppression; and

4) 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.

Excess water is:

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

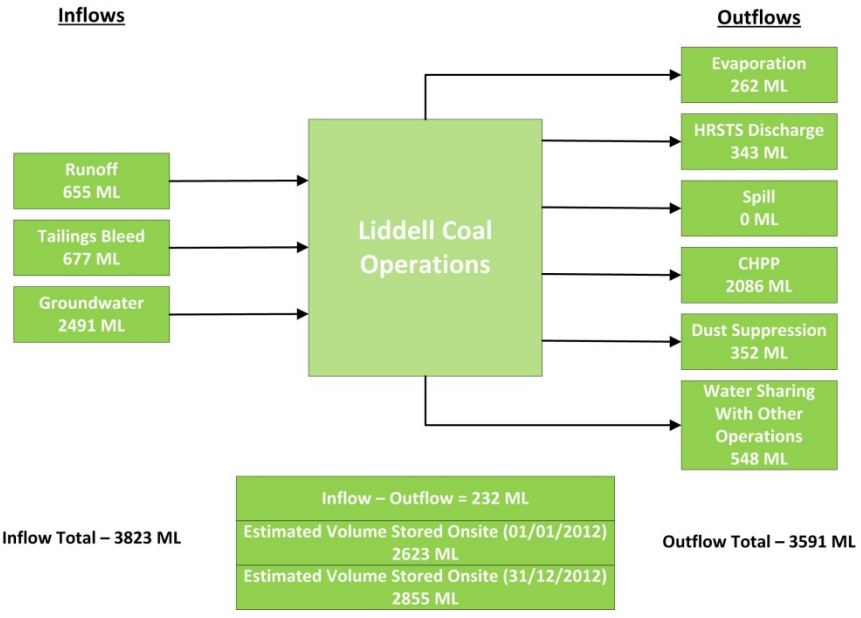
The existing water management system at LCO operates as follows:

- 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, Dam 14, Dam 17 and RWTV (Raw Water Transfer Void) which provide central storage for the site, via a number of staging dams and pumps;

- RWTV is the main mine water dam which supplies the LCO CHPP and from time to time the Howick and Newdell 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 the RWTV from underground storage in the Liddell seam workings of the former Hazeldene and Liddell underground coal mines.
- surplus water in the RWTV 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 the Reservoir Tailings Dams;
- tailings supernatant migrates northward and is decanted into the Decant Dam which is pumped into Dam 4. Water recovered from Dam 4 is transferred to Dam 17 and either pumped back to the RWTV or the Mt Owen CHPP;
- 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.

Stored water volumes during the reporting period are provided in Figure 5.

Figure 5 LCO Water Balance January – December 2012



2.7.2 Water Consumption

The water uses at LCO include CHPP uses, tailings export, dust suppression (haul roads and stockpiles), equipment washdown and potable water usage.

Water is also lost on site through evaporation from dam water surfaces.

Measures implemented by LCO to minimise water use include:

- regular 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 storage and reuse in the toilet system;
- reduced flow showerheads are used in the bathhouse; and

- water efficient design in the CHPP.

Monthly consumption data for the reporting period is provided in Table 8.

Table 8 Water Consumption 2012

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
Raw Water (ML)	212.5	213.2	197.1	211.3	185.8	168.1	193.7	224.6	182	218.8	220.7	181.4	2409.2
Export (ML)	16.2	113.8	162.6	0	0	77	139	66	92.9	78.3	52	30.4	828.2
Potable (ML)	0.279	0.290	0.306	0.249	0.302	0.261	0.271	0.369	0.274	0.280	0.314	0.326	3.521
Discharge (ML)	0	96	189.4	0	0	0	57.88	0	0	0	0	0	343.28

A total 3.521ML of potable water and 2,409.2ML of raw water were used during the reporting period. 828.2ML was exported to other mining operations, and 343.28ML was discharged from LCO during the reporting period.

The water consumption at LCO was generally consistent with previous reporting periods.

2.8 Hazard Material Management

The LCO *Explosives Management Plan* (LCO 2010) defines a system to ensure the safe handling and use of explosives on site.

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 that is not included in the management of the CHPP or Open Cut.

2.10 Modifications to Development Consent

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

The Life of Mine planning process at LCO has identified the opportunity to maximise the recovery of coal resources within the existing development consent boundary and mining lease via the extension of open cut mining activities. In addition, LCO currently has approval to conduct mining operations until the end of 2023; however available mining areas within the approved mining footprint will be exhausted by 2015.

LCO are therefore seeking approval to modify DA 305-11-01 within the next reporting period to allow for this extension of mining activities, with the primary objectives of the Project to:

- Develop the on-going open cut mining operations with a focus on maximising resource recovery within the existing development consent and mining lease boundaries;
- Maintain continuity of coal production;
- Secure on-going employment opportunities and socio-economic flow-on benefits; and
- Continue to conduct mining at LCO in an environmentally responsible manner to ensure the potential for adverse impact is minimised.

The key components of the Project, include the following:

- Extension of the South and Entrance Pits to the south east, and, upon completion of mining in these pits, the mining of coal resources under the Mine Infrastructure Area (MIA) during which the MIA would be relocated to temporary facility.
- The extension of open cut mining activities would lead to an associated extension of the life of mine at LCO from 2023 to 2028.
- An additional tailings emplacement area would be constructed within the final void of the South Pit to dispose of the additional tailings associated with the extension of open cut mining activities.
- Coal would continue to be processed at the LCO Coal Handling and Preparation Plant (CHPP) at the approved rate of up to 8 Mtpa. As a contingency for coal processing, LCO also propose to deliver up to 1.5 Mtpa of this ROM coal to the Ravensworth Coal Handling and Preparation Plant (RCHPP) for washing via a new connection to the existing overland conveyor or the road transport route to RCHPP. In addition, up to 2 Mtpa may be received from the adjacent Mt Owen Complex for processing via a new connection to the existing overland conveyor.
- Infrastructure and auxiliary surface disturbance to support the new mining areas would also be required, including but not limited to, powerlines, water management infrastructure and haul roads.

The proposed works lie wholly within both the existing development consent boundary and the mining lease ML 1597 boundary. No changes are proposed to the annual ROM coal production, approved operating hours, mining method, or mining equipment, which will remain as approved under DA 305-11-01, as modified. LCO has received confirmation from the Department of Planning and Infrastructure (DoPI) that the project will be assessed under section 75W of Part 3A of the EP&A Act.

3.0 Environmental Management and Performance

3.1 Environmental Management System

LCO has developed and implemented an Environmental Management System (EMS) generally in accordance with ISO 14001. The principle focus of LCO's EMS is on continual environmental improvement. The EMS was reviewed and updated during the reporting period following the Independent Environmental Audit. The EMS was updated to reflect current operations and also include Xstrata PLC Sustainable Development requirements.

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.

The LCO *Environmental Management Strategy* was developed in accordance with Schedule 5, Condition 1 of DA 305-11-01 and updates the LCO EMS. The LCO *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 LCO *Environmental Management Strategy* builds on the environmental management controls outlined in the EA prepared for the project.

The LCO *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 Sustainable Development Management Framework. The LCO *Environmental Management Strategy* applies to all components of the operations.

Implementation of the EMS assists in minimising the environmental impacts of LCO by facilitating continual improvement in environmental performance.

3.2 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.

In June 2009 a Broad Brush Risk Assessment (BBRA) was completed by Umwelt Australia Pty Limited. The BBRA was reviewed and updated in 2010, and again during 2012. The BBRA Review is presented in Appendix B.

3.3 Environmental Incidents

3.3.1 Environmental Management

During the reporting period, LCO recorded 3 reportable environmental incidents.

LCO had one reportable incident in relation to Hunter River Salinity Trading Scheme (HRSTS) discharge monitoring during 2012. Monitoring Point 2 (HRSTS licenced discharge point under EPL 2094) had not been communicating conductivity and flow metering data to the HRSTS service provider due to an equipment malfunction. The equipment has since been replaced and is now functioning correctly. This issue was voluntarily reported as a non-compliance to the EPA in the 2011/2012 Annual Return for EPL 2094 that was submitted on 21 August 2012. Despite continuous communication not being maintained to the service provider, Liddell operates a data logger that backs up all data recorded at Discharge Point 2. This data demonstrates that, as per the 2011/2012 HRSTS Annual Return, each discharge from Point 2 was conducted in accordance with the River Register for that block, and that no material harm to the environment occurred. LCO was issued a Penalty Infringement Notice by the NSW Environment Protection Authority as a result of this incident. This incident was recorded as a Category 2 incident on Xstrata's Environmental Incident Category Matrix (Table 9).

There was one incident involving a minor disturbance of a known artefact during the reporting period. During construction of an 11kVpowerline, site LID36 (AHIMS #37-3-1152) was disturbed by a vegetation mulcher and excavator traversing the area. An inspection immediately afterwards located the artefact concerned. The artefact was not damaged. The incident as reported to the relevant authorities and fencing and signage was installed in order to better demarcate the site and avoid a recurrence. This incident was recorded as a Category 1 incident on Xstrata's Environmental Incident Category Matrix (Table 9).

LCO had one reportable incident during the reporting period which occurred during a significant rainfall event on 2 March 2012. Following heavy rainfall, the Workshop sediment dam began to overflow into Bowman's Creek despite attempts to

dewater the dam. The discharge occurred between 6:45am and 8am. The incident was self reported to relevant government departments as per requirements of Environmental Protection Licence 2094 issued to LCO. An internal investigation into the incident found that while the dam was designed in accordance with Blue Book procedures, the rainfall received was less than the amount that should trigger an overflow event. The dam has since been reconstructed and assigned a larger pump which will reduce the probability of a recurrence. This incident was recorded as a Category 2 incident on Xstrata's Environmental Incident Category Matrix (Table 9).

In addition to the three externally reportable incidents, LCO recorded twelve incidents during 2012 that were defined as Category 1 or less on Xstrata's Environmental Incident Category Matrix (Table 9) that did not require external reporting. Of these, eight related to minor oil and diesel spills, three related to dust from mining operations and blasting and one involving inappropriate segregation of waste, with waste grease being disposed of in a general waste bin.

Table 9 Xstrata Environmental Incident Category Matrix

Category	Definition
Nil	Potential environmental incident, hazard, near miss or actual incident resulting in no environmental harm.
Category 1	An incident that has caused negligible, reversible environmental impact requiring very minor or no remediation.
Category 2	An incident that has caused minor, reversible environmental impact requiring minor remediation.
Category 3	An incident that has caused moderate, reversible environmental impact with short-term effect requiring moderate remediation.
Category 4	An incident that has caused serious environmental impact, with medium-term effect requiring significant remediation.
Category 5	An incident that has caused disastrous environmental impact, with long-term effect requiring major remediation.

3.4 Meteorological Monitoring

3.4.1 Environmental Management

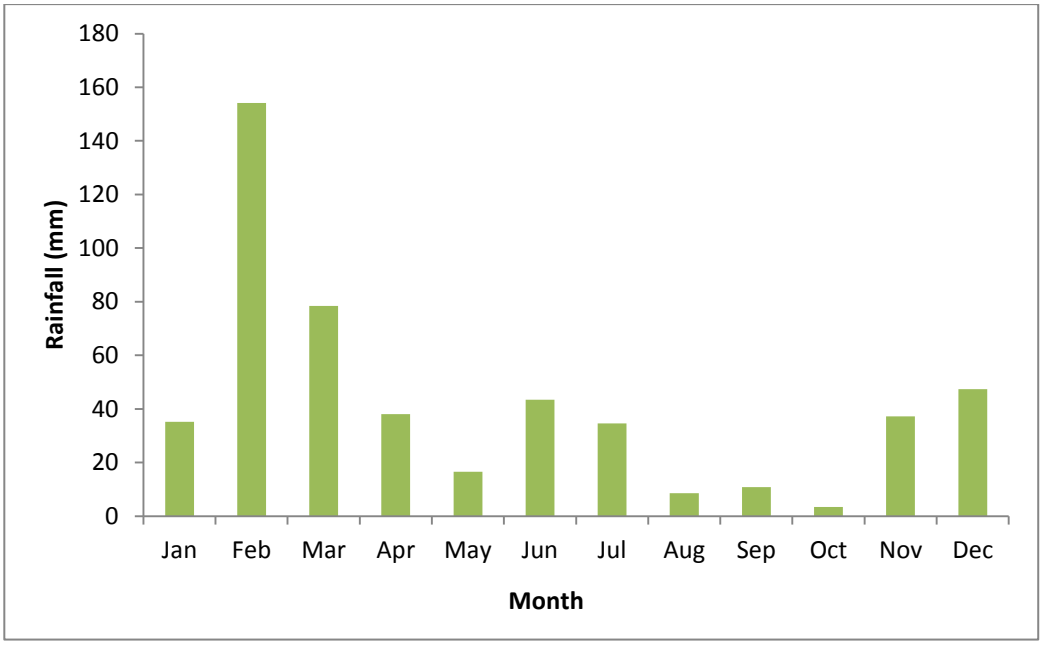
The meteorological station established at the office and workshop complex was installed and is operated in accordance with the *Approved Methods for Sampling of Air Pollutants in New South Wales* (Department of Environment and Climate Change (DECC), 2007) and the requirements outlined in the DECC submission for the Environmental Assessment for the Liddell Coal Modification to Development Consent. Meteorological conditions at LCO are continuously monitored on site.

3.4.2 Environmental Performance

3.4.2.1 Rainfall

Total annual rainfall for the reporting period was 508.8mm. The highest daily rainfall of 51.2 millimetres was recorded in March 2012. The wettest month was February, with 154.2mm of rainfall recorded, while the driest month was October, recording only 3.4mm of rainfall. The total monthly rainfall data for the monitoring period is shown on Figure 6.

Figure 6 **Total monthly rainfall January – December 2012**

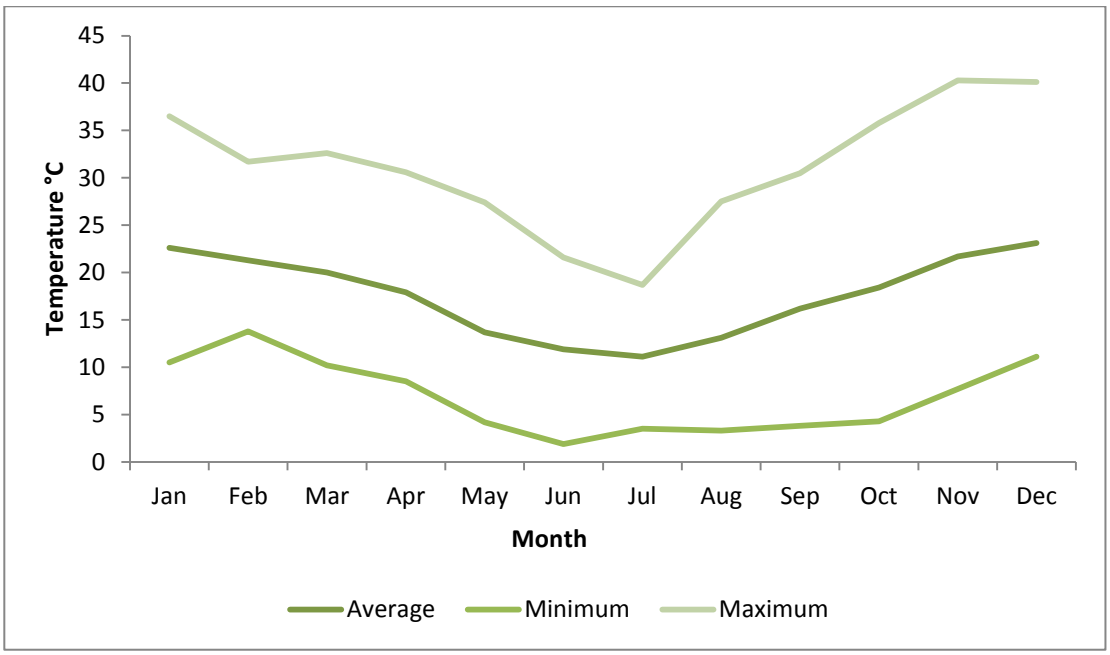


3.4.2.2 Temperature

The average daily temperature recorded at the meteorological station varied from 11.1°C to 23.1°C during the reporting period. July 2012 was the coolest month, and November 2012 was the warmest month. The temperature data was consistent with standard seasonal patterns.

The annual temperature data is presented in Figure 7.

Figure 7 **Minimum, average and maximum monthly temperatures January – December 2012**

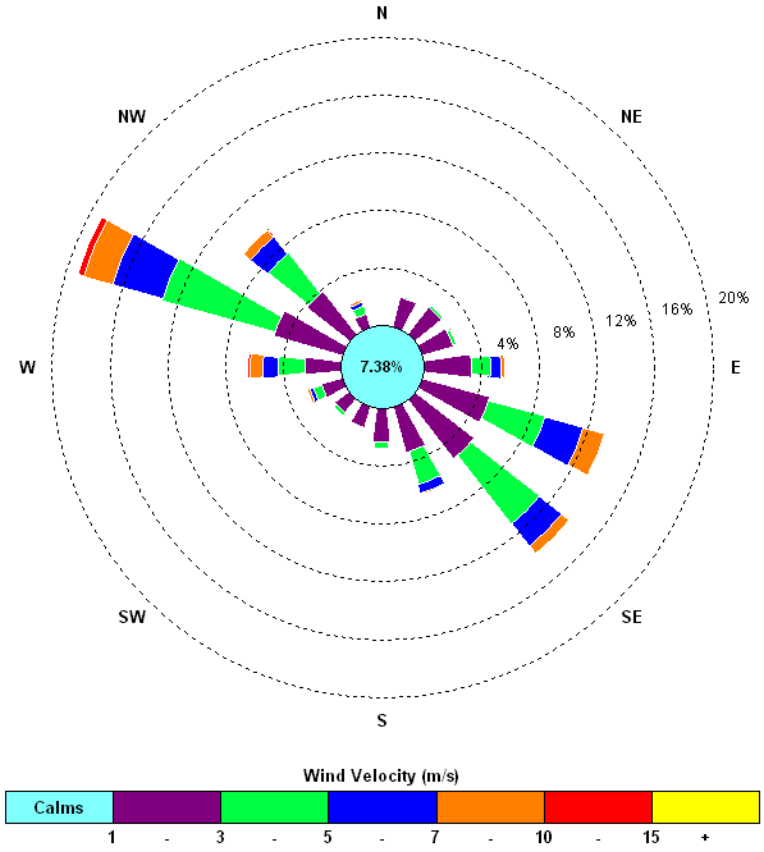


3.4.2.3 Wind and Wind Direction

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 September) the prevailing wind direction is north-west. Wind directions are referenced to magnetic north.

The annual wind rose for 2012 is presented in Figure 8. The monthly wind roses for 2012 are presented in Appendix C.

Figure 8 Annual Wind Rose 2012



3.5 Air Quality

3.5.1 Environmental Management

Air quality monitoring is undertaken in accordance with the Liddell Coal Air Quality Monitoring Program. In addition, the LCO *Environmental Monitoring Program* (November 2009), LCO *Dust Management TARP* and LCO *Spontaneous Combustion Management Plan* are used for the ongoing management of air quality.

The Air Quality Monitoring Program (AQMP) was developed in accordance with Schedule 3 Condition 19 of DA-305-11-01. In accordance with this condition, the AQMP includes a combination of deposited dust gauges and high volume air samplers (HVAS) to monitor any dust emissions, and an air quality monitoring protocol for evaluation of compliance with the air quality impact assessment and land acquisition criteria. The AQMP was reviewed and updated during 2012 following the Independent Environmental Audit. At the time of reporting, the revised AQMP is still under review by DP&I.

The LCO air quality monitoring network is shown in Figure 9. The LCO air quality monitoring network comprises ten deposited dust gauges and six high volume air samplers (HVAS).

Suspended particulate dust was measured in the reporting period by six HVAS, including three TSP samplers and three PM_{10} samplers. Each HVAS was run for 24 hours on a six-day cycle in accordance with OEH requirements.

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.

Air Quality Criteria

Schedule 3, Condition 16 of DA 305-11-01 requires that LCO manage their operations so as to satisfy the relevant OEH air quality criteria for deposited dust and dust concentration emitted to privately owned land not owned by LCO.

Deposited dust 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. The LCO Air Quality Impact Assessment Criteria for deposited dust is summarised in Table 10.

Table 10 Impact Assessment Criteria for Deposited Dust

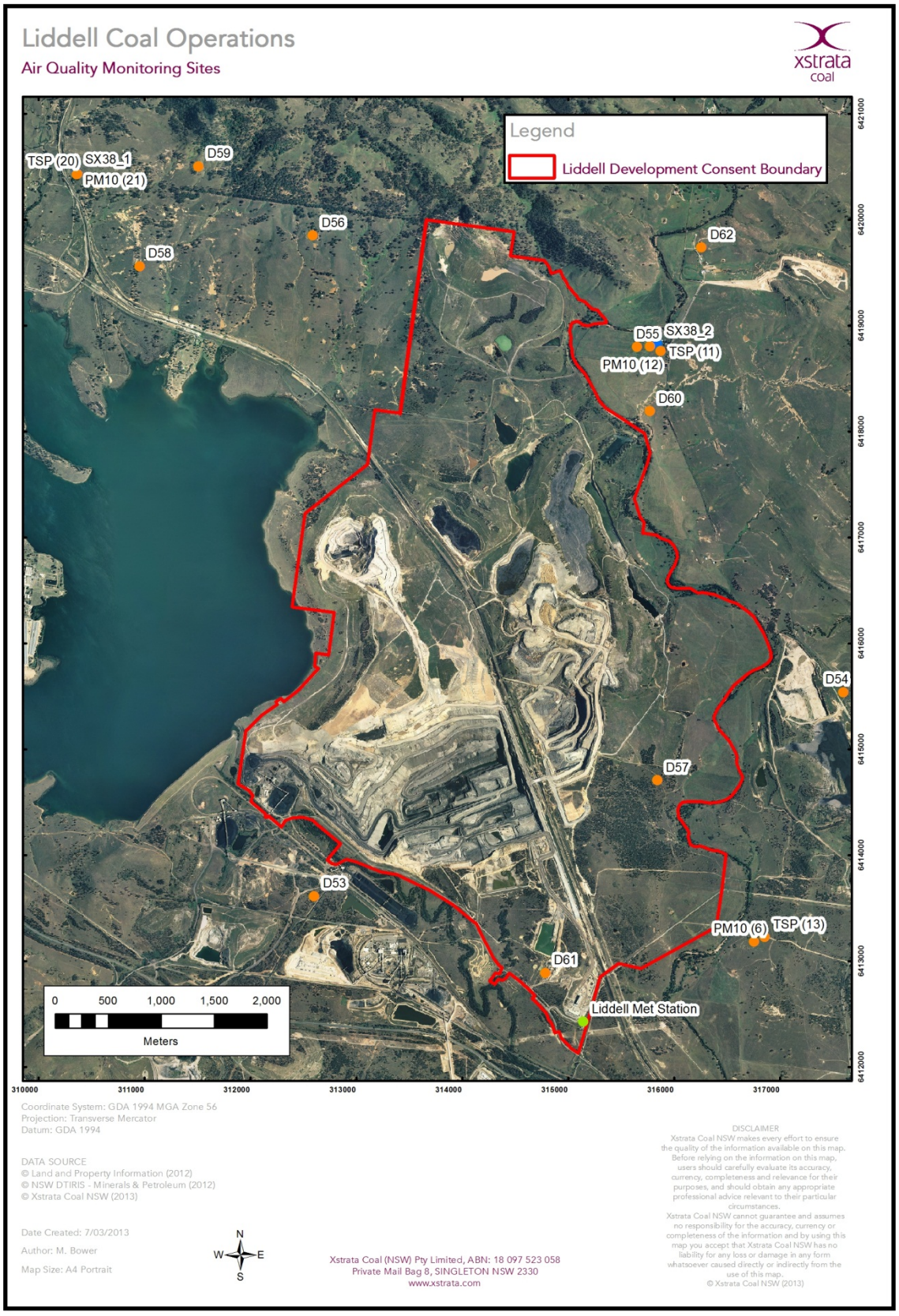
Pollutant	Averaging Period	Maximum increase in deposition dust level	Maximum total deposition dust level
Deposited dust	Annual	2 g/m^2/month	4 g/m^2/month

Dust concentration refers to airborne dust and is measured in micrograms per cubic metre ($\mu g/m^3$). Dust concentration is measured as total suspended particulate matter (TSP) and particulate matter of less than 10 microns in diameter (PM_{10}). TSP relates to all suspended particles, which are usually in size range of zero to 50 micrometres (µm). TSP measurements include PM_{10} particles. TSP and PM_{10} are compared to long term (annual average) and short term (24 hour maximum) goals. Particle sizes larger than 50 µm are measured as deposited dust. The LCO Air Quality Impact Assessment Criteria for dust concentration (particulate matter) is summarised in Table 11.

Table 11 Impact Assessment Criteria for Particulate Matter

Pollutant	Standard/Goal	Averaging Period
Total Suspended Particulate Matter (TSP)	90 $\mu g/m^3$ (Long-term goal)	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

Figure 9 **LCO Air Quality Monitoring Sites**



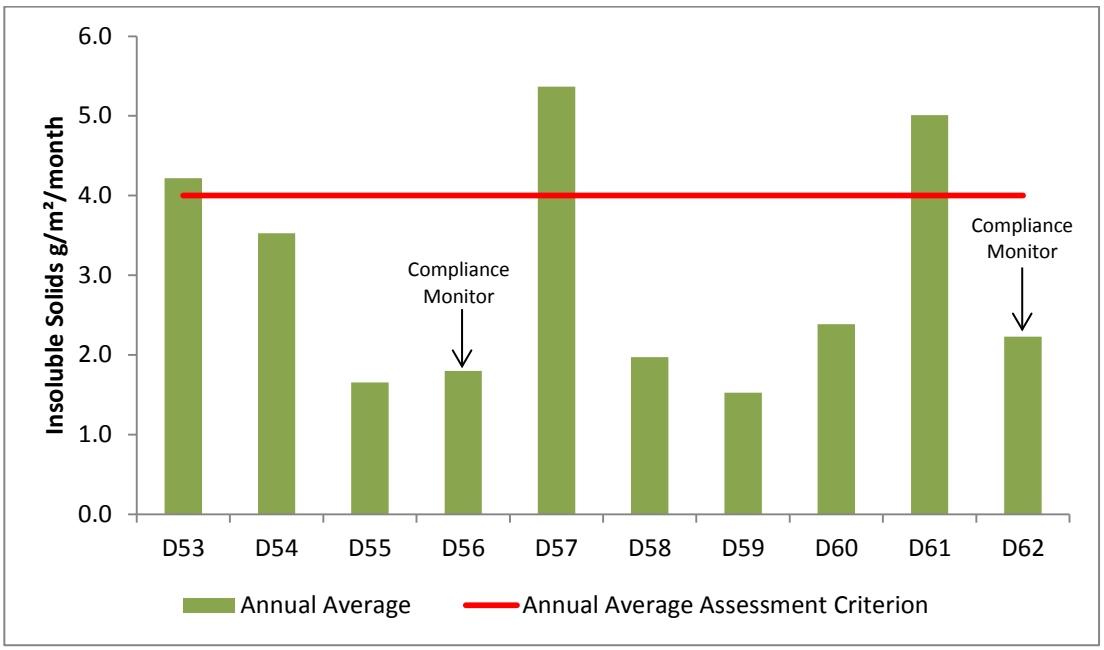
3.5.2 Environmental Performance

Deposited Dust

The location of LCO's dust deposition gauges are shown on Figure 9.

In accordance with the EPL and Air Quality Monitoring Program, monitoring results are collected from all deposited dust gauges on a monthly basis. Deposited dust monitoring results are provided in Appendix D. Figure 10 shows the average deposited dust results for the reporting compared with the deposited dust impact assessment criterion of 4 g/m^2/month (maximum total deposited dust).

Figure 10 Dust Deposition - Annual Average Insoluble Matter



Two dust gauges maintained by LCO are representative of private residences (D55, and D62). During the reporting period both monitoring sites met the annual average criteria. The remaining eight dust gauges are representative of mine owned residences and are used for internal management purposes.

Data recovery for the ten dust deposition gauges varied between 50% and 100%. Gauges that had high levels of contamination throughout the reporting period included D54, D55, D57, D58, D60, D61 and D62. 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.

Comparison of the annual average deposited dust levels to the previous two reporting periods is presented in Table 12. Three of these locations (D53, D57 & D61) are above the annual average dust deposition criteria of 4 g/m^2/month. These gauges are not representative of residential properties, are located on mine owned land and are heavily impacted by the nearby mining operations. The results are used for internal management purposes only and, as predicted, the increases in deposited dust levels are predominantly related to the mine progressing towards these monitoring sites.

Table 12 Annual Average Deposited Dust (g/m2/month) Comparisons

Monitoring Location	July 2010 – December 2010	January 2011 – December 2011	January 2012 – December 2012
D53	3.4	3.1	4.2
D54	2.8	2.4	3.5
D55	2.1	1.3	1.7
D56	1.0	1.0	1.8
D57	5.5	5.5	5.4
D58	1.3	1.3	2.0
D59	0.9	1.0	1.5
D60	1.9	2.0	2.4
D61	4.4	5.3	5.0
D62	1.5	1.8	2.2

Comparison to EA Predictions

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

A summary of annual average deposited 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.

High Volume Air Sampling - TSP

LCO operates three High Volume Air Samplers (HVAS) which sample Total Suspended Particulates (TSP), as shown in Figure 10. In accordance with the Air Quality Monitoring Program and EPL requirements, TSP is measured by the samplers every six days.

TSP monitoring results are presented in Figure 11 to Figure 13 and provided in Appendix D.

Figure 11 **Annual Average HVAS TSP Results – Scrivens (HVAS11)**

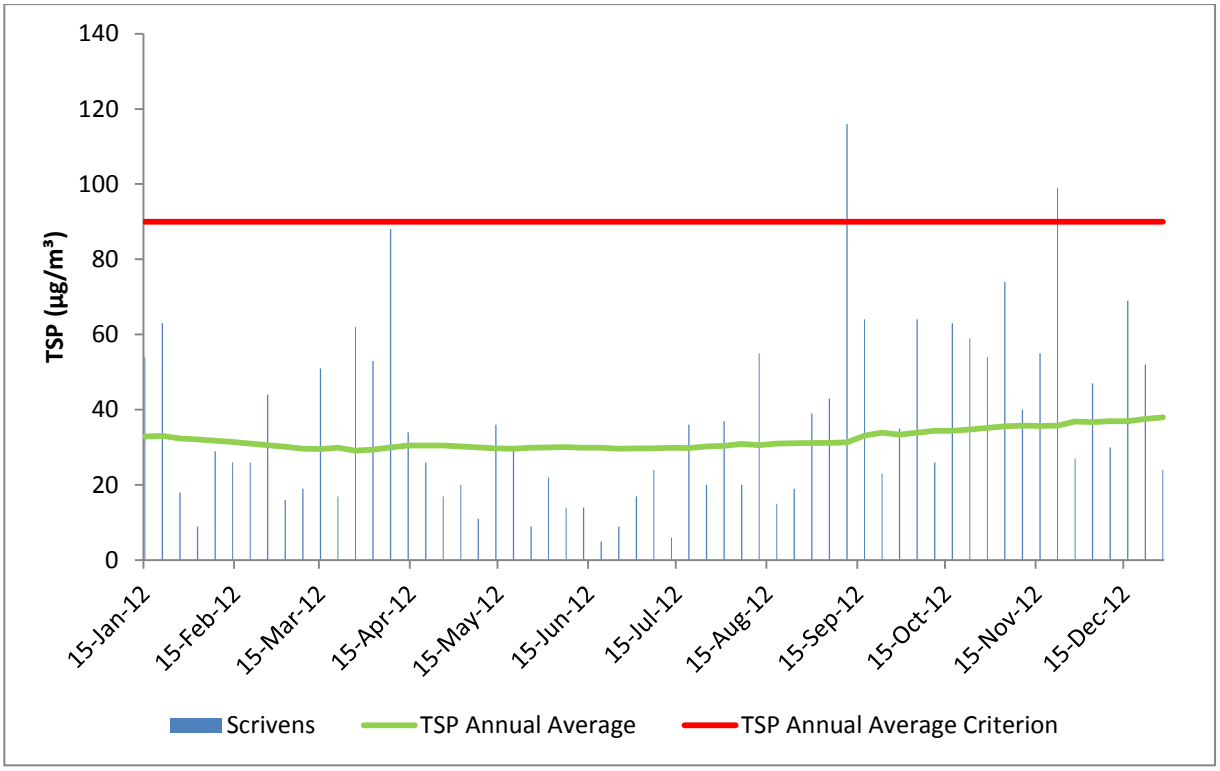


Figure 12 **Annual Average HVAS TSP Results – Ravensworth Farm (HVAS13)**

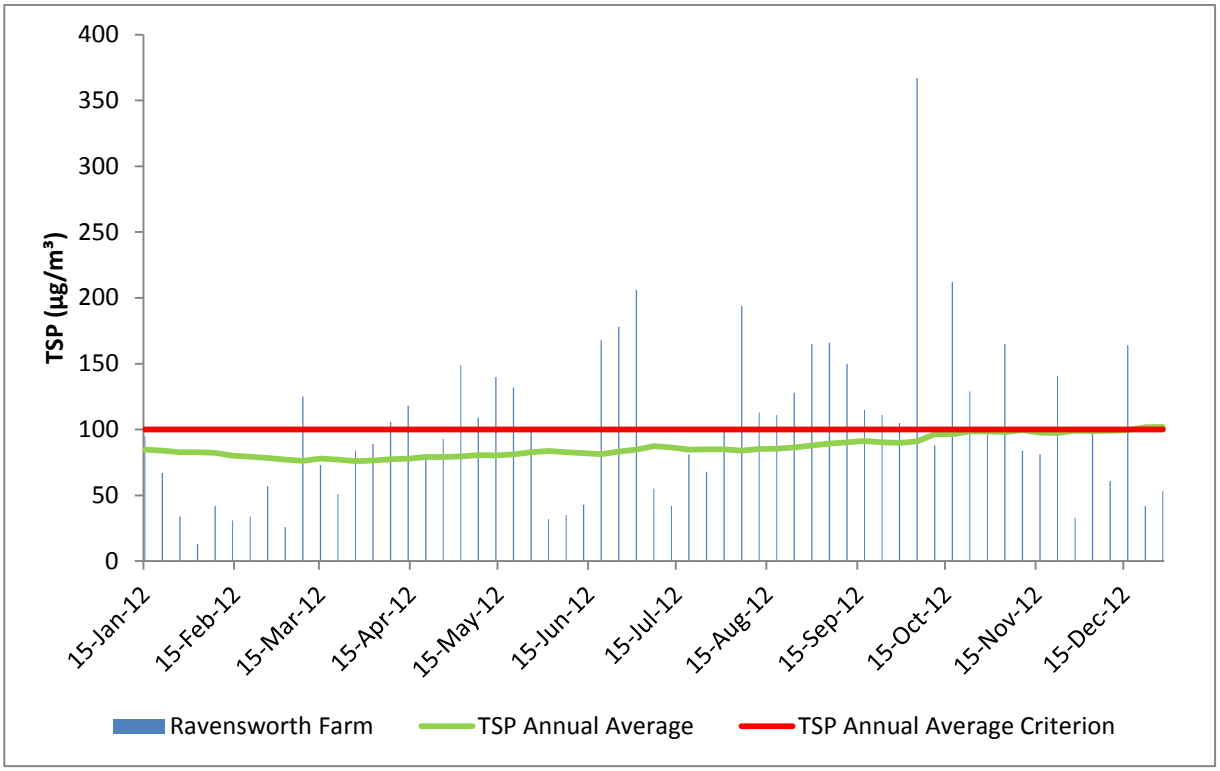
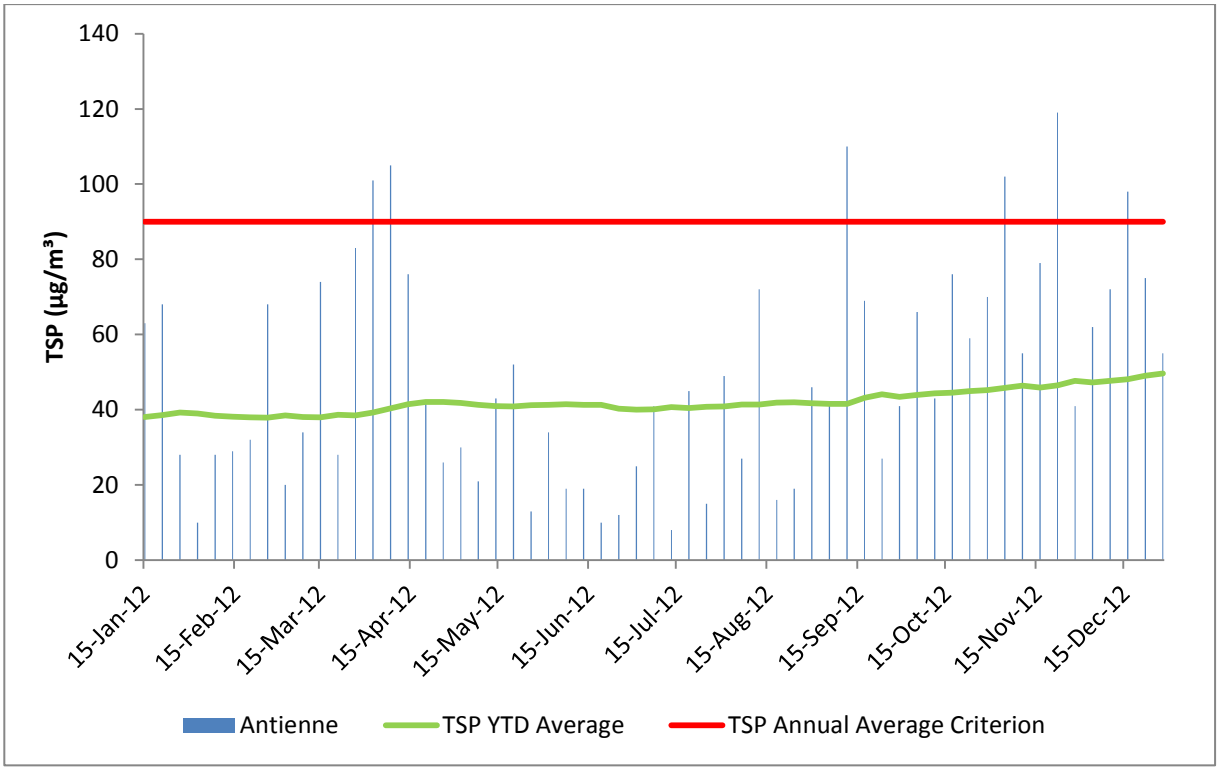


Figure 13 **Annual Average HVAS TSP Results – Antienne (HVAS20)**



During the reporting period LCO complied with the TSP annual average goal (90 µg/m^3) at the Scrivens property (HVAS 11) and Antienne (HVAS20). The Scrivens property is privately owned land. The annual average TSP at HVAS 11 was 44µg/m^3 with a maximum concentration of 116 µg/m^3 (recorded on 11 September 2012). HVAS20 (owned by LCO) was commissioned in May 2010. The annual average TSP at HVAS 20 was 56µg/m^3 with a maximum concentration of 119µg/m^3 (recorded on 22 November 2012).

Ravensworth Farm, located on mine owned land (HVAS 13) is not a compliance monitor and is used for on-site management purposes only. To date, there has been a private Licence Agreement with the tenant to allow an alternative air quality criterion of 100µg/m^3. This criterion was exceeded during the reporting period, with an annual average of 120 µg/m^3 being recorded. As a result of ongoing monitoring indicating that dust levels were approaching agreed trigger levels, the rental agreement was terminated during 2012and the property is now vacant. The maximum TSP concentration recorded at HVAS 13 was 367µg/m^3 on 5 October 2012. This result is likely to have been due to a regional scale air quality event as the Upper Hunter Air Quality Monitoring Network (UHAQMN) monitors at Camberwell and Singleton also showed elevated results on this day.

Comparison of annual average TSP levels to the previous two reporting periods is presented in Table 13. HVAS 11 and HVAS 13 have both showed a decrease in TSP from the previous reporting period. No comparison of TSP levels can be made for HVAS 20 as 2010 is the reporting period of operation for this sampler.

Table 13 **Annual Average TSP (µg/m^3) Monitoring Results Comparison**

Monitoring Location	July 2009 – June 2010	July 2010 – December 2011	January – December 2012
HVAS 11 (Scrivens)	45.0	30.0	44.0
HVAS 13 (Ravensworth Farm)	97.0	85.0	120.0
HVAS 20 (Antienne)	N/A	43.0	56.0

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 LCO and other sources combined were identified with no privately owned residence predicted to be affected. Monitoring results during the reporting period confirm these predictions.

High Volume Air Sampling – PM_{10}

LCO operates three HVAS which sample fine particulates with an aerodynamic diameter of less than 10 microns (PM_{10}), as shown in Figure 10. In accordance with the Air Quality Monitoring Program and EPL requirements, PM_{10} is measured by the samplers every six days.

PM_{10} monitoring results are presented in Figure 14 to Figure 16 and provided in Appendix D. These results are compared against daily meteorological dates (wind speed and direction) to determine whether dust levels are attributable to Liddell Coal Operations.

During the reporting period, LCO complied with the PM_{10} long term (annual average) goal (30µg/m^3) at Scrivens and Antienne. Ravensworth Farm is not a compliance monitor and has a private Licence Agreement with alternative air quality criterion of 40 µg/m^3, and this criterion was also complied with.

The short term (24 hour) goal of 50µg/m^3 was exceeded at HVAS 6 on 5 October 2012. An investigation based on a review of the meteorological data indicates that the most likely source of the elevated results was LCO as the wind was predominantly from a westerly direction. However, the result is likely to have been due to a regional scale air quality event as the UHAQMN monitors at Camberwell and Singleton also showed elevated results on this day.

Comparison of annual average PM_{10} levels to the previous two reporting periods is presented in Table 14. Results have increased for HVAS 6 and remained relatively steady for HVAS 12 and for HVAS 21. The annual average for all locations is below the relevant annual average criteria.

Table 14 Annual Average PM_{10} (µg/m^3) Monitoring Results Comparison

Monitoring Location	July 2009 – June 2010	July 2010 – December 2011	January – December 2012
HVAS 6 (Ravensworth Farm)	26	25	36
HVAS 12 (Scrivens)	17	11	15
HVAS 21 (Antienne)	N/A	14	17

Figure 14 **Annual Average HVAS PM_{10} Results – Ravensworth Farm (HVAS6)**

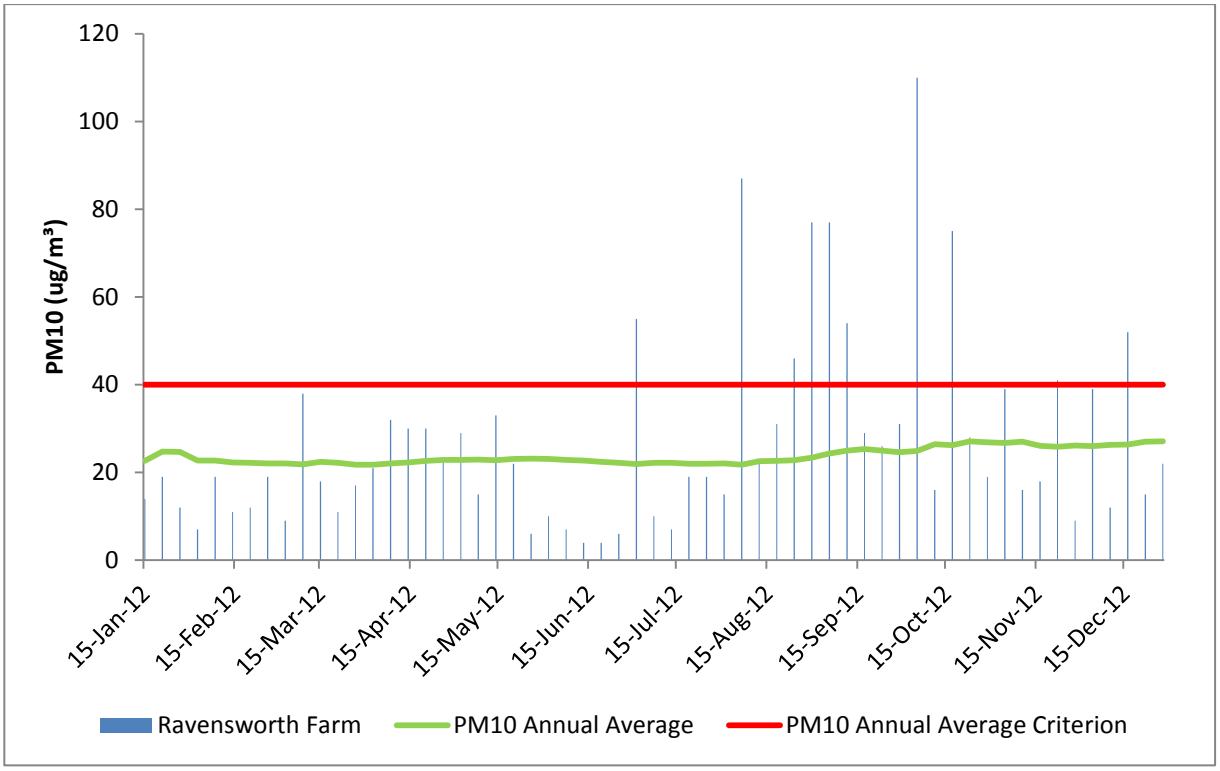


Figure 15 **Annual Average HVAS PM_{10} Results – Scrivens (HVAS12)**

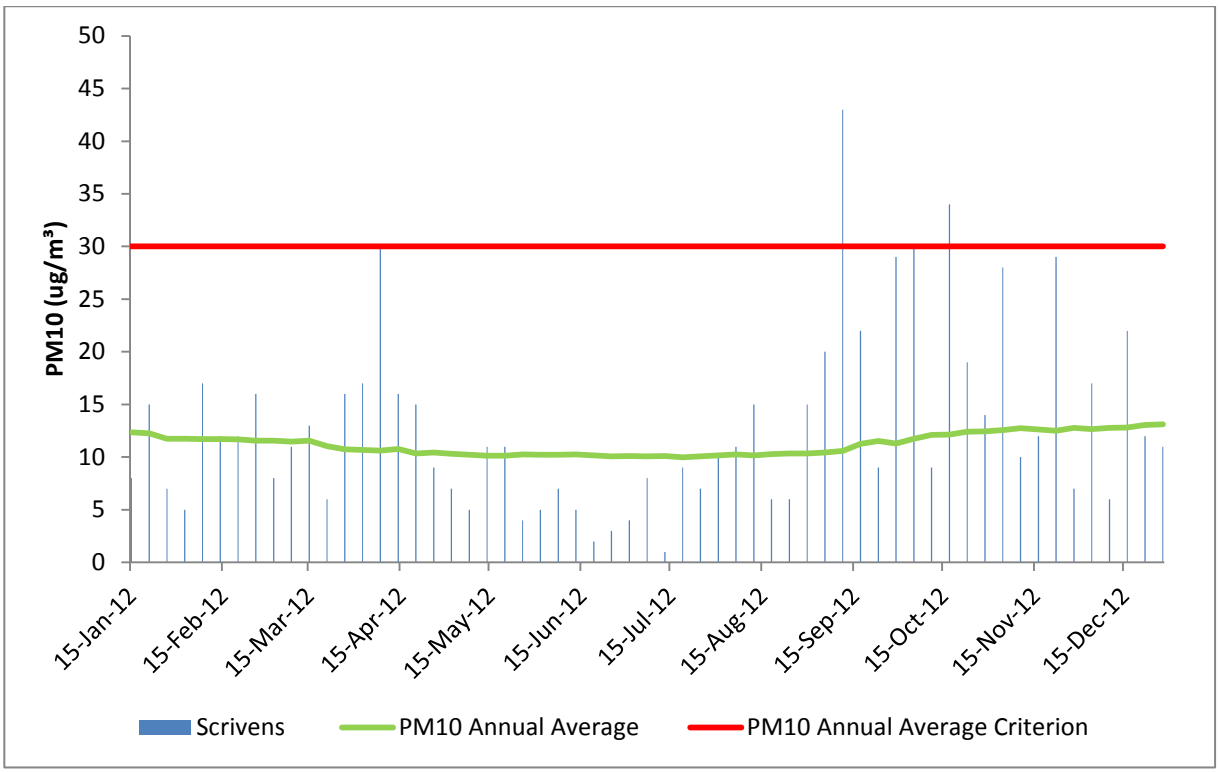
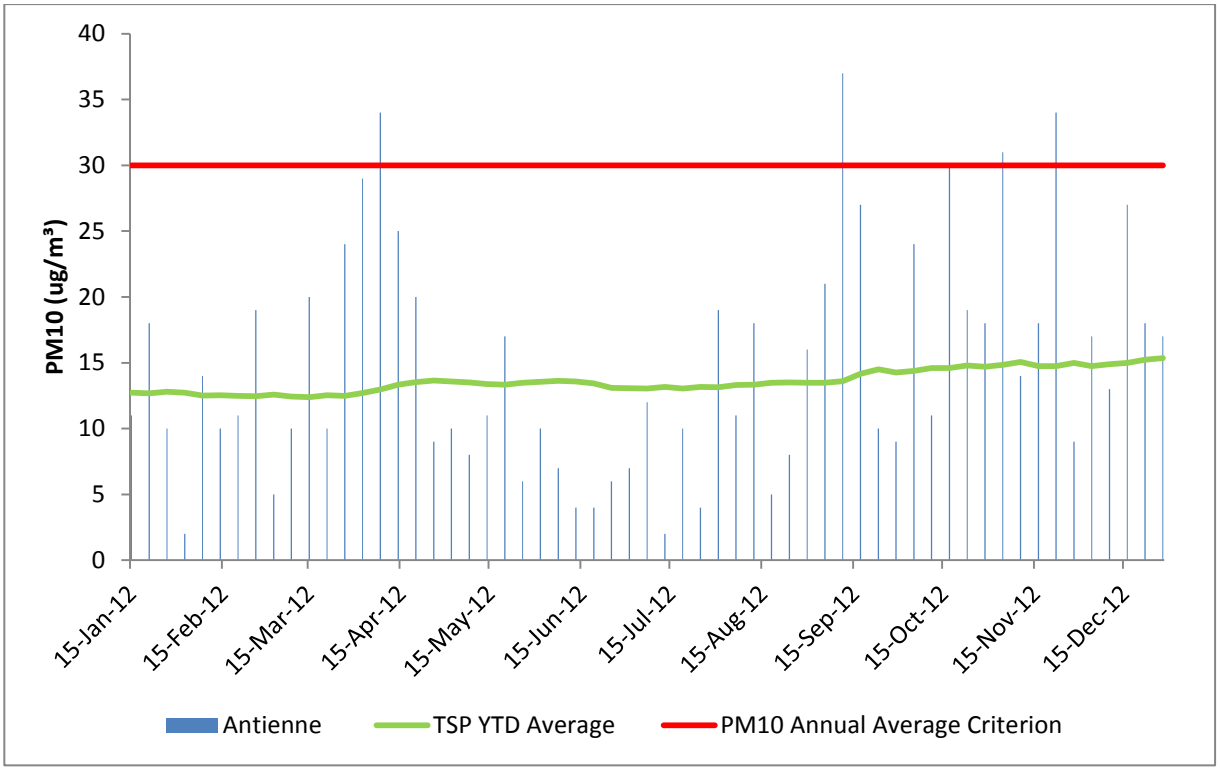


Figure 16 **Annual Average HVAS PM_{10} Results – Antienne (HVAS21)**



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 monitors located on privately owned land.

3.6 Erosion and Sediment Control

3.6.1 Environmental Management and Performance

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 LCO *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 *Managing Urban Stormwater: Soils and Construction Manual* (Landcom, 2004). The requirements outlined under Schedule 3, Condition 25 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 abovementioned controls, management of sediment and erosion is achieved through the implementation of the following measures:

- minimising all disturbed areas and stabilisation by progressive rehabilitation as soon as practicable;
- construction of catch drains to capture runoff from disturbed areas and direct runoff into sediment dams;
- other erosion and sediment controls 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.

3.7 Surface Water

3.7.1 Environmental Management

The LCO *Surface Water Monitoring Program* outlines the surface water monitoring required to be undertaken by Liddell Coal to ensure compliance with statutory requirements. The program addresses the requirements contained in DA 305-11-01 and the LCO EPL 2094.

LCO also participates in the Hunter River Salinity Trading Scheme (HRSTS), allowing it to discharge from licensed discharge point downstream of Dam 13. These discharges take place during high flow periods in compliance with strict HRSTS regulations.

3.7.2 Environmental Performance

Surface water quality was monitored on a monthly basis at 15 sites, as shown in Figure 17.

All surface water samples were collected and analysed according to:

- The *Approved Methods for Sampling and Analysis of Water Pollutants in New South Wales* (Department of Environment, Climate Change and Water (DECCW) 2004);
- *AS/NZS 5667.1. 1998. Water Quality – Sampling – Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples*; and
- *AS/NZS 5667.6. 1998. Water Quality – Sampling – Guidance on the Sampling of Rivers and Streams*.

Due to the highly disturbed nature of the site, as recommended by *ANZECC Water Quality Guidelines* (ANZECC, 2000) and adopted in the LCO *Water Management Plan,* site-specific historic monitoring data has been used to define the trigger values for electrical conductivity (EC), total dissolved solids (TDS) and the upper bound value for pH. Furthermore, an 80th percentile value has been applied to these values to account for the highly disturbed nature of the ecosystem, with the objective of improving water quality. 80th percentile upper bound refers to the value below which 80% of all sample values fall. The trigger values for the total suspended solids (TSS) and the lower bound for pH have been adopted from the default trigger value defined by *ANZECC Water Quality Guidelines* (ANZECC, 2000).

The trigger values based on the historic site-specific monitoring data and ANZECC (2000) guidelines are outlined in Table 15.

Table 15 Trigger Values for Surface Water Quality

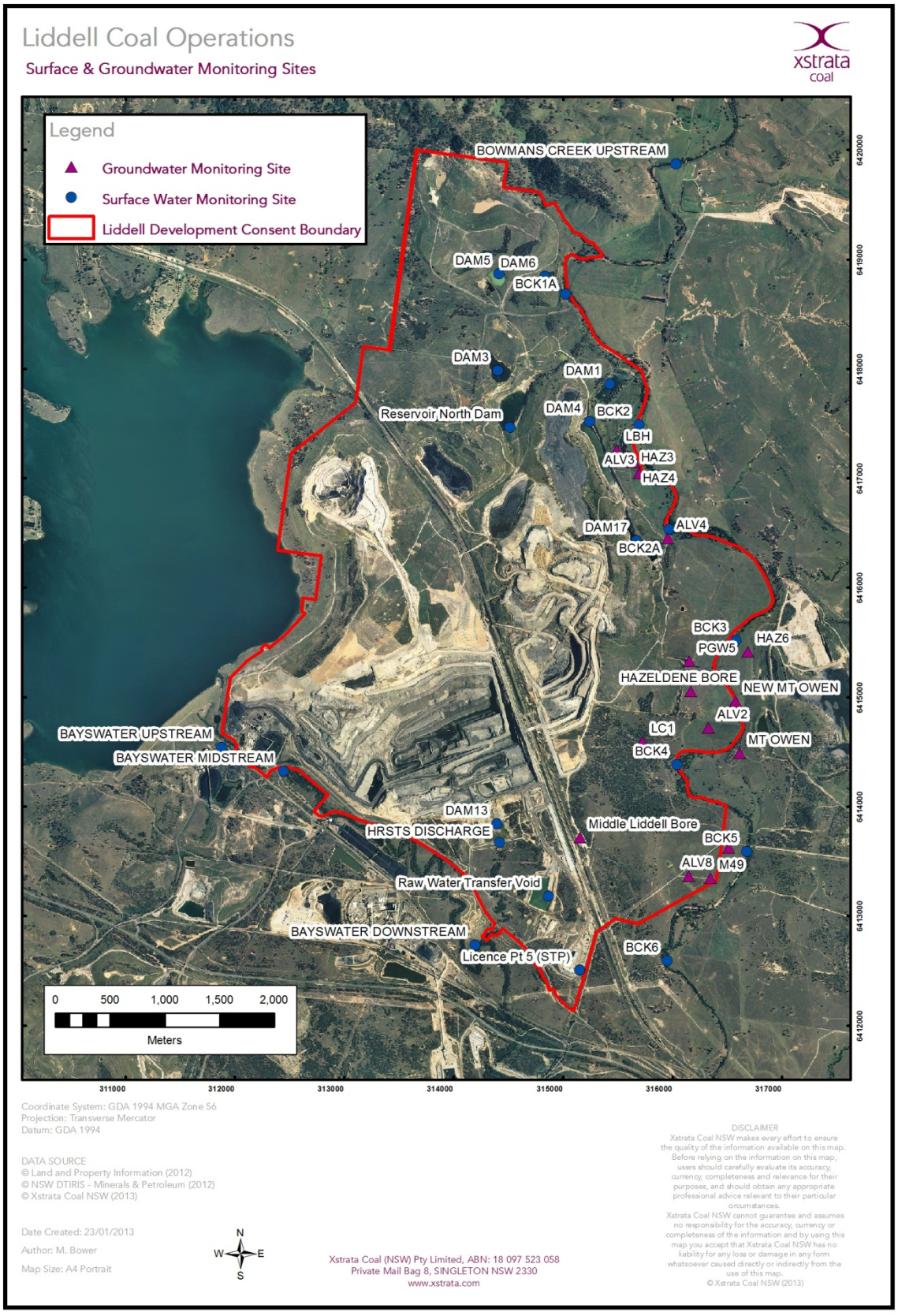
Analyte	Bayswater Creek Surface Water		Bowmans Creek Surface Water		Onsite Dams Surface Water	
	80th %ile	Maximum	80th %ile	Maximum	80th %ile	Maximum
pH[1]	6.5 – 8.3	6.5 – 8.7	6.5 – 8.0	6.5 – 7.9	6.5 – 9.2	6.5 – 10.2
Conductivity (µS/cm)	5024	7110	2270	2450	6180	12 000
TSS (mg/L)	50[2]	235	50[2]	50[2]	50[2]	386
TDS (mg/L)	3460	6845	1420	1168	3880	10 500

[1] - ANZECC criteria for pH lower limit. 80th percentile used for upper limit.

[2] - ANZECC criteria for TSS upper limit

These guideline trigger values are the concentrations (or loads) of the key performance indicators, below which there is a low risk of adverse biological effects. The physical and chemical trigger values are not designed to be used as 'magic numbers' or threshold values at which an environmental problem is inferred if they are exceeded. Rather they are designed to be used in conjunction with professional judgement, to provide an initial assessment of the state of the water body regarding the issue in question.

Figure 17 **LCO Surface and Ground Water Monitoring Sites**



Condition L2.4 of EPL 2094 contains criteria for Surface Water Quality; however these criteria apply only to water to be discharged via Licensed Discharge Point 2. These limits are:

- pH: 6.5 - 9.0; and
- TSS: 120 mg/L.

Surface Water Monitoring - Bayswater Creek

Surface water quality was monitored on a monthly basis at three sites along Bayswater Creek:

- Bayswater Creek Upstream;
- Bayswater Creek Midstream;
- Bayswater Creek Downstream.

All surface water samples were analysed for pH, EC, TSS and TDS. These sites are also analysed on a bi-annual basis for chemical species present. Full surface water monitoring results are presented in Appendix E.

Bayswater Creek pH

The monitoring results for pH for Bayswater Creek are shown on Figure 18.

pH levels for Bayswater ranged from 7.7 (upstream) to 8.4 (upstream, midstream and downstream). Three readings lie outside the 80th percentile trigger value of 8.3. These were recorded during January (midstream), September (downstream) and December (upstream). There were no exceedances of the maximum trigger value (pH 8.0) during the reporting period. Bayswater Creek is a highly modified watercourse and regularly experiences periods of low or no flow. These levels are likely a result of stagnant water being sampled.

Bayswater Creek Electrical Conductivity (EC)

The monitoring results for EC for Bayswater Creek are shown on Figure 19.

Monthly EC results vary between 2210 µS/cm (upstream) and 4420 µS/cm (midstream). There were no exceedances of EC trigger values during the reporting period.

Bayswater Creek Total Suspended Solids (TSS)

The monitoring results for TSS for Bayswater Creek are shown on Figure 20.

Monitoring results for the TSS ranged between <5 mg/L (midstream) and 782 mg/L (midstream) for the reporting period. There were 4 exceedances of the 80th percentile trigger value during the reporting period. These were recorded in January, May and June at the midstream sampling site and in September at the downstream site. Two results exceeded the maximum trigger at the midstream sampling site during the reporting period, one in September and the other in December. Bayswater Creek is a highly modified watercourse and regularly experiences periods of low or no flow. These levels are likely a result of stagnant water being sampled.

Bayswater Creek Total Dissolved Solids (TDS)

The monitoring results for TDS for Bayswater Creek are shown on Figure 21.

Monitoring results for Bayswater Creek TDS generally correlate with the EC results. TDS results ranged between 1410 mg/L and 3070 mg/L. All results lie below the 80th percentile trigger value (6845 mg/L) for TDS.

Bayswater Creek Chemical Speciation

Biannual chemical speciation monitoring was carried out during January and July 2012. There are no site specific trigger values available for comparison with the results, and the majority of results returned fell below the limit of reporting for each element.

LCO proposes to continue to monitor the catchment so that site specific long term monitoring trigger values can be established.

Figure 18 **Bayswater Creek Surface Water pH 2012**

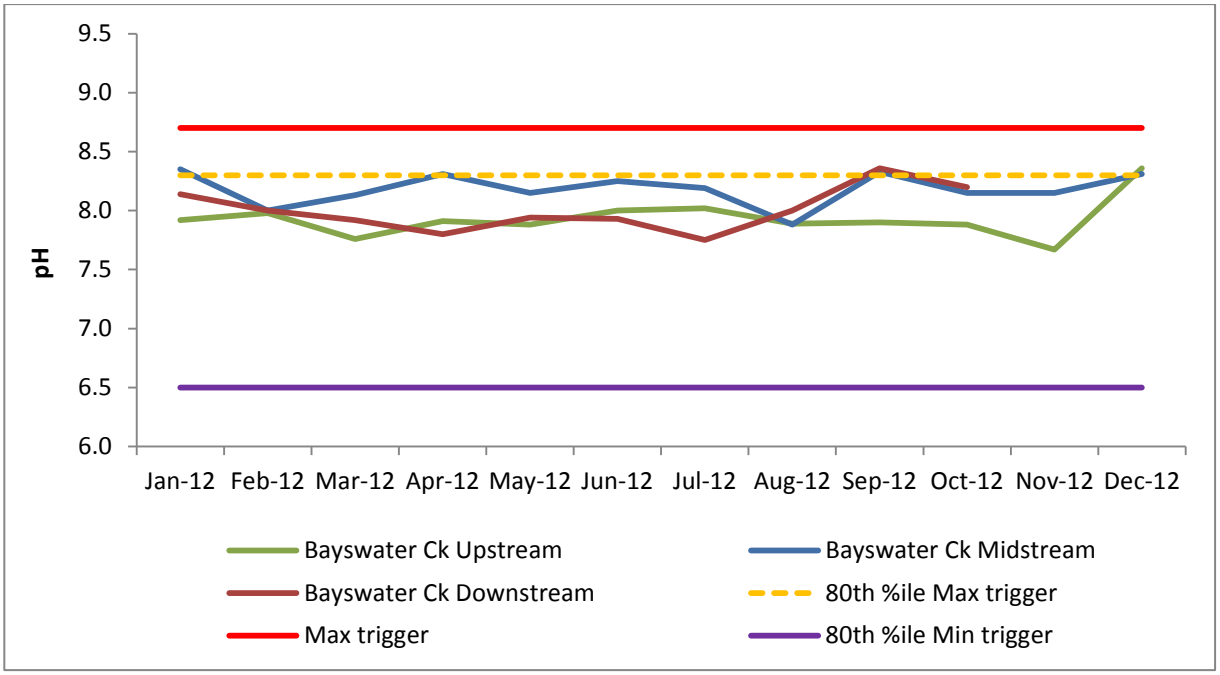


Figure 19 **Bayswater Creek Surface Water Electrical Conductivity 2012**

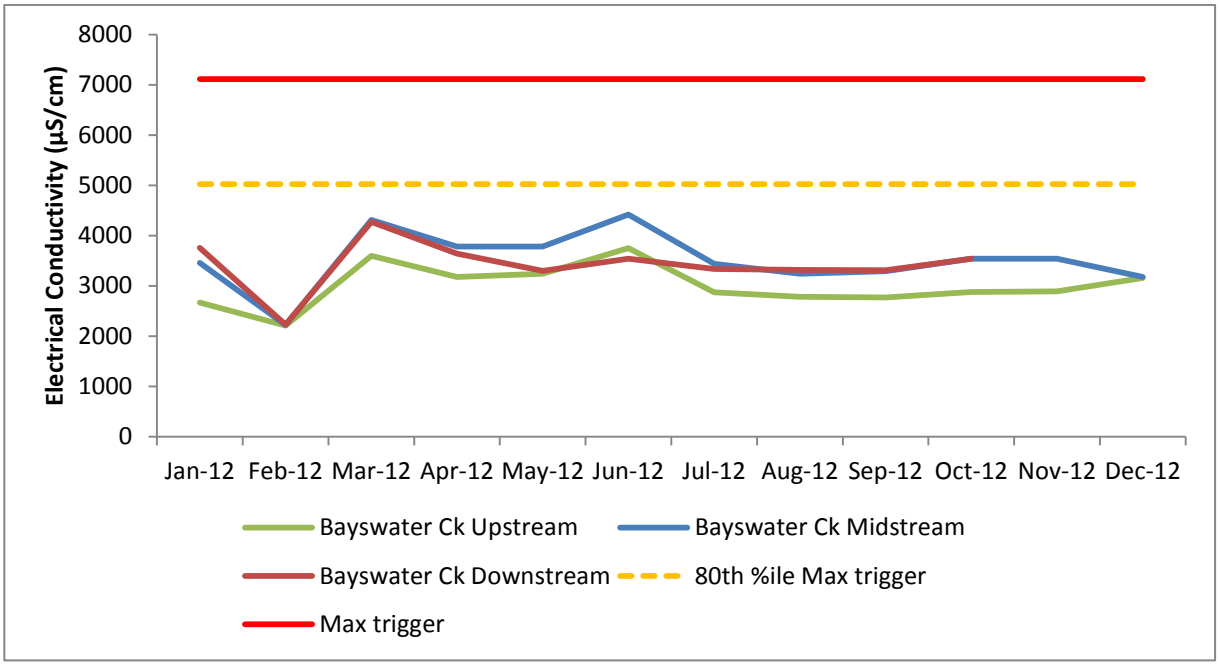


Figure 20 **Bayswater Creek Surface Water TSS 2012**

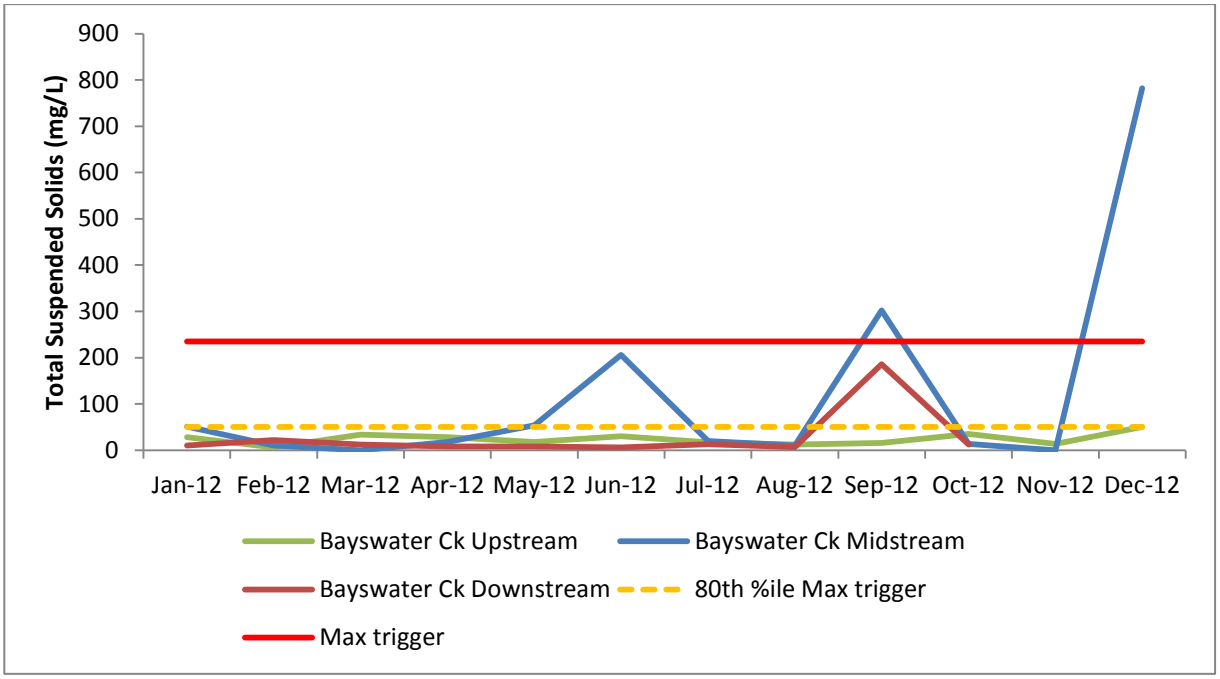
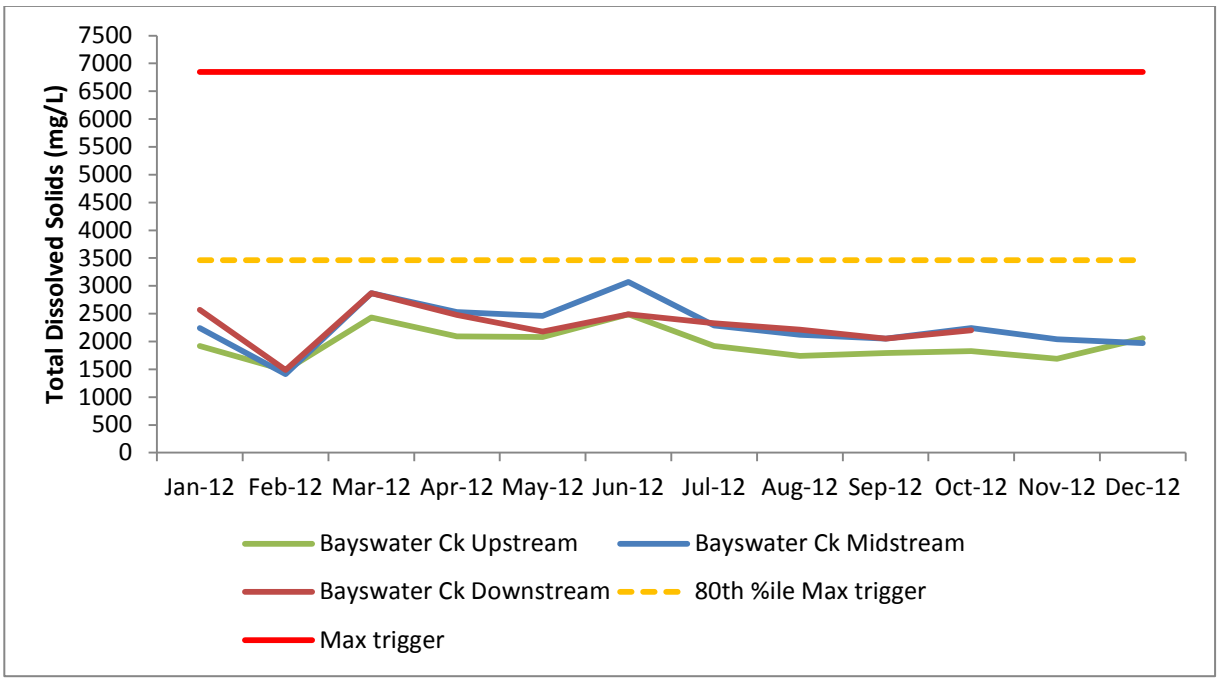


Figure 21 **Bayswater Creek Surface Water TDS 2012**



Bayswater Creek Three Year Comparison

Comparison of annual average pH, EC, TSS and TDS levels to the previous two reporting periods is presented in Table 16. Annual average results for pH remained relatively steady at all Bayswater Creek monitoring locations over the three year comparison period. Electrical conductivity has slightly increased over the three year period at the upstream and midstream sites, but has decreased at the downstream site. Annual average TSS has remained relatively stable at the upstream and downstream sites, but has shown a marked increase at the midstream site when 2012 data is compared to previous years. Annual average TDS has fluctuated at all sites over the three year comparison period.

No long term trends were detailed in the EA, so no comparison between the predicted and observed surface water quality can be provided.

Surface Water Monitoring – Bowmans Creek

Surface water quality was monitored on a monthly basis at two sites along Bowmans Creek:

- Bowmans Creek Upstream (BCK1);
- Bowmans Creek Downstream (BCK6).

All surface water samples were analysed for pH, EC, TSS and TDS. These sites are also analysed on a bi-annual basis for chemical species present. Six additional sites along Bowmans creek (BCK1A, BCK2, BCK2A, BCK3, BCK4 and BCK5) were sampled quarterly and analysed for pH, EC, TSS and TDS. Full surface water monitoring results are presented in Appendix E.

Bowmans Creek pH

The monitoring results for pH for Bowmans Creek are shown on Figure 22 and Figure 23.

Monthly pH levels for Bowmans Creeks ranged from 7.5 (upstream) to 8.3 (downstream). There were no exceedances of pH trigger values during the reporting period.

Bowmans Creek EC

The monitoring results for EC for Bowmans Creek are shown on Figure 24 and Figure 25.

Monthly EC results vary between 472 µS/cm (upstream) and 1290 µS/cm (upstream) for the reporting period. There were no exceedances of EC trigger values during the reporting period.

Bowmans Creek TSS

The monitoring results for TSS for Bowmans Creek are shown on Figure 26 and Figure 27.

Monthly monitoring results for the TSS range between <5 mg/L and 73 mg/L for the reporting period. Two results exceeded the maximum trigger value for TSS. These results were recorded during February (downstream) and December (downstream). February was the wettest month recorded during the reporting period and during February sampling, Bowmans Creek was experiencing high flow. Therefore, the anomalous result recorded in February is likely to be due to higher rainfall and increased runoff. The high result returned for the December monitoring period was recorded at a time of low flow and is likely to be a result of stagnant water being sampled.

Bowmans Creek TDS

The monitoring results for TDS for Bowmans Creek are shown on Figure 28 and Figure 29.

Monthly monitoring results for TDS generally correlate with the EC results. TDS results ranged between 286 mg/L and 744 mg/L. There were no exceedances of trigger values during the reporting period.

Table 16 **Annual Average Surface Water Comparisons of Bayswater Creek for pH, EC, TSS and TDS**

	Bayswater Creek Upstream				Bayswater Creek Midstream				Bayswater 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)
July 2010 – December 2010	7.8	2858	11	1967	8.0	3020	4	2063	7.9	4308	12	2912
January 2011 – December 2011	7.7	3101	13	2037	8.1	3451	13	2020	7.8	3780	10	2395
January 2012 – December 2012	8	3000	24	1960	8	3517	147	2274	8	3425	28	2287

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Figure 22 **Bowmans Creek Surface Water pH (Monthly) 2012**

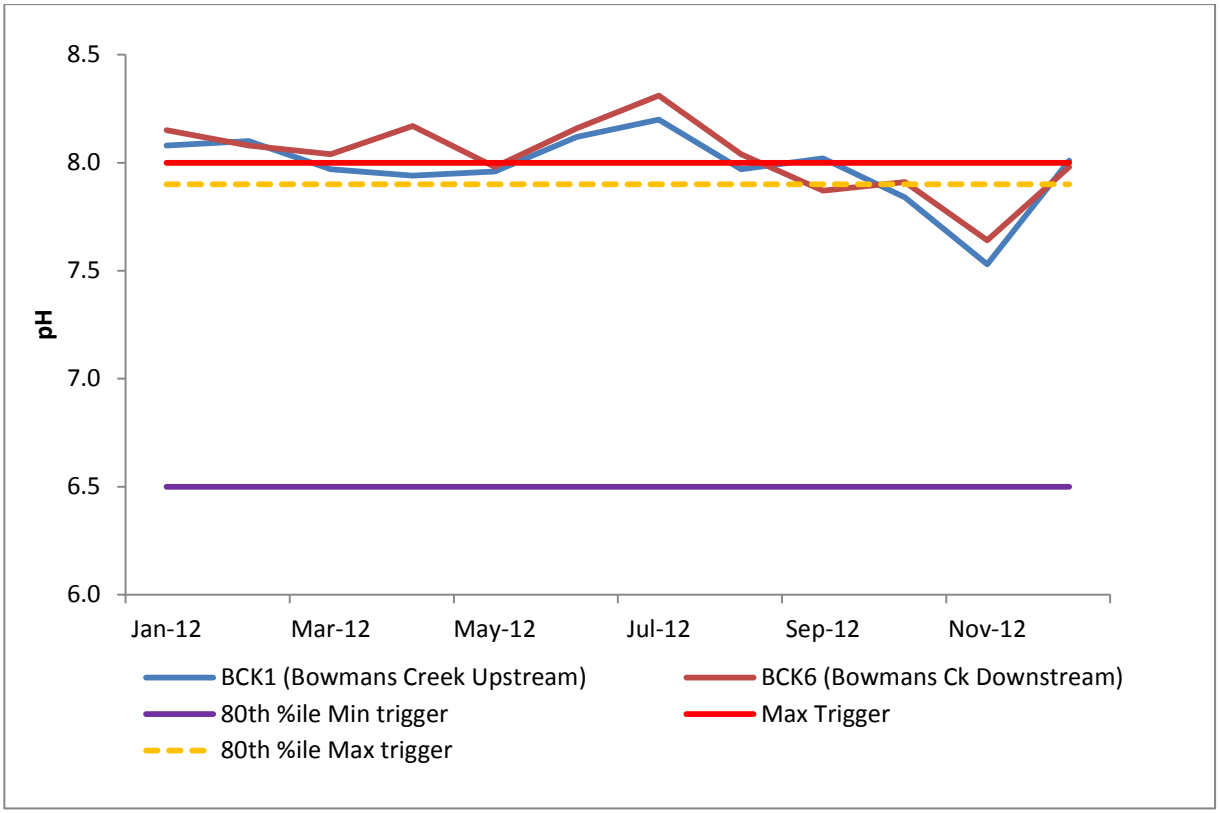


Figure 23 **Bowmans Creek Surface Water pH (Quarterly) 2012**

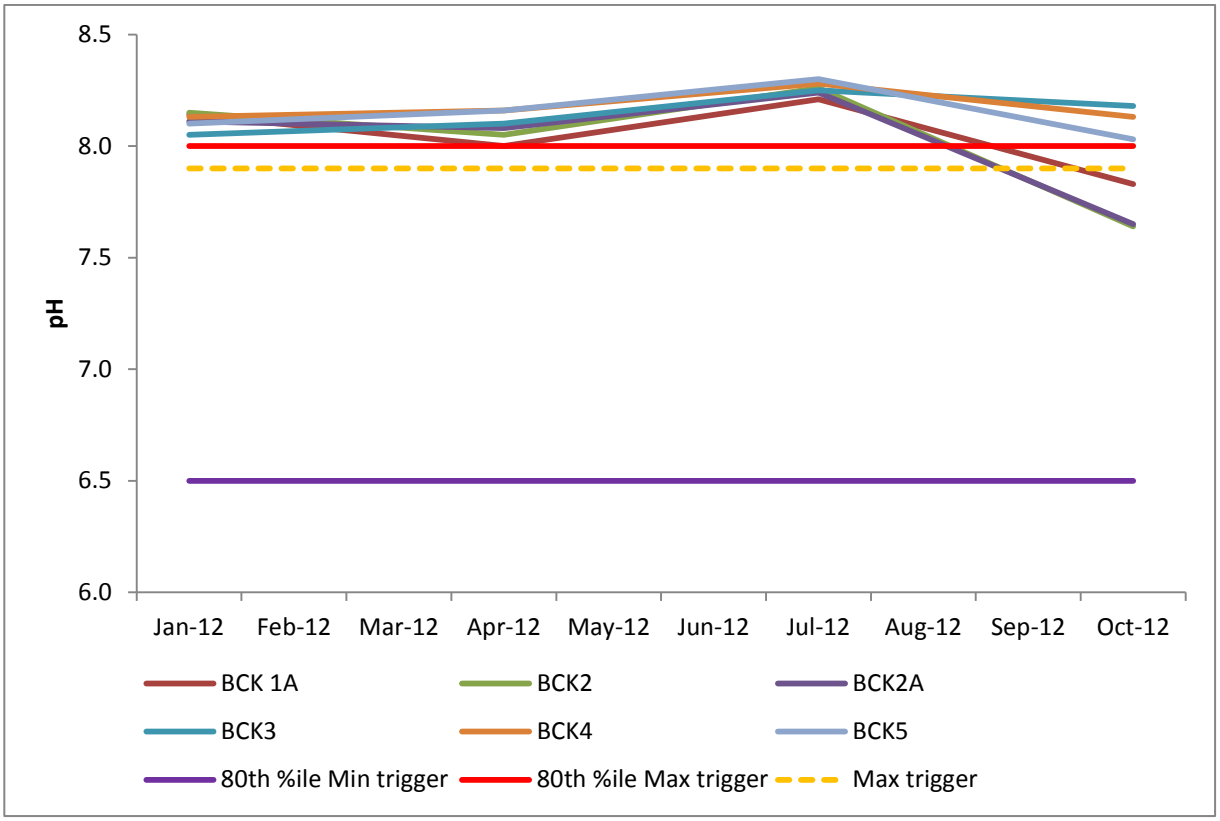


Figure 24 **Bowmans Creek Surface Water EC (Monthly) 2012**

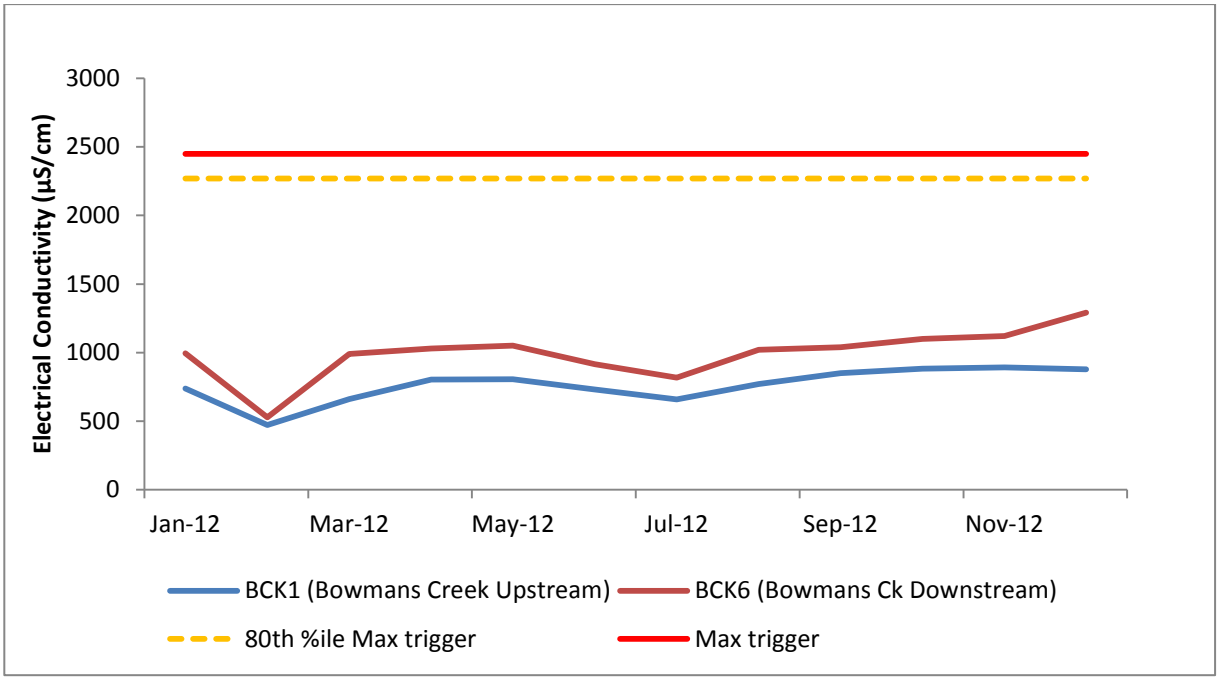


Figure 25 **Bowmans Creek Surface Water EC (Quarterly) 2012**

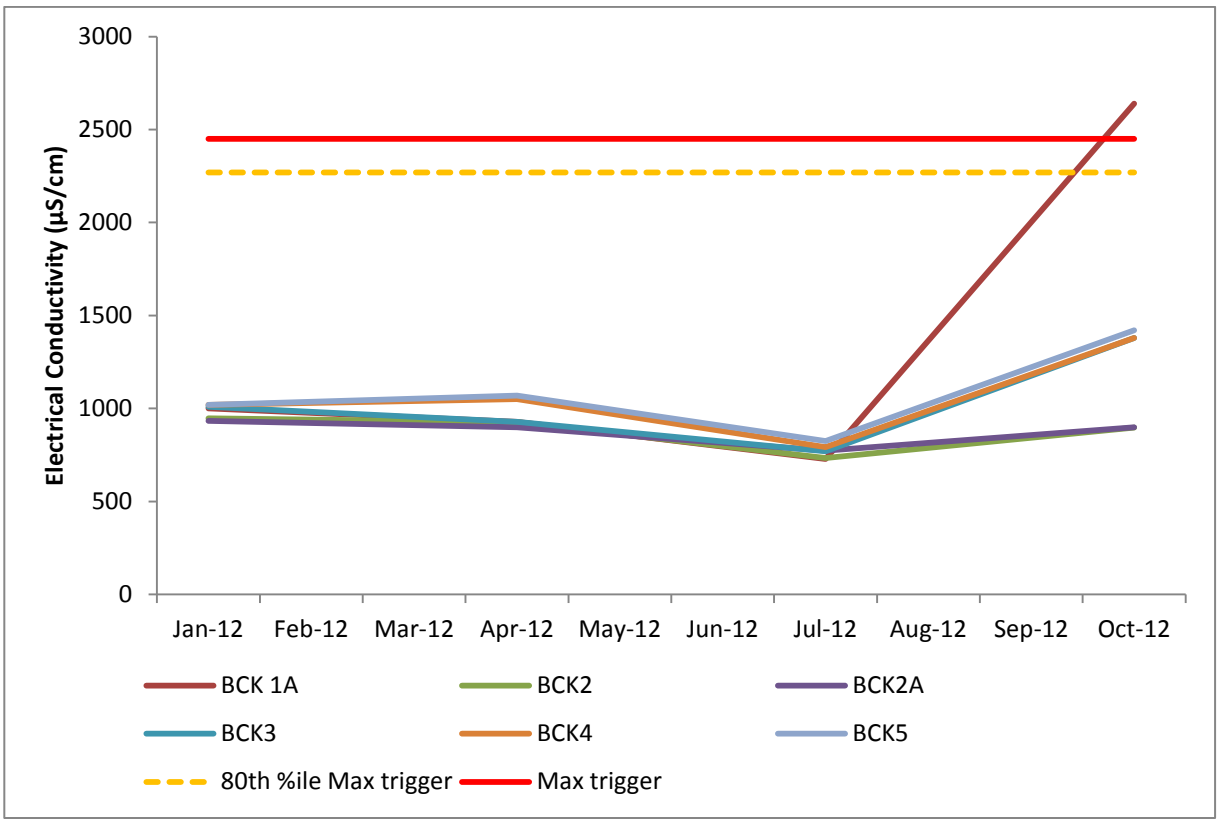


Figure 26 **Bowmans Creek Surface Water TSS (Monthly) 2012**

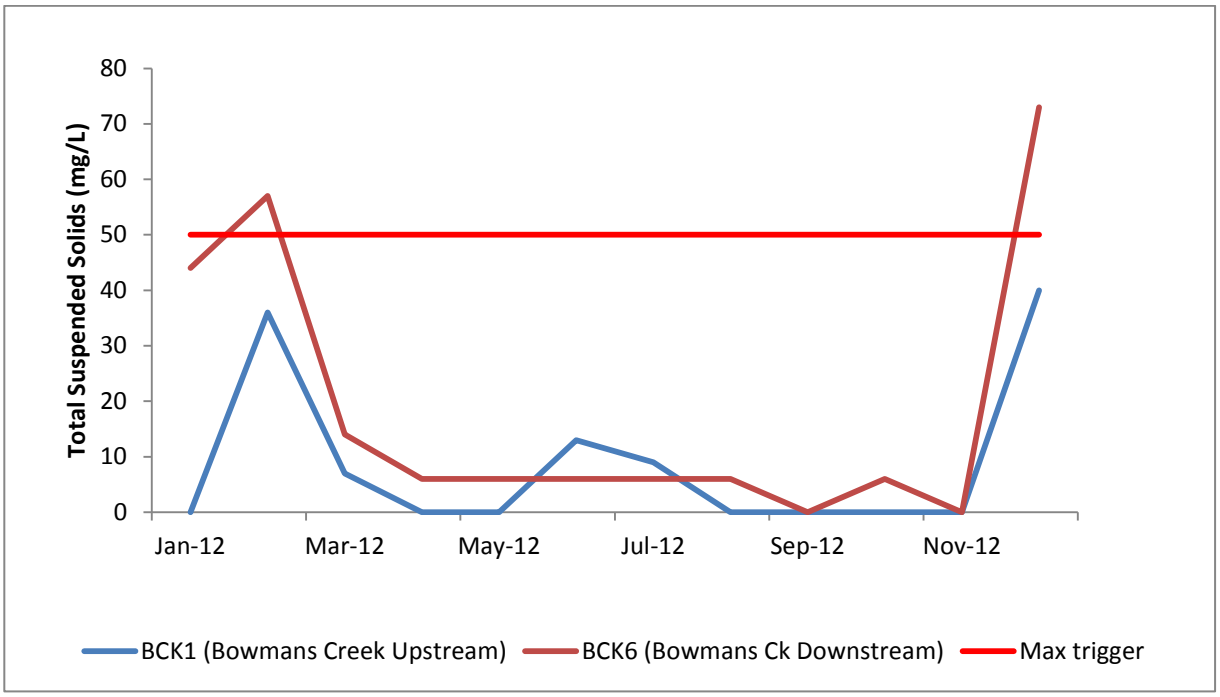


Figure 27 **Bowmans Creek Surface Water TSS (Quarterly) 2012**

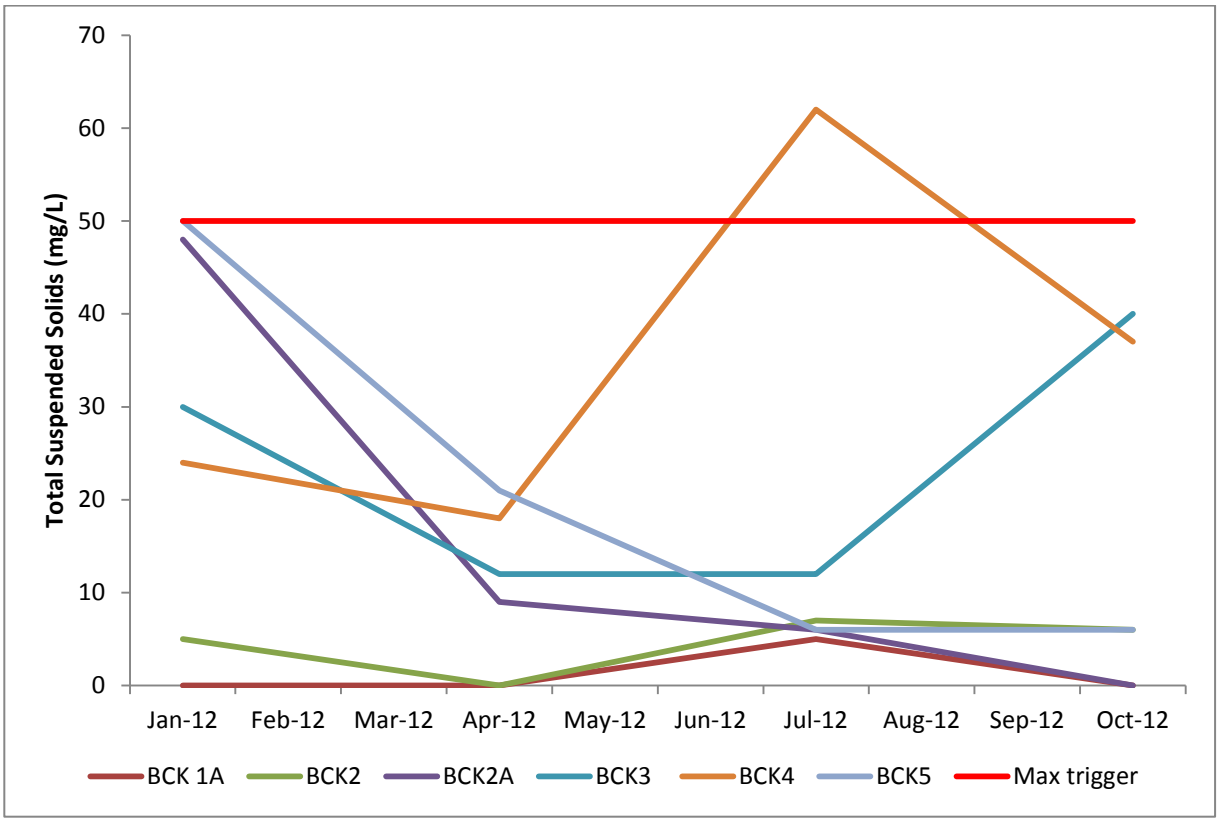


Figure 28 **Bowmans Creek Surface Water TDS (Monthly) 2012**

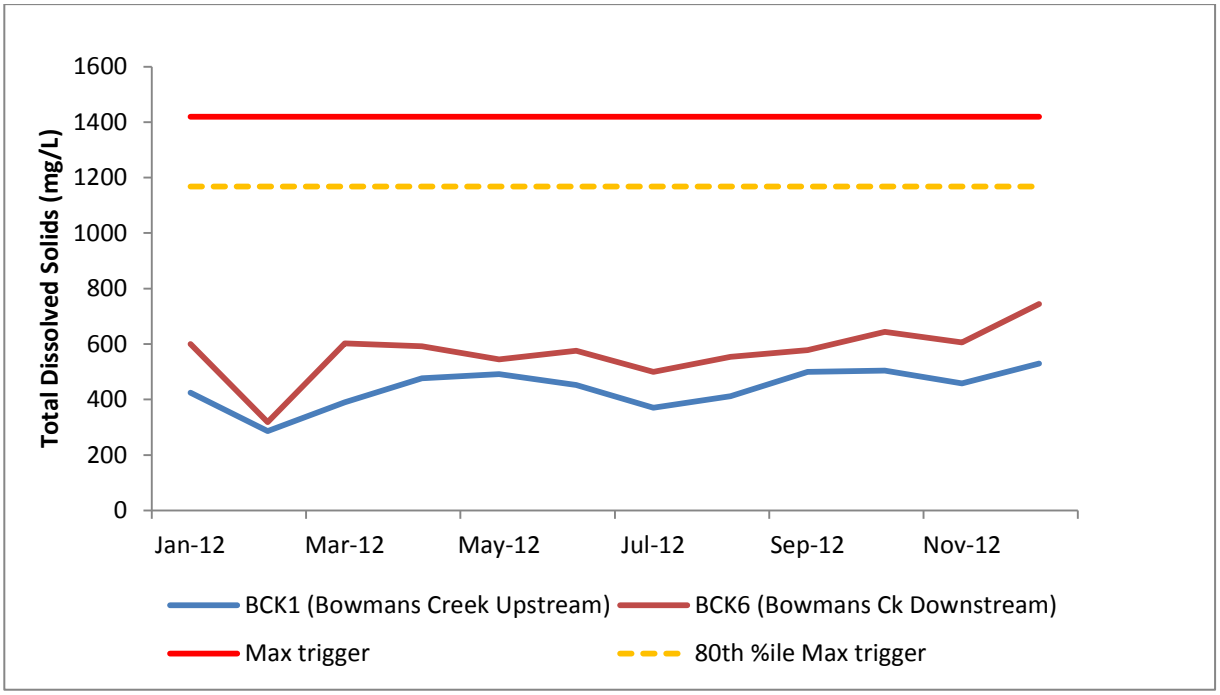
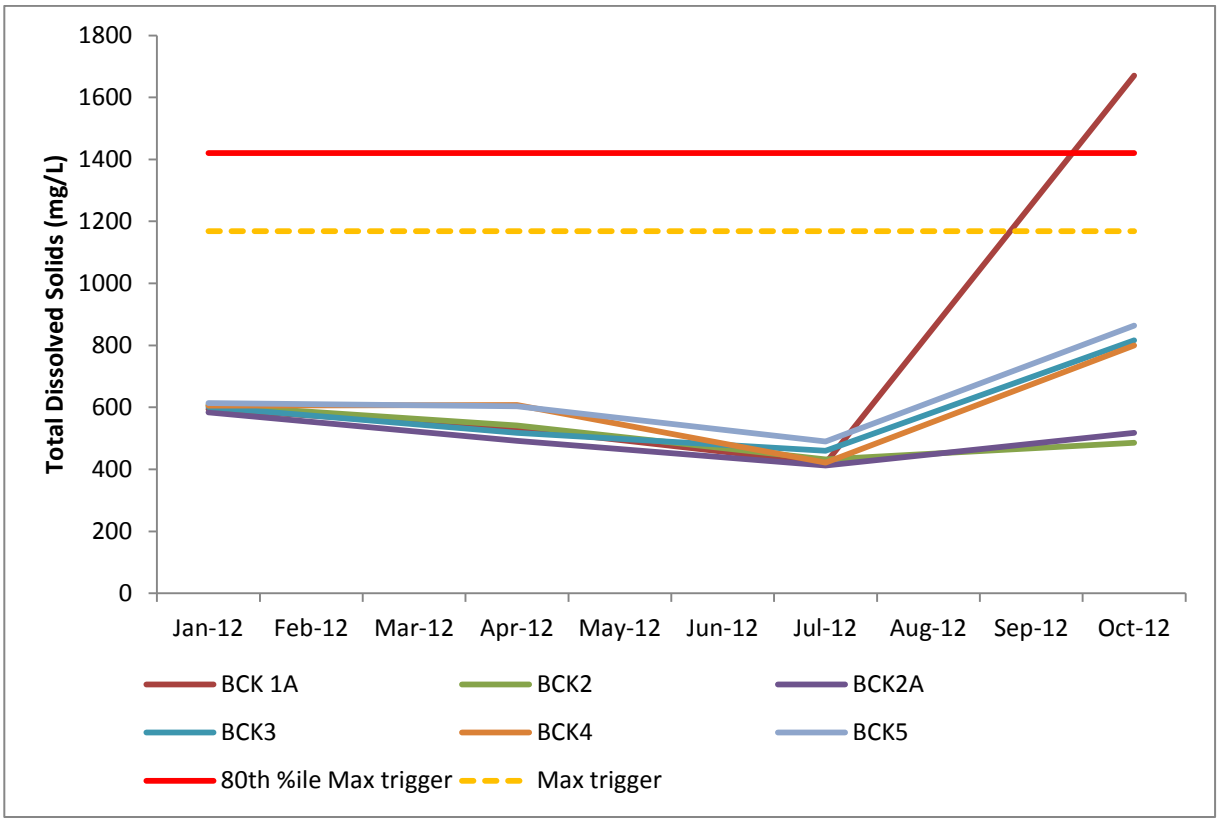


Figure 29 **Bowmans Creek Surface Water TDS (Quarterly) 2012**



Bowmans Creek Chemical Speciation

Biannual chemical speciation monitoring was carried out during January and July 2012. There are no site specific trigger values available for comparison with the results, and the majority of results returned fell below the limit of reporting for each element.

LCO proposes to continue to monitor the catchment so that site specific long term monitoring trigger values can be established.

Bowmans Creek Three Year Comparison

Comparison of annual average pH, EC, TSS and TDS levels to the previous two reporting periods is presented in Table 17. Annual average pH results remained relatively consistent over the three reporting periods. Annual average conductivity, TSS and TDS results are varied and no significant trends are identifiable over the three reporting periods.

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

Surface Water Monitoring Results for On-site Dams

Surface water quality was monitored on a monthly basis at eight on-site dams – Dam 1, Dam 3, Dam 4, Dam 13, Dam 17, the Mount Owen Transfer Dam, the Reservoir Tailings Dam and Raw Water Transfer Void (RWTV).

All surface water samples were analysed for pH, EC, TSS and TDS. These sites are also analysed on a bi-annual basis for chemical species present. Full surface water monitoring results are presented in Appendix E.

On-site Dams pH Results

The monitoring results for pH for On Site Dams are shown on Figure 30.

Monthly pH testing for the annual reporting period shows variations between pH 8.1 (Dam 1) and pH 9.7 (Mt Owen Transfer Dam). There were 4 80th percentile trigger value (pH 6.5-10.2) exceedances during the reporting period, 2 at Dam 13 in November and December (pH 9.4 and 9.5 respectively) and 2 at Mt Owen Transfer Dam in January and February (pH 9.7 and 9.5 respectively). The maximum trigger value was not exceeded during the reporting period.

On-site Dams EC Results

The monitoring results for EC for On Site Dams are shown on Figure 31.

The EC results for the on-site dams shows variations between 677 µS/cm (Dam 1) and 14,200 µS/cm (Reservoir Tailings Dam). There were 7 exceedances of the 80th percentile trigger value during the reporting period. Two of these results were recorded at the Reservoir Tailings Dam in July and August (6650 µS/cm and 10,100 µS/cm), three were at Dam 13 in October, November and December (8070 µS/cm, 10,100 µS/cm and 11,100 µS/cm) and two were at the Raw Water Transfer Void in September and October (6460 µS/cm and 6500 µS/cm). There was one exceedance of the maximum trigger value recorded at the Reservoir Tailings Dam in September (14,200 µS/cm).

Table 17 **Annual Average Surface Water Comparisons of Bowmans Creek for pH, EC, TSS and TDS**

	BCK1 (Bowmans Creek Upstream)				BCK1A				BCK2				BCK2A			
	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)
July 2010 – Dec 2010	8.2	654.0	5.7	392.3	8.1	885.0	6.5	451.0	7.9	1000.5	5.5	565.0	8.1	890.0	9.0	527.0
January 2011 – Dec 2011	7.8	1019.5	10.0	653.2	7.9	1667.8	8.3	1087.0	8.0	871.5	39.3	490.0	8.0	775.3	19.3	417.3
January 2012 – Dec 2012	8	762	21	441	8	1324	5	804	8	877	6	517	8	877	21	502
	BCK3				BCK4				BCK5				BCK6 (Bowmans Creek Downstream)			
	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)
July 2010 – Dec 2010	8.2	875.0	13.5	507.0	8.1	1075.0	8.5	644.0	8.1	1058.5	11.0	612.0	8.1	959.8	15.6	581.3
January 2011 – Dec 2011	8.0	880.5	23.0	501.5	8.0	1094.0	12.0	630.0	8.1	1036.0	18.0	600.5	7.8	903.2	13.1	772.0
January 2012 – Dec 2012	8	1022	24	599	8	1061	35	609	8	1084	21	643	8	991	22	572

Figure 30 **On Site Dams Surface Water pH 2012**

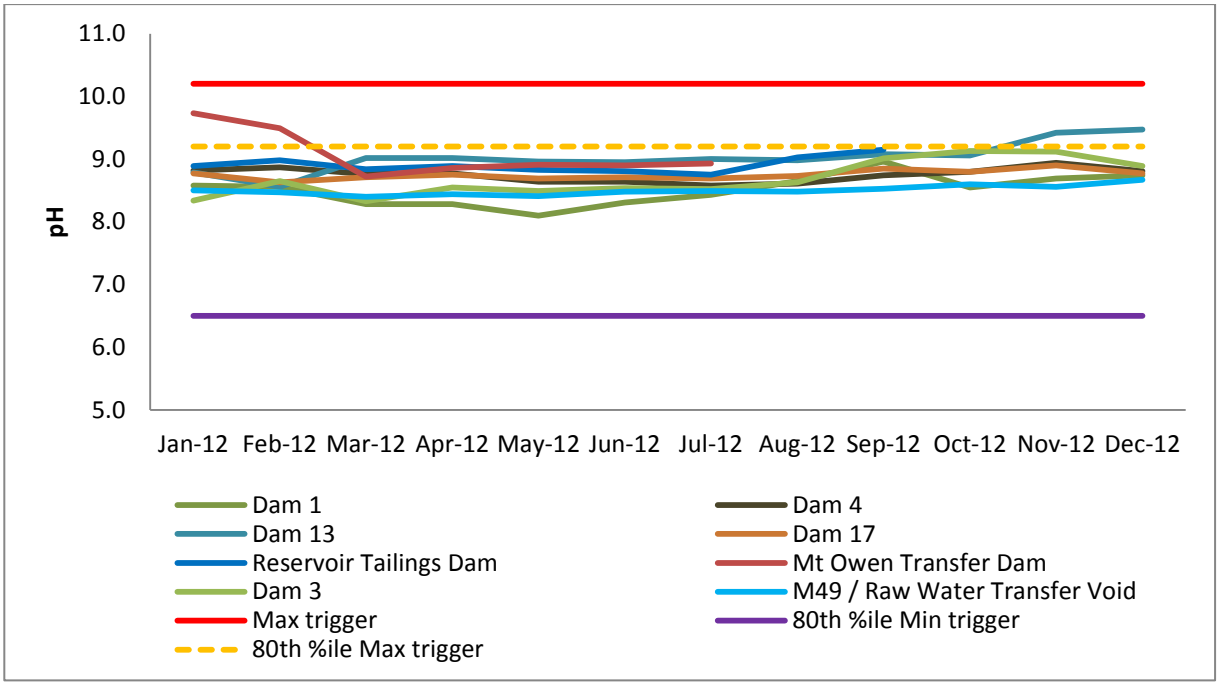


Figure 31 **On Site Dams Surface Water EC 2012**

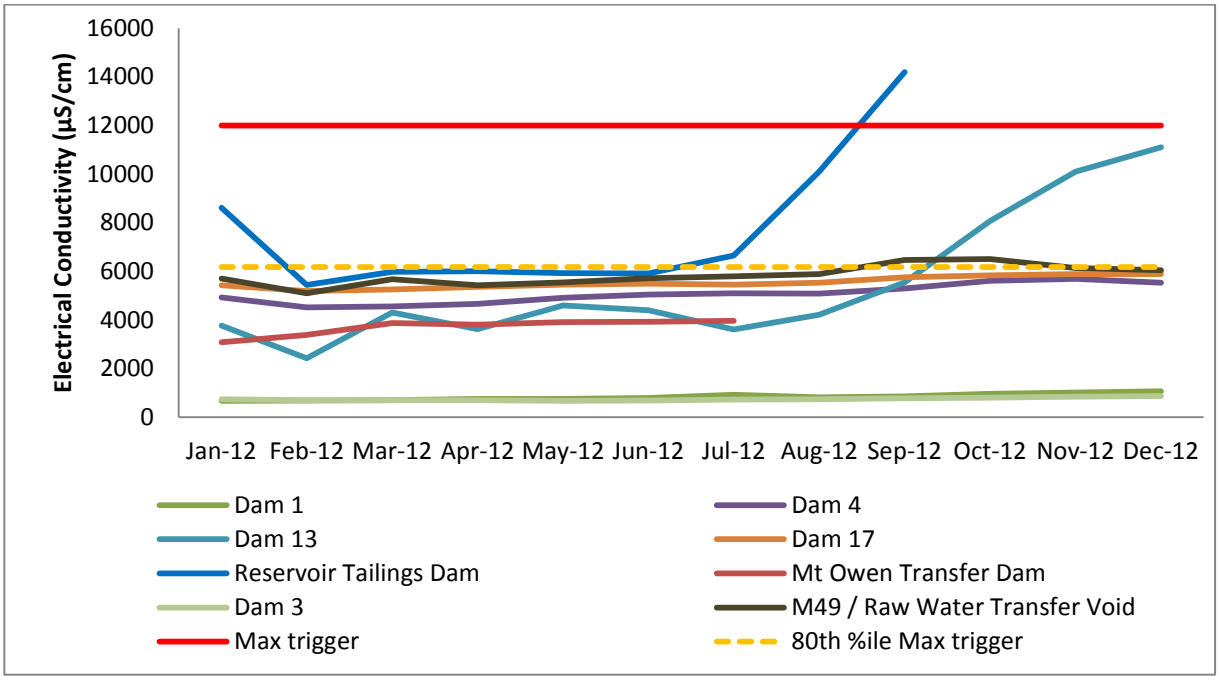


Figure 32 **On Site Dams Surface Water TDS 2012**

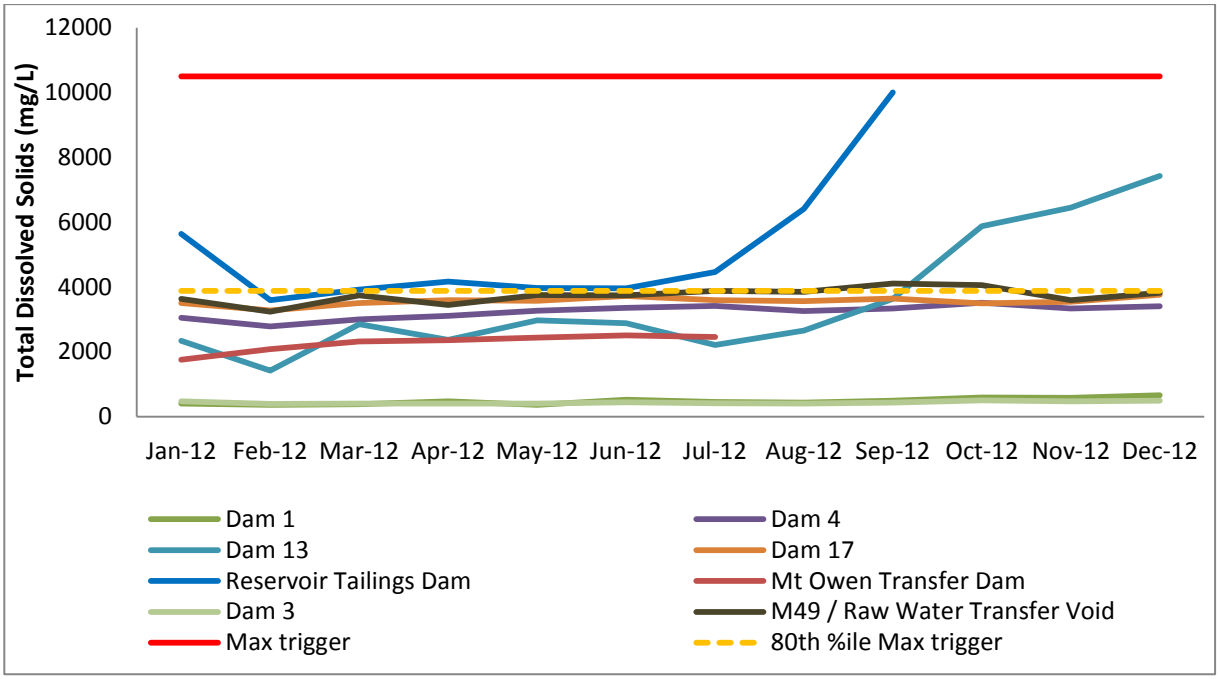
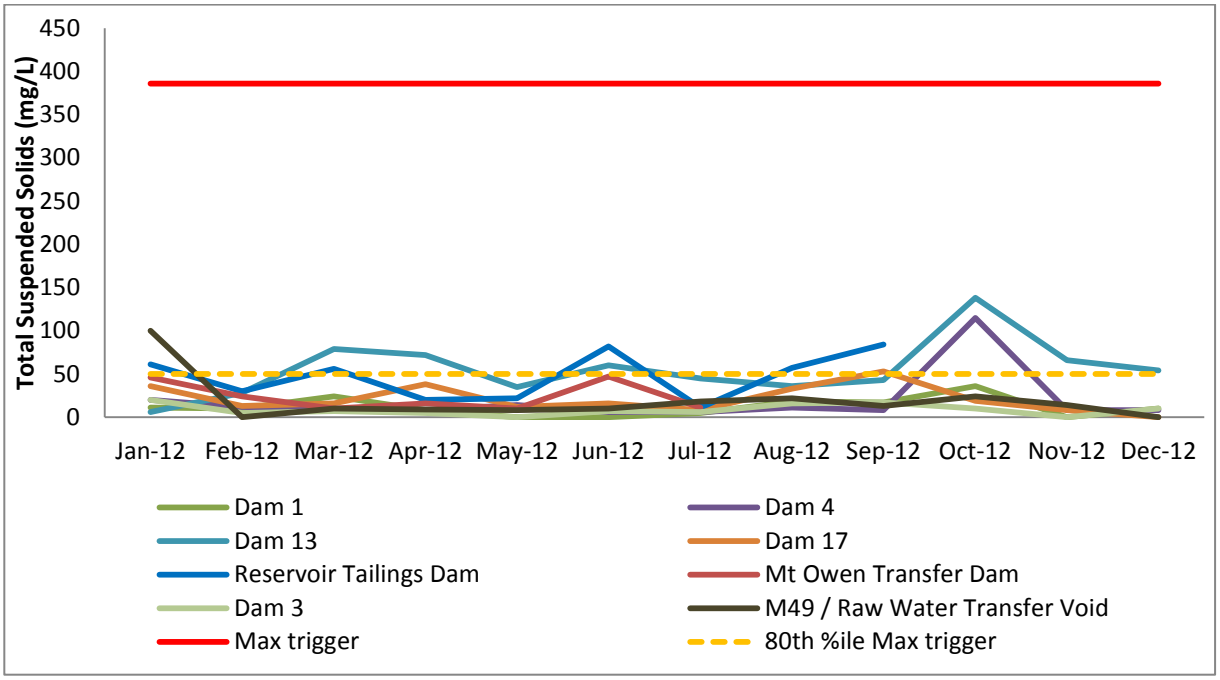


Figure 33 **On Site Dams Surface Water TSS 2012**



On-site Dams TDS Results

The monitoring results for TDS for On Site Dams are shown on Figure 32.

Monitoring results for the Total Dissolved Solids (TDS) for the on-site dams correlate with the EC results. During the reporting period, there were 13 exceedances of the 80th percentile trigger limit (3880 mg/L) during the reporting period, including:

- 3 occasions at Dam 13 in October (5880 mg/L), November (6450 mg/L) and December (7430 mg/L).
- 8 occasions at the Reservoir Tailings Dam in January (5640 mg/L) and March to September (3920 mg/L, 4170 mg/L, 3970 mg/L, 3960 mg/L, 4460 mg/L, 6410 mg/L, 10,000 mg/L).
- 2 occasions at the Raw Water Transfer Void in September (4110 mg/L) and October (4060 mg/L).

No result exceeded the maximum trigger value for TDS (10500 mg/L).

On-site Dams TSS Results

The monitoring results for EC for On Site Dams are shown on Figure 33.

There were 13 exceedances of the 80th percentile trigger limit (50 mg/L) during the reporting period, including:

- One occasion at Dam 4 in October (115 mg/L).
- Six occasions at Dam 13 in March (79 mg/L), April (72 mg/L), June (60 mg/L), October (138 mg/L), November (66 mg/L) and December (54 mg/L).
- One occasion at Dam 17 in September (53 mg/L).
- Five occasions at the Reservoir Tailings Dam in January (61 mg/L), March (56 mg/L), June (82 mg/L), August (57 mg/L) and September (84 mg/L).

There were no exceedances of the maximum trigger value during the reporting period.

On-site Dams Chemical Speciation Results

Biannual chemical speciation monitoring was carried out during January and July 2012. There are no site specific trigger values available for comparison with the results, and the majority of results returned fell below the limit of reporting for each element.

LCO proposes to continue to monitor the catchment so that site specific long term monitoring trigger values can be established.

On-site Dams Three Year Comparison

Comparison of annual average pH, EC, TSS and TDS levels to the previous two reporting periods is presented in Table 18. Annual average pH levels remained generally constant at all dams over the three year reporting periods, with the exception of the Raw Water Transfer Void where pH levels have increased from 7.8 to 9. Annual average EC levels remained stable at Dam 4, Dam 13, Dam 17 and the Raw Water Transfer Void. An increase in EC was observed at the Reservoir Tailings Dam, while decreases were observed at Dam 1, Dam 3 and the Mt Owen Transfer Dam. Annual Average TSS has increased at all dams over the three year period, with the exception of Dam 3, Dam 17 and the Reservoir Tailings Dam. The annual average TDS increased at Dam 13, the Reservoir Tailings Dam and the Raw Water Transfer Void, while a decrease in TDS levels was observed at all other sites.

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.

Table 18 **Annual Average Surface Water Comparisons of Onsite Dams for pH, EC, TSS and TDS**

	Dam 1				Dam 3				Dam 4				Dam 13			
	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)
July 2010 – Dec 2010	8.6	1379	6	827	9.5	1423	11	879	8.9	4786	9	3633	8.7	5810	17	3640
January 2011 – Dec 2011	8.5	1006	7	605	8.8	1206	15	750	8.9	5693	16	3623	8.9	4925	78	3086
January 2012 – December 2012	8.5	833	15	479	9	745	10	438	9	5076	19	3239	9	5479	55	3591
	Dam 17				Reservoir Tailings Dam				Mt Owen Transfer Dam				Raw Water Transfer Void			
	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)
July 2010 – Dec 2010	8.7	5782	13	3835	8.8	5000	136	2860	9.2	5110	11	3323	7.8	5420	3	3295
January 2011 – Dec 2011	8.8	6122	120	3836	8.8	6432	414	4086	9.3	4744	57	2819	8.5	5767	21	3570
January 2012 – December 2012	9	5543	23	3568	9	7648	47	5126	9	3704	23	2276	9	5833	23	3739

HRSTS Discharge Monitoring

Any discharges from the Liddell Colliery must be undertaken in accordance with the Hunter River Salinity Trading Scheme (HRSTS). 16 discharge events occurred during the reporting period. Monitoring results at the Stilling Basin during the discharge events are presented in Table 19.

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

Table 19 HRSTS Discharge Events 2012

Date	Discharge Volume (ML)	pH (Stilling Basin)	EC (µS/cm) (Stilling Basin)	TSS (mg/L) (Stilling Basin)
3/2/12	28.5	8.4	5498	16
4/2/12	26.8	8.4	5502	9.5
5/2/12	14.2	8.4	5527	8
6/2/12	8.3	8.4	5548	6
24/2/12	3.3	8.4	5255	7
24/2/12	14.9	8.4	5467	4
3/3/12	10.6	8.6	3362	30
3/3/12	34.5	8.6	3258	22
4/3/12	36.7	8.5	3379	35
5/3/12	31.9	8.5	3703	28.5
6/3/12	29.4	8.4	5162	5
7/3/12	29.6	8.5	5218	6
8/3/12	16.7	8.5	5249	5.5
15/7/12	19.55	8.5	5723	22.5
16/7/12	28.89	8.5	5746	16
17/7/12	9.44	8.5	5734	11

3.8 Groundwater

3.8.1 Environmental Management

The *Liddell Colliery – Groundwater Monitoring Program* outlines the groundwater monitoring required to be undertaken by LCO to ensure compliance with statutory requirements and is part of a set of documents prepared to support the *Liddell Colliery – Water Management Plan*. The monitoring program addresses the requirements specified in Development Consent DA 305-11-01 MOD 4 and LCO's Environmental Protection Licence EPL 2094. The monitoring program specifically satisfies schedule 3, condition 27 of the development consent, which requires the development of a groundwater monitoring program as a component of the overall Water Management Plan prepared for the development.

LCO is located within an area of the Upper Hunter Valley subject to extensive underground and open cut mining activities since the early 20th century. Current and historical mining operations have extensively altered the physical features and environmental setting of the local area, including the region's surface water and groundwater systems. Mining operations to the west, south and east of LCO, Lake Liddell to the west, and the major geological feature Hunter Thrust to the north, all have major influence on groundwater levels in the region. Due to such operations and features regional groundwater levels

largely reflect current and past mining activities, with water levels varying with time and location according to local mining activities.

LCO has an established groundwater monitoring program comprising a network of 19 piezometers (refer to Figure 17) that target both the surrounding alluvial aquifer associated with Bowmans Creek and the regional hard rock aquifer associated with the coal measures. All of the piezometers in the monitoring network are located outside the current open cut pits at LCO, and as such are considered appropriate locations for providing data on groundwater levels and pressures and groundwater quality for surrounding aquifers, including both alluvial aquifer systems and the regional hard rock aquifers associated with the coal measures. Piezometers targeting the alluvium are paired and monitor both the alluvial aquifer and the adjacent underlying shallow bedrock strata (where the bore name suffix L = alluvium and S = shallow bedrock or overburden). The piezometers are monitored monthly for groundwater level and every two months for water quality parameters pH and electrical conductivity. Eleven of the piezometers are also sampled biannually and analysed for a range of inorganic species.

3.8.2 Environmental Performance

Groundwater sampling was conducted in accordance with the *Groundwater Monitoring Guidelines for Mine Sites within the Hunter Region* (Department of Infrastructure, Planning and Natural Resources (DIPNR), 2003), as adapted from *AS 5667.11* (1998).

As described in the *Liddell Colliery – Groundwater Monitoring Program* and as recommended in the *ANZECC (2000) Water Quality Guidelines*, historic monitoring data has been used to define the default assessment criteria for groundwater at the site. Due to the highly disturbed nature of the site, an 80th percentile value has been applied to the default trigger values for the water quality parameters pH and electrical conductivity (EC). The trigger values based on historical monitoring data for the alluvial and hard rock aquifers are summarized in Table 20.

Table 20 Trigger Values for Groundwater Quality

Analyte	Alluvial Aquifer		Hard Rock Aquifer	
	80th percentile[1]	Maximum	80th percentile[1]	Maximum
pH	6.5 – 7.8	3.2 – 9.6	6.5 – 8.2	6.5 – 10.7
Electrical Conductivity (µS/cm)	2791	5480	5356	5840

[1] - ANZECC criteria for pH lower limit; 80th percentile of historical monitoring data used for upper limit.

The trigger values for pH in the alluvial aquifer defined in the *Liddell Colliery – Groundwater Monitoring Program* comprise a smaller pH range than the default trigger values for pH for south-east Australia for slightly disturbed lowland river ecosystems (pH range 6.5 to 8; ANZECC, 2000). As such the trigger values defined in the monitoring program are conservative in comparison to default guideline values provided in the *ANZECC (2000) Water Quality Guideline*. Re-evaluation of the groundwater assessment criteria adopted is considered worthwhile in the next revision of the LCO groundwater monitoring program.

The trigger values adopted for the groundwater monitoring program are intended to provide an indication of potential impacts to groundwater resources as a result of mining operations. Further investigations into such potential impacts are to be conducted if monitoring results suggest significant and continuous deviation from historical or background trends in water quality parameters.

In addition to pH and EC, the other key parameter measured as part of the groundwater monitoring program is groundwater level. Monitoring of these parameters provides an indication of pressures / water levels and groundwater quality within the coal measures and the alluvial aquifer associated with Bowmans Creek and its shallow underlying strata (i.e. overburden).

Groundwater Quality Monitoring Results

Groundwater quality is monitored at seven locations targeting the alluvial aquifer associated with Bowmans Creek using dual piezometers penetrating the alluvium and the underlying hard rock strata (ie. overburden). Piezometers ALV1L through ALV8L and LBH target the Bowmans Creek alluvium while piezometers ALV1S through ALV8S target the hard rock strata immediately beneath the alluvium. Groundwater quality in the deeper hard rock aquifer associated with the coal measures is monitored at six other locations (PGW5L, PGW5S, HAZ 3/4, HAZ 6, LC1 and Mt Owen 2). Location PGW5

includes a dual piezometer targeting the overburden (PGW5L) and Pikes Gully coal seam (PGW5S). Groundwater at each of these locations is monitored monthly for depth to water and in situ pH and EC readings using a field pH/EC probe. In addition, every six months groundwater samples are collected and analysed for TSS, TDS, heavy metals, cations and anions. Groundwater quality monitoring results for the reporting period are shown in Figure 34 to Figure 37 and in Appendix F, and a summary of these results is provided below.

Alluvial and Shallow Bedrock Aquifers

During the reporting period, the 80th percentile trigger value for pH (pH 7.8) was exceeded on 11 isolated occasions:

- Four times at ALV1S in August (7.99), September (7.94), October (7.9) and November (7.9);
- Four times at ALV2S in August (8.09), October (7.92), November (7.89) and December (7.89);
- Once at ALV4S in August (7.82); and
- Twice at ALV8L in February (7.9) and August (7.82).

The *ANZECC (2000) Water Quality Guideline* (pH=8) was only exceeded once (ALV2S in August). The minimum pH (pH 6.5) and maximum upper limit trigger value for pH (pH 9.6) were not exceeded during the reporting period.

Electrical conductivity measurements for piezometer ALV4S exceeded the 80th percentile trigger value (2791 μS/cm) for the entire reporting period, though the maximum trigger value (5480 μS/cm) was not exceeded. Other monitoring results above the 80th percentile trigger value for EC included:

- Four exceedances at ALV2S in May (2800 μS/cm), September (2890 μS/cm), October (2830 μS/cm) and November (2830 μS/cm);
- Two exceedances at ALV3S in September (2850 μS/cm) and October (2870 μS/cm); and
- Two exceedances at ALV4L in March (3080 μS/cm) and April (2910 μS/cm).

The pH and EC monitoring data collected between January 2012 and December 2012 is consistent with historical monitoring data recorded for these locations (AECOM, 2012), indicating no further investigations into the impact of mining operations on groundwater within the alluvium and shallow bedrock are required.

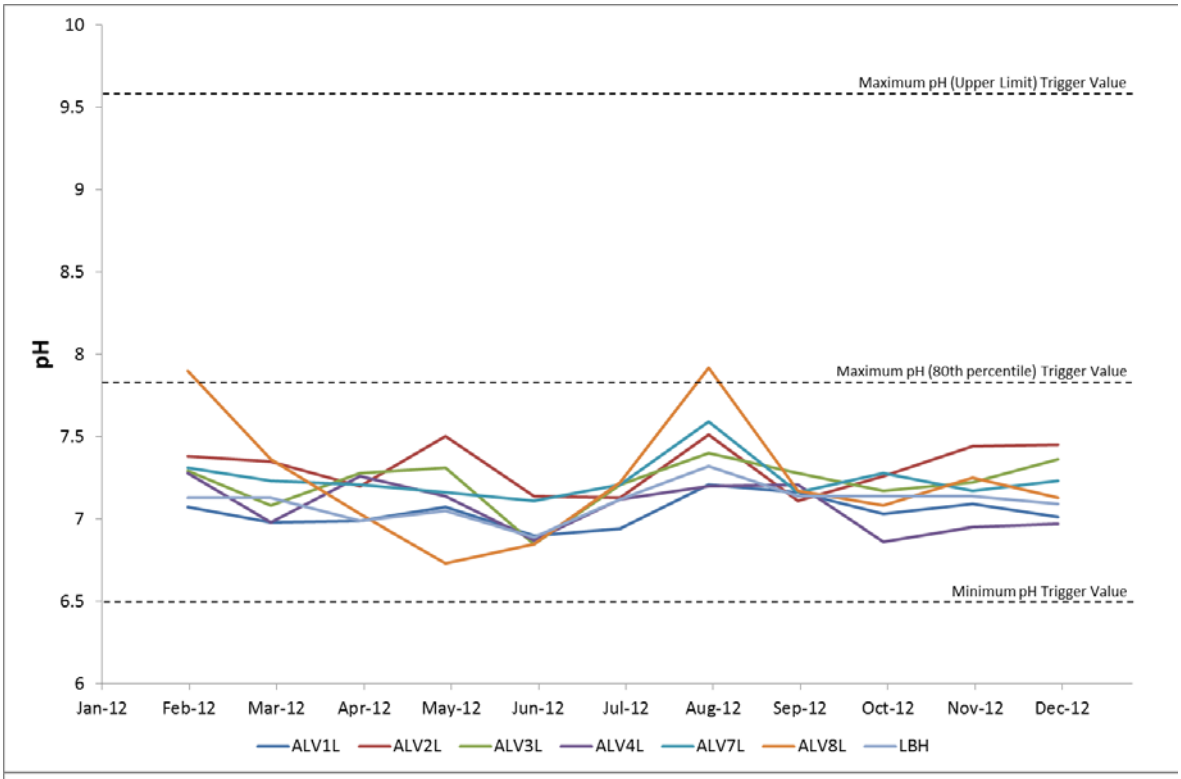
Hard Rock Aquifer (Coal Measures)

pH and EC monitoring data was not able to be collected from piezometers LC1, Haz 3/4, and Mt Owen 2 for the entire reporting period. LC1 and Mt Owen 2 were dry for the entire reporting period, and the casing for HAZ 4 was bent and prohibited sample collection. Piezometers PGW5L and PGW5S were intermittently dry during the reporting period, preventing the collection of monitoring data during selected months.

pH values recorded at PGW5L, PGW5S and Haz 6 were within the minimum and 80th percentile pH trigger value range for the entire reporting period. One EC measurement at PGW5S (5380 μS/cm) exceeded the 80th percentile trigger value (5356 μS/cm), however all other EC measurements were below the adopted criteria.

The pH and EC data collected for the hard rock aquifer during the monitoring period is consistent with historical monitoring data recorded for these locations (AECOM, 2012), hence no further investigations into the impact of mining operations on groundwater within the regional hard rock aquifer are required.

Figure 34 **pH Data for Alluvial and Shallow Bedrock (ie. overburden) Piezometers – January to December 2012**



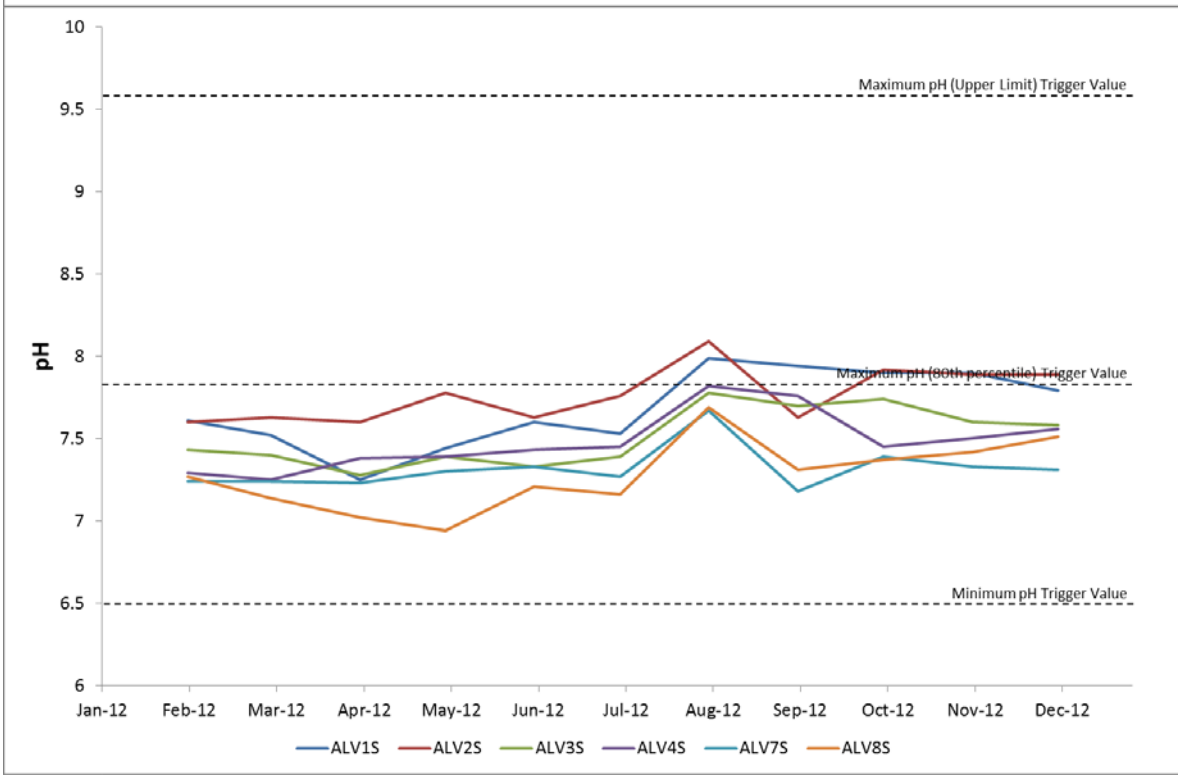


Figure 35 **EC Data for Alluvial and Shallow Bedrock (ie. overburden) Piezometers – January to December 2012**

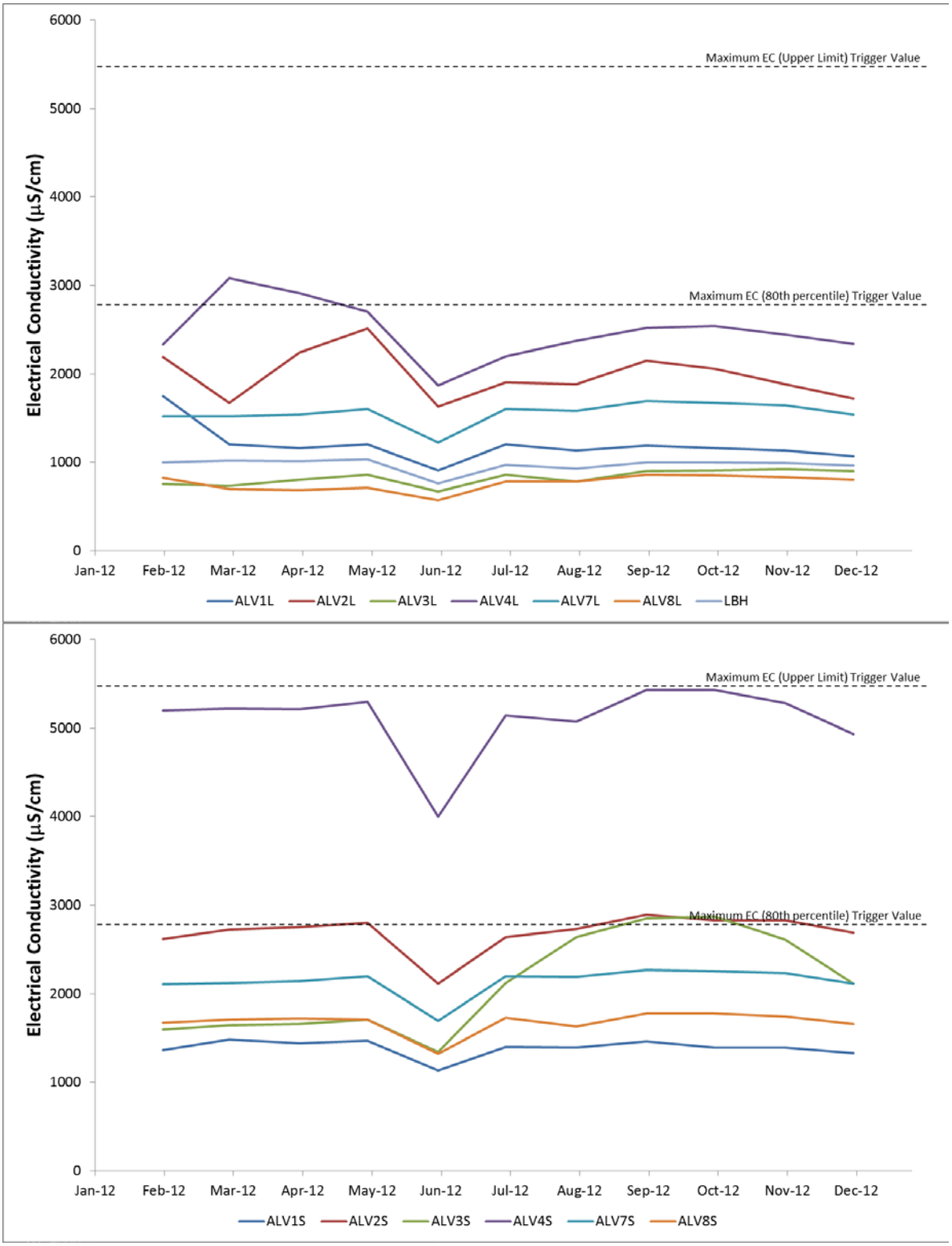


Figure 36 pH Data for Hard Rock Piezometers – January to December 2012

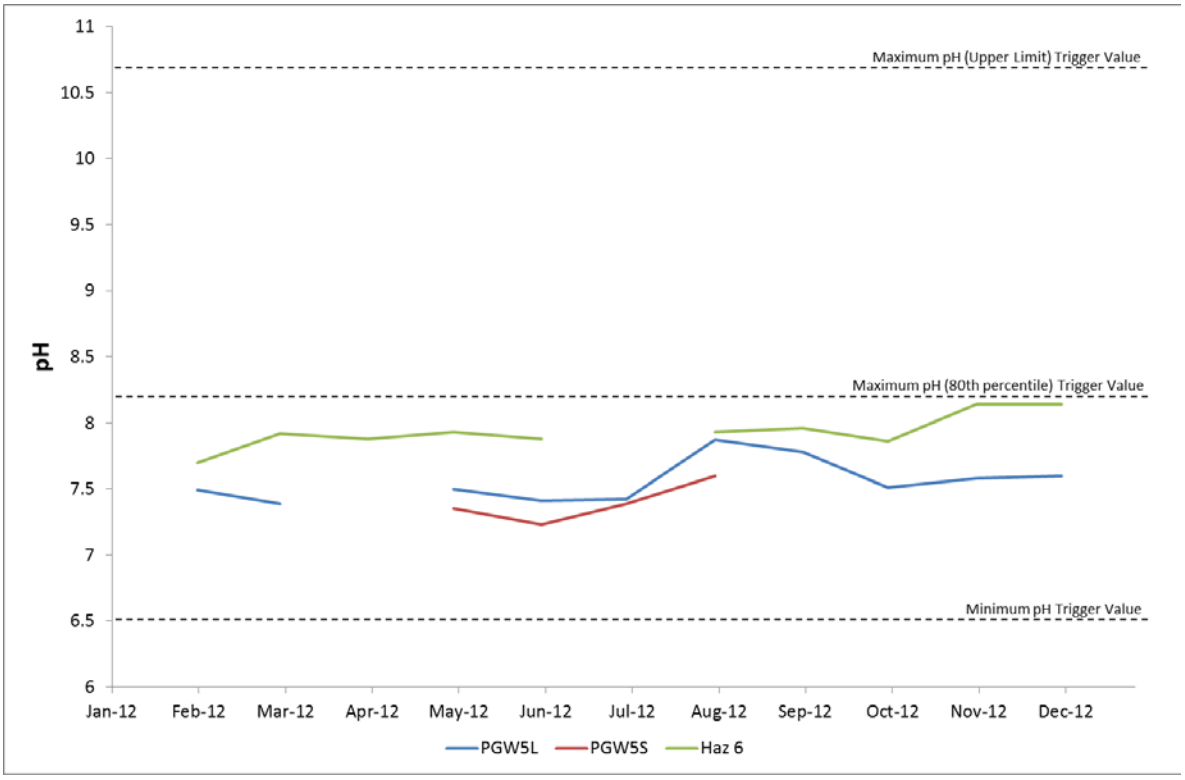
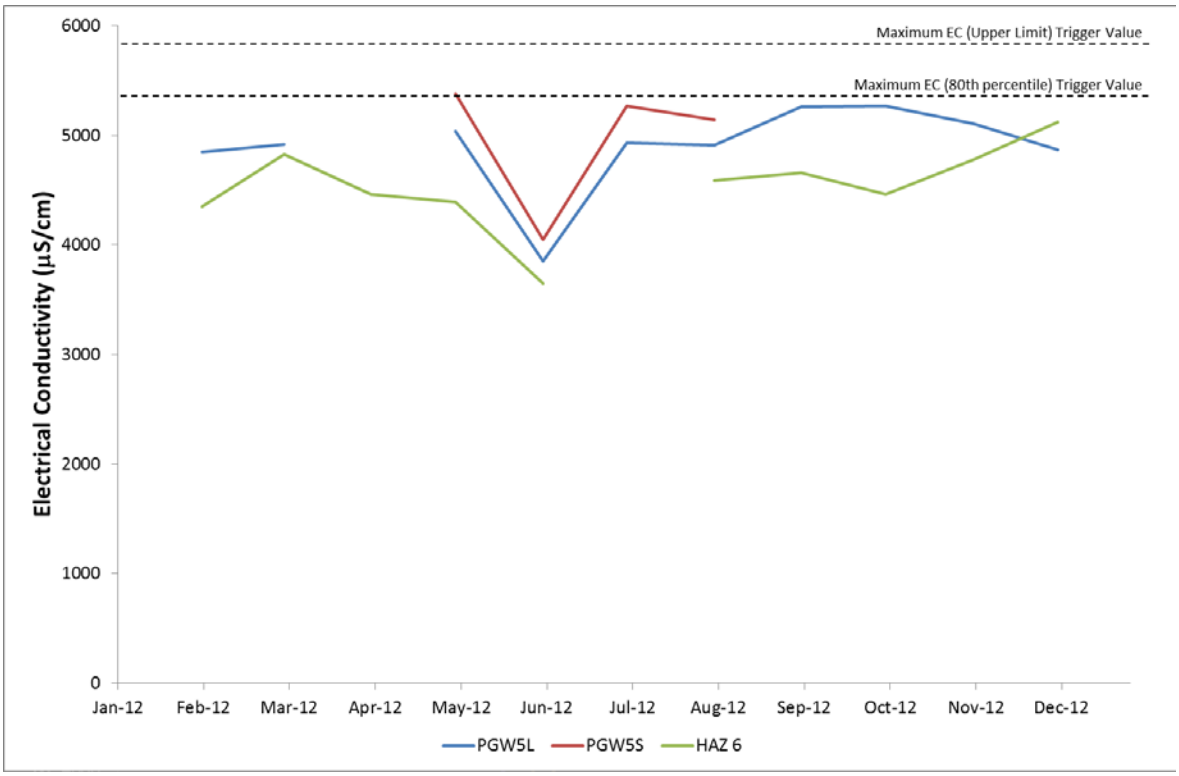


Figure 37 EC Data for Hard Rock Piezometers – January to December 2012



Groundwater Levels

Historical trends in groundwater levels are shown in Figure 38 to Figure 40 for all of the piezometers monitored as part of LCO's groundwater monitoring program.

Alluvial and Shallow Bedrock Aquifers

Hydrographs for piezometers targeting the alluvium and shallow bedrock are displayed in Figure 38 and Figure 39 respectively. Groundwater elevations at these bores decrease with distance along Bowmans Creek, and the similar water level responses observed in the paired bores indicates these two units are hydraulically connected. Figure 38 and Figure 39 indicate groundwater levels generally decreased from 2001 to 2006 before rebounding to 2001 levels following the June 2007 floods. Since then groundwater levels have remained fairly stable.

Hard Rock Aquifer (Coal Measures)

Hydrographs for piezometers targeting the regional hard rock aquifer associated with the coal measures are shown in Figure 40. The groundwater elevations shown vary significantly between the piezometers monitored, reflecting differences in groundwater levels between stratigraphic layers and due to current and historical mining and dewatering operations.

Groundwater levels observed for the paired piezometers PGW5L and PGW5S, which target the overburden and Pikes Gully coal seam, respectively, have been very consistent since 2006. PGW5 is located above the Hazeldene underground workings, which have been subject to periodic dewatering operations to accommodate mining operations at LCO. Hydrographs for Haz 3/4 and Haz 6 reflect such dewatering (and subsequent recovery) operations for the Hazeldene workings. The lack of response in groundwater levels for PGW5L and PGW5S indicates the intervening strata between the deeper Hazeldene underground workings and the Pikes Gully seam and overburden effectively confines any depressurization (and recovery) to the deeper strata, with little impact to the overlying strata or aquifers. The similar hydrographs for Haz 3/4 and Haz 6 also indicate these bores or hydraulically connected, presumably via the Hazeldene underground workings.

Hydrographs for piezometers LC1 and Mt Owen 2 are also similar, suggesting these bores are hydraulically connected through the former Liddell underground workings. Groundwater levels in the Liddell underground workings are subject to depressurization due to dewatering activities to accommodate current open cut mining operations at LCO. Piezometer LC1 has been dry since July 2010 as a result of these dewatering activities.

Mine Dewatering

Reduced groundwater levels are observed in the open cut pit due to dewatering ahead of mining from M49 bore (20BL172293) and Mt Owen bore (20BL168209). An annual volume of 2117.03 ML was extracted from these bores, which is within their combined 2500ML annual extraction allocation limit.

Figure 38 **Groundwater Levels for Alluvial Piezometers – 2006 to 2012**

Figure 39 **Groundwater Levels for Shallow Bedrock Piezometers – 2006 to 2012**

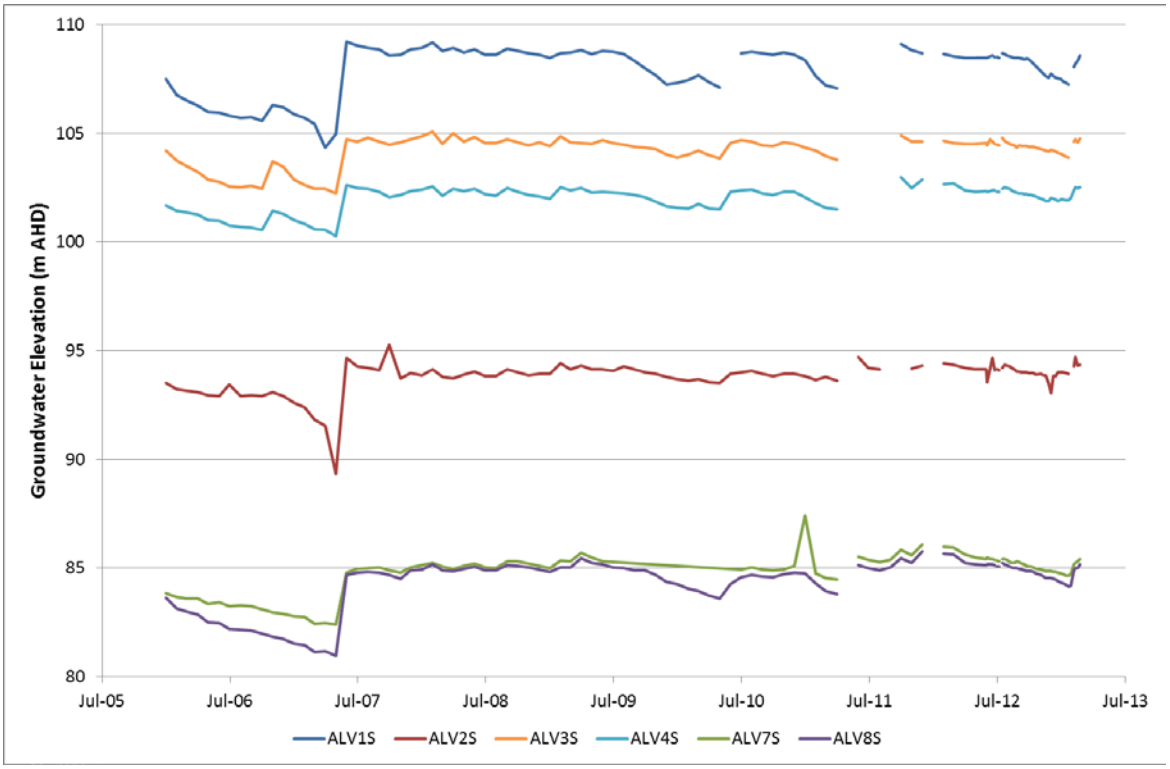
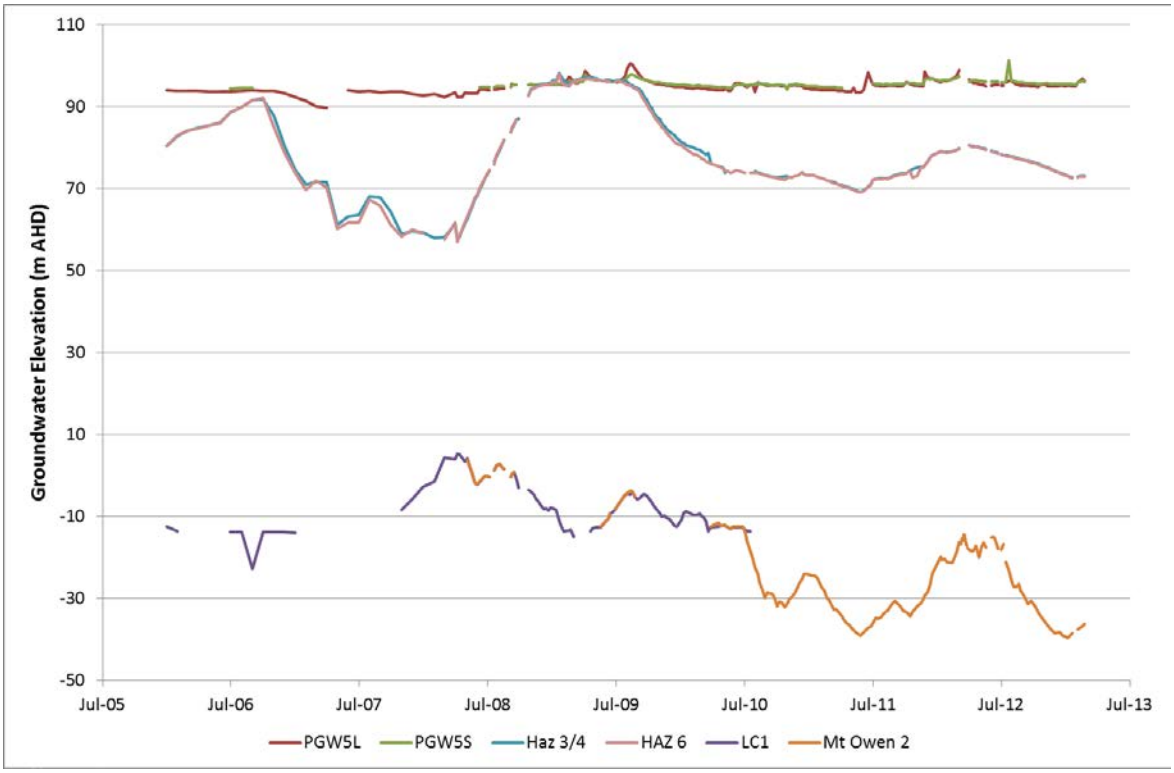


Figure 40 Groundwater Levels for Hard Rock Piezometers – 2006 to 2012



3.9 Contaminated Land

3.9.1 Environmental Management and Performance

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

3.10 Flora and Fauna

3.10.1 Environmental Management and Performance

A review of the flora and fauna monitoring program was undertaken in 2012 and a revised program has been implemented. The revised program is based on 6 specific objectives, as listed below:

1. Implement functional Blue-billed Duck habitat.
2. Avoid impacts from mining operations on remnant vegetation within Liddell Colliery.
3. Avoid impacts from mining operations on native fauna that utilise habitat within Liddell Colliery (especially threatened fauna).
4. Implement revegetation program to restore disturbed areas designated for native vegetation to pre-mining condition.
5. Native revegetation supports native fauna (especially threatened species) at similar diversity and abundance to pre-mining condition.
6. Implement revegetation program to restore pasture land to reference condition.

The flora and fauna monitoring survey was undertaken from 26 – 30 November 2012. Subsequent *Dasyurus maculatus maculatus* (Spotted-tailed Quoll) den monitoring was undertaken from 30 November 2012 – 18 December 2012.

Results of the 2012 monitoring survey have presented baseline flora and fauna data for riparian (R01, R02) and woodland habitat (W01, W02) and woodland revegetation (WR01, WR02). Flora data was also collected for pasture rehabilitation at Liddell Colliery (P01, P02). A Landscape Function Analysis (LFA) was undertaken at woodland revegetation to assess the condition of the landscape and its ability to recover from disturbance. The monitoring program has targeted fauna groups with a higher chance of being impacted by current land use practises.

Woodland revegetation sites had very low cover of native species, however up to a third of the species detected were native (Table 21). Pasture sites are currently dominated by non-pasture species, with at least twice as many non-pasture species than pasture species recorded at both sites. Results of the pasture monitoring survey are detailed in Table 22.

No threatened flora species have been recorded during the monitoring at Liddell Colliery. Threatened fauna species recorded during the 2012 survey were *Pyrrholaemus sagittatus* (Speckled Warbler), *Pomatostomus temporalis temporalis* (Grey-crowned Babbler (eastern subspecies)), *Mormopterus norfolkensis* (East Coast Freetail-bat), *Miniopterus australis* (Little Bentwing Bat), *Miniopterus orianae oceanensis* (Eastern Bentwing Bat), *Falsistrellus tasmaniensis* (Eastern falsistrelle), *Myotis macropus* (Large-footed Myotis), *Vespadelus troughtoni* (Eastern Cave Bat) and *Dasyurus maculatus maculatus* (Spotted-tailed Quoll). A Spotted-tailed Quoll den site was located in a log jam along Bowmans Creek. An adult pair and two joeys were found to be using the den site at the time of the survey. Bowmans Creek was observed to be a corridor for the Spotted-tailed Quoll to move through the landscape and forage along the creek bank. Results of the fauna monitoring conducted at site R01 are detailed in Table 23.

Table 21 Flora Monitoring Results 2012

Site	Native Species Count	Introduced Species Count	% Native species present
Dam 3	8	11	72.7
Triangle Dam	3	13	23
W01	25	11	69.4
W02	26	7	78.7
R01	11	25	30.5
R02	25	30	45.5
WR01	12	22	35.2
WR02	6	15	28.6

Table 22 Flora Monitoring Results for Pasture Rehabilitation sites 2012

Plot	Total Species	Non-pasture	Pasture	Plant Cover (%)	Leaf Litter (%)	Bare Soil (%)
P01	9	7	2	52	44	4
P02	15	10	5	54	32	14

Table 23 Fauna Monitoring Results for site R01 2005-2012

Fauna Group	2005	2006	2007	2008	2009	2010	2011	2012
Birds	28	23	14	11	22	NA	11	17
Mammals	0	4	7	8	7	NA	14	11
Reptiles	1	5	5	1	0	NA	1	0
Amphibians	1	3	3	3	5	NA	2	0
TOTAL	**30**	**29**	**29**	**23**	**34**	NA	**28**	**28**
Threatened species	0	2	5	3	1	NA	3	3
Introduces species	0	3	0	0	6	NA	1	0

3.11 Blasting

3.11.1 Environmental Management

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 over a period of 12 months 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% of the total number of blasts over a period of 12 months 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 have been set as 133 dB(L) and 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 OEH.

LCO operates a combined 24 hour blasting information and community complaints hotline (1800 037 317).

3.11.2 Environmental Performance

Blast monitoring locations are presented in Figure 41 and monitoring results for the reporting period are provided in Appendix G.

Blast monitoring was undertaken at two privately owned residences and the Chain of Ponds Hotel throughout the reporting period. There were 150 blasts fired throughout the reporting period.

During the reporting period, there were no levels above the ground vibration limit of 5mm/s recorded at privately owned residences. There was however one record of overpressure above the criterion of 115dB(L) recorded at a privately owned residence.

A peak overpressure level of 116.2dB(L) was recorded at the Scrivens monitoring station on 3 August 2012. Whilst this is within the 5% total allowable non-compliance criteria, this recording was believed to be affected by a wind gust. An investigation was carried out, and this identified that the peak overpressure was recorded before the air blast would arrive at the monitor. It was subsequently concluded from a detailed wavetrace analysis that the maximum estimated air vibration level was approximately 103.2dB(L). The investigation report is provided in Appendix G.

No levels above the ground vibration limit of 10 mm/s or the overpressure limit of 133dB(L) (as established by the Department of Planning) were recorded at the Chain of Ponds Hotel during the reporting period.

All blasts were conducted within the hours of 09:00 and 17:00 and on Monday to Saturday No blasts were undertaken on Public Holidays.

The blast monitoring system recorded 100% blast data at all sites.

A comparison of blast monitoring compliance for the last three reporting periods is presented in Table 24.

Table 24 Three Year Blast Monitoring Compliance Comparison

Reporting Period	Number of Blasts	Criteria Exceedances	Non-compliance
July 2009 – 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)
July 2010 – December 2010	68	Three blasts (4.4%) above 115dB(L) (within 5% criteria) and one result above 120dB(L) at 'Burlings' which was wind affected. One blast above the 133dB(L) at the Chain of Ponds Hotel.	1 (Overpressure >120dB(L) – wind affected) 1 (Overpressure >133dB(L)) 2 (blast monitoring data not collected)
January 2011 – December 2011	106	Two blasts (1.9%) above 115dB(L) (within 5% criteria) and one result above 120dB(L) at 'Scrivens' which was wind affected.	1 (Overpressure >120dB(L) – wind affected)
January 2012 – December 2012	150	One blast (0.67%) above 115dB(L) (within 5% criteria) at 'Scrivens' which was wind affected	Nil

3.12 Operational Noise

3.12.1 Environmental Management

The *Noise Monitoring Program* 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 LCO EPL 2094.

Regular attended noise monitoring is undertaken at representative locations surrounding LCO (refer to Figure 41). Monitoring also consists of unattended continuous noise logging over a minimum 72 hour period on a biannual basis during the 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.

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 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 25 at any residence on, or on more than 25 percent of, any privately owned land. The criteria do not apply to mine owned residences.

Table 25 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 Holiday

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 25 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.

3.12.2 Environmental Performance

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

Noise monitoring during the reporting period was undertaken in February, March and September 2012 by a specialist noise consultant (Global Acoustics). Results of attended noise monitoring during the reporting period show that LCO complied with the noise limits applicable at all monitoring locations, with the exception of two occasions, as detailed below.

LCO exceeded the LA1,1min criterion by 1 dB at Liddell Recreation Area on 19 March 2012. A continuum and dozer tracks were audible from LCO throughout the measurement. These sources generated the LCO only LAeq of 32 dB. Dozer tracks generated the LCO only LA1,1min of 46 dB. A horn, engine surges and dumping noise were all noted. The exceedance of the LA1,1min criterion is not considered significant as Chapter 11 of the OEH 'Industrial Noise Policy' deems a development to be in non-compliance only when "*the monitored noise level is more than 2 dB above the statutory noise limit specified in the consent or licence condition*."

Wind speed and/or estimated temperature inversion conditions resulted in development consent criteria not always being applicable.

Results summaries are presented in Table 26 and Table 27 below.

Figure 41 **LCO Blast and Noise Monitoring Locations**

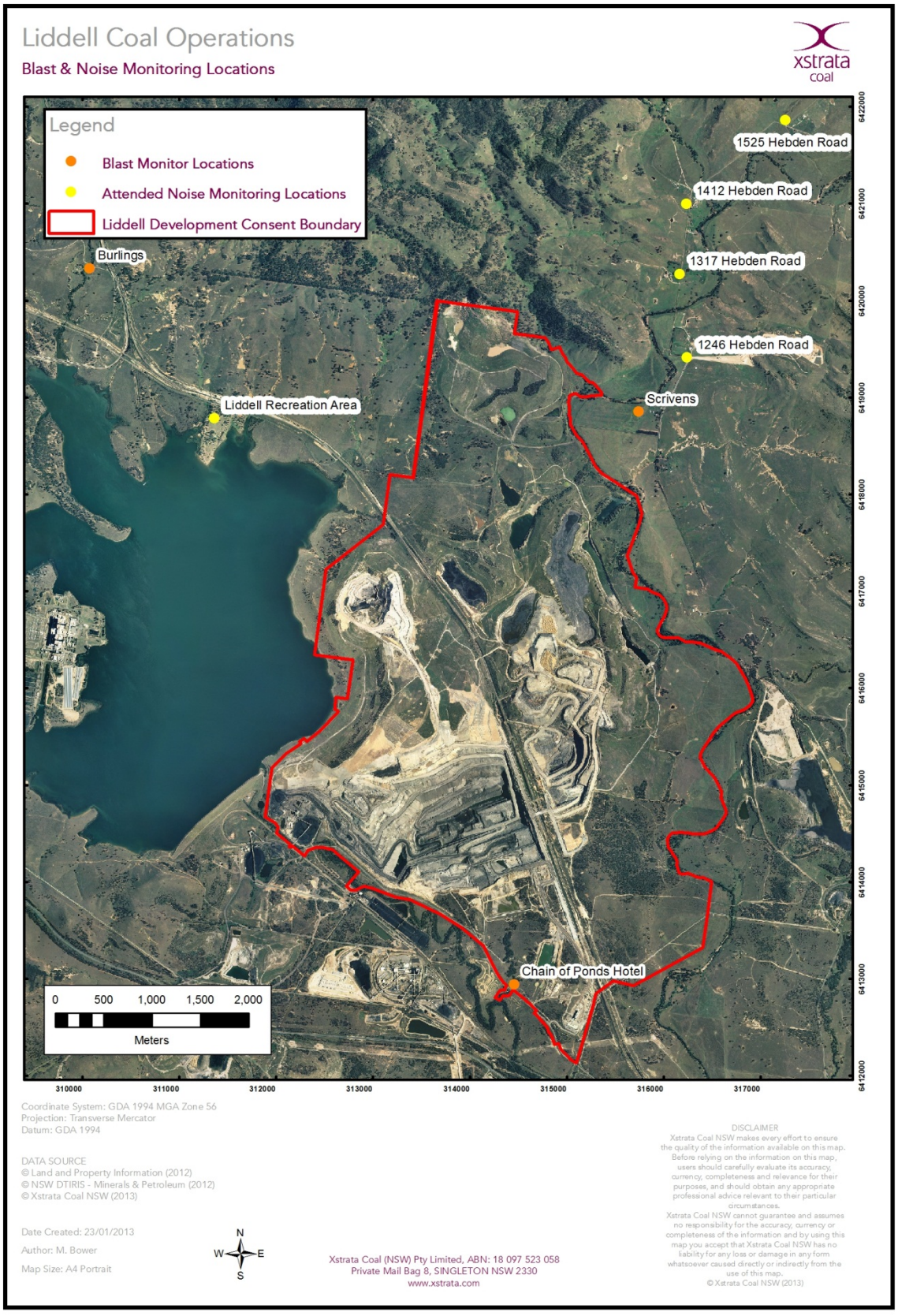


Table 26 Attended Noise Monitoring Results February and March 2012

Location	Date	Wind Speed (m/s)	LCO LAeq (15 min)
1	4/2/12	3.7	Inaudible
2	4/2/12	2.9	<20
3	4/2/12	3.1	22
4	4/2/12	2.6	<20
LRA	4/2/12	1.8	<30
1	27/2/12	1.2	25
2	27/2/12	0.8	21
3	27/2/12	0.8	26
4	27/2/12	1.7	24
LRA	27/2/12	1.3	34
1	18/3/12	2.8	Inaudible
2	18/3/12	2.8	30
3	18/3/12	1.6	29
4	18/3/12	1.6	28
LRA	18/3/12	1.4	32

Table 27 Attended Noise Monitoring Results September 2012

Location	Date	Wind Speed (m/s)	LCO LAeq (15 min)
1	3/9/12	0.4	23
2	3/9/12	1.7	30
3	3/9/12	2.2	35
4	3/9/12	2.5	35
LRA	3/9/12	1.6	41
1	16/9/12	1.1	Inaudible
2	16/9/12	1.3	Inaudible
3	16/9/12	1.3	Inaudible
4	16/9/12	1.3	Not measurable
LRA	16/9/12	0.7	Inaudible
1	20/9/12	2.1	Inaudible
2	20/9/12	1.3	Inaudible
3	20/9/12	1.1	Inaudible
4	20/9/12	1.3	Not measurable
LRA	20/9/12	0.9	Inaudible

Comparison to EA Predictions

The Liddell Coal EA (2006) proposes that modifications to the development consent would not produce an exceedance of the LCO operational specific noise criteria at any surrounding privately owned residence, however, noise levels were expected to exceed criteria at a number of mined owned residences. The noise monitoring for 2012 and previous reporting periods confirm these predictions.

3.13 Visual and Stray Light

3.13.1 Environmental Management

Visual impact management is undertaken in accordance with the practices outlined in the Liddell Coal MOP (LCO, 2008) and the LCO *Landscape Management Plan*. Under these plans, 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.

3.13.2 Environmental Performance

During the reporting period, flood lighting in mining areas was located to minimise direct light emitted to Hebden Road, Antienne 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 Mining Supervisor and mobile lighting plants are located to reduce the offsite impact of lighting where ever possible.

3.14 Aboriginal Heritage

3.14.1 Environmental Management and Performance

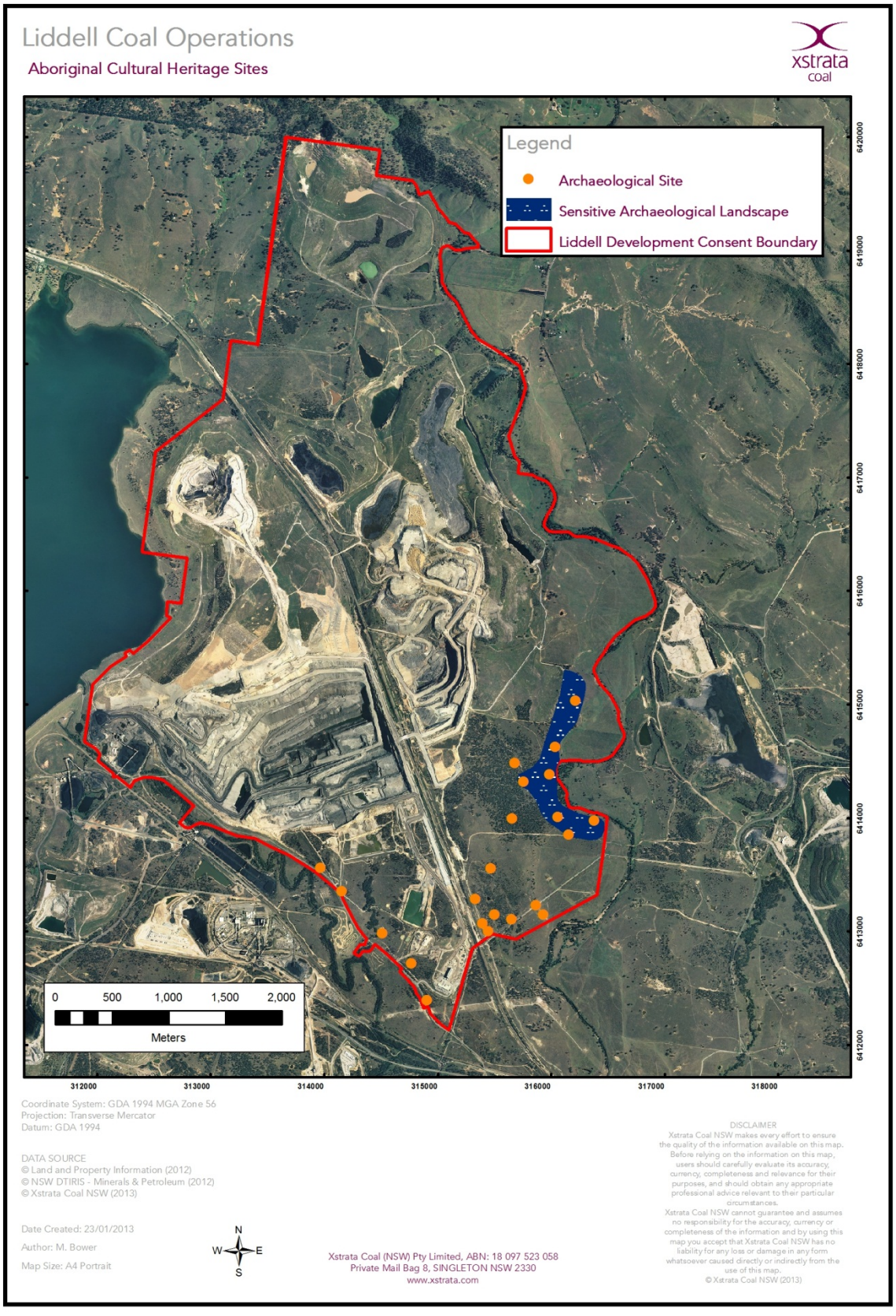
The LCO development consent area has been the subject of a number of archaeological investigations. A total of 40 sites have been recorded within the LCO development consent area, consisting of 27 artefact scatters and 13 isolated finds. The approximate location of the sites are shown in Figure 42.

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

Artefact salvage and management at Liddell has occurred under eight Section 90 and three section 87 Aboriginal Heritage Impact Permits issued under the *National Parks and Wildlife Act 1974*. During the reporting period artefact management was covered by three of these permits (2348, 2896 and 2883). Section 90 Permit 2348 provides consent for the destruction of Aboriginal objects during dam infrastructure works in the Chain of Ponds Area and covers Aboriginal sites LID29, LID 30, LID 31 and LID 32. Section 90 Permit 2896 has been issued to enable surface collection and salvage in the Bayswater Creek area which includes Aboriginal sites LID 5, LID 23, LID 24, LID 25, SP 1, SP 2, SP 3, and Liddell Fines 1. Section 87 Permit 2883 permits the carrying out of preliminary research ahead of coal mining at Brayshaw Site B.

Schedule 3, Condition 35 of DA 305-11-01 required LCO to revise the *Aboriginal Cultural Heritage Management Plan* in consultation with relevant Aboriginal stakeholders and to the satisfaction of the Director-General. This revision was undertaken by Umwelt (Australia) Pty Limited and approved by the Director-General in January 2008.

Figure 42 **Archaeological Sites within the LCO Consent Area**



3.15 Historic Sites

3.15.1 Environmental Management and Performance

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 required 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 prepared in accordance with this condition was provided to DoP on 29 January 2008 and NSW Heritage on 23 May 2008.These records are to be updated every five years until the cessation of mining to the satisfaction of the DG. The next review is due to occur during 2013. As of at the end of the reporting period, there have been no development activities at Chain of Ponds Hotel site. Of the 150 blasts fired throughout the reporting period, none were recorded above the ground vibration limit of 10 mm/s or the overpressure limit of 133dB(L) (as established by the Department of Planning).

Former Police Lock-up Site

The Police Lock-up is located approximately 40 metres south-west of the development consent boundary. Schedule 3 Condition 37 of DA 305-11-01 required LCO to prepare an archival record of the former Police Lock Up precinct, prior to any activity associated with the development that may disturb this site. An archival record prepared in accordance with this condition was provided to the DoP on 11 February 2011. There was no development during the reporting period that impacted this site.

3.16 Spontaneous Combustion

3.16.1 Environmental Management and Performance

Areas of spontaneous combustion have been found when mining through the old underground workings in the Liddell Seam. The *Spontaneous Combustion Management Plan* (LCO 2009) outlines the standards to be maintained, the monitoring system and the procedures to be followed in the case of a spontaneous combustion incident. 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 with recycled mine water prior to mining. Every effort is made in managing heat affected overburden or coal which is cooled and saturated with water where practicable prior to mining to minimise dust generation.

3.17 Bushfire

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

3.18 Greenhouse Gas and Energy

3.18.1 Environmental Management and Performance

LCO continuously 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.

LCO monitors the greenhouse gas emissions generated by the development and investigates 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.

During the reporting period, LCO undertook a series of Greenhouse Gas abatement measures, including the ongoing implementation of the LCO *Energy Savings Action Plan* (LCO, 2008), as required by Schedule 3, Condition 46 of DA 305-11-01.

Actions completed during the reporting period included the installation of a power factor correction unit at the CHPP and the replacement of workshop lights with a high efficiency LED lighting system.

3.19 Public Safety

3.19.1 Environmental Management and Performance

LCO 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.

During the reporting period, there were no incidents involving members of the general public being detected in vehicles on the LCO site.

4.0 Community Relations

4.1 Environmental Complaints

The management of complaints is undertaken in accordance with EMS procedures and Schedule 5, Condition 1 of DA 305-11-01. LCO operates a combined 24 hour community complaints and blasting information hotline (1800 037 317) which is advertised in the community newsletter and on the LCO website.

Nine environmental complaints were received during the reporting period, and are summarised in Table 28.

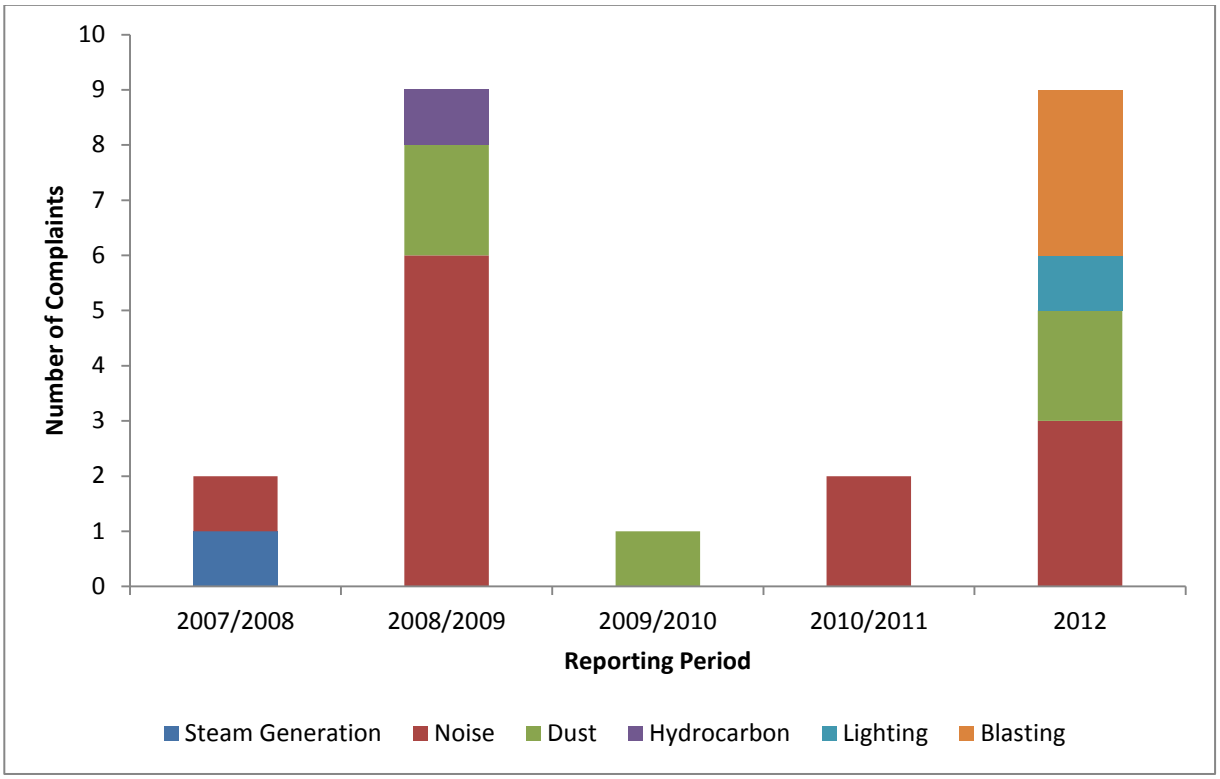
A complaints comparison summary for the previous five reporting periods is presented in Figure 43.

Table 28 Summary of Complaints January 2012 – December 2012

Date	Source	Management
1/7/5/12	Dust	The "dust" reported was actually believed to be smoke generated by a known area of spontaneous combustion. Management already in place included the use of pipelines and sprinklers to irrigate and cool the area, the construction of a dump over the area, complete with a veneer of inert material. Clay was also imported and packed against the exposed underground workings (the source of the spontaneous combustion). Water carts were also being utilised to fight visible fires where sprinklers and pipelines could not be used.
17/8/12	Blasting	Monitoring results were reviewed and found to be compliant. Agreed to inform the resident by telephone of future blasts. Followed up with a face to face meeting with the resident on 21/8/12.
2/10/12	Blasting	Anonymous complaint regarding a blast on 28/9/12. Following the blast, a dust cloud was observed leaving site by LCO staff. The incident was reported to both the DP&I and the EPA. The incident was investigated internally and an incident report containing actions was prepared.
15/10/12	Noise	The complaint was retrospective, regarding noise and lighting over the preceding 12 months. Quarterly noise monitoring reports for the area were reviewed and indicated that noise levels were compliant. Positioning of lighting plant was discussed and reviewed at the daily production meeting to ensure that they were not directed towards the road. Follow up meeting arranged with resident on 18/10/12.
18/10/12	Dust	At follow up meeting with resident, it was asked that a formal complaint regarding dust staining the exterior of the house and contaminating their drinking water be recorded. It was agreed that LCO would investigate the cause of the staining and have the drinking water tested.
19/10/12	Blasting	Complaint regarding dust cloud from blast the previous day. Review of blast footage and weather data confirmed that dust travelled in the direction of Lake Liddell, which is in the opposite direction to the complainant's property. Complainant did not request any follow up, just that the complaint be recorded.
20/10/12	Noise	Upon receipt of complaint, a phone call was made to the shift Mining Supervisor to discuss operations occurring at the time. All machinery was operating in the South Pit with nothing in the Entrance Block which is closest to the caller. A call was then made to the complainant who reported that because it was a warm night all windows and doors in the house were open and mining noise seemed much louder than usual. He also stated that he could hear an occasional loud bang, which he thought may have been rocks landing in a truck body. This information was then discussed with the mining supervisor who indicated that some blocky material was being loaded by EX112 earlier in the night. He then drove out to and listened to the mining noise for a period of time and no loud banging was noted. No further changes were made to the operation as a result. Noise levels were reviewed via a real-time noise monitor in the area, which indicated compliance with noise criteria.
15/11/12	Lighting	Complaint received at 12:18am. Environment and Community Superintendent (ECS) contacted shift mining supervisor at 12:32am who advised he had received the complaint and was in the process of adjusting three separate lighting plants that may have been causing the issue. ECS then contacted the complainant at 12.34am and advised the changes being made. He advised there were two lights in particular that were causing the problem, and would call back if there was still an issue.
20/11/12	Noise	Complaint regarding dozer noise at 00:15. DZ002 had been operating on the 160RL rehab area in the Entrance Block since 23:30 on the 19/11/2012. Dispatch notified the OCE, who immediately shut the dozer down. Real-time noise monitoring unit data was analysed and what sounded like

Date	Source	Management
		dozer tracks could be heard on and off during the period between 00:00 and 00:15 on the 20/11/2012. The real-time data also indicated elevated noise levels during the same 15 minute monitoring period, and also confirmed that the action taken by the Mining Supervisor was successful in lowering noise levels after the equipment was shut down.

Figure 43 Environmental complaints current and previous reporting periods



4.2 Community Liaison

4.2.1 Community relations

LCO undertakes community liaison activities in accordance with the *Social Involvement and Community Engagement Plan* which was developed in consultation with the Community Consultative Committee (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.

During the reporting period, the LCO Community Newsletter was distributed to the local community and other stakeholders in July 2012. The newsletter provided an update on the recent personnel changes and the preparation of an Environmental Assessment for a proposed modification that would extend mine life until 2028. A copy of the newsletter is provided in Appendix H.

4.2.2 Community Consultative Committee

Schedule 5 Condition 7 of DA 305-11-01 requires LCO maintain a 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 LCO CCC provides a forum for 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. The CCC met on two occasions during the reporting period May 2012 and November 2012.

CCC Meeting Minutes are available to download from the LCO website.

4.2.3 Liddell Coal Operations Website

In accordance with Schedule 5, Condition 9 of DA 305-11-01, LCO has established a website (www.xstratacoalliddell.com.au) to provide access to information on the operation including environmental, community and operational updates.

Copies of all relevant plans, programs and strategies (once approved by DP&I or other relevant agencies) are available on the website. In addition, environmental monitoring results are uploaded to the website quarterly.

4.2.4 Donations and Sponsorships

LCO aims to provide support for local projects relating to the community, health, education and the environment, in the form of cash donations, sponsorship, and in-kind support for a range of community, educational and environmental initiatives.

During the reporting period LCO made donations to the following organisations and charities:

- Singleton Theatrical Society
- Singleton Heights Pre-school
- Variety
- Captain Courageous
- SJRLC - Women in League Day
- Lake Liddell
- Black Coal Cup
- Singleton Fly Fishing Club
- MS - Sydney to Gong Ride
- Muswellbrook Public School - Award Sponsorship
- Muswellbrook High School - Awards night sponsorship
- Singleton Primary School - Award Sponsorship
- Singleton High School - Awards night sponsorship
- Special Children's Christmas Party
- Singleton High School - 2012 welfare programs
- Muswellbrook High School - 2012 welfare programs

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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 compatible with the surrounding land uses. The proposed end land use for the site includes a combination of grazing and bushland/wildlife habitat.

5.1 Buildings

No buildings or other infrastructure were removed, installed or renovated during the reporting period at LCO.

5.2 Rehabilitation of Disturbed Land

The post-mining landform design of LCO has been generally undertaken in accordance with the *Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of NSW* (Department of Mineral resources, 1999).

5.2.1 Rehabilitation methods

Rehabilitation activities are undertaken as soon as possible following the completion of mining activities, in accordance with the LCO Rehabilitation Management Plan, a component of the LCO Landscape Management Plan.

Mine Closure Criteria (LCO, 2011) have been developed for LCO to monitor rehabilitation progress in line with internal XCN requirements and external relinquishment goals. Further revisions of the Closure Criteria will be required during the life of the operation as criteria and goals become more refined as LCO approached closure.

The Preliminary Closure Criteria describe five rehabilitation stages for all domains (infrastructure areas, open cut mining areas and tailings disposal areas):

1) Decommissioning;
2) Landform establishment;
3) Growth medium development;
4) Ecosystem Establishment; and
5) Ecosystem development.

5.2.2 Vegetation species and establishment

Areas rehabilitated to pasture will generally include the following species:

- Cover crops of Ryecorn/Oats or Japanese Millet;
- Cocksfoot;
- Ryegrass;
- Setaria;
- Rhodes Grass;
- Couch;
- Medic;
- Clover;
- Chicory
- Plantain;
- Vetch; and
- Lucerne.

The seed mix may vary dependent upon the season and other species may be utilised where appropriate. Pasture, cover crop and tree seed is applied at a rate determined appropriate to site conditions. Where required, seed is appropriately pre-treated to enhance germination and then evenly mixed and spread.

The establishment of habitat corridors using native species aims to provide a functional and sustainable ecosystem consistent with the rehabilitation closure criteria. The species utilised within these habitat corridors are established from locally sourced native seed, where possible and assist in maintaining local genetic diversity and the genetic integrity of the region. However, the seed mix is at times supplemented with stocks sourced from outside of the region, dependent upon seed availability.

5.3 Rehabilitation Progress

Rehabilitation of land disturbed during the reporting period was carried out in general accordance with the MOP.

Table 29 presents a summary of the rehabilitation undertaken by LCO during the reporting period.

Table 29 Summary of Disturbed and Rehabilitation areas

Area	Area Affected (ha)		
	To Date (31 December 2012)	**Last Report (31 December 2011)**	**At Next report (estimated) (31 December 2013)**
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	128.1	128.1
B2 Active mining area (excluding items B3-B5 below)	164.6	183	194.1
B3 Waste emplacements (active/unshaped/uncapped)	321.9	325.2	258.3
B4 Tailings emplacements (active/unshaped/uncapped)	49	49	75
B5 Shaped waste emplacement (awaits final vegetation)	0	0	0
TOTAL DISTURBED AREA	**663.6**	**685.3**	**655.5**
C1 Total rehabilitated area (except for maintenance)	**615.02**	**581.6**	**666.02**
D: REHABILITATION ON SLOPES			
D1 10 to 18 degrees	62.2	62.2	63.2
D2 Greater than 18 degrees	10.0	10.0	12.0
E: SURFACE OF REHABILITATED LAND			
E1 Pasture and grasses	549.82	531.4	600.82
E2 Native forest/ecosystems	65.2	50.2	65.2
E3 Plantations and crops	0.0	0.0	0.0
E4 Other (include non-vegetative outcomes)	0.0	0.0	0.0

5.4 Rehabilitation Management Plan

The LCO Rehabilitation Management Plan, a component of the LCO Landscape Management Plan was developed in accordance with Schedule 3, Condition 31 of DA 305-11-01 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.

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.

Rehabilitation management and maintenance activities undertaken in the reporting period are summarised in Table 30.

Table 30 Maintenance Activities on Rehabilitated Land

Nature of Treatment	Area Treated (ha)		
	This Reporting Period	**Next Reporting Period**	**Comment/control strategies/ treatment detail**
Additional erosion control works (drains re-contouring, rock protection)	3	2	Erosion and sediment control works as per recommendations of 2012 Annual Rehabilitation Inspection Report
Re-covering (detail - further topsoil, subsoil sealing etc)	-	-	As required
Soil treatment	-	-	Soil amelioration post soil sampling

Nature of Treatment	Area Treated (ha)		
	This Reporting Period	**Next Reporting Period**	**Comment/control strategies/ treatment detail**
(detail - fertiliser, lime, gypsum etc)			where required
Treatment/Management (detail - grazing, cropping, slashing etc)	123	123	Mountain Block fenced and rotational grazing conducted. Reservoir block fenced with grazing trials currently being conducted.
Re-seeding/Replanting (detail - species density, season etc)	Nil	Nil	
Adversely Affected by Weeds (detail - type and treatment)	25	25	Primarily targeting *Galenia pubescens* using foliar spray application of Glyphosate and Picloram based herbicide (refer Section 5.4.1)
Feral animal control (detail - additional fencing, trapping, baiting etc)	200	200	Wild dog baiting, pig trapping and open range shooting as per the Vertebrate Pest Control Program (refer Section 5.4.2)

5.4.1 Weed Management

During 2012, Liddell Coal Operations undertook site weed management under direction from the Liddell Weed Action Plan 2012. During the development of the plan, a day long weed survey was undertaken across Liddell's mining operation prior to the prioritising of weed management activities and the development of a detailed treatment schedule. Liddell Colliery undertakes the weed control program in accordance with the site Rehabilitation Management Plan that was prepared in accordance with Schedule 3, Condition 30, of DA 305-11-01.

Weed control practices undertaken at LCO during the reporting period include:

- regular site inspections to identify areas of weed infestation and weed species;
- maintenance of regular contact with neighbouring property owners in an attempt to manage 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 manage weed infestation.

Weed control works were undertaken at LCO by Hunter Land Management Pty Limited during the reporting period and are summarised in Table 31.

Table 31 Weed control – target species 2012

Weed species	Scientific Name	Legislative Listing	Target Area
African Boxthorn	*Lycium ferrocissimum*	Class 4 Noxious Weed	Sporadic across the LCO site
African Lovegrass	*Eragrostis curvula*	Environmental weed	Roadsides
African Olive	*Olea europaea*	Environmental weed	Adjacent to Hebden Road and Bowmans Creek

Blackberry	*Rubus fruiticosus*	Class 4 Noxious Weed	Hillcrest
Castor Oil Plant	*Ricinus communis*	Environmental weed	Old New England Hwy
Galenia	*Galenia pubescens*	Environmental weed	Old New England Hwy disturbed ground along conveyor belt
Mother of Millions	*Bryophyllum delagoense*	Class 3 Noxious Weed	Bowmans Creek
Noogoora Burr	*Xanthium occidentale*	Class 4 Noxious Weed	Bowmans Creek
Pampas Grass	*Cortaderia selloana*	Class 4 Noxious Weed	Sporadic across the LCO site
Prickly Pear	*Opuntia species*	Class 4 Noxious Weed	Adjacent to Conveyor belt
Saffron Thistle	*Carthamus lanatus*	Environmental weed	Bowmans Creek alluvial flats
Spiny Rush	*Juncus acutus*	Environmental weed	Dams and creeklines
St John's Wort	*Hypericum perforatum*	Class 4 Noxious Weed	Paddocks adjacent to Conveyor belt
Tree tobacco	*Nicotiana glauca*	Environmental weed	CHPP and Antiene dams

5.4.2 Vertebrate Pest Control

Vertebrate pest 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 vertebrate pests 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 vertebrate pest species or the occurrence of a previously unrecorded 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 on a quarterly (seasonal) basis by Hunter Land Management Pty Limited during the reporting period. Each quarter, the results from the previous program (along with any focused control required) are considered to plan the following control program. As with previous control programs, the 2012 vertebrate pest control program was based on a comprehensive baiting program to target wild dogs and foxes using meat baits injected with sodium monoflouroacetate (commonly known as 1080) and pig traps were used to control feral pigs in the in the area.

Table 32 summarises the vertebrate pest control undertaken at LCO during the reporting period.

Table 32 2012 Vertebrate Pest Control Summary

Season	Total lethal baits laid	Wild dog takes	Fox takes	Non-target species takes	Pig trapping results
Summer	108	2	12	2	0
Autumn	120	1	9	3	10
Winter	120	0	10	0	0
Spring	114	2	6	2	4
TOTAL	**462**	**5**	**37**	**7**	**14**

5.5 Mine Planning Objectives and Criteria

The 2006 Environmental Assessment 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 NSW Department of Trade and Investment.

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 (Department of Trade & Investment, undated), 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 I, with the Proposed Mining Activities and Proposed Rehabilitation Plans being displayed as one consolidated plan.

6.1 Targets for Next Reporting Period

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

- compliance with regulatory requirements during mine operation;
- review the current real time dust and noise monitoring network for improved operational control;
- continued implementation of the site energy savings action plan (ESAP);
- continual review and update of the mine's EMS;
- preparation of Environmental Impact Assessment to support modification to DA 305-11-01 to allow for the extension of mining activities;
- review pipeline monitoring and inspection systems to identify areas for infrastructure improvement;
- expand existing Water Management TARP to include water balance requirements (i.e critical storage levels), pipeline management, and pollution control requirements;
- develop and implement a site weed action plan (WAP) with a focus on systematic weed management within, but not limited to rehabilitated areas;
- continue site wide vertebrate pest management program;
- develop an additional 51 hectares of rehabilitated pasture and grassland;
- review and update final landform design and mine closure criteria for Life Of Mine;
- develop and implement an erosion and sediment control training 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's 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;
- 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.

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7.0 References

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

AS/NZS 5667.1 (1998) *Water Quality – Sampling – Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples*

AS/NZS 5667.6 (1998) *Water Quality – Sampling – Guidance on the Sampling of Rivers and Streams*

Department of Environmental and Climate Change (DECC) (2007) *Approved Methods for Sampling of Air Pollutants in New South Wales*

Department of Environment, Climate Change and Water (DECCW) (2004) *Approved Methods for Sampling and Analysis of Water Pollutants in New South Wales*

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

Department of Trade & Investment (undated) *EDG003 Guidelines to the Mining, Rehabilitation, and Environmental Management Process*

Eco Logical Australia (2013) *Liddell Coal Operations 2012 Annual Rehabilitation Inspection* **

Landcom (2004) *Managing Urban Stormwater: Soils and Construction Manual*

LCO (2008) *Energy Savings Action Plan**

LCO (2009) *Liddell Colliery Noise Monitoring Program***

LCO (2009) *Spontaneous Combustion Management Plan**

LCO (2012) *Airborne Dust Management Plan*

LCO (2012) *Land Clearing and Topsoil Stripping Procedure***

LCO (2012) Liddell *Dust Management TARP*

LCO (2012) *Waste Management Plan***

LCO (2013) *Environmental Management Strategy**

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

Umwelt (2008) *Liddell Colliery Aboriginal Cultural Heritage Management Plan**

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

Umwelt (2008) *Liddell Colliery Erosion and Sediment Control Plan***

Umwelt (2008) *Liddell Colliery Groundwater Monitoring Program***

Umwelt (2008) *Liddell Colliery Landscape Management Plan**

Umwelt (2008) *Liddell Colliery Surface Water Monitoring Program***

Umwelt (2008) *Liddell Colliery Water Management Plan**

*LCO document available on public website (www.xstratacoalliddell.com.au)

**LCO document not publicly available

Appendix A

Daily Train Haulage Movements

Appendix A Daily Train Haulage Movements

Train Loading Report

Date: 1/01/2012 to 31/12/2012

Site: Liddell Coal Marketing Pty Limited

Train No	Vessel Name	Arrival Time	Load Start	Load End Time	Qty	Duration (min	Load Rate (T/Hr)
LD282	SINCERE PISCES	1/1/2012	03:21 a	05:23 a	8,451	122	4,156
LD158	OCEAN SUNRISE	1/1/2012	10:39 a	12:47 p	8,190	128	3,839
LD276	UNITED TREASURE	2/1/2012	02:51 a	04:53 a	8,438	122	4,150
LD142	UNITED TREASURE	2/1/2012	11:45 a	02:06 p	8,610	141	3,664
LD174	UNITED TREASURE	2/1/2012	02:32 p	05:32 p	8,535	180	2,845
LD122	UNITED TREASURE	3/1/2012	06:28 a	08:42 a	8,392	134	3,758
LD274	UNITED TREASURE	4/1/2012	01:11 a	03:33 a	8,479	142	3,583
LD118	UNITED TREASURE	4/1/2012	06:44 a	09:35 a	8,346	171	2,928
LD200	UNITED TREASURE	4/1/2012	04:04 p	06:22 p	8,507	138	3,699
LD252	TARUMAESAN MARU	4/1/2012	12:17 a	02:35 a	8,478	138	3,686
LD142	TARUMAESAN MARU	5/1/2012	08:36 a	10:50 a	8,607	134	3,854
LD176	TARUMAESAN MARU	5/1/2012	02:21 p	04:29 p	8,498	128	3,983
LD182	MIZUNAGI MARU	5/1/2012	05:03 p	07:10 p	8,266	127	3,905
LD290	SHIYO	8/1/2012	04:40 a	07:06 a	8,521	146	3,502
LD242	MATSUURA	10/1/2012	09:31 p	11:51 p	8,345	140	3,577
LD124	SHIYO	11/1/2012	05:39 a	07:53 a	8,596	134	3,849
LD190	MATSUURA	11/1/2012	01:53 p	04:31 p	8,339	158	3,167
LD252	PRABHU PUNI	12/1/2012	01:10 a	03:23 a	8,635	133	3,895
LD136	PRABHU PUNI	13/1/2012	07:30 a	09:36 a	8,072	126	3,844
LD176	PRABHU PUNI	13/1/2012	12:45 p	03:20 p	8,595	155	3,327
LD204	PRABHU PUNI	13/1/2012	04:42 p	06:57 p	8,370	135	3,720
LD122	ORIENT ANGEL	14/1/2012	06:40 a	08:44 a	8,393	124	4,061
LD128	ORIENT ANGEL	15/1/2012	06:47 a	08:50 a	8,290	123	4,044
LD162	ORIENT ANGEL	15/1/2012	11:00 a	01:04 p	8,501	124	4,113
LD192	ORIENT ANGEL	15/1/2012	03:41 p	05:49 p	8,675	128	4,067
LD110	ORIENT ANGEL	16/1/2012	03:43 a	06:33 a	8,359	170	2,950
LD134	NSS GRANDEUR	17/1/2012	07:54 a	12:46 p	8,478	292	1,742
LD136	CORONA INFINITY	18/1/2012	07:50 a	09:56 a	8,270	126	3,938
LD126	CHS WORLD	20/1/2012	10:15 a	12:57 p	8,057	162	2,984
LD270	BRILLIANT TRADER	23/1/2012	01:47 a	04:13 a	8,337	146	3,426
LD126	BRILLIANT TRADER	23/1/2012	07:01 a	09:01 a	8,238	120	4,119
LD154	BRILLIANT TRADER	23/1/2012	10:36 a	12:49 p	8,707	133	3,928
LD182	BRILLIANT TRADER	23/1/2012	02:31 p	04:38 p	8,451	127	3,993
LD204	BRILLIANT TRADER	23/1/2012	05:32 p	07:40 p	8,512	128	3,990
LD260	BRILLIANT TRADER	24/1/2012	02:00 a	04:18 a	8,723	138	3,793
LD236	BRILLIANT TRADER	24/1/2012	07:25 p	09:38 p	8,086	133	3,648
LD130	BRILLIANT TRADER	25/1/2012	06:36 a	08:43 a	8,353	127	3,946
LD292	BRILLIANT TRADER	25/1/2012	10:11 a	01:31 p	8,782	200	2,635
LD200	BRILLIANT TRADER	25/1/2012	03:12 p	05:18 p	8,274	126	3,940
LD234	PEGASUS ISLAND	26/1/2012	08:42 p	11:08 p	8,524	146	3,503
LD266	PEGASUS ISLAND	26/1/2012	11:52 p	02:37 a	8,630	165	3,138
LD164	PEGASUS ISLAND	27/1/2012	10:46 a	01:07 p	8,267	141	3,518
LD222	PEGASUS ISLAND	27/1/2012	07:09 p	09:08 p	8,127	119	4,097
LD270	PEGASUS ISLAND	28/1/2012	01:31 a	03:44 a	8,419	133	3,798
LD102	ANANGEL AMBITION	28/1/2012	04:31 a	06:47 a	8,490	136	3,746
LD210	PEGASUS ISLAND	28/1/2012	06:18 p	08:30 p	8,438	132	3,835
LD128	PEGASUS ISLAND	29/1/2012	07:38 a	09:40 a	8,753	122	4,305
LD162	KAIEN	29/1/2012	11:58 a	02:04 p	8,519	126	4,057
LD252	KAIEN	29/1/2012	10:01 p	12:11 a	8,417	130	3,885
LD124	KAIEN	30/1/2012	06:01 a	08:18 a	8,125	137	3,558
LD290	SINCERE PISCES	1/2/2012	12:26 p	02:37 p	9,001	131	4,123
LD280	SINCERE PISCES	1/2/2012	01:24 a	03:43 a	8,453	139	3,649
LD182	KWK PROVIDENCE	2/2/2012	01:43 p	04:03 p	8,461	140	3,626
LD190	KWK PROVIDENCE	2/2/2012	04:26 p	06:31 p	8,483	125	4,072
LD210	KWK PROVIDENCE	2/2/2012	07:41 p	10:26 p	8,585	165	3,122
LD102	KWK PROVIDENCE	3/2/2012	04:08 a	06:16 a	8,330	128	3,905
LD124	KWK PROVIDENCE	3/2/2012	06:33 a	08:42 a	8,527	129	3,966
LD236	KWK PROVIDENCE	3/2/2012	11:17 p	01:31 a	8,288	134	3,711
LD156	SINCERE PISCES	4/2/2012	12:09 p	02:37 p	8,663	148	3,512
LD230	SINCERE PISCES	4/2/2012	08:28 p	10:34 p	8,180	126	3,895
LD244	FAIR WIND	5/2/2012	09:35 p	11:58 p	8,434	143	3,539
LD272	FAIR WIND	6/2/2012	12:49 a	02:59 a	8,300	130	3,831
LD284	FAIR WIND	6/2/2012	03:11 a	05:21 a	8,108	130	3,742
LD136	FAIR WIND	6/2/2012	11:54 a	02:12 p	8,505	138	3,698
LD166	IRIS FRONTIER	6/2/2012	05:45 p	09:05 p	8,501	200	2,550
LD204	KWK PROVIDENCE	6/2/2012	09:29 p	11:36 p	8,553	127	4,041
LD242	FAIR WIND	6/2/2012	12:08 a	04:58 a	8,584	290	1,776
LD278	IRIS FRONTIER	7/2/2012	05:59 a	09:05 a	8,283	186	2,672
LD168	RUBIN OAK	7/2/2012	01:43 p	04:36 p	8,518	173	2,954

Train Loading Report

Date: 1/01/2012 to 31/12/2012

Site: Liddell Coal Marketing Pty Limited

Train No	Vessel Name	Arrival Time	Load Start	Load End Time	Qty	Duration (min	Load Rate (T/Hr)
LD178	RUBIN OAK	7/2/2012	07:08 p	09:35 p	8,449	147	3,448
LD276	RUBIN OAK	8/2/2012	12:42 a	02:53 a	8,288	131	3,796
LD158	RUBIN OAK	8/2/2012	03:31 p	05:46 p	8,608	135	3,826
LD204	RUBIN OAK	8/2/2012	06:56 p	09:02 p	8,325	126	3,964
LD122	IRIS FRONTIER	9/2/2012	07:39 a	09:49 a	8,296	130	3,829
LD222	IRIS FRONTIER	10/2/2012	07:02 p	08:59 p	7,832	117	4,016
LD256	CERVIA	11/2/2012	10:03 p	12:07 a	8,350	124	4,040
LD118	CERVIA	12/2/2012	05:00 a	09:01 a	8,344	241	2,077
LD226	CERVIA	12/2/2012	06:27 p	08:25 p	7,811	118	3,971
LD252	AMARANTHA	16/2/2012	10:34 p	12:44 a	8,212	130	3,790
LD112	AMARANTHA	17/2/2012	04:45 a	07:26 a	8,448	161	3,148
LD136	AMARANTHA	17/2/2012	09:59 a	12:50 p	8,669	171	3,042
LD116	MAPLE WAVE	18/2/2012	05:28 a	07:39 a	8,544	131	3,913
LD174	MAPLE WAVE	18/2/2012	12:02 p	02:06 p	8,577	124	4,150
LD210	MAPLE WAVE	18/2/2012	06:11 p	08:16 p	8,414	125	4,039
LD256	MAPLE WAVE	18/2/2012	10:15 p	12:21 a	8,598	126	4,094
LD108	MAPLE WAVE	19/2/2012	03:44 a	05:57 a	8,314	133	3,751
LD168	MAPLE WAVE	19/2/2012	12:25 p	02:29 p	8,260	124	3,997
LD122	NEW STAGE	22/2/2012	06:41 a	08:56 a	8,234	135	3,659
LD154	NEW STAGE	22/2/2012	10:33 a	01:13 p	8,419	160	3,157
LD272	PACIFIC TRIANGLE	24/2/2012	01:00 a	03:07 a	8,020	127	3,789
LD148	PACIFIC TRIANGLE	24/2/2012	09:16 a	11:28 a	8,198	132	3,727
LD168	DOLCE	25/2/2012	10:45 a	12:58 p	8,627	133	3,892
LD220	DOLCE	25/2/2012	07:03 p	09:18 p	8,630	135	3,836
LD158	DOLCE	26/2/2012	10:40 a	12:48 p	8,455	128	3,963
LD208	NEW STAGE	26/2/2012	03:44 p	05:50 p	8,487	126	4,041
LD242	NEW STAGE	26/2/2012	10:20 p	12:33 a	8,483	133	3,827
LD292	DOLCE	27/2/2012	06:05 a	08:19 a	8,543	134	3,825
LD258	DOLCE	27/2/2012	10:03 p	12:04 a	8,167	121	4,050
LD278	DOLCE	28/2/2012	02:00 a	04:08 a	8,481	128	3,975
LD136	DOLCE	28/2/2012	07:46 a	09:54 a	8,323	128	3,901
LD174	DOLCE	28/2/2012	12:29 p	03:13 p	8,264	164	3,023
LD256	DOLCE	28/2/2012	10:32 p	12:41 a	8,551	129	3,977
LD154	SHIRAKUMO	1/3/2012	10:58 a	12:57 p	8,308	119	4,189
LD192	SHIRAKUMO	1/3/2012	03:23 p	05:49 p	8,288	146	3,406
LD128	SHIRAKUMO	2/3/2012	12:51 p	01:54 p	8,511	63	8,106
LD114	SHIRAKUMO	3/3/2012	06:57 a	09:07 a	8,312	130	3,836
LD192	SHIRAKUMO	3/3/2012	05:16 p	07:36 p	8,333	140	3,571
LD170	FRONTIER GARLAND	10/3/2012	11:55 a	02:30 p	8,235	155	3,188
LD226	FRONTIER GARLAND	10/3/2012	09:17 p	11:42 p	8,437	145	3,491
LD114	FRONTIER GARLAND	11/3/2012	05:57 a	08:19 a	8,168	142	3,451
LD138	FRONTIER GARLAND	11/3/2012	09:23 a	11:23 a	8,375	120	4,188
LD258	FRONTIER GARLAND	11/3/2012	01:11 a	03:27 a	8,824	136	3,893
LD182	C S PEGASUS	23/3/2012	04:07 p	06:27 p	8,360	140	3,583
LD246	C S PEGASUS	24/3/2012	12:28 a	02:41 a	9,109	133	4,109
LD128	C S PEGASUS	24/3/2012	07:09 a	09:21 a	8,756	132	3,980
LD146	C S PEGASUS	24/3/2012	10:53 a	01:19 p	8,751	146	3,596
LD274	C S PEGASUS	25/3/2012	02:40 a	04:55 a	9,143	135	4,064
LD162	C S PEGASUS	25/3/2012	11:28 a	01:51 p	8,450	143	3,545
LD196	C S PEGASUS	25/3/2012	07:39 p	09:56 p	8,221	137	3,600
LD220	C S PEGASUS	25/3/2012	10:11 p	12:27 a	8,750	136	3,860
LD230	CORONA POWER	27/3/2012	12:00 a	01:00 a	8,727	60	8,727
LD264	CORONA POWER		12:00 a	01:00 a	8,775	60	8,775
LD274	C S PEGASUS	27/3/2012	01:29 a	02:46 a	8,732	77	6,804
LD230	MEDI TAIPEI	28/3/2012	08:28 p	10:36 p	8,182	128	3,835
LD276	CORONA POWER	28/3/2012	11:03 p	01:18 a	8,786	135	3,905
LD272	CORONA POWER	29/3/2012	12:00 a	01:00 a	8,746	60	8,746
LD166	CORONA POWER	29/3/2012	04:25 p	07:04 p	8,770	159	3,310
LD226	CORONA POWER	29/3/2012	10:37 p	12:57 a	9,146	140	3,920
LD162	CRYSTAL WIND	30/3/2012	02:33 p	04:52 p	8,796	139	3,797
LD194	CRYSTAL WIND	30/3/2012	05:09 p	08:05 p	9,157	176	3,122
LD248	CRYSTAL WIND	31/3/2012	01:31 a	04:14 a	9,063	163	3,336
LD120	AMAGISAN	1/4/2012	09:07 a	11:28 a	8,706	141	3,705
LD216	AMAGISAN	1/4/2012	03:23 p	05:47 p	9,145	144	3,810
LD122	GRAND THALIA	8/4/2012	05:22 a	07:47 a	8,398	145	3,475
LD276	GRAND THALIA	8/4/2012	02:14 a	03:50 a	6,519	96	4,075
LD150	SEKIYO	9/4/2012	10:08 a	12:22 p	8,542	134	3,825
LD200	SEKIYO	9/4/2012	03:55 p	06:16 p	8,538	141	3,633
LD126	GRAND THALIA	10/4/2012	06:50 a	09:13 a	8,416	143	3,531

Train Loading Report

Date: 1/01/2012 to 31/12/2012

Site: Liddell Coal Marketing Pty Limited

Train No	Vessel Name	Arrival Time	Load Start	Load End Time	Qty	Duration (min	Load Rate (T/Hr)
LD168	SEKIYO	10/4/2012	11:58 a	03:25 p	7,729	207	2,240
LD222	SEKIYO	10/4/2012	07:33 p	09:33 p	8,071	120	4,035
LD276	SEKIYO	10/4/2012	03:00 a	05:42 a	8,300	162	3,074
LD110	SEKIYO	11/4/2012	08:46 a	11:06 a	8,343	140	3,576
LD220	SEKIYO	11/4/2012	07:23 p	06:38 a	8,450	675	751
LD110	SEKIYO	12/4/2012	06:54 a	09:08 a	8,345	134	3,736
LD132	SEKIYO	12/4/2012	09:27 a	11:37 a	8,263	130	3,814
LD130	SANTA LUCIA	13/4/2012	07:25 a	09:58 a	8,512	153	3,338
LD180	SANTA LUCIA	13/4/2012	03:27 p	05:46 p	8,551	139	3,691
LD262	SANTA LUCIA	13/4/2012	12:08 a	02:19 a	8,437	131	3,864
LD238	SANTA LUCIA	14/4/2012	08:37 p	11:02 p	8,615	145	3,565
LD270	SANTA LUCIA	15/4/2012	01:05 a	03:32 a	8,482	147	3,462
LD104	SANTA LUCIA	16/4/2012	05:11 a	06:22 a	8,587	71	7,257
LD162	MAIZURU BENTEN	16/4/2012	10:49 a	12:53 p	8,301	124	4,017
LD248	SANTA LUCIA	16/4/2012	11:41 p	01:55 a	8,430	134	3,775
LD290	SANTA LUCIA	17/4/2012	04:01 a	06:23 a	8,718	142	3,683
LD142	SANTA LUCIA	17/4/2012	09:22 a	11:32 a	8,677	130	4,005
LD202	IRIS FRONTIER	17/4/2012	03:07 p	05:24 p	8,322	137	3,645
LD226	IRIS FRONTIER	17/4/2012	10:00 p	12:30 a	8,283	150	3,313
LD276	IRIS FRONTIER	18/4/2012	03:04 a	05:17 a	8,690	133	3,920
LD114	IRIS FRONTIER	18/4/2012	09:50 a	12:11 p	8,324	141	3,542
LD202	MAIZURU BENTEN	18/4/2012	05:50 p	08:16 p	8,294	146	3,408
LD262	MAIZURU BENTEN	19/4/2012	08:54 a	10:59 a	8,299	125	3,984
LD232	RISING SUN	19/4/2012	07:18 p	10:40 p	8,598	202	2,554
LD120	MAIZURU BENTEN	20/4/2012	05:57 a	08:04 a	8,225	127	3,886
LD200	YAHAGI MARU	20/4/2012	04:13 p	06:42 p	9,031	149	3,637
LD246	MAIZURU BENTEN	20/4/2012	12:00 a	02:02 a	8,268	122	4,066
LD162	YAHAGI MARU	21/4/2012	02:35 p	04:39 p	8,399	124	4,064
LD226	YAHAGI MARU	21/4/2012	08:46 p	10:48 p	8,439	122	4,150
LD288	ULUSOY 11	22/4/2012	08:01 a	10:08 a	8,465	127	3,999
LD200	PACIFIC STAR	22/4/2012	03:35 p	05:56 p	8,434	141	3,589
LD230	ULUSOY 11	22/4/2012	10:02 p	12:15 a	8,282	133	3,736
LD288	ULUSOY 11	23/4/2012	02:51 a	04:53 a	8,572	122	4,216
LD124	TAIPOWER PROSPERIT	23/4/2012	11:40 a	01:53 p	8,300	133	3,744
LD230	YAHAGI MARU	23/4/2012	07:54 p	09:59 p	8,214	125	3,943
LD260	YAHAGI MARU	24/4/2012	12:31 a	02:31 a	8,506	120	4,253
LD276	ULUSOY 11	24/4/2012	03:01 a	05:04 a	8,385	123	4,090
LD264	ULUSOY 11	24/4/2012	11:05 p	01:16 a	8,574	131	3,927
LD292	ULUSOY 11	25/4/2012	03:13 a	05:30 a	8,577	137	3,756
LD154	ULUSOY 11	25/4/2012	12:47 p	02:50 p	8,103	123	3,953
LD166	ULUSOY 11	25/4/2012	03:28 p	05:35 p	8,522	127	4,026
LD276	ULUSOY 11	26/4/2012	02:27 a	04:32 a	8,359	125	4,012
LD112	AMAKUSA ISLAND	26/4/2012	05:19 a	08:27 a	8,166	188	2,606
LD178	AMAKUSA ISLAND	26/4/2012	02:56 p	04:59 p	8,594	123	4,192
LD262	AMAKUSA ISLAND	26/4/2012	12:05 a	02:10 a	8,254	125	3,962
LD110	SINCERE PISCES	28/4/2012	03:15 a	05:25 a	8,239	130	3,803
LD178	SINCERE PISCES	29/4/2012	01:22 p	03:31 p	8,454	129	3,932
LD194	PEGASUS ISLAND	5/5/2012	03:38 p	05:39 p	8,505	121	4,217
LD268	PEGASUS ISLAND	6/5/2012	02:18 a	04:30 a	8,439	132	3,836
LD186	TW BEIJING	6/5/2012	01:51 p	04:09 p	8,541	138	3,713
LD274	PEGASUS ISLAND	7/5/2012	01:58 a	04:14 a	8,133	136	3,588
LD136	NSS ENDEAVOR	7/5/2012	09:06 a	11:44 a	8,344	158	3,169
LD248	NSS ENDEAVOR	7/5/2012	12:37 a	02:56 a	8,455	139	3,650
LD280	TW BEIJING	8/5/2012	03:29 a	05:45 a	8,570	136	3,781
LD118	NSS ENDEAVOR	8/5/2012	07:03 a	09:16 a	8,473	133	3,822
LD208	NSS ENDEAVOR	8/5/2012	07:17 p	09:19 p	8,252	122	4,058
LD240	NSS ENDEAVOR	8/5/2012	10:25 p	12:31 a	8,524	126	4,059
LD258	NSS ENDEAVOR	9/5/2012	02:17 a	04:27 a	8,330	130	3,845
LD146	IRON FORTUNE	9/5/2012	12:15 p	02:48 p	8,412	153	3,299
LD174	IRON FORTUNE	9/5/2012	03:42 p	05:57 p	8,563	135	3,806
LD234	IRON FORTUNE	9/5/2012	08:42 p	10:46 p	8,545	124	4,135
LD286	IRON FORTUNE	10/5/2012	05:09 a	07:15 a	8,553	126	4,073
LD104	IRON FORTUNE	10/5/2012	07:43 a	09:58 a	8,374	135	3,722
LD224	IRON FORTUNE	10/5/2012	10:30 p	12:37 a	8,449	127	3,992
LD290	IRON FORTUNE	11/5/2012	03:33 a	05:43 a	8,333	130	3,846
LD174	PEGASUS ISLAND	11/5/2012	02:28 p	04:36 p	8,532	128	3,999
LD214	TSUNOMINE	11/5/2012	05:38 p	07:39 p	8,458	121	4,194
LD246	TSUNOMINE	12/5/2012	01:35 a	03:53 a	8,429	138	3,665
LD290	TSUNOMINE	12/5/2012	05:05 a	07:19 a	8,403	134	3,762

Train Loading Report

Date: 1/01/2012 to 31/12/2012

Site: Liddell Coal Marketing Pty Limited

Train No	Vessel Name	Arrival Time	Load Start	Load End Time	Qty	Duration (min	Load Rate (T/Hr)
LD228	TSUNOMINE	12/5/2012	10:09 p	12:26 a	8,513	137	3,728
LD282	TSUNOMINE	13/5/2012	03:29 a	05:44 a	8,381	135	3,725
LD118	TSUNOMINE	13/5/2012	05:59 a	08:10 a	8,330	131	3,815
LD156	TSUNOMINE	13/5/2012	10:50 a	01:57 p	8,536	187	2,739
LD176	ASAHI MARU	19/5/2012	01:11 p	03:13 p	8,187	122	4,026
LD224	ASAHI MARU	19/5/2012	08:47 p	11:06 p	8,325	139	3,593
LD260	FRONTIER CORONET	19/5/2012	11:38 p	01:46 a	8,092	128	3,793
LD142	FRONTIER CORONET	20/5/2012	01:01 p	03:07 p	8,661	126	4,124
LD176	FRONTIER CORONET	20/5/2012	04:41 p	06:45 p	8,623	124	4,172
LD282	FRONTIER CORONET	21/5/2012	03:15 a	05:17 a	8,438	122	4,150
LD110	FRONTIER CORONET	21/5/2012	07:16 a	09:37 a	8,397	141	3,573
LD188	FRONTIER CORONET	21/5/2012	05:57 p	08:06 p	8,354	129	3,885
LD114	FRONTIER CORONET	22/5/2012	11:56 a	02:06 p	8,409	130	3,881
LD110	FRONTIER CORONET	23/5/2012	07:18 a	09:19 a	7,740	121	3,838
LD172	STAR ANGEL	23/5/2012	12:00 p	02:10 p	8,404	130	3,879
LD242	TATSUKI MARU	31/5/2012	08:23 p	10:30 p	8,471	127	4,002
LD286	TATSUKI MARU	1/6/2012	03:42 a	05:50 a	8,329	128	3,904
LD222	TATSUKI MARU	1/6/2012	08:51 p	10:55 p	8,406	124	4,067
LD272	TATSUKI MARU	2/6/2012	02:22 a	04:25 a	8,174	123	3,987
LD214	SINCERE PISCES	2/6/2012	07:47 p	10:05 p	9,239	138	4,017
LD290	SINCERE PISCES	3/6/2012	06:01 a	08:10 a	9,108	129	4,236
LD276	CORONA KINGDOM	4/6/2012	01:54 a	04:18 a	9,750	144	4,062
LD148	CORONA KINGDOM	6/6/2012	11:39 a	02:12 p	9,302	153	3,648
LD128	AMARANTHA	14/6/2012	06:09 a	08:21 a	8,540	132	3,882
LD150	HOKURIKU MARU	15/6/2012	12:22 p	02:35 p	8,096	133	3,652
LD214	HOKURIKU MARU	15/6/2012	06:48 p	08:55 p	8,425	127	3,980
LD152	AMARANTHA	16/6/2012	09:52 a	11:53 a	7,915	121	3,925
LD226	HOKURIKU MARU	16/6/2012	06:31 p	08:31 p	7,973	120	3,987
LD180	SHIRAKUMO	17/6/2012	01:13 p	03:18 p	8,234	125	3,952
LD274	AMARANTHA	18/6/2012	01:01 a	03:06 a	8,287	125	3,978
LD134	SHIRAKUMO	18/6/2012	07:51 a	10:03 a	8,418	132	3,827
LD212	SHIRAKUMO	18/6/2012	06:27 p	08:39 p	8,571	132	3,896
LD280	SHIRAKUMO	19/6/2012	02:48 a	04:49 a	8,193	121	4,063
LD116	SHIRAKUMO	20/6/2012	12:00 a	01:00 a	8,216	60	8,216
LD240	HEBEI QINHUANGDAO	21/6/2012	08:14 p	10:22 p	8,291	128	3,886
LD274	HEBEI QINHUANGDAO	22/6/2012	03:27 a	05:36 a	8,590	129	3,995
LD248	HEBEI QINHUANGDAO	22/6/2012	10:31 p	12:45 a	8,581	134	3,842
LD156	NSS GRANDEUR	23/6/2012	12:48 p	02:49 p	8,040	121	3,987
LD240	UNITED ADVENTURE	23/6/2012	10:05 p	12:19 a	8,677	134	3,885
LD282	UNITED ADVENTURE	24/6/2012	02:45 a	05:03 a	8,485	138	3,689
LD124	UNITED ADVENTURE	24/6/2012	09:10 a	11:10 a	8,485	120	4,242
LD200	UNITED ADVENTURE	24/6/2012	03:24 p	05:34 p	8,259	130	3,812
LD240	UNITED ADVENTURE	24/6/2012	10:39 p	12:52 a	8,427	133	3,802
LD288	UNITED ADVENTURE	25/6/2012	02:31 a	04:39 a	8,385	128	3,930
LD174	UNITED ADVENTURE	25/6/2012	01:06 p	03:17 p	8,179	131	3,746
LD260	UNITED ADVENTURE	26/6/2012	02:42 a	05:05 a	8,194	143	3,438
LD144	FRONTIER VOYAGER	26/6/2012	09:19 a	11:37 a	8,498	138	3,695
LD168	FRONTIER VOYAGER	26/6/2012	12:23 p	02:23 p	8,584	120	4,292
LD226	FRONTIER VOYAGER	26/6/2012	08:53 p	11:08 p	8,565	135	3,807
LD128	OCEAN WIND	28/6/2012	01:24 p	06:31 p	8,563	307	1,674
LD286	OCEAN WIND	29/6/2012	03:10 a	05:18 a	8,414	128	3,944
LD160	FRONTIER VOYAGER	29/6/2012	11:02 a	01:04 p	8,255	122	4,060
LD162	NOBLE SALUTE	1/7/2012	11:00 a	01:01 p	8,910	121	4,418
LD202	NOBLE SALUTE	1/7/2012	04:01 p	06:03 p	8,203	122	4,034
LD246	NOBLE SALUTE	1/7/2012	11:14 p	01:16 a	8,520	122	4,190
LD204	NOBLE SALUTE	2/7/2012	04:40 p	06:33 p	8,075	113	4,288
LD244	NOBLE SALUTE	3/7/2012	01:27 a	03:38 a	8,575	131	3,927
LD190	OCEAN WIND	3/7/2012	03:56 p	05:50 p	7,656	114	4,029
LD224	NOBLE SALUTE	3/7/2012	06:50 p	09:04 p	8,546	134	3,827
LD288	NOBLE SALUTE	5/7/2012	02:21 a	04:32 a	8,178	131	3,746
LD170	NOBLE SALUTE	5/7/2012	01:32 p	03:47 p	8,973	135	3,988
LD174	NOBLE SALUTE	6/7/2012	12:51 p	03:06 p	8,623	135	3,833
LD186	MONA PEGASUS	8/7/2012	01:35 p	03:44 p	8,580	129	3,991
LD204	MONA PEGASUS	8/7/2012	05:36 p	07:50 p	8,163	134	3,655
LD270	MONA PEGASUS	9/7/2012	01:37 a	04:14 a	8,540	157	3,264
LD108	MONA PEGASUS	9/7/2012	06:10 a	08:07 a	8,214	117	4,212
LD150	MONA PEGASUS	9/7/2012	10:49 a	12:58 p	8,422	129	3,917
LD278	SOUTHERN WISDOM	10/7/2012	02:29 a	04:37 a	8,378	128	3,927
LD130	MONA PEGASUS	11/7/2012	10:39 a	12:57 p	8,792	138	3,823

Train Loading Report

Date: 1/01/2012 to 31/12/2012

Site: Liddell Coal Marketing Pty Limited

Train No	Vessel Name	Arrival Time	Load Start	Load End Time	Qty	Duration (min	Load Rate (T/Hr)
LD196	LEGATO	11/7/2012	04:09 p	06:16 p	8,827	127	4,170
LD250	SOUTHERN WISDOM	11/7/2012	09:32 p	12:04 a	8,642	152	3,411
LD122	SOUTHERN WISDOM	12/7/2012	08:22 a	11:28 a	8,420	186	2,716
LD224	SOUTHERN WISDOM	12/7/2012	08:01 p	10:16 p	8,538	135	3,795
LD268	REIYO	12/7/2012	01:18 a	03:31 a	8,511	133	3,839
LD124	REIYO	13/7/2012	08:03 a	11:19 a	8,767	196	2,684
LD222	LEGATO	13/7/2012	07:19 p	09:24 p	8,693	125	4,172
LD248	LEGATO	13/7/2012	09:53 p	11:51 p	8,024	118	4,080
LD266	LEGATO	13/7/2012	12:48 a	03:06 a	8,786	138	3,820
LD120	LEGATO	14/7/2012	06:15 a	08:23 a	8,528	128	3,997
LD180	LEGATO	14/7/2012	12:37 p	02:53 p	8,801	136	3,883
LD226	LEGATO	14/7/2012	07:24 p	09:27 p	8,634	123	4,212
LD194	GOLDEN HOPE	15/7/2012	12:00 a	01:00 a	8,638	60	8,638
LD240	GOLDEN HOPE		12:00 a	01:00 a	8,563	60	8,563
LD290	LEGATO	15/7/2012	04:18 a	06:21 a	8,566	123	4,179
LD140	GOLDEN HOPE	15/7/2012	07:58 a	10:06 a	8,703	128	4,079
LD174	GOLDEN HOPE	15/7/2012	12:57 p	03:10 p	8,797	133	3,969
LD102	GOLDEN HOPE	16/7/2012	12:00 a	01:00 a	8,693	60	8,693
LD146	SINCERE PISCES		12:00 a	01:00 a	8,678	60	8,678
LD222	SINCERE PISCES		12:00 a	01:00 a	8,670	60	8,670
LD120	TORM SALTHOLM	17/7/2012	01:32 p	04:11 p	8,476	159	3,198
LD216	TORM SALTHOLM	17/7/2012	05:29 p	07:54 p	8,806	145	3,644
LD240	TORM SALTHOLM	17/7/2012	10:31 p	01:05 a	8,512	154	3,316
LD128	TORM SALTHOLM	18/7/2012	06:33 a	10:04 a	8,658	211	2,462
LD212	TORM SALTHOLM	18/7/2012	07:08 p	09:18 p	8,698	130	4,015
LD122	CRYSTAL WIND	19/7/2012	01:20 p	04:08 p	8,608	168	3,074
LD110	CRYSTAL WIND	21/7/2012	05:37 a	07:45 a	8,734	128	4,094
LD172	CRYSTAL WIND	22/7/2012	12:55 p	03:03 p	8,280	128	3,881
LD142	ETERNAL POWER	23/7/2012	08:15 a	10:24 a	8,884	129	4,132
LD156	ETERNAL POWER	23/7/2012	11:14 a	01:46 p	8,838	152	3,489
LD204	ETERNAL POWER	24/7/2012	06:39 p	08:47 p	8,457	128	3,964
LD260	ETERNAL POWER	24/7/2012	11:57 p	02:06 a	8,825	129	4,105
LD286	ETERNAL POWER	25/7/2012	03:27 a	05:44 a	8,839	137	3,871
LD184	ETERNAL POWER	25/7/2012	05:06 p	07:12 p	8,826	126	4,203
LD110	PAOLA	31/7/2012	06:50 a	08:56 a	8,562	126	4,077
LD104	PAOLA	2/8/2012	05:11 a	07:13 a	8,566	122	4,213
LD176	NSS GRANDEUR	2/8/2012	12:47 p	02:58 p	8,817	131	4,038
LD152	NSS GRANDEUR	3/8/2012	12:00 a	01:00 a	8,893	60	8,893
LD226	NSS GRANDEUR		12:00 a	01:00 a	8,635	60	8,635
LD272	NSS GRANDEUR	4/8/2012	12:51 a	04:32 a	8,730	221	2,370
LD180	NSS GRANDEUR	4/8/2012	03:15 p	05:24 p	8,560	129	3,981
LD252	NSS GRANDEUR	5/8/2012	12:37 a	03:10 a	8,769	153	3,439
LD280	NSS GRANDEUR	5/8/2012	03:41 a	05:55 a	8,580	134	3,842
LD216	TARUMAESAN MARU	5/8/2012	07:40 p	09:48 p	8,604	128	4,033
LD264	NSS GRANDEUR	6/8/2012	01:47 a	03:57 a	8,815	130	4,068
LD146	TARUMAESAN MARU	6/8/2012	09:16 a	12:02 p	8,317	166	3,006
LD174	NSS GRANDEUR	6/8/2012	02:45 p	04:50 p	8,785	125	4,217
LD206	NSS GRANDEUR	6/8/2012	08:15 p	10:30 p	8,649	135	3,844
LD208	OCEAN WIND	11/8/2012	12:00 a	01:00 a	8,626	60	8,626
LD264	OCEAN WIND	11/8/2012	12:01 a	02:20 a	8,463	139	3,653
LD236	OCEAN WIND	12/8/2012	08:42 p	10:45 p	8,822	123	4,303
LD270	OCEAN WIND	13/8/2012	12:46 a	03:02 a	8,513	136	3,756
LD156	OCEAN WIND	13/8/2012	09:41 a	11:39 a	8,404	118	4,273
LD154	CHANG HO	14/8/2012	12:14 p	02:30 p	9,004	136	3,972
LD206	CHANG HO	14/8/2012	03:54 p	06:23 p	8,967	149	3,611
LD220	CHANG HO	14/8/2012	06:53 p	08:05 p	9,252	72	7,710
LD114	CHANG HO	15/8/2012	04:48 a	07:57 a	8,958	189	2,844
LD154	CHANG HO	15/8/2012	12:18 p	02:39 p	9,282	141	3,950
LD106	CHANG HO	16/8/2012	08:54 a	11:05 a	9,061	131	4,150
LD164	CHANG HO	16/8/2012	11:52 a	02:04 p	9,041	132	4,110
LD196	CHANG HO	16/8/2012	04:43 p	07:02 p	9,286	139	4,008
LD280	CHANG HO	17/8/2012	01:45 a	03:52 a	8,767	127	4,142
LD268	SHIN SAPPORO MARU	18/8/2012	12:00 a	01:00 a	8,687	60	8,687
LD138	SHIN SAPPORO MARU	18/8/2012	08:50 a	11:05 a	8,793	135	3,908
LD186	SHIN SAPPORO MARU	18/8/2012	01:18 p	03:38 p	8,685	140	3,722
LD228	SHIN SAPPORO MARU	18/8/2012	08:22 p	10:46 p	8,937	144	3,724
LD128	SHIN SAPPORO MARU	19/8/2012	08:51 a	10:56 a	8,552	125	4,105
LD186	SHIN SAPPORO MARU	19/8/2012	02:30 p	04:36 p	8,034	126	3,826
LD248	SHIN SAPPORO MARU	19/8/2012	09:56 p	12:06 a	8,667	130	4,000

Train Loading Report

Date: 1/01/2012 to 31/12/2012

Site: Liddell Coal Marketing Pty Limited

Train No	Vessel Name	Arrival Time	Load Start	Load End Time	Qty	Duration (min	Load Rate (T/Hr)
LD168	UNITED ADVENTURE	20/8/2012	12:00 a	01:00 a	8,729	60	8,729
LD110	SHIN SAPPORO MARU	20/8/2012	04:56 a	07:04 a	8,536	128	4,001
LD128	UNITED ADVENTURE	20/8/2012	07:48 a	09:58 a	7,832	130	3,615
LD198	UNITED ADVENTURE	20/8/2012	07:04 p	09:12 p	8,650	128	4,055
LD252	UNITED ADVENTURE	20/8/2012	11:38 p	01:53 a	8,661	135	3,849
LD122	UNITED ADVENTURE	21/8/2012	07:30 a	09:50 a	8,710	140	3,733
LD236	UNITED ADVENTURE	21/8/2012	07:24 p	09:35 p	8,634	131	3,955
LD144	ASAHI MARU	22/8/2012	09:06 a	11:21 a	8,591	135	3,818
LD290	CORONA JOYFUL	23/8/2012	02:56 a	05:20 a	8,649	144	3,604
LD140	DOUBLE PRESTIGE	23/8/2012	08:09 a	10:35 a	8,735	146	3,590
LD142	CORONA JOYFUL	26/8/2012	09:11 a	10:29 a	8,788	78	6,760
LD128	LAKE DAHLIA	30/8/2012	09:51 a	11:51 a	7,776	120	3,888
LD220	LAKE DAHLIA	31/8/2012	12:55 a	03:11 a	8,332	136	3,676
LD154	LAKE DAHLIA	31/8/2012	09:41 a	11:50 a	8,840	129	4,112
LD188	LAKE DAHLIA	31/8/2012	02:57 p	05:07 p	8,467	130	3,908
LD246	LAKE DAHLIA	31/8/2012	10:02 p	12:14 a	8,805	132	4,002
LD108	MYOKEN	1/9/2012	06:00 a	08:34 a	8,757	154	3,412
LD158	LAKE DAHLIA	1/9/2012	10:49 a	01:33 p	8,833	164	3,232
LD194	LAKE DAHLIA	1/9/2012	03:53 p	06:18 p	8,409	145	3,480
LD148	LAKE DAHLIA	2/9/2012	09:22 a	11:33 a	8,752	131	4,009
LD208	LAKE DAHLIA	2/9/2012	05:31 p	07:53 p	8,264	142	3,492
LD264	MYOKEN	2/9/2012	01:04 a	03:04 a	7,887	120	3,944
LD124	TACHIBANA	3/9/2012	10:00 a	12:18 p	8,352	138	3,631
LD148	TACHIBANA	3/9/2012	01:19 p	03:14 p	8,466	115	4,417
LD272	TSUNOMINE	3/9/2012	12:07 a	02:08 a	8,445	121	4,188
LD158	TSUNOMINE	4/9/2012	10:48 a	12:59 p	8,566	131	3,923
LD194	TACHIBANA	4/9/2012	02:58 p	05:25 p	8,409	147	3,432
LD284	PINE WAVE	5/9/2012	01:50 a	04:08 a	8,734	138	3,797
LD150	PINE WAVE	5/9/2012	10:55 a	01:08 p	8,528	133	3,847
LD192	TACHIBANA	5/9/2012	05:15 p	07:17 p	8,537	122	4,199
LD230	TACHIBANA	5/9/2012	08:47 p	11:03 p	8,587	136	3,788
LD118	PINE WAVE	6/9/2012	05:42 a	08:06 a	8,252	144	3,438
LD154	PINE WAVE	6/9/2012	10:42 a	01:46 p	8,331	184	2,717
LD124	LOWLANDS CAMELLIA	7/9/2012	12:00 a	01:00 a	8,342	60	8,342
LD162	ANDREA PALLADIO		12:00 a	01:00 a	8,632	60	8,632
LD204	ANDREA PALLADIO	7/9/2012	05:43 p	08:03 p	8,509	140	3,647
LD246	PINE WAVE	7/9/2012	10:47 p	12:46 a	8,563	119	4,317
LD272	ANDREA PALLADIO	8/9/2012	02:09 a	04:17 a	8,503	128	3,986
LD138	LOWLANDS CAMELLIA	8/9/2012	09:03 a	11:19 a	8,299	136	3,661
LD252	RIN YO	8/9/2012	11:26 p	01:28 a	8,550	122	4,205
LD150	RIN YO	9/9/2012	10:32 a	12:44 p	8,644	132	3,929
LD184	RIN YO	9/9/2012	01:42 p	03:52 p	8,786	130	4,055
LD218	RIN YO	9/9/2012	07:02 p	09:20 p	8,735	138	3,798
LD266	RIN YO	12/9/2012	12:52 a	03:03 a	8,446	131	3,868
LD102	FRONTIER TRIUMPH	16/9/2012	06:14 a	08:26 a	8,751	132	3,978
LD210	FRONTIER TRIUMPH	16/9/2012	05:07 p	07:09 p	8,656	122	4,257
LD116	NSS GRANDEUR	17/9/2012	05:47 a	08:01 a	8,498	134	3,805
LD192	NSS GRANDEUR	17/9/2012	04:13 p	06:20 p	8,460	127	3,997
LD212	FRONTIER TRIUMPH	19/9/2012	05:00 p	07:14 p	8,508	134	3,809
LD268	FRONTIER TRIUMPH	19/9/2012	02:06 a	04:32 a	8,633	146	3,548
LD102	NSS GRANDEUR	20/9/2012	04:47 a	06:51 a	8,363	124	4,047
LD176	NSS ENDEAVOR	20/9/2012	04:10 p	06:23 p	8,731	133	3,939
LD216	NSS ENDEAVOR	20/9/2012	09:06 p	11:41 p	8,838	155	3,421
LD254	NSS ENDEAVOR	20/9/2012	12:21 a	02:28 a	8,083	127	3,819
LD232	NSS ENDEAVOR	21/9/2012	08:37 p	10:44 p	8,531	127	4,030
LD288	NSS ENDEAVOR	22/9/2012	02:41 a	04:51 a	8,567	130	3,954
LD140	NSS ENDEAVOR	22/9/2012	08:58 a	11:12 a	8,558	134	3,832
LD148	NSS ENDEAVOR	22/9/2012	11:53 a	02:06 p	8,632	133	3,894
LD240	NSS ENDEAVOR	22/9/2012	10:38 p	12:47 a	8,531	129	3,968
LD178	CORAL RUBY	23/9/2012	01:05 p	03:06 p	8,365	121	4,148
LD222	NSS ENDEAVOR	23/9/2012	08:14 p	01:34 a	8,717	320	1,634
LD122	JASMINE HALO	24/9/2012	06:06 a	08:12 a	8,413	126	4,006
LD146	CORAL RUBY	24/9/2012	09:38 a	12:08 p	8,185	150	3,274
LD176	NSS ENDEAVOR	24/9/2012	02:41 p	05:08 p	8,426	147	3,439
LD184	CORAL RUBY	24/9/2012	05:28 p	08:23 p	8,550	175	2,931
LD266	CORAL RUBY	24/9/2012	12:10 a	02:17 a	8,863	127	4,187
LD108	CORAL RUBY	25/9/2012	04:02 a	05:59 a	8,432	117	4,324
LD164	CORAL RUBY	25/9/2012	11:26 a	01:37 p	8,708	131	3,988
LD208	CORAL RUBY	25/9/2012	04:27 p	06:36 p	8,449	129	3,930

Train Loading Report

Date: 1/01/2012 to 31/12/2012

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	CORAL RUBY	26/9/2012	01:23 a	03:26 a	8,516	123	4,154
LD140	JASMINE HALO	26/9/2012	07:38 a	09:45 a	8,469	127	4,001
LD266	JASMINE HALO	26/9/2012	12:02 a	02:03 a	8,446	121	4,188
LD150	CORAL TOPAZ	27/9/2012	10:54 a	12:55 p	8,425	121	4,178
LD282	CORAL TOPAZ	28/9/2012	01:11 a	03:17 a	8,481	126	4,038
LD290	PEGASUS ISLAND	30/9/2012	05:57 a	08:08 a	9,142	131	4,187
LD154	PEGASUS ISLAND	30/9/2012	09:49 a	12:01 p	9,043	132	4,110
LD142	NEW STAGE	4/10/2012	08:56 a	11:05 a	8,451	129	3,931
LD230	NEW STAGE	4/10/2012	07:18 p	09:32 p	8,375	134	3,750
LD288	NEW STAGE	5/10/2012	04:57 a	07:40 a	8,945	163	3,293
LD208	NEW STAGE	6/10/2012	04:50 p	06:50 p	8,136	120	4,068
LD250	NEW STAGE	6/10/2012	09:20 p	11:35 p	8,893	135	3,952
LD110	NEW STAGE	7/10/2012	07:34 a	09:33 a	7,884	119	3,975
LD166	NORTH FORTUNE	8/10/2012	01:27 p	03:46 p	8,611	139	3,717
LD186	NORTH FORTUNE	8/10/2012	04:19 p	06:21 p	8,188	122	4,027
LD252	NORTH FORTUNE	8/10/2012	11:26 p	01:25 a	7,987	119	4,027
LD144	NORTH FORTUNE	9/10/2012	09:42 a	11:51 a	8,386	129	3,900
LD226	NORTH FORTUNE	9/10/2012	06:43 p	08:47 p	8,382	124	4,056
LD270	CAPE PRIDE	11/10/2012	03:20 a	05:44 a	8,546	144	3,561
LD138	CAPE PRIDE	11/10/2012	07:56 a	10:01 a	8,575	125	4,116
LD164	CAPE PRIDE	11/10/2012	12:59 p	03:07 p	8,544	128	4,005
LD276	CAPE PRIDE	12/10/2012	02:10 a	04:17 a	8,570	127	4,049
LD152	CORONA DYNAMIC	15/10/2012	10:48 a	01:14 p	9,225	146	3,791
LD210	CORONA DYNAMIC	15/10/2012	08:21 p	10:37 p	9,240	136	4,076
LD288	CORONA DYNAMIC	17/10/2012	04:22 a	06:36 a	9,130	134	4,088
LD200	CORONA DYNAMIC	17/10/2012	05:52 p	08:08 p	9,178	136	4,049
LD156	HOKURIKU MARU	18/10/2012	11:41 a	02:01 p	8,844	140	3,790
LD224	MAIZURU BISHAMON	18/10/2012	07:17 p	09:25 p	8,617	128	4,039
LD246	MAIZURU BISHAMON	18/10/2012	10:15 p	12:32 a	8,584	137	3,760
LD122	MAIZURU BISHAMON	19/10/2012	06:39 a	09:00 a	8,479	141	3,608
LD120	HOKURIKU MARU	21/10/2012	07:18 a	09:13 a	8,055	115	4,203
LD200	HOKURIKU MARU	21/10/2012	03:40 p	05:50 p	8,710	130	4,020
LD134	HOKURIKU MARU	23/10/2012	08:27 a	11:40 a	8,398	193	2,611
LD200	HOKURIKU MARU	23/10/2012	05:56 p	08:04 p	8,621	128	4,041
LD258	LOWLANDS PHOENIX	23/10/2012	12:02 a	02:03 a	8,088	121	4,011
LD112	MAIZURU DAIKOKU	26/10/2012	07:01 a	09:08 a	8,504	127	4,018
LD120	MAIZURU DAIKOKU	27/10/2012	06:13 a	08:14 a	8,291	121	4,111
LD162	MAIZURU DAIKOKU	27/10/2012	11:09 a	01:17 p	8,479	128	3,974
LD266	MAIZURU DAIKOKU	27/10/2012	12:59 a	03:29 a	8,259	150	3,304
LD240	EIGEN	30/10/2012	10:19 p	12:29 a	8,444	130	3,897
LD102	SINCERE PISCES	31/10/2012	04:01 a	06:08 a	8,726	127	4,122
LD136	SINCERE PISCES	31/10/2012	09:04 a	11:08 a	8,816	124	4,266
LD156	SINCERE PISCES	31/10/2012	05:17 p	05:17 p	8,989	0	
LD174	CORONA GARLAND	1/11/2012	01:44 p	04:02 p	8,911	138	3,874
LD196	CORONA GARLAND	1/11/2012	05:10 p	07:21 p	8,634	131	3,954
LD266	CAPE TREASURE	2/11/2012	12:52 a	02:52 a	8,543	120	4,272
LD116	NSS GRANDEUR	2/11/2012	08:14 a	10:22 a	8,678	128	4,068
LD202	CAPE TREASURE	2/11/2012	01:57 p	03:57 p	8,581	120	4,291
LD248	CAPE TREASURE	2/11/2012	09:57 p	12:04 a	8,704	127	4,112
LD278	CAPE TREASURE	3/11/2012	03:02 a	05:25 a	8,858	143	3,717
LD124	NSS GRANDEUR	3/11/2012	07:10 a	09:20 a	8,602	130	3,970
LD176	SAIYO	3/11/2012	12:41 p	02:50 p	8,663	129	4,029
LD224	CAPE TREASURE	3/11/2012	06:12 p	08:15 p	8,476	123	4,135
LD272	CAPE TREASURE	4/11/2012	01:17 a	03:21 a	8,785	124	4,251
LD128	PACIFIC TRIANGLE	4/11/2012	07:33 a	09:45 a	8,484	132	3,856
LD200	NSS GRANDEUR	4/11/2012	08:03 p	10:11 p	8,596	128	4,029
LD158	CAPE TREASURE	5/11/2012	10:51 a	02:17 p	8,586	206	2,501
LD126	PACIFIC TRIANGLE	6/11/2012	11:00 a	01:25 p	8,672	145	3,588
LD216	SHIRAKUMO	6/11/2012	06:53 p	09:12 p	8,834	139	3,813
LD262	SHIRAKUMO	6/11/2012	01:55 a	03:59 a	8,598	124	4,160
LD232	NSS GRANDEUR	7/11/2012	10:19 p	12:49 a	9,016	150	3,606
LD150	SHIRAKUMO	9/11/2012	10:40 a	12:49 p	8,763	129	4,076
LD248	ENERGIA CENTAURUS	10/11/2012	01:05 a	03:09 a	8,403	124	4,066
LD196	SHIRAKUMO	10/11/2012	02:38 p	04:43 p	8,491	125	4,076
LD224	SHIRAKUMO	10/11/2012	07:32 p	09:51 p	8,982	139	3,877
LD136	ENERGIA CENTAURUS	11/11/2012	07:23 a	09:24 a	8,621	121	4,275
LD188	SAIYO	11/11/2012	02:37 p	03:45 p	8,835	68	7,796
LD256	SAIYO	11/11/2012	12:22 a	02:37 a	8,573	135	3,810
LD284	GL DAISHAN	12/11/2012	12:00 a	01:00 a	8,426	60	8,426

Train Loading Report

Date: 1/01/2012 to 31/12/2012

Site: Liddell Coal Marketing Pty Limited

Train No	Vessel Name	Arrival Time	Load Start	Load End Time	Qty	Duration (min	Load Rate (T/Hr)
LD104	MAPLE WAVE	26/11/2012	06:22 a	09:39 a	8,505	197	2,590
LD198	IKAN BAGANG	26/11/2012	03:05 p	05:14 p	8,874	129	4,127
LD264	MAPLE WAVE	27/11/2012	12:00 a	01:00 a	8,358	60	8,358
LD378	MAPLE WAVE		12:00 a	01:00 a	8,593	60	8,593
LD364	IKAN BAGANG	27/11/2012	05:57 a	08:23 a	9,246	146	3,800
LD308	CORONA DYNAMIC	27/11/2012	10:02 p	12:39 a	9,147	157	3,496
LD104	MAPLE WAVE	28/11/2012	03:01 a	06:02 a	8,679	181	2,877
LD210	CORONA DYNAMIC	28/11/2012	03:50 p	06:06 p	9,417	136	4,154
LD294	MAPLE WAVE	28/11/2012	07:09 p	09:08 p	8,456	119	4,264
LD302	ENERGY PRIMAVERA	29/11/2012	12:00 a	01:00 a	8,515	60	8,515
LD110	ENERGY PRIMAVERA	29/11/2012	04:47 a	07:18 a	8,620	151	3,425
LD150	ENERGY PRIMAVERA	29/11/2012	08:57 a	11:15 a	8,741	138	3,801
LD302	NORD SATURN	30/11/2012	06:38 p	08:48 p	8,911	130	4,113
LD374	NORD SATURN	1/12/2012	12:00 a	01:00 a	9,145	60	9,145
LD156	NORD SATURN	1/12/2012	02:48 p	05:02 p	9,085	134	4,068
LD128	NORD SATURN	2/12/2012	10:06 a	12:17 p	9,227	131	4,226
LD216	NORD SATURN	2/12/2012	03:03 p	05:24 p	9,272	141	3,946
LD280	NORD SATURN	2/12/2012	08:08 p	10:18 p	9,223	130	4,257
LD376	SINCERE PISCES	3/12/2012	06:27 a	08:45 a	9,258	138	4,025
LD130	SINCERE PISCES	3/12/2012	09:10 a	11:29 a	9,239	139	3,988
LD310	SINCERE PISCES	3/12/2012	11:32 p	01:46 a	9,257	134	4,145
LD350	BLUE WAVE	4/12/2012	11:46 p	03:14 a	8,834	208	2,548
LD344	DOUBLE HAPPINESS	6/12/2012	02:30 a	04:50 a	8,800	140	3,771
LD270	DOUBLE HAPPINESS	6/12/2012	04:49 p	06:49 p	8,774	120	4,387
LD148	MERCURY OCEAN	7/12/2012	06:04 a	08:33 a	9,287	149	3,740
LD266	DOUBLE HAPPINESS	7/12/2012	06:37 p	08:57 p	8,532	140	3,657
LD318	PERLA BULKER	10/12/2012	02:24 a	04:44 a	9,200	140	3,943
LD188	PERLA BULKER	10/12/2012	08:58 a	11:21 a	9,141	143	3,836
LD326	PERLA BULKER	11/12/2012	11:12 p	01:25 a	9,300	133	4,195
LD386	PERLA BULKER	12/12/2012	02:19 a	04:32 a	9,305	133	4,198
LD150	SHIN SAPPORO MARU	12/12/2012	06:11 a	08:28 a	9,187	137	4,024
LD278	SHIN SAPPORO MARU	12/12/2012	02:36 p	05:03 p	9,278	147	3,787
LD346	SHIN SAPPORO MARU	12/12/2012	06:37 p	09:00 p	9,291	143	3,898
LD378	SHIN SAPPORO MARU	13/12/2012	03:46 a	06:11 a	9,311	145	3,853
LD320	SHIN SAPPORO MARU	13/12/2012	07:15 p	09:30 p	9,282	135	4,126
LD106	NSS GRANDEUR	16/12/2012	04:02 a	06:29 a	9,392	147	3,834
LD220	NSS GRANDEUR	16/12/2012	03:56 p	06:19 p	9,378	143	3,935
LD306	NSS GRANDEUR	16/12/2012	09:05 p	11:27 p	9,191	142	3,883
LD140	NSS GRANDEUR	17/12/2012	08:46 a	11:05 a	9,116	139	3,935
LD288	NSS GRANDEUR	17/12/2012	06:24 p	08:47 p	9,211	143	3,865
LD342	NSS GRANDEUR	17/12/2012	12:01 a	02:24 a	9,304	143	3,904
LD378	SEA GLORIA	18/12/2012	03:28 a	05:59 a	9,291	151	3,692
LD132	NSS GRANDEUR	18/12/2012	07:48 a	10:09 a	9,205	141	3,917
LD198	SEA GLORIA	18/12/2012	04:28 p	06:45 p	9,205	137	4,031
LD246	SEA GLORIA	18/12/2012	07:51 p	10:18 p	9,353	147	3,817
LD124	BRILLIANT CENTURY	20/12/2012	04:48 a	06:52 a	8,871	124	4,292
LD298	YUE GUAN FENG	20/12/2012	01:19 a	03:36 a	9,218	137	4,037
LD114	BRILLIANT CENTURY	22/12/2012	09:00 a	11:25 a	9,565	145	3,958
LD184	CAPE CANARY	23/12/2012	11:49 a	02:09 p	8,449	140	3,621
LD294	BRILLIANT CENTURY	23/12/2012	07:58 p	10:13 p	9,284	135	4,126
LD368	BRILLIANT CENTURY	24/12/2012	04:22 a	06:46 a	9,862	144	4,109
LD188	CAPE CANARY	24/12/2012	10:44 a	12:55 p	8,661	131	3,967
LD126	HANJIN HAYPOINT	29/12/2012	06:13 a	08:17 a	8,710	124	4,215

Summary

Number of Trains:	536
Total Nett Weight:	4,592,216.2
Average Nett Weight:	8,567.6
Average Load Rate:	3,818.4
Average Load Duration:	134.6

Total Tonnes Railed

LID10	908,442
LID11	845,302

LID12	913,883
LID12.5	115,978
LID14	992,081
LID35	189,863
LID8	34,499
LID9	307,569
LID9.5	284,599

Stockpile (t's)	**31/12/2012**
LID10	9,331
LID11	31,083
LID12	13,794
LID14	0
LID35	9,104
LID8	0
LID9	4,837
LID9.5	5,846
LID12.5	26,392
LID10.5	0

Appendix B

Risk Assessment Review

Appendix B Risk Assessment Review

Liddell Coal Operations

Environment and Community Broad Brush Risk Assessment

E&C BBRA Workshop Report

Liddell Coal Operations

October 2012

XCN07-024

GSS ENVIRONMENTAL
Environmental, Land and Project Management Consultants

TABLE OF CONTENTS

TABLES

APPENDICES

ABBREVIATIONS

BBRA	Broad Brush Risk Assessment
E&C	Environment and Community
GSSE	GSS Environmental
LCO	Liddell Coal Operations
LGA	Local Government Area
RCE	Risk Control Effectiveness
XCN	Xstrata Coal NSW

1.0 INTRODUCTION

1.1 Overview

GSS Environmental (GSSE) was engaged by Liddell Coal Operations (LCO), to undertake a review of the sites Environment and Community (E&C) Broad Brush Risk Assessment (BBRA).

A qualitative risk assessment has been undertaken by GSSE in accordance with the ***Australian Standard AS/NZS ISO 31000:2009 – Risk Management – Principles and Guidelines***, and the ***Xstrata Coal Risk & Change Management Standard (XC RI STD 0001).***

A phone call between GSSEs Andrew Hutton and the LCO E&C Superintendent Ben de Somer was conducted to define the relevant criteria and scope the boundaries for the risk assessment workshop. GSSE received past E&C BBRAs conducted at LCO in 2009 and 2010 as well as the site wide BBRA conducted in 2012. These risk assessments were used to preload the current XCN risk template.

The E&C BBRA review workshop was held at the Liddell Coal Operations Commercial Boardroom, on 15 October 2012. The review workshop was a chance for LCO staff and contractors to review the risks and current controls pre-loaded into the spreadsheet. The workshop was facilitated by GSSE's Andrew Hutton (Principal Environmental Consultant). Andrew Hutton has formal qualifications in Risk Assessment Facilitation (G2) and over 17 years experience in the mining industry in both operational and consulting roles. A copy of Andrew's CV is attached as **Appendix 1**.

This report summarises the main aims and objectives of the workshop, describes the methodology used throughout the process, and details various findings, outcomes and actions, which are detailed in the Risk Register (Attached as **Appendix 2**).

1.2 Project Background

Liddell Coal Operations (LCO) is an established open-cut mining operation. Liddell Colliery is located within the Hunter Coalfields of New South Wales, approximately 25km northwest of Singleton, and 26 kilometres southeast of Muswellbrook.

1.3 Risk Assessment Process

The methodology used is in accordance with the following requirements:

- *Xstrata Coal Risk & Change Management Standard (XC RI STD 0001).*
- *The Australian Standard AS/NZS 31000:2009 Risk Management – Principles and Guidelines;*
- *NSW Department of Primary Industries – Mineral Resources (DPI-MR) MDG1014: Guide to Reviewing a Risk Assessment of Mine Equipment and Operations; and*

Further details on the risk assessment methodology are provided in **Section 4**.

2.0 AIMS AND OBJECTIVES

The aims and objectives of the E&C BBRA were to formally and systematically identify and rank risks associated with the Environment and/or Community aspects at Liddell Coal. The key objectives and outcomes of the E&C BBRA were to:

- Assemble primary stakeholders from LCO with a responsibility within the area of E&C as well as key technical positions at the complex;
- Identify the key activities that may pose an E&C risk to the complex;
- Identify the specific nature of the risks;

- Identify the existing controls in place to mitigate or minimise the potential for risk, and determine whether these controls are adequate;
- Determine and/or develop what additional controls, investigations, and/or risk assessments may need to be implemented to either eliminate or, mitigate or minimise likely impacts to reduce the risk(s) to as low as reasonably practicable; and
- Assign accountabilities for these additional treatment plans/tasks.

3.0 SCOPE

Prior to the workshop, the XCN Risk Assessment template was preloaded with risks taken from previous E&C and Broad Brush risk assessments conducted at the complex. Risks were collated from these various sources and grouped into Key Elements. Workshop preparation and preloading the risk register identified 21 key E&C issues relevant to the Liddell Coal Complex to be assessed during the workshop.

4.0 METHODOLOGY

4.1 Workshop Session

Key Xstrata Coal NSW (XCN), Liddell Coal Operations personnel and site contractors were invited to attend the E&C BBRA workshop. The involvement of site personnel assisted in establishing a high level of site input for the risk assessment process. This ensures that the risks assessed throughout the process were by those who have relevant experience in the particular areas, who understand the project, and who also have the authority to action key findings/outcomes that result from the risk assessment workshop.

The E&C BBRA workshop attendees are listed in **Table 1**. A scanned copy of the Attendance Register for the Risk Assessment is attached as **Appendix 3**.

Table 1: E&C BBRA Workshop Attendees

Name	Position	Knowledge/Experience
Ben de Somer	E&C Superintendent	8 years operations 4 years consulting
Kelvin Mather	Purchasing Officer	30 years in industry
Clive Taylor	Engineering Manager	+20 years in industry
Elizabeth Ruppe	E&C Graduate	1 year operations
Daniel Oldknow	Contractor on-site	3 years in industry
Stephen Garland	Coal Quality Coordinator	30 years in Industry
Tiffany Hunt	Trainer/Assessor	8 years in industry
Marty Bower	E&C Officer	1 year mining 7 years environmental field
Neil Gibbs	Manager Coal Operations	+20 years in industry
Murray Gregson	Mine Manager	15 years in industry
Andrew Hutton	GSSE – Principal Environmental Consultant	G2 Risk Assessment Facilitation Training, 17 years industry experience (10 consulting & 7 operational). Site knowledge and experience.
Loren Yallop	GSSE – Graduate Environmental Scientist	Attendance of scoping session

4.2 Outline of General Approach

The following section outlines the approach used by GSSE to assign a specific risk to each potential risk.

4.2.1 Definition of Terms

Risk Assessment is the formalised means by which the aspect of the project and their associated impacts are systematically identified, assessed, ranked according to perceived risks and addressed by means of appropriate and effective controls or management outcomes.

Risk is the chance of something happening that will have either a positive or negative impact upon the project. It involves consideration of the sources of the risk, assessing the consequences and considering the likelihood that an event that might occur which could give rise to a consequence. The impact may vary in consequence from 1 (extremely high consequences) through to 5 (very minimum consequence).

The *Risk Rating* is the method of prioritising the level of risk through the use of the risk assessment process. The risk rating assigned to the activity during this process is measured in terms of both Consequence Rating and Probability Rating of the event occurring. This is discussed in more detail below.

4.2.2 Compliance with XC Risk & Change Management Standard and AS/NZS 31000:2009 Risk Assessment –Principles and Guidelines

The XC Risk & Change Management Standard (XC RI STD 0001) establishes a qualitative risk assessment methodology in accordance with the requirements of the Joint Australian & New Zealand Standard ***AS/NZS 31000:2009 Risk Management- Principles and Guidelines.*** GSSE has applied the following steps during the Risk Assessment process including:

- Identifying project related risks, including what could happen, when and where;
- Analysing the risks using a qualitative risk approach (i.e. identifying existing controls, determining specific consequences/likelihoods and then determining the level of risk);
- Evaluating the risks to determine the significant issues. The purpose of risk evaluation is to make decisions based on the outcomes of the risk assessment about which risks need control or a mitigation strategy and to assign priorities; and
- Establishing controls to mitigate/treat the risks identified as part of the process.

The following section is intended to summarise the methodology used in determining the risk ranking for each of the nominated risks.

4.2.3 Risk Control Effectiveness

The effectiveness of existing controls for each risk was ranked using the Risk Control Effectiveness (RCE) criteria from XCN's Risk Matrix (**Table 2**). RCE is a relative assessment of the actual level of control that is currently present and effective compared with that reasonably achievable for that particular risk. RCE is an indicator as to whether the existing controls are doing all that they could or should to manage the risk. Risks already controlled to a satisfactory standard did not require new treatment plans.

Table 2: Risk Control Effectiveness Criteria

RCE	Guide
Satisfactory	- Controls are well designed and appropriate for the risk; - Controls are largely "preventative" and address the root causes; - Management believes that they are effective and reliable at all times; - Nothing more to be done except review and monitor the existing controls.
Require Improvement	- Most controls are designed correctly and are in place and effective; - Controls may only treat some of the root causes of the risk, and/or are not currently effective and/or there may be an over-reliance on "reactive" controls; - Management has doubts about operational effectiveness and reliability; - More work is required to improve operating effectiveness.
Poor or No Existing Controls	- Significant control gaps or no credible control; - Either controls do not treat root causes, are non-existent or, if they exist, they are ineffective; - Management has no confidence that any degree of control is being achieved due to poor control design; - Very limited or no operational effectiveness.

4.2.4 Consequence Category

For the purpose of this risk assessment 'consequence' has been defined as the outcome of an event or situation expressed qualitatively or quantitatively due to damage to people or property or environment, disadvantage or gain.

Prior to assigning a risk rating, each identified risk was categorised by the type of loss the risk posed to the business. In accordance with Xstrata's Standard, these included:

- Financial
- Property Damage
- Investment Return
- Health and Safety
- Environment
- Community/Reputation
- Legal and Compliance

Having identified the existing controls and their adequacy and effectiveness in controlling the risk, the expected consequence is determined using the Consequence Criteria as shown in **Table 3**. The consequence of an event was assessed using these descriptors and assigned a Rating of 1 (Catastrophic) to 5 (Insignificant).

Table 3: Consequence Criteria

Rating	Financial impact US$ EBIT	Property Damage US$	Investment Return US$ NPV	Health and Safety	Environment	Community / Reputation	Legal and Compliance
5	$100m+ loss or gain	$20m+	$600m + loss or gain	– 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	$20m - $99.9m loss or gain	$2m - $19.9m	$60m - $599.9m loss or gain	– 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	$2m – $19.9m loss or gain	$200k - $2m	$6m – $59.9m loss or gain	– 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 legislation with punitive fine. – Significant litigation involving many weeks of senior management time.
2	$200k – $1.9m loss or gain	$10k - $199.9k	$600k – $5.9m loss or gain	– 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 legislation with investigation or report to authority with prosecution and/or moderate fine possible.
1	<$200k loss or gain	<$10k	<$599.9k loss or gain	– 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 legislation.

4.2.5 Likelihood

For the purpose of this risk assessment 'probability' has been defined as the likelihood of the event occurring or recurring. The likelihood category is determined on the basis of probability of the occurrence of the expected consequence. This was considered by the workshop participants and risks were rated according to the descriptions in XCN's Risk Matrix, ranging from E (Certain) to A (Improbable) as outlined in **Table 4**.

Table 4: 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

4.2.6 Risk Rating

Risk Ratings were assigned by combining the Consequence rating and the Likelihood rating. A numerical Risk Rating, between 1 and 25, was allocated for each aspect using XCNs Risk Matrix. This aims to identify the priority and level of management action(s) required to reduce the Risk Rating.

According to XCN's Risk Matrix and as identified in **Table 5,** the following Risk Ratings were used -

- Risk Ratings 17 to 25 – classified as a High Risk;
- Risk Ratings 6 to 16 – classified as a Medium Risk;
- Risk Ratings 1 to 5 – classified as a Low Risk.

Table 5: Risk Rating Matrix and Classification

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				

Classification
High Risk
Medium Risk
Low Risk

The risk ratings assigned to each potential risk identified were dependent on group consensus

5.0 RISK REGISTER

GSSE has completed a Risk Register to document the outcomes of all aspects identified throughout the E&C BBRA process, attached as **Appendix 2**.

The workshop assessed 21 key E&C elements with a total of 24 risks. Of these 24 risks, 22 were assessed as having Risk Control Effectiveness (the current controls managing the risk) at a satisfactory level. The remaining two risks were assessed as requiring improvement and treatment plans/tasks have been assigned to bring the Risk Control Effectiveness to a satisfactory level.

Of the 24 risks, none were assessed as being high risk, 6 as medium risks and 18 as low risks. The six aspects that were categorised as medium risk, included risks associated with the following:

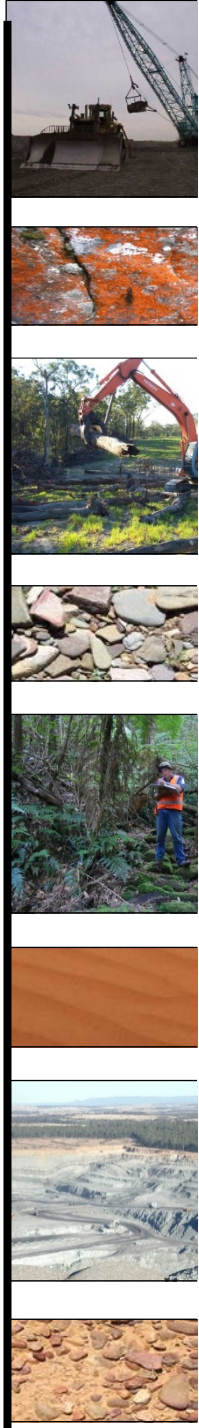
- Noise
- Dust/Air Quality
- Blasting (Blasting at the mine exceeds criteria or results in a complaint);
- Spontaneous Combustion;
- Water/Erosion & Sediment Control; and
- Aboriginal Cultural Heritage.

These risks are highest priority and as such treatment plans/tasks have identified to try to reduce the risks to a low level. Overall, the majority of Broad Brush Environment and Community Risks at the LCO were assessed as having a low Risk Rating.

6.0 REFERENCES

- Liddell Coal Operations Environment and Community Broad Brush Risk Assessment Review, 2010.
- Liddell Coal Operations Broad Brush Risk Assessment, 2012.
- Liddell Coal Operations Environment and Community Broad Brush Risk Assessment, Umwelt Environmental Consultants, June 2009.
- Standards Australia, September 2009, AS/NZS 31000:2009 Risk Management- Principles and Guidelines.
- Xstrata Coal, Xstrata Coal Risk & Change Management Standard (XC RI STD 0001).

Andrew Hutton CV



APPENDIX 1

Statement of Experience

Andrew Hutton

Bachelor of Natural Resources (B. Nat Res),

Masters of Business and Environmental Management (M. B&EM)

Principal Environmental Consultant

Education

Masters in Business and Environmental Management, University of Newcastle (NSW), 2004

Bachelor of Natural Resources, University of New England (NSW), 1995

Areas of Expertise

- Environmental Impact Assessment, Project Approvals and Regulatory Compliance
- Environmental Compliance and Due Diligence Auditing
- Mine Rehabilitation – Planning, Design and Project Management
- Mine Closure Planning and Rehabilitation Liability Assessment
- External Third Party and Internal Environmental Reporting
- Major Project Risk Assessment
- Contractor Engagement and Management
- Community/Stakeholder Engagement and Consultation
- Environmental Monitoring Programs and Reporting
- Environmental Management Systems and Environmental Management Plans
- Environmental Awareness and Workforce Training
- Subsidence Management Approvals

Career Summary

Andrew is the Principal Environmental Consultant and General Manager of GSS Environmental. Andrew has over 17 years experience in the mining industry in both operational and consulting roles in NSW and Qld. Previously Andrew has held positions with BHP Australia Coal as an Environmental Officer and with a multidiscipline environmental services group based in Mackay as the Environmental Projects/Operations Manager. In 2000 Andrew was seconded by the GSS Group to the greenfield Donaldson Open Cut Mine as the Environmental Manager for the project. In 2003, Andrew moved from the operation role to take up the position as Senior Environmental Projects Manager with GSSE. Since that time Andrew has become the Principal Environmental Consultant leading a multi-disciplinary team of environmental planners, engineers and scientists based in both NSW and Qld.

Andrew has significant experience in environmental impact assessment, regulatory approvals and licensing, stakeholder consultation, mine closure planning and rehabilitation, risk assessment facilitation (major project and life of mine) the development and implementation of integrated environmental monitoring programs, producing environmental plans of management, environmental management systems and environmental auditing.

The following sections provide some insight into Andrew's key areas of expertise.

Career Detail

Environmental Impact Assessment and Project Approvals

In the capacity of Environmental Manager on mines and as an environmental consultant, Andrew has been responsible for a wide range of project approvals both prior to and after the commencement of the project. He has fulfilled to role of Project Director or Project Manager on numerous coal project approvals and modifications. The following is a sample of on-going and recently completed key projects:

- New State Significant Development proposal seeking new underground mining operations at Airly Coal Mine (Centennial Coal).
- Section 75W project modification to increase coal production and install additional surface infrastructure at Springvale Mine (Centennial Coal).
- Section 75W project modification to significantly expand open cut mining operations at Liddell Coal Operations (Xstrata Coal NSW).
- Section 75W project modification of an existing underground coal mine in the Newcastle area (Centennial Coal).
- Section 75W project modification for Stage 9 of the Ravensworth Underground Mine in Hunter Valley (Xstrata Coal NSW).
- Part 3A Project Approval for Rocglen Coal Mine in the Gunnedah Basin (Whitehaven Coal Limited).

Mine Closure Planning and Rehabilitation Liability Assessment

Andrew has had extensive experience in decommissioning and mine closure planning, including development of mine closure plans and assessment of rehabilitation liabilities, from the preliminary phase through to detailed closure planning. Included in this experience is significant mine closure work and the development of mine closure liability calculators for the NSW and Victorian governments. The following is a sample of recent key experiences:

- Preliminary Decommissioning and Closure Plan (component of the project ESIA) for an infrastructure corridor consisting of a 230 kV power line, substation, product transfer pipeline and access roads to link the Port and Power Station to the Tampakan Copper-Gold Project in the Philippines.
- Preliminary Decommissioning and Closure Plan (component of the project ESIA) for a proposed Power Station and Port Facility to support the Tampakan Copper-Gold Project in the Philippines.
- Preparation of a Preliminary Mine Rehabilitation and Decommissioning Plan (component of the project ESIA) for the Tampakan Copper-Gold Project in the Philippines.
- Full review of mine closure and rehabilitation liability costs for all Xstrata Coal NSW sites for audit and accounting purposes.

Environmental Compliance and Due Diligence Auditing

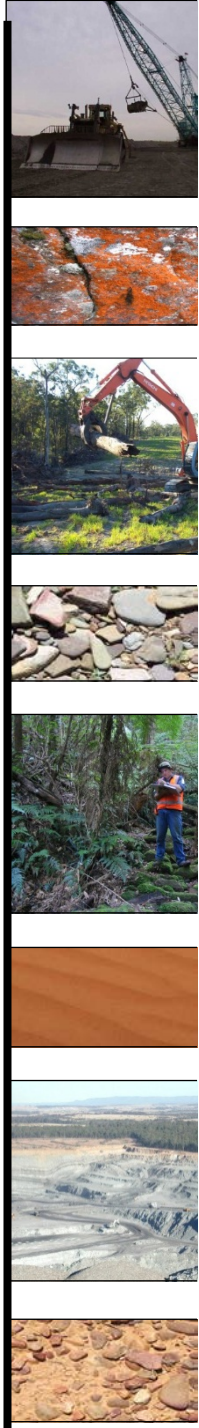
Andrew has been involved on a number of environmental compliance, EMS and due diligence audits across a range of facilities in NSW and Qld. A sample of major projects is listed below:

- Environmental due diligence audit of 32 coal mines/projects in the Surat and Galilee coal basins in Qld with specific emphasis on environmental approval status and tenure requirements to deliver on a take or pay agreement for a major infrastructure project (confidential client).
- Independent environmental compliance audit for the Invincible and Cullen Valley Open Cut Coal Mines near Lithgow NSW (Coalpac).
- Due diligence audits for potential acquisitions of mining operations in Qld (confidential clients).

Risk Assessment Facilitation and Reporting

Andrew has extensive experience in risk management holding formal qualifications in MNCG1002A - Risk Management and Facilitation “Implement and Apply Risk Management Processes (G2 Course)”. Andrew has contributed to and led risk management workshops for a range of clients for purposes including project pre-feasibility/feasibility, life of mine, operational expansions, Mining Operations Plans, Subsidence Management Plans, environment and community, and health and safety.

Risk Register



APPENDIX 2

Environmental Risk Assessment: Liddell Coal - Environment and Community BBRA

Step 2: Assess Type; Key Elements-These change depending on TYPE of Risk Assessment	Step 3: Identify the risks, causes and potential consequences			Step 4: Identify the existing controls to manage the identified risks	Step 5: Determine RCE	Steps 6, 7 & 8: Determine the Expected Consequence / Likelihood applicable to the Expected Consequence / Current level of risk				Step 10: PMC	Step 11: Treat the Risks		
Key Element (CURA Context/Category)	**Risk Description - Something happens……**	**Consequence - resulting in:**	**Causes - Caused by**	**Existing Control Description**	**Risk Control Effectiveness**	**Consequence Category**	**Expected Risk Consequence**	**Risk Likelihood**	**Current Risk Rating**	**Potential Maximum Consequence**	**Treatment plans/tasks (Description)**	**Task Owner**	**Due Date**
Noise	Mine generated noise that exceeds criteria or results in a complaint	Non-compliance Community complaint Compulsory acquisition Delayed/constrained/no approvals Business interruption Loss of reputation Prosecution Loss of future opportunity	Mobile equipment (mining) Cumulative Impact (other mines) Construction Drilling Washery Climatic Conditions Changed Community expectations Blasting	Noise Management Plan Noise Monitoring Program Noise Management Procedure Explosives Management Plan Real time noise monitoring network (alarms) Attended monitoring In pit measures Attenuated equipment Permits Training and awareness Sound Power testing on the fleet EPL Conditions Blasting/ complaints Hotline Blast Monitoring Hours of Blasting	**Satisfactory**	Community / Reputation	2	C	**8**	2	Review and adjust real time noise monitoring locations as required.	Ben de Somer	31-Dec-12
Dust/Air Quality (particulates)	Mine generated dust that exceeds criteria or results in a complaint	Non-compliance Community complaint (visible dust, health, aesthetics) Potential health impacts Compulsory acquisition Delayed/constrained/no approvals Business interruption Cumulative impacts Air Pollution Prosecution Loss of reputation Loss of future opportunity	Mine activities that generate dust Traffic on unsealed roads Exposed areas Ineffective topsoil management Excavation Climatic Conditions Changed Community expectations Blasting	EMS MOP Permits Complaints hotline Use of water surfactant Training and education Erosion and Sediment Control Plan Air Quality Monitoring Program (cameras, etc) Topsoil Stripping and Land Clearing Procedure Dust Management TARP Dumping Procedures Hours of blasting Explosives Management Plan Spontaneous Combustion Management Plan Monthly Environmental Inspections Tool box talks - environmental interactions Annual Rehab Plans Dust Supression and Road Watering Procedure ROM Stockpile Management Procedure	**Require Improvement**	Community / Reputation	2	D	**12**	2	Review and implement Dust Stop Pollution Reduction Programs	Ben de Somer	31-Dec-12
Blasting	Blasting at the mine exceeds criteria or results in a complaint	Community complaints Non-compliance Poor community perception Damage to property Potential health impacts Increased regulator attention Increased media attention Loss of resource	Vibration / Overpressure as a result of blasting Fumes as a result of blasting	Explosives Management Plan Blast monitoring Hours of blasting Blast Notifications Post Blast Fume Procedure Blasting in Sensitive Areas Procedure Meteorological Assessment of Blasting Communication of Blasting Procedure Air Quality Monitoring Program Drill/Blast Design Community education Blasting/ Complaints hotline Continuous improvement programs Exclusion zones / road closure EPL Conditions Road Closure Procedure Current Consultation with Coal & Allied	**Satisfactory**	Community / Reputation	2	C	**8**	2	Development of Blast Management Strategy for Chain of Ponds Hotel as part of the DA for the MOD 5 project.	Ben de Somer	01-Nov-13
Blasting	Damage to heritage listed buildings (CoP)	Poor community perception Increased regulator attention Increased media attention Non compliance with DA	Vibration / Overpressure as a result of blasting	Explosives Management Plan Blast Monitoring Blasting in Sensitive Areas Procedure Communication of Blasting Procedure Blasting, design and loading procedures	**Satisfactory**	Community / Reputation	2	B	**5**	2			
Blasting	Damage to other infrastructure (roads, powerlines, conveyors, railway, fibre optic cable, C&A infrastructure)	Poor community perception Increased regulator attention Increased media attention Non compliance with DA Loss of reputation with infrastructure owner	Vibration / Overpressure / fly rock damage as a result of blasting	EPL/DA Conditions Assessment of weather conditions Explosives Management Plan Blasting in Sensitive Areas Procedure Communication of Blasting Procedure Blasting, design and loading procedures Complaints hotline Blast notification	**Satisfactory**	Financial	2	A	**3**	4			
Spontaneous Combustion	Community complaint	Fire/explosion Non compliance of DA Increased regulator attention Increased media attention	Underground workings Excavation, transport and emplacement of overburden Air quality, odour, visual impacts	MOP Cameras Sprays in hopper Sealing of exposed tunnels Spontaneous Combustion Management Plan Water pipelines in close proximity Complaints hotline	**Satisfactory**	Community / Reputation	2	C	**8**	2	Improvement actions captured in DA Compliance Audit dated 27 July 2012.		

Environmental Risk Assessment: Liddell Coal - Environment and Community BBRA

Step 2: Assess Type; Key Elements-These change depending on TYPE of Risk Assessment	Step 3: Identify the risks, causes and potential consequences			Step 4: Identify the existing controls to manage the identified risks	Step 5: Determine RCE	Steps 6, 7 & 8: Determine the Expected Consequence / Likelihood applicable to the Expected Consequence / Current level of risk				Step 10: PMC	Step 11: Treat the Risks		
Key Element (CURA Context/Category)	**Risk Description - Something happens……**	**Consequence - resulting in:**	**Causes - Caused by**	**Existing Control Description**	**Risk Control Effectiveness**	**Consequence Category**	**Expected Risk Consequence**	**Risk Likelihood**	**Current Risk Rating**	**Potential Maximum Consequence**	**Treatment plans/tasks (Description)**	**Task Owner**	**Due Date**
Lighting	Mine generated light that exceeds criteria or results in a complaint	Constraints on mining Loss of Reputation Non-compliance Community Complaint	Poor placement of lighting plant Non compliant fixed lighting	Fit for purpose equipment Operating procedures Mine Inspection System Lighting Management Procedure Complaints Hotline	**Satisfactory**	Community / Reputation	2	B	**5**	2			
Flora and Fauna	Breach of legislation	Non-compliance Prosecution	Clearing of land without approval Surface disturbance outside areas that are approved Changes in legislation (EEC) LTA planning of the works Lack of awareness	Permits Training and awareness GIS Landscape Management Plan Clearing Procedure	**Satisfactory**	Legal & Compliance	2	B	**5**	2			
Water / Erosion & Sediment Control	Pollution of surface or ground water	Community dis-satisfaction Non-compliance & fines Licence Breach Business interruption Soil Erosion Water pollution	Flooding/ significant rainfall LTA design Erosion/sedimentation Pipeline failure Dam failure Tailings spill (dam and/or pipelines) Construction activities LTA monitoring Unauthorised discharge	Site Water Management Plan Erosion and Sediment Control Plan XCN Pipeline Management Standard Tailings Management Strategy Environmental Monitoring Program Monthly Environmental Inspections Water Licences Water Balance Training and awareness Permits EMS MOP Clean water diversions Minimise cleared land Mine Water Discharge Procedure	**Require Improvement**	Environment	2	C	**8**	3	HRSTS discharge requires review and update	Marty Bower	31-Dec-12
Stakeholders (Community)	Increased community concerns Changes in community expectations Community dis-satisfaction	Community complaints Increased regulator attention Objections to approvals No/constrained approvals Private property access Loss of trust with community Requests for unecessary acquistions	Increased focus on the industry Other non XCN approvals and activities Poor performance Media attention Lack of understanding in the community Lack of consultation Planning process Modification to DA	CCC SIP Website Newsletters Sponsorship Public notices Permit system Environmental monitoring AEMR Complaints procedure Approvals Environmental Management Strategy	**Satisfactory**	Community / Reputation	2	B	**5**	2			
Stakeholders (Government)	Delays in future approvals Increase scrutinity by regulators	No/constrained approval Non-compliance Increased regulator attention Prosecution Changes in policy and legislation	Increased community expectations Poor environmental compliance Modification to DA	XC SD policy Environmental Management Strategy CMO Approvals procedure External audits Internal audits Monthly environmental inspection AEMR Reporting (other) SIP XCN / Liddell existing relationships	**Satisfactory**	Legal & Compliance	2	B	**5**	3			
Stakeholders (non XCN mining, C&A, MacGen, ARTC, Wild Quarries, Telstra, etc)	Negative perception towards the Liddell Coal - impact on reputation Restricted Access Lack of support for DA Modifications/ Lack of cooperation	No/constrained approval Increased regulator attention Increased community concern Loss of trust	Cumulative Impacts (percieved or real) LTA performance by non XCN mining (includes others) Different criteria Different approach in community engagement/interactions	Commercial Agreements Environmental Monitoring SIP XCN Sustainable Development Policy	**Satisfactory**	Community / Reputation	2	B	**5**	2			
Traffic	Increased community concerns about mine related traffic	Breach of road rules Damage to public roads Sediment on public roads Community complaints Traffic accident	Use of public roads for mine access Speeding vehicles Mine use of public roads Equipment to and from the mine (float)	DA (describes use of roads) Road rules Site inductions Signage Education Disciplinary action Restrict the number of entrances that are used Washdown Bay	**Satisfactory**	Community / Reputation	1	C	**4**	2			
Aboriginal Cultural Heritage	Damage/destruction of Aboriginal heritage known / unknown sites (prosecution) Delay in mining activities/construction where clearance is required Unauthorised clearance of archaeological site	Damage or loss to items of Aboriginal cultural heritage Objections from Aboriginal community Prosecution / Fines Lack of trust from the Community More onerous conditions in Mgt Plans	LTA planning and awareness for known sites LTA complaince with the work permit requirements LTA procedures with respect to Aboriginal sites	EMS Aboriginal Cultural Heritage Management Plan Consultation with Aboriginal community Section 90 approvals DA/EIS Training and awareness of workforce GIS On-ground barriers Contractor MP Permits	**Satisfactory**	Legal & Compliance	2	C	**8**	2	ACHMP requires review and update. Action has been captured in 2012 DA Compliance Audit.		
Historic (European) Heritage	Damage/destruction of European heritage known / unknown sites (prosecution)	Damage or loss of european heritage. Loss of community trust	LTA planning for known sites LTA complaince with the work permit requirements LTA procedureswith respect to European sites	GIS DA/EIS Work authorisations EMS Contractor MP Permits	**Satisfactory**	Legal & Compliance	2	A	**3**	2			

Environmental Risk Assessment: Liddell Coal - Environment and Community BBRA

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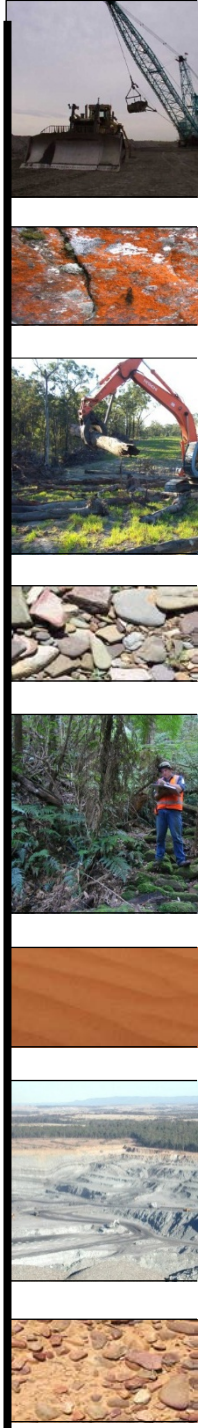
Key Element (CURA Context/Category)	**Risk Description - Something happens……**	**Consequence - resulting in:**	**Causes - Caused by**	**Existing Control Description**	**Risk Control Effectiveness**	**Consequence Category**	**Expected Risk Consequence**	**Risk Likelihood**	**Current Risk Rating**	**Potential Maximum Consequence**	**Treatment plans/tasks (Description)**	**Task Owner**	**Due Date**
Waste Management	Inappropriate waste disposal resulting in a liability for LCO Increased cost associated with waste management Water Pollution Land Contamination	Breach of the EPL requirements Pollution/contamination	LTA training and awareness People bringing waste in from off site Not providing appropriate waste bins/equipment	Training and awareness Waste contract (pre-qualification) Waste Tracking MSDS (ChemAlert) Purchasing, storage and handling procedures. Waste Management Plan Bunded waste storage facility Spill Response Procedure EPL Conditions	**Satisfactory**	Legal & Compliance	1	A	**1**	1			
Hazardous Materials and Dangerous Goods	Contamination and/or pollution Hydrocarbon Spill	Non-compliance Prosecution Requirement to report to EPA Remediation cost Damage to infrastructure/property/ environment/people	Inappropriate storage Spills and Leaks LTA construction of bunded facilities LTA awareness, procedures, competency, equipment	EMS Audits Dedicated storage areas/security keys Dangerous Goods Notifications Bunding Spill management procedure/Environmental spill response/Spill Kits XCN Hydrocarbon Management Standard Monthly Environmental Inspection Training and Awareness Spill Response Procedure Explosive magazine (included in the explosive Mgt Plan) Emergency MP PIRMP	**Satisfactory**	Environment	2	B	**5**	3	AS1940 Gap Analysis for CHPP diesel tanks Review containment for bulk grease at MIA		
Land & Property Management	Loss of reputation with neighbours and community Degradation of the land	Decreased land value Poor community perception Decreased ecological diversity Security/public safety	LTA property management (includes properties that are rented) The need to acquire land Natural Hazard (flood) Lack of resources to management Limited weed and pest management	Landscape Management Plan Liddell EMS Rental/lease agreements Firefighting equipment/personnel Contractor Management Plan Mine Inspection System Monthly Environmental Inspections Fit for purpose equipment Permits MOP Emergency Management Plan	**Satisfactory**	Community / Reputation	2	B	**5**	2			
Land & Property Management	Bushfire	Environmental Impact Personal Injury Loss of reputation Damage to Infrastructure/property Loss of assets on the properties owned/managed by XCN Loss of life or injury to personnel or community	Poor bushfire control Vehicle fire Spontaneous combustion Hot surfaces Lightning strink Others working in rail corridor	Bushfire MP Permits Mine Inspection System Fit for purpose equipment Spontaneous Combustion Management Plan Landscape Management Plan Emergency Management Plan	**Satisfactory**	Community / Reputation	2	B	**5**	2			
Climate Change	Community perception is that LCO is not addressing the climate change issue Non-compliance with the abatement requirements in the approval Excessive GHG emissions	Delayed/constrained/no approval Business interruption Non-compliance with EIS predictions/commitments Non-compliance with reporting scheme	Greater than expected gas make Further changes in the legislation relating to CO2 Changes in XC mitigation expectations Excessive use of electricity/power consumption	Energy Saving Action Plan (ESAP) projects National Pollution Inventory EEO Reporting Sustainability database Increased focus on issue when engaging the community Change from method 1 to method 2 emissions calculations National Greenhouse & Energy Reporting Scheme Cost and Budget Tracking	**Satisfactory**	Community / Reputation	2	B	**5**	2			
Monitoring and Reporting	LTA monitoring and reporting	Non compliance with the reporting requirements Non-complaince with regulatory requirements Difficulty in demonstrating compliance when comparing to baseline.	LTA review of the monitoring results and monitoring locations LTA resourcing Increased internal and external monitoring and reporting requirements Failure to report Inappropriate limits	Environmental Monitoring Program Consultants EMD CMO Website reporting AEMR Annual Return (EPL) Monthly Environmental Inspections	**Satisfactory**	Legal & Compliance	2	B	**5**	3			
Rehabilitation & Mine Closure	Poor Community and regulator perception towards rehabilitation and final landuse Rehabilitation closure criteria agreement with stakeholders not achieved	Decreased land value Poor community perception Decreased ecological diversity Failed lease relinquishment Ongoing liabilities Reduced land capacity/capability Unstable landform Poor drainage Delayed sign-off on rehabilitation Degradation of rehabilitated lands	Not achieving rehabilitation targets LTA rehabilitation strategy integrated into the mine plan LTA landform design Mine plan change Insufficient accrual for mine closure Poor quality/quantity of rehab results in failure to reach agreement Overgrazing Uncontrolled feral animals Weed infestation	MOP Annual Rehabilitation Plan Landscape Management Plan Ecological monitoring DA/EIS Flora and Fauna Management Plan Rehabilitation Monitoring XCN Mine Closure Standard Mine Closure Plan Water Management Plan Monitoring and Management requirements Survey Control	**Satisfactory**	Legal & Compliance	2	B	**5**	3			

Environmental Risk Assessment: Liddell Coal - Environment and Community BBRA

Step 2: Assess Type; Key Elements-These change depending on TYPE of Risk Assessment	Step 3: Identify the risks, causes and potential consequences			Step 4: Identify the existing controls to manage the identified risks	Step 5: Determine RCE	Steps 6, 7 & 8: Determine the Expected Consequence / Likelihood applicable to the Expected Consequence / Current level of risk				Step 10: PMC	Step 11: Treat the Risks		
Key Element (CURA Context/Category)	**Risk Description - Something happens……**	**Consequence - resulting in:**	**Causes - Caused by**	**Existing Control Description**	**Risk Control Effectiveness**	**Consequence Category**	**Expected Risk Consequence**	**Risk Likelihood**	**Current Risk Rating**	**Potential Maximum Consequence**	**Treatment plans/tasks (Description)**	**Task Owner**	**Due Date**
Approvals (all)	Delay/constrained/no approval Onerous conditions	Increased costs Discontinuity of mining	Changes in legislation Changes in government Governments inability to turn around approvals Poor Site performance Late submission LTA planning LTA engineering Lack of ownership of the approval(s) Poor consultant project management Prolonged public opposition	Planning Project Approvals procedures EMS LOM process SIP CCC Consultation with state government	**Satisfactory**	Community / Reputation	2	B	**5**	3			
Visual Impact	Poor community and regulatior perception	Increased complaints Increased scrutinity Increased costs	Increased disturbance by mining Industrialisation of the landscape Inability to complete rehab due to future mining options Poor rehabilitation of ground disturbance Rehabilitation Legacy Emissions Proximity of mine to train/highway	Progressive rehabilitation Tree screening Temporary rehabilitation Visual Bunding Emissions management Visual ammenity commitments in DA Monthly Environmental Inspections	**Satisfactory**	Community / Reputation	2	B	**5**	2			

Attendance Sheet



APPENDIX 3

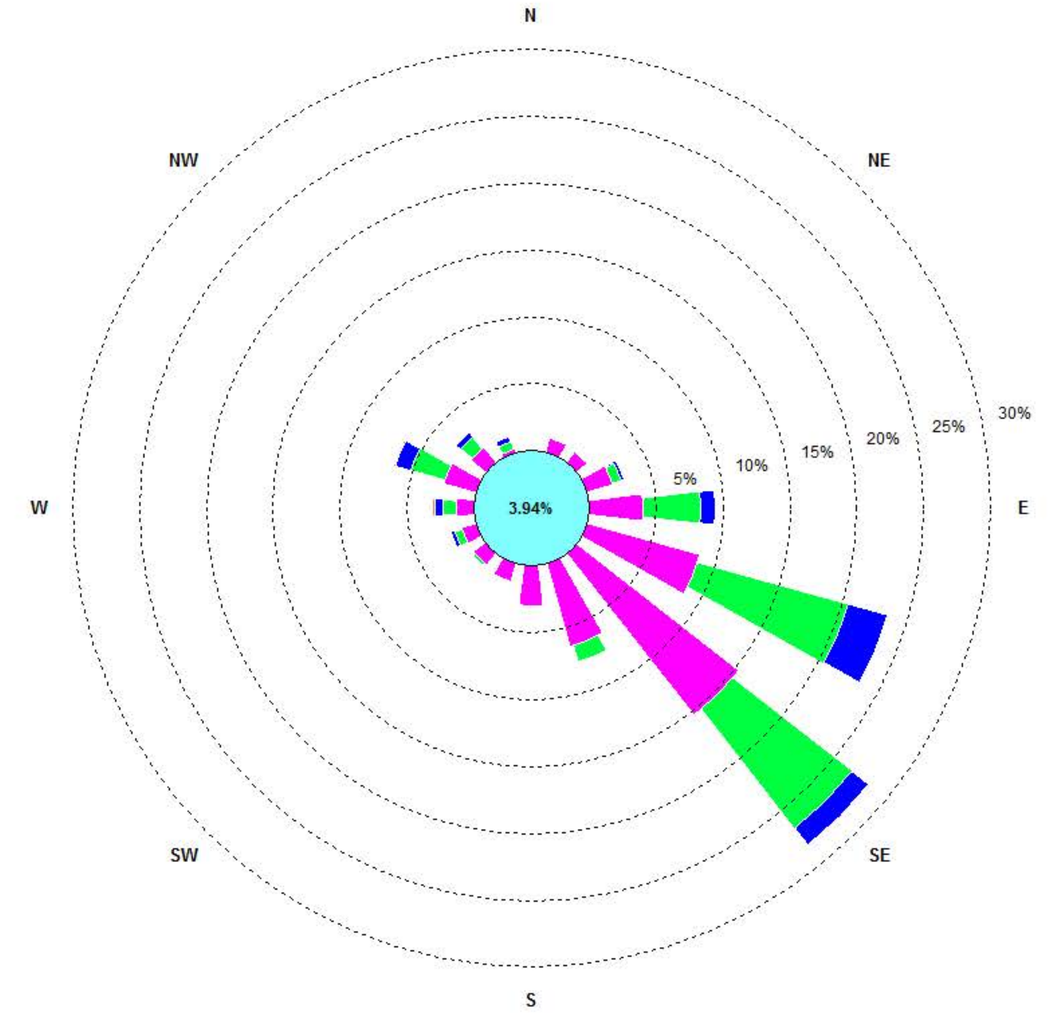
Team Members and Qualifications: **Liddell Coal - Environmental**

Name (Print & Sign)	Position	Company/Site	Years in Industry	Related Qualifications	Related Experience	15/10/2012
A. Hutton	GSSE FACILITATOR	GSSE	17	B. NAT RES M.BEA.	7 YEARS OPERATIONS 10 YEARS CONSULTING	✓
Ben de Sonet	E&C Superintendent	LCO	8	B. EnvSc.	8 years operations 4 years consulting.	✓
Elizabeth Ruppe	Env G Grad	LCO	1	B. EnvSc & Mngmt	1 yr operations	✓
Kelvin Mather	Purchasing Officer	LCO	30			✓
Clive Taylor	Engineering Manager	LCO.	+20	BEng MBA		✓
DANIEL OLDKNOW	CONTRACTOR ON SITE	OLDKNOW EARTHMOVING MANAGER	3			
STEPHEN GARLAND	Coal Quality Co-ord.	LCO	30	OCE	Industry 30yrs	✓
Tiffany Hunt.	TRAINER/ASSESSOR	LCO	8			✓
MARTY BOWER	E&C OFFICER	LCO	1	B. App. Science Dip. Nat Res Mgmt	1 year mining 7 years Enviro field.	✓
NEIL GIBBS	MANAGER-COAL PREPARATION	LCO	+20	MEM+R		
MURRAY GREGSON	MINE MANAGER	"	15	BE MINING	MINING	✓
Loren Yallop	GSSE graduate Env. Scientist	GSSE	0.5	B. EnvSc + Mgt.		

Appendix C

Monthly Windroses

Appendix C Monthly Windroses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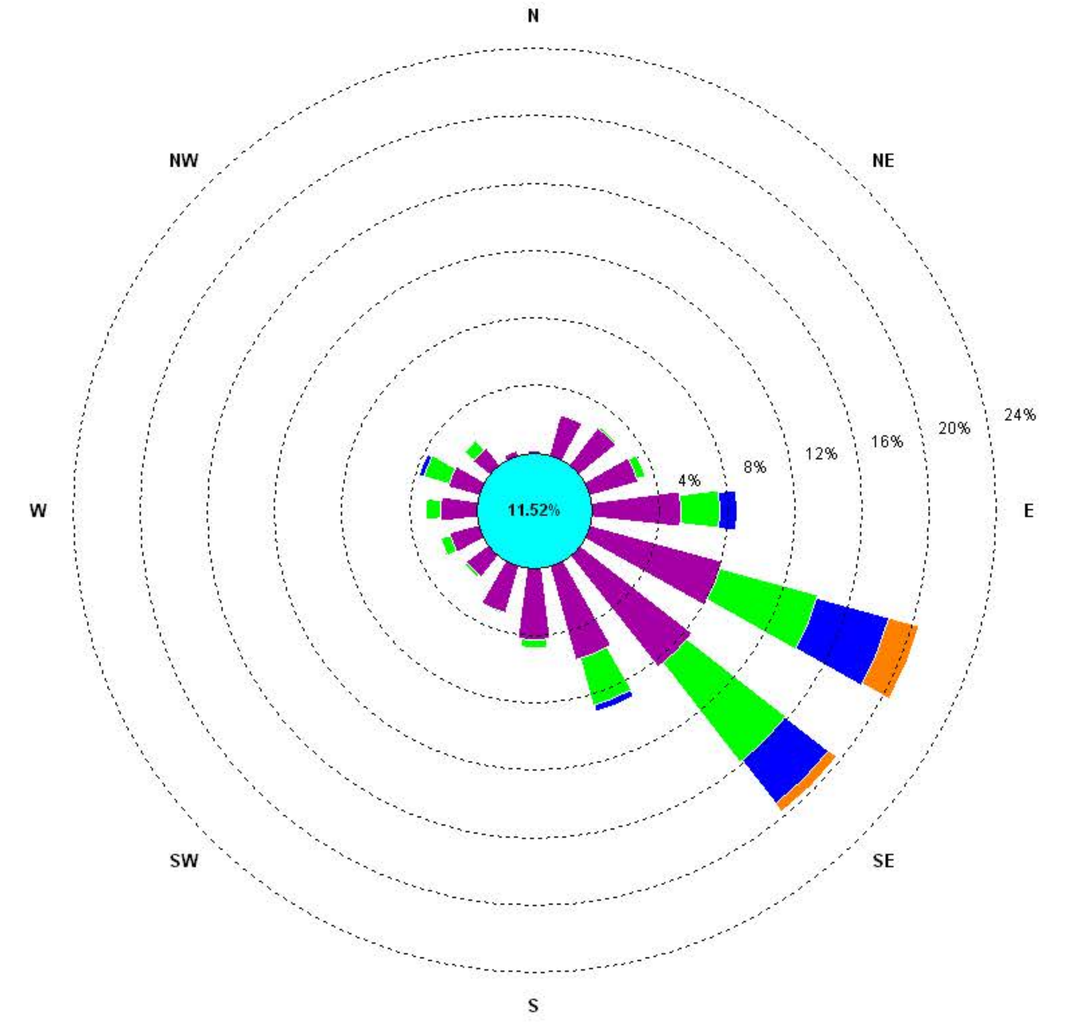
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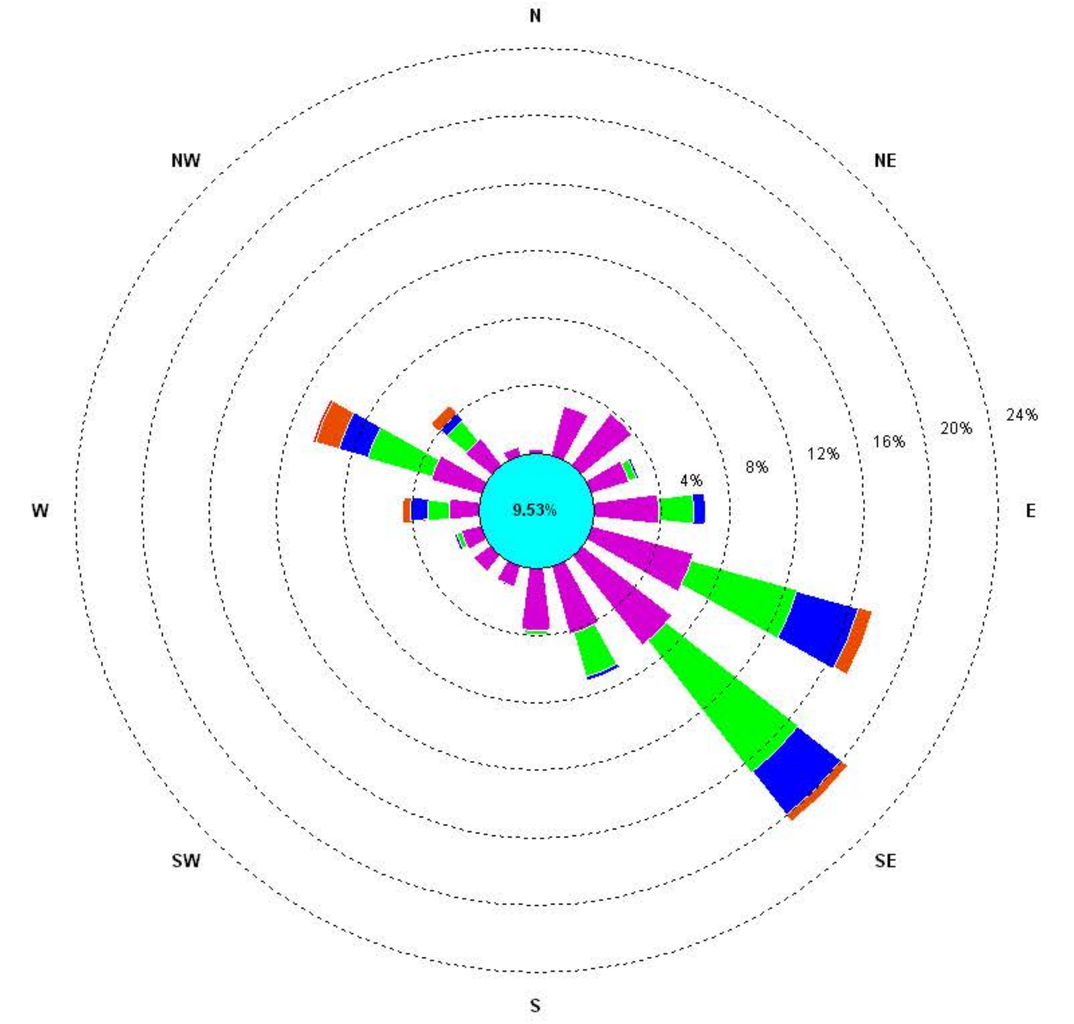
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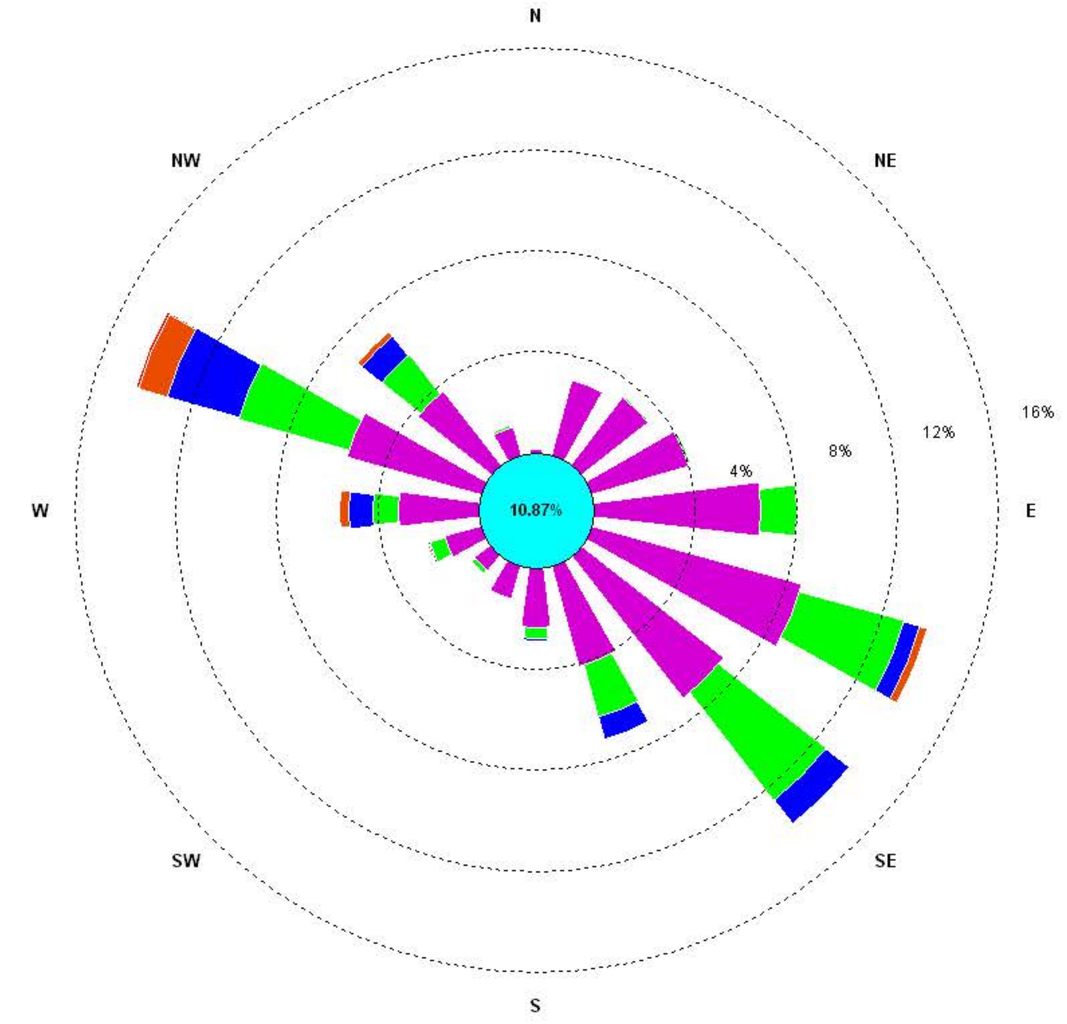
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Wind Velocity (m/s)
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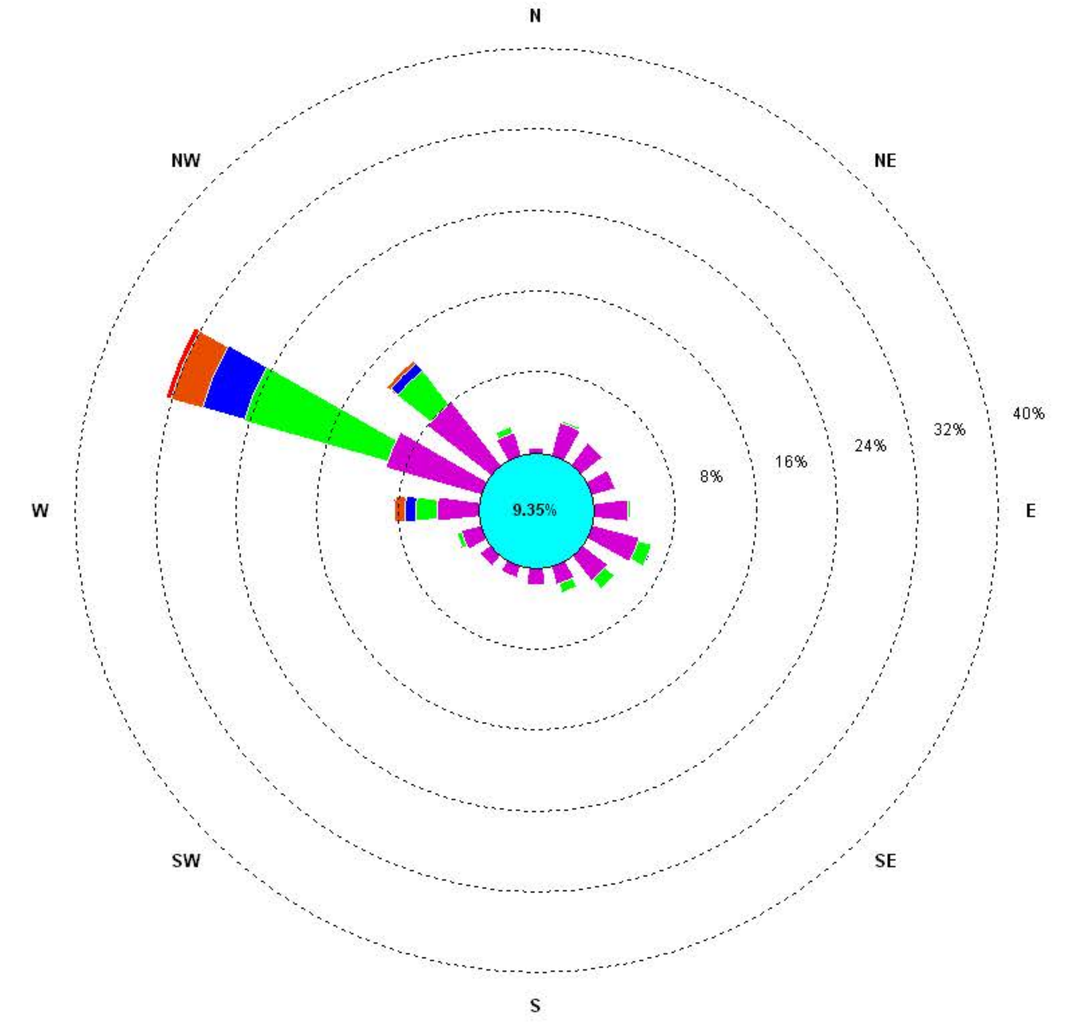
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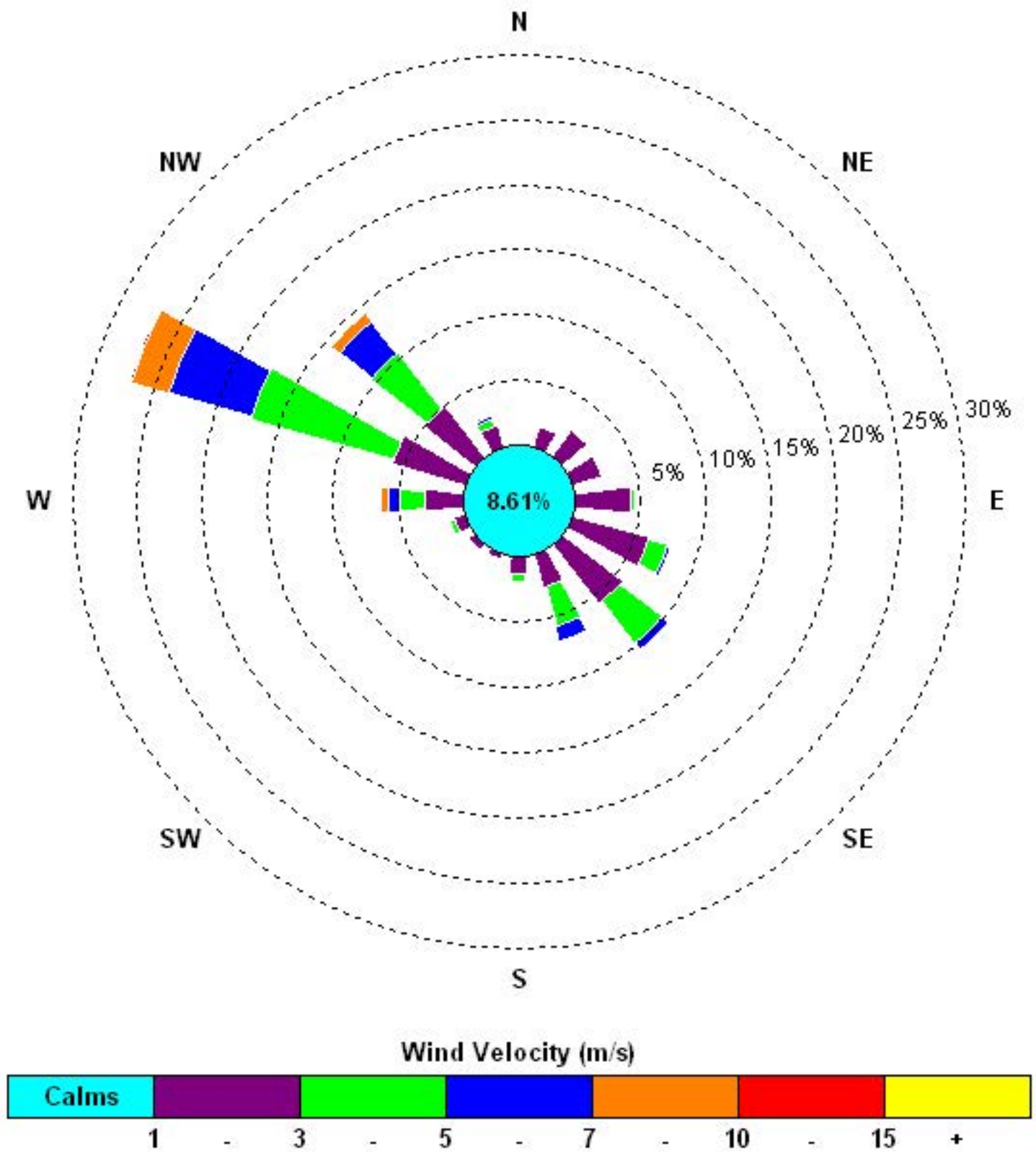
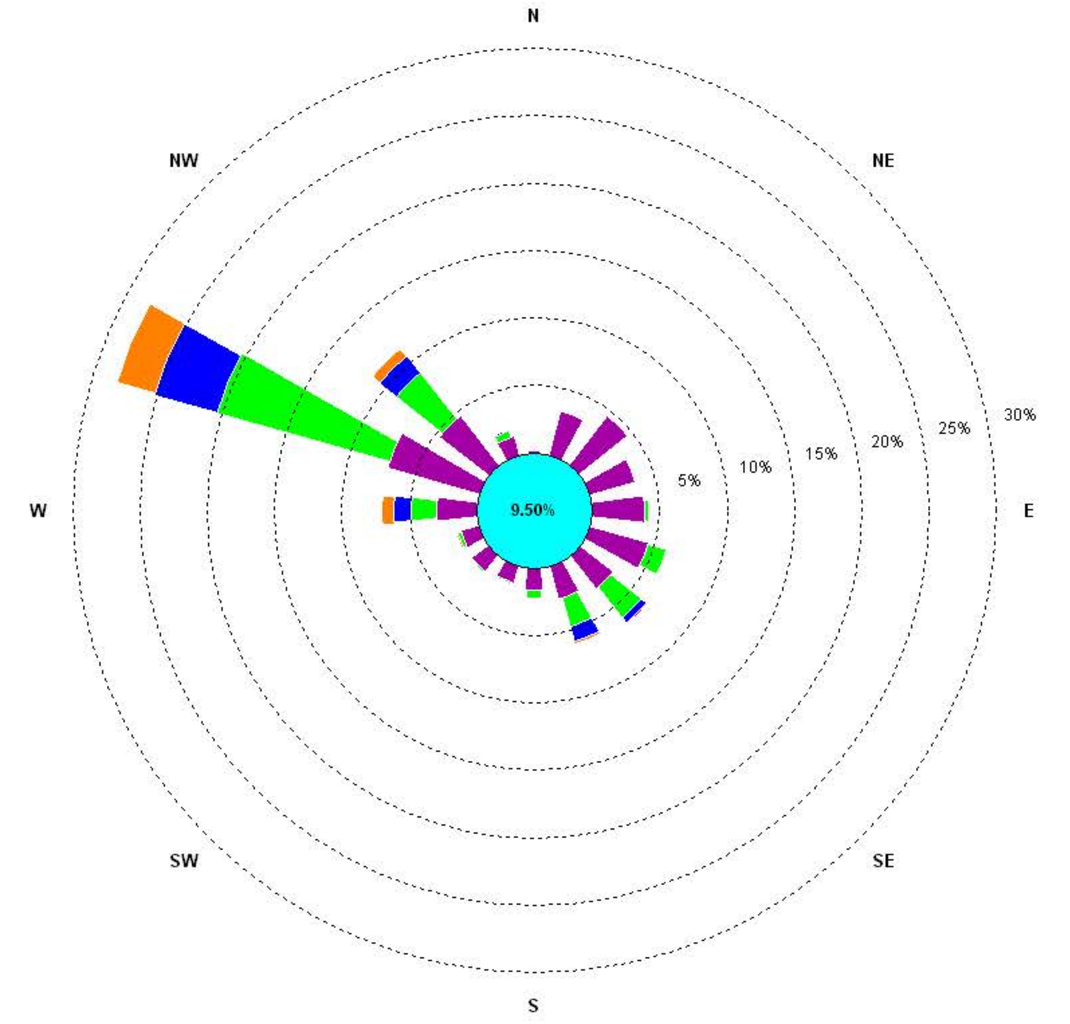
Wind Velocity (m/s)
Calms
1 - 3 - 5 - 7 - 10 - 15 +


N
NE
E
SE
S
SW
W
NW
5%
10%
15%
20%
25%
30%
8.61%
Wind Velocity (m/s)
Calms
1 - 3 - 5 - 7 - 10 - 15 +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NE
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E
SW
SE
S
5%
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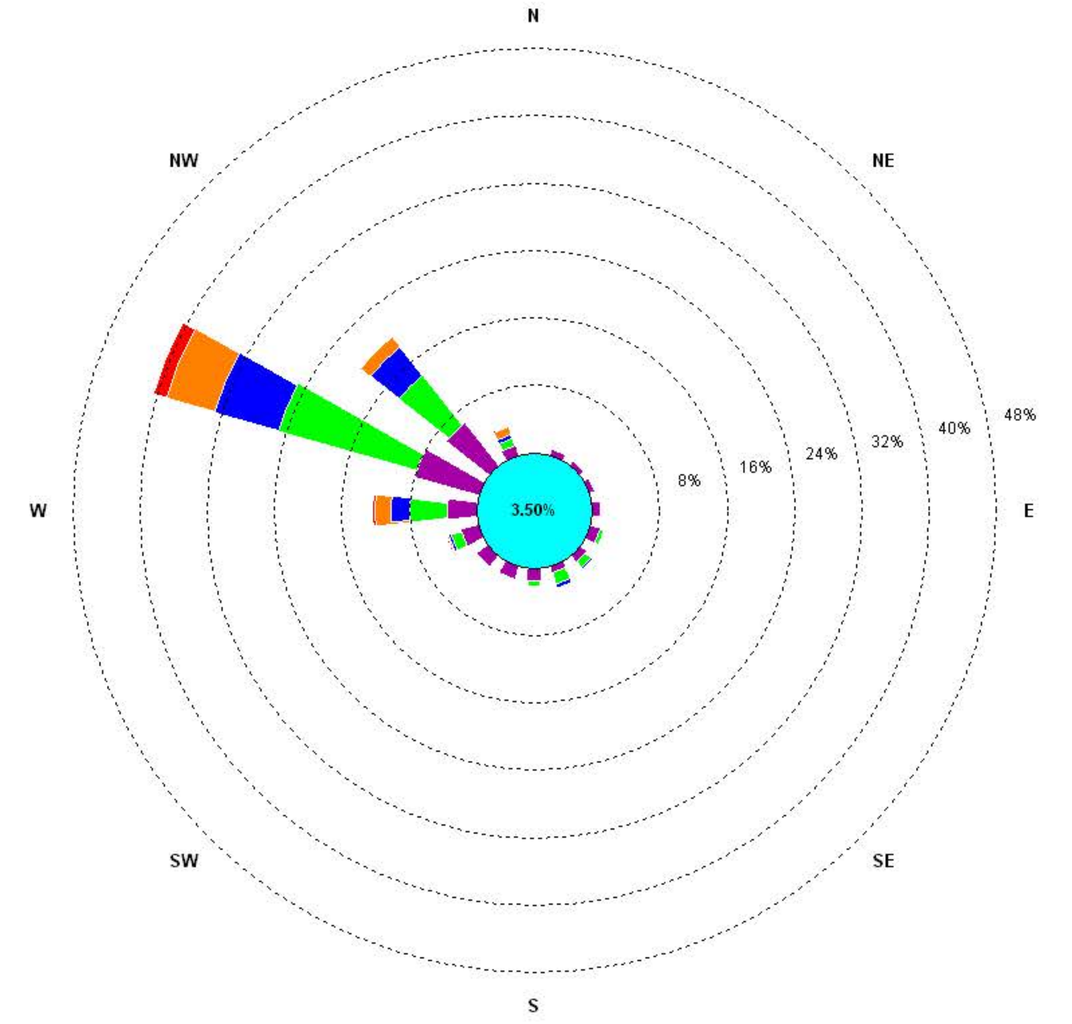
Wind Velocity (m/s)
Calms
1 - 3 - 5 - 7 - 10 - 15 +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W
E
SW
SE
S
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24%
32%
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48%
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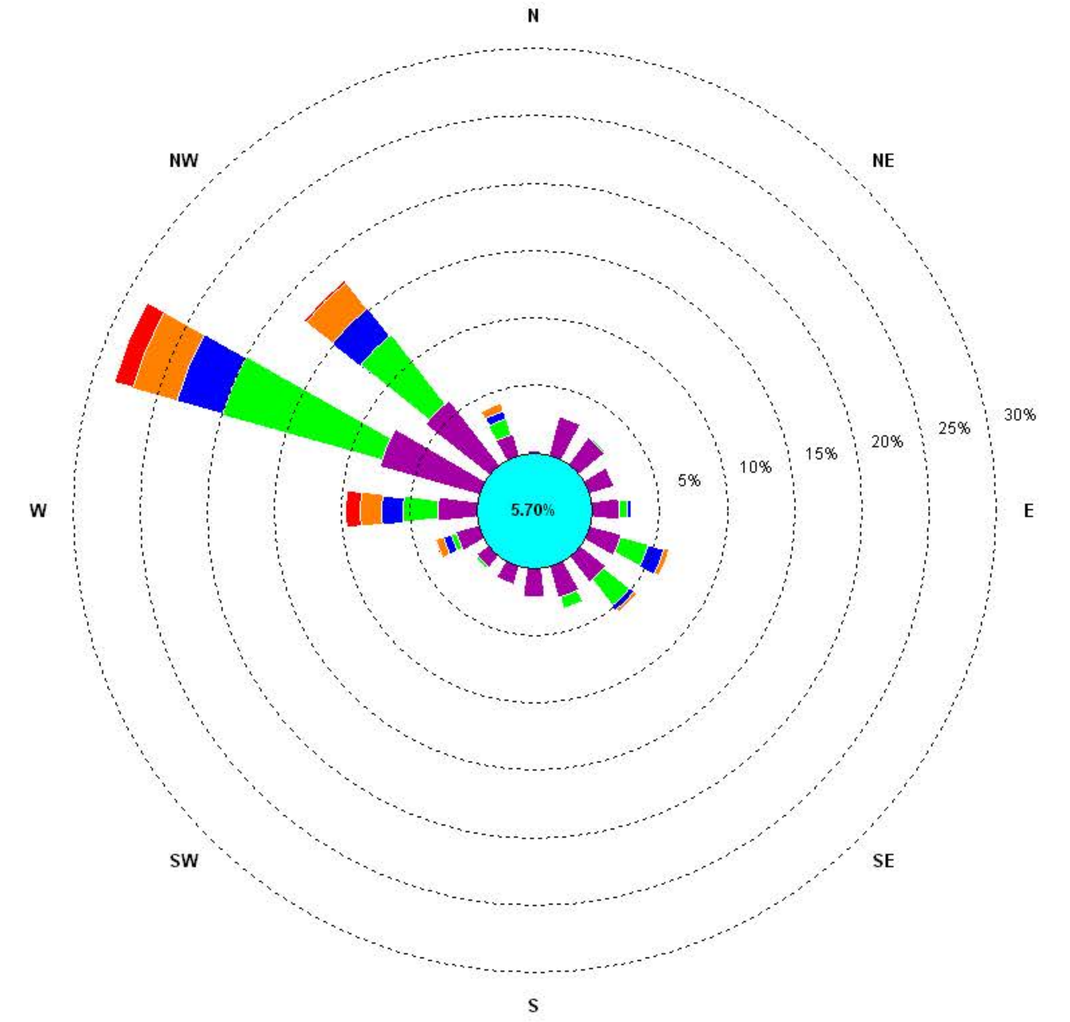
Wind Velocity (m/s)
Calms
1 - 3 - 5 - 7 - 10 - 15 +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E
SE
S
SW
W
NW
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20%
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30%
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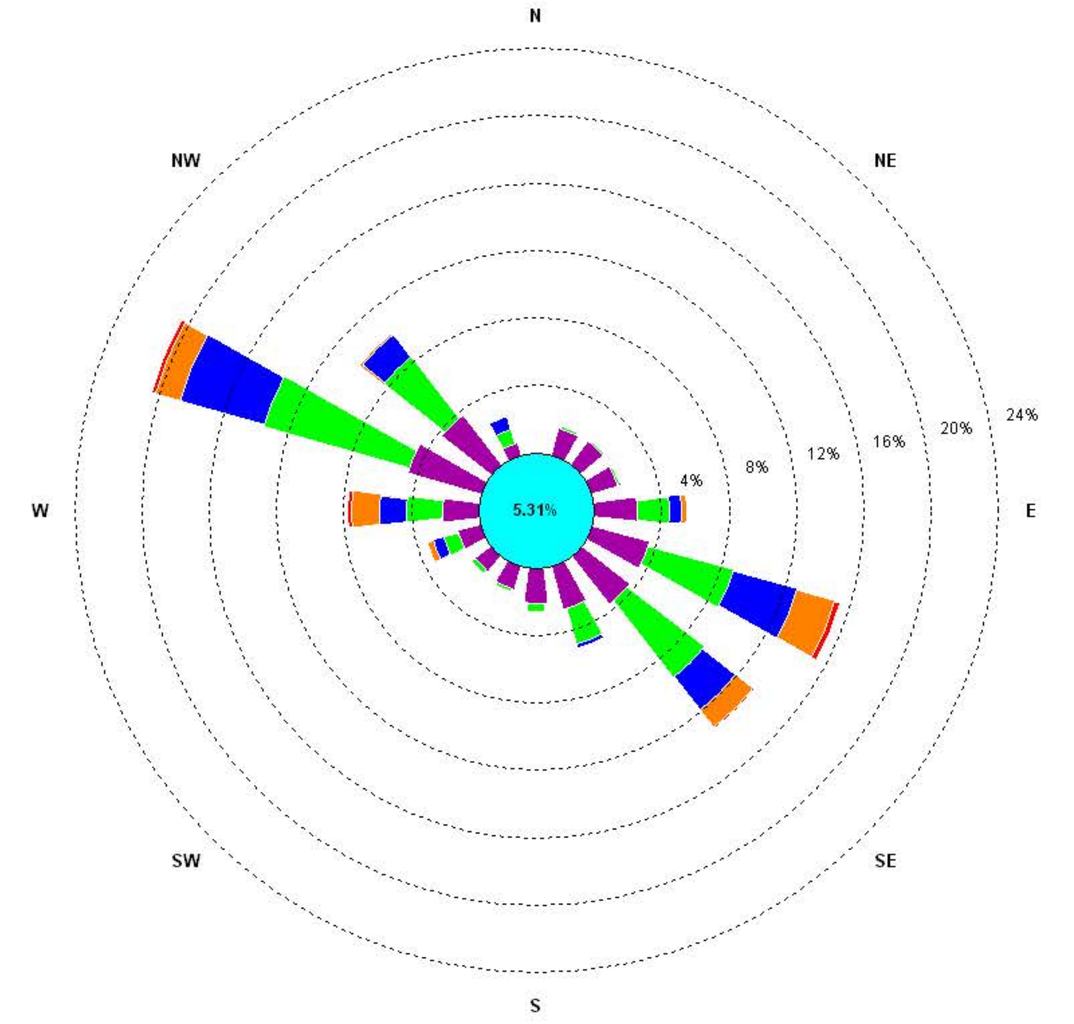
Wind Velocity (m/s)
Calms
1 - 3 - 5 - 7 - 10 - 15 +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NE
E
SE
S
SW
W
NW
4%
8%
12%
16%
20%
24%
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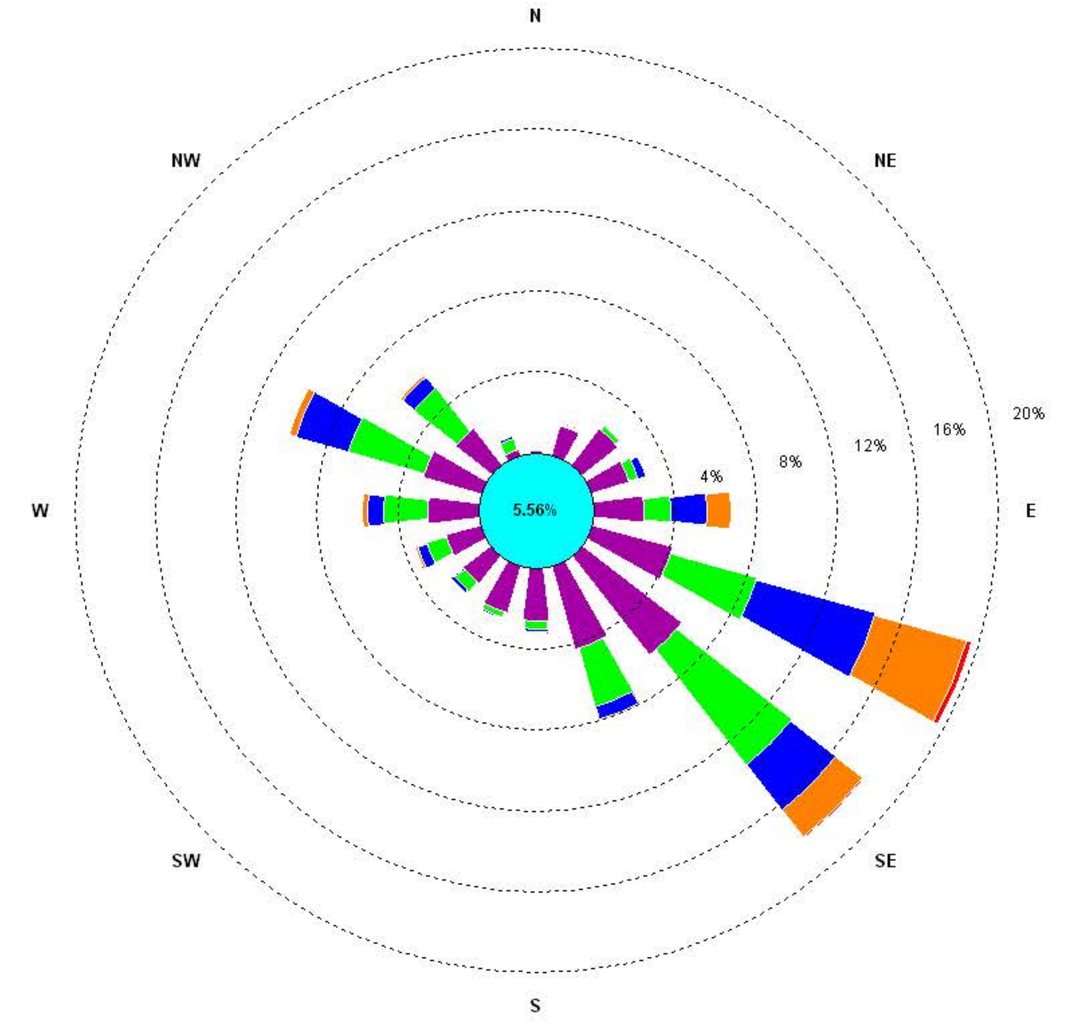
Wind Velocity (m/s)
Calms
1 - 3 - 5 - 7 - 10 - 15 +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E
SE
S
SW
W
NW
4%
8%
12%
16%
20%
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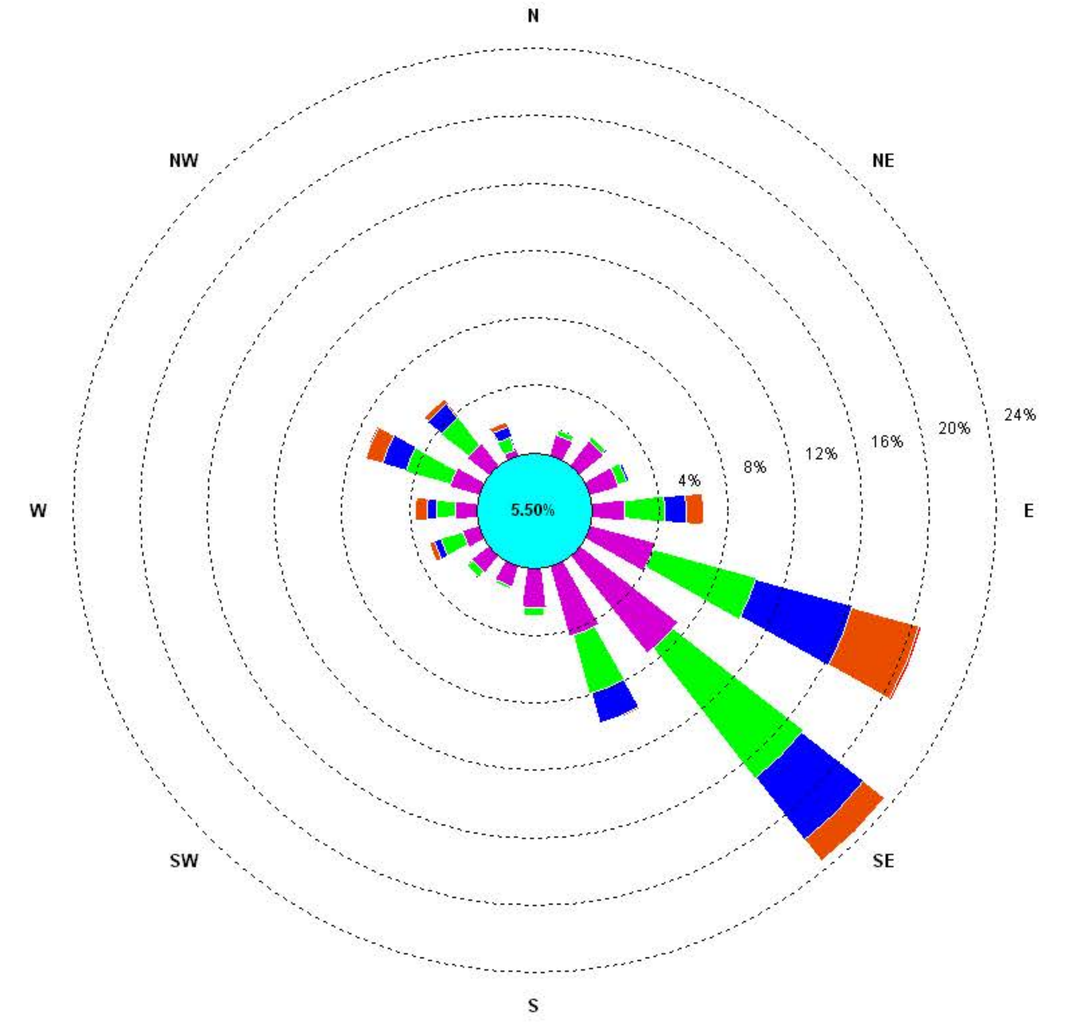
Wind Velocity (m/s)
Calms
1 - 3 - 5 - 7 - 10 - 15 +


N
NE
E
SE
S
SW
W
NW
4%
8%
12%
16%
20%
24%
5.50%
Wind Velocity (m/s)
Calms
1 - 3 - 5 - 7 - 10 - 15 +

Appendix D

Air Quality Monitoring Results

Appendix D Air Quality Monitoring Results

Month	D53		D54		D55		D56		D57		D58		D59		D60		D61		D62	
	Insoluble Solids	Annual Average	Insoluble Solids	Annual Average	Insoluble Solids	Annual Average	Insoluble Solids	Annual Average	Insoluble Solids	Annual Average	Insoluble Solids	Annual Average	Insoluble Solids	Annual Average	Insoluble Solids	Annual Average	Insoluble Solids	Annual Average	Insoluble Solids	Annual Average
Jan-12	2.4	3.3	4	3.0	3.7	1.6	1.9	1.3	4.2	5.4	2.2	1.6	0.9	1.0	1.8	1.9	4.1	4.6	5.3	2.4
Feb-12	3.7	3.4	3.7	3.0	1.4	1.6	2.7	1.4	3.3	5.4	1.7	1.6	1.4	1.0	5.4	2.1	2.6	4.6	2.6	2.3
Mar-12	2.6	3.3	2.6	2.9	1	1.5	1.4	1.4	4.4	5.5	1.2	1.5	1	1.0	1.2	2.0	2.4	4.5	1.3	2.2
Apr-12	5.9	3.5	**11.1c**	2.8	2	1.5	2.2	1.4	10	6.0	2.6	1.5	1.1	0.9	**5.8c**	1.9	**5.9c**	4.6	**12.8c**	2.0
May-12	4.3	3.5	2.4	2.7	1.2	1.5	0.9	1.4	**18.8c**	5.7	2	1.5	0.8	0.9	**8.9c**	2.0	**6.1c**	4.3	1	2.0
Jun-12	3.8	3.6	2.8	2.7	1.3	1.5	1.1	1.3	**14.3c**	5.8	1.6	1.5	3.9	1.2	1.9	2.0	5.5	4.7	1.6	2.1
Jul-12	3.2	3.8	2.5	3.8	1.1	1.7	1.0	2.2	**20.7c**	5.8	1.5	2.1	1	1.5	**19.6c**	2.4	4.6	4.9	0.8	2.6
Aug-12	4.2	3.9	0.5	3.6	0.9	1.7	0.9	2.1	**22.0c**	5.7	**4.1c**	2.2	0.8	1.4	**20.4c**	2.6	5.1	4.6	1.4	2.7
Sep-12	4.2	3.8	3.4	3.5	1.4	1.6	1.2	2.0	**10.8c**	5.3	1.4	2.2	1	1.3	**8.3c**	2.6	7.7	4.5	2.1	2.6
Oct-12	5.1	3.8	3.8	3.5	2	1.6	1.3	1.9	1.4	4.6	**11.3c**	2.2	1.1	1.2	1.4	2.5	6.1	4.8	2.8	2.4
Nov-12	4.6	3.9	6.5	3.7	2.2	1.6	4.5	2.1	**19.4c**	4.6	1.8	2.1	1.5	1.2	2.6	2.4	5.9	4.8	2	2.3
Dec-12	6.6	4.1	6.6	3.7	**4c**	1.6	2.5	1.9	8.9	4.9	3.7	2.1	3.8	1.4	**5.3c**	2.2	6.1	4.9	3.6	2.4

*c – denotes contaminated sample

	Total Suspended Particulates						Scrivens/Antienne Assessment Criteria	Ravensworth Farm Assessment Criteria
	Ravensworth Farm		Scrivens		Antienne			
Date	TSP ($\mu g/m^3$)	TSP Annual Average	TSP ($\mu g/m^3$)	TSP Annual Average	TSP ($\mu g/m^3$)	TSP YTD Average	TSP Annual Average Criterion	TSP Annual Average Criterion
3-Jan-12	98	86	56	34	88	37	90	100
9-Jan-12	85	87	34	34	43	38	90	100
15-Jan-12	95	85	54	33	63	38	90	100
21-Jan-12	67	84	63	33	68	39	90	100
27-Jan-12	34	83	18	32	28	39	90	100
2-Feb-12	13	83	9	32	10	39	90	100
8-Feb-12	42	82	29	32	28	38	90	100
14-Feb-12	31	80	26	31	29	38	90	100
20-Feb-12	34	79	26	31	32	38	90	100
26-Feb-12	57	79	44	31	68	38	90	100
3-Mar-12	26	77	16	30	20	38	90	100
9-Mar-12	125	76	19	30	34	38	90	100
15-Mar-12	73	78	51	30	74	38	90	100
21-Mar-12	51	77	17	30	28	39	90	100
27-Mar-12	84	76	62	29	83	39	90	100
2-Apr-12	89	76	53	29	101	39	90	100
8-Apr-12	106	77	88	30	105	40	90	100
14-Apr-12	118	78	34	30	76	42	90	100
20-Apr-12	79	79	26	31	42	42	90	100
26-Apr-12	93	79	17	31	26	42	90	100
2-May-12	149	80	20	30	30	42	90	100
8-May-12	109	81	11	30	21	41	90	100
14-May-12	140	80	36	30	43	41	90	100
20-May-12	132	81	30	30	52	41	90	100
26-May-12	102	83	9	30	13	41	90	100
1-Jun-12	32	84	22	30	34	41	90	100
7-Jun-12	35	83	14	30	19	42	90	100
13-Jun-12	43	82	14	30	19	41	90	100
19-Jun-12	168	81	5	30	10	41	90	100
25-Jun-12	178	83	9	30	12	40	90	100
1-Jul-12	206	85	17	30	25	40	90	100
7-Jul-12	55	87	24	30	41	40	90	100
13-Jul-12	42	86	6	30	8	41	90	100
19-Jul-12	81	85	36	30	45	40	90	100
25-Jul-12	68	85	20	30	15	41	90	100
31-Jul-12	102	85	37	30	49	41	90	100
6-Aug-12	194	84	20	31	27	41	90	100
12-Aug-12	113	85	55	31	72	41	90	100
18-Aug-12	111	86	15	31	16	42	90	100

	Total Suspended Particulates						Scrivens/Antienne Assessment Criteria	Ravensworth Farm Assessment Criteria
	Ravensworth Farm		Scrivens		Antienne			
Date	TSP ($\mu g/m^3$)	TSP Annual Average	TSP ($\mu g/m^3$)	TSP Annual Average	TSP ($\mu g/m^3$)	TSP YTD Average	TSP Annual Average Criterion	TSP Annual Average Criterion
24-Aug-12	128	86	19	31	19	42	90	100
30-Aug-12	165	88	39	31	46	42	90	100
5-Sep-12	166	89	43	31	42	42	90	100
11-Sep-12	150	90	116	31	110	42	90	100
17-Sep-12	115	91	64	33	69	43	90	100
23-Sep-12	111	90	23	34	27	44	90	100
29-Sep-12	105	90	35	33	41	43	90	100
5-Oct-12	367	91	64	34	66	44	90	100
11-Oct-12	88	96	26	34	43	44	90	100
17-Oct-12	212	96	63	34	76	45	90	100
23-Oct-12	129	99	59	35	59	45	90	100
29-Oct-12	99	99	54	35	70	45	90	100
4-Nov-12	165	98	74	36	102	46	90	100
10-Nov-12	84	100	40	36	55	46	90	100
16-Nov-12	81	98	55	36	79	46	90	100
22-Nov-12	141	97	99	36	119	46	90	100
28-Nov-12	33	99	27	37	41	48	90	100
4-Dec-12	101	99	47	37	62	47	90	100
10-Dec-12	61	99	30	37	72	48	90	100
16-Dec-12	164	100	69	37	98	48	90	100
22-Dec-12	42	102	52	38	75	49	90	100
28-Dec-12	53	102	24	38	55	50	90	100

	PM 10						Scrivens/Antienne Assessment Criteria		Ravensworth Farm Assessment Criteria	
	Ravensworth Farm		Scrivens		Antienne					
Date	PM_{10} (ug/m^3)	PM_{10} Annual Average	PM_{10} (ug/m^3)	PM_{10} Annual Average	PM_{10} (ug/m^3)	TSP YTD Average	PM_{10} Individual Event Criterion	PM_{10} Annual Average Criterion	PM_{10} Individual Event Criterion	PM_{10} Annual Average Criterion
3-Jan-12	28	24	16	13	23	12	50	30	90	40
9-Jan-12	32	24	9	13	21	13	50	30	90	40
15-Jan-12	14	23	8	12	11	13	50	30	90	40
21-Jan-12	19	25	15	12	18	13	50	30	90	40
27-Jan-12	12	25	7	12	10	13	50	30	90	40
2-Feb-12	7	23	5	12	2	13	50	30	90	40
8-Feb-12	19	23	17	12	14	13	50	30	90	40
14-Feb-12	11	22	12	12	10	13	50	30	90	40
20-Feb-12	12	22	12	12	11	12	50	30	90	40
26-Feb-12	19	22	16	12	19	12	50	30	90	40
3-Mar-12	9	22	8	12	5	13	50	30	90	40
9-Mar-12	38	22	11	11	10	12	50	30	90	40
15-Mar-12	18	22	13	12	20	12	50	30	90	40
21-Mar-12	11	22	6	11	10	13	50	30	90	40
27-Mar-12	17	22	16	11	24	12	50	30	90	40
2-Apr-12	21	22	17	11	29	13	50	30	90	40
8-Apr-12	32	22	30	11	34	13	50	30	90	40
14-Apr-12	30	22	16	11	25	13	50	30	90	40
20-Apr-12	30	23	15	10	20	14	50	30	90	40
26-Apr-12	23	23	9	10	9	14	50	30	90	40
2-May-12	29	23	7	10	10	14	50	30	90	40
8-May-12	15	23	5	10	8	14	50	30	90	40
14-May-12	33	23	11	10	11	13	50	30	90	40
20-May-12	22	23	11	10	17	13	50	30	90	40
26-May-12	6	23	4	10	6	13	50	30	90	40
1-Jun-12	10	23	5	10	10	14	50	30	90	40
7-Jun-12	7	23	7	10	7	14	50	30	90	40
13-Jun-12	4	23	5	10	4	14	50	30	90	40
19-Jun-12	4	22	2	10	4	13	50	30	90	40
25-Jun-12	6	22	3	10	6	13	50	30	90	40
1-Jul-12	55	22	4	10	7	13	50	30	90	40
7-Jul-12	10	22	8	10	12	13	50	30	90	40
13-Jul-12	7	22	1	10	2	13	50	30	90	40
19-Jul-12	19	22	9	10	10	13	50	30	90	40
25-Jul-12	19	22	7	10	4	13	50	30	90	40
31-Jul-12	15	22	10	10	19	13	50	30	90	40
6-Aug-12	87	22	11	10	11	13	50	30	90	40
12-Aug-12	22	23	15	10	18	13	50	30	90	40
18-Aug-12	31	23	6	10	5	13	50	30	90	40

	PM 10						Scrivens/Antienne Assessment Criteria		Ravensworth Farm Assessment Criteria	
	Ravensworth Farm		Scrivens		Antienne					
Date	PM_{10} (ug/m^3)	PM_{10} Annual Average	PM_{10} (ug/m^3)	PM_{10} Annual Average	PM_{10} (ug/m^3)	TSP YTD Average	PM_{10} Individual Event Criterion	PM_{10} Annual Average Criterion	PM_{10} Individual Event Criterion	PM_{10} Annual Average Criterion
24-Aug-12	46	23	6	10	8	14	50	30	90	40
30-Aug-12	77	23	15	10	16	13	50	30	90	40
5-Sep-12	77	24	20	10	21	13	50	30	90	40
11-Sep-12	54	25	43	11	37	14	50	30	90	40
17-Sep-12	29	25	22	11	27	14	50	30	90	40
23-Sep-12	26	25	9	12	10	15	50	30	90	40
29-Sep-12	31	25	29	11	9	14	50	30	90	40
5-Oct-12	110	25	30	12	24	14	50	30	90	40
11-Oct-12	16	26	9	12	11	15	50	30	90	40
17-Oct-12	75	26	34	12	30	15	50	30	90	40
23-Oct-12	28	27	19	12	19	15	50	30	90	40
29-Oct-12	19	27	14	12	18	15	50	30	90	40
4-Nov-12	39	27	28	13	31	15	50	30	90	40
10-Nov-12	16	27	10	13	14	15	50	30	90	40
16-Nov-12	18	26	12	13	18	15	50	30	90	40
22-Nov-12	41	26	29	13	34	15	50	30	90	40
28-Nov-12	9	26	7	13	9	15	50	30	90	40
4-Dec-12	39	26	17	13	17	15	50	30	90	40
10-Dec-12	12	26	6	13	13	15	50	30	90	40
16-Dec-12	52	26	22	13	27	15	50	30	90	40
22-Dec-12	15	27	12	13	18	15	50	30	90	40
28-Dec-12	22	27	11	13	17	15	50	30	90	40

Appendix E

Surface Water Monitoring Results

Appendix E Surface Water Monitoring Results

Bayswater Creek Quarterly Results

Month	BCK 1A				BCK2				BCK2A				BCK3				BCK4				BCK5			
	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)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jan-12	8.14	1000	<5	594	8.15	948	5	608	8.11	934	48	584	8.05	1010	30	602	8.13	1020	24	606	8.1	1020	50	614
Apr-12	8	928	<5	532	8.05	926	<5	542	8.08	900	9	492	8.1	929	12	518	8.16	1050	18	608	8.16	1070	21	604
Jul-12	8.21	728	5	420	8.26	734	7	432	8.24	774	6	412	8.25	770	12	460	8.28	793	62	422	8.3	825	6	490
Oct-12	7.83	2640	<5	1670	7.64	898	6	486	7.65	899	<5	518	8.18	1380	40	816	8.13	1380	37	800	8.03	1420	6	864
Average	**8**	**1324**	**5**	**804**	**8**	**877**	**6**	**517**	**8**	**877**	**21**	**502**	**8**	**1022**	**24**	**599**	**8**	**1061**	**35**	**609**	**8.15**	**1084**	**21**	**643**

Bayswater Creek Monthly Results

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)
Jan-12	7.92	2670	28	1920	8.35	3460	51	2240	8.14	3760	10	2570
Feb-12	7.98	2210	6	1480	8	2220	10	1410	8	2230	22	1490
Mar-12	7.76	3600	34	2430	8.13	4310	<5	2870	7.92	4270	12	2870
Apr-12	7.91	3180	28	2090	8.31	3780	18	2530	7.8	3640	8	2480
May-12	7.88	3240	18	2080	8.15	3780	54	2460	7.94	3300	8	2180
Jun-12	8	3750	30	2490	8.25	4420	206	3070	7.93	3540	6	2490
Jul-12	8.02	2870	17	1920	8.19	3440	20	2290	7.75	3340	13	2330
Aug-12	7.89	2780	12	1740	7.88	3240	10	2120	8	3320	7	2210
Sep-12	7.9	2770	16	1790	8.33	3290	302	2050	8.36	3310	186	2050
Oct-12	7.88	2880	35	1830	8.15	3540	14	2240	8.2	3540	12	2200
Nov-12	7.67	2890	14	1690	8.15	3540	<5	2040	No Sample			
Dec-12	8.36	3160	50	2060	8.31	3180	782	1970				
Average	**8**	**3000**	**24**	**1960**	**8**	**3517**	**147**	**2274**	**8**	**3425**	**28**	**2287**

Bowmans Creek Monthly Results

Month	BCK1 (Bowmans Creek Upstream)				BCK6 (Bowmans Ck Downstream)			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jan-12	8.08	738	<5	424	8.15	994	44	600
Feb-12	8.1	472	36	286	8.08	528	57	318
Mar-12	7.97	661	7	390	8.04	990	14	602
Apr-12	7.94	804	<5	476	8.17	1030	6	592
May-12	7.96	806	<5	492	7.98	1050	6	544
Jun-12	8.12	731	13	452	8.16	916	6	576
Jul-12	8.2	658	9	370	8.31	818	6	500
Aug-12	7.97	771	<5	412	8.04	1020	6	554
Sep-12	8.02	850	<5	500	7.87	1040	<5	578
Oct-12	7.84	883	<5	504	7.91	1100	6	644
Nov-12	7.53	893	<5	458	7.64	1120	<5	606
Dec-12	8.01	877	40	530	7.98	1290	73	744
Average	**8**	**762**	**21**	**441**	**8**	**991**	**22**	**572**

Onsite Dams Monthly Results

Month	Dam 1				Dam 4				Dam 6			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jan-12	8.58	677	11	410	8.82	4920	20	3050	No Sample			
Feb-12	8.56	685	10	370	8.87	4520	12	2790				
Mar-12	8.28	694	24	386	8.76	4560	8	3000				
Apr-12	8.28	756	8	476	8.77	4660	8	3110				
May-12	8.1	754	<5	362	8.64	4910	14	3270				
Jun-12	8.31	784	<5	524	8.64	5040	6	3360				
Jul-12	8.43	921	5	456	8.58	5100	6	3420				
Aug-12	8.65	813	18	434	8.61	5080	11	3260				
Sep-12	8.96	850	17	492	8.74	5290	8	3340				
Oct-12	8.55	967	36	592	8.8	5610	115	3520	8.44	5740	28	4280
Nov-12	8.69	1020	<5	586	8.94	5690	8	3340	8.49	6190	12	4310
Dec-12	8.74	1070	10	662	8.81	5530	8	3410	8.62	5980	6	4280
Average	**9**	**833**	**15**	**479**	**9**	**5076**	**19**	**3239**		**5970**	**15**	**4290**

Month	Dam 13								Dam 17				Reservoir Tailings Dam				Mt Owen Transfer Dam			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	Total Phosphorus (mg/L)	Total Nitrogen (mg/L)	Total Coliforms (Col/100mL)	Faecal Coliforms (Col/100mL)	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)
Jan-12	8.79	3760	6	2340	0.04	2.9	>48392	Est. 67	8.77	5420	36	3510	8.89	8610	61	5640	9.73	3080	46	1760
Feb-12	8.56	2420	28	1420	0.07	4.3	29090	170	8.63	5190	13	3280	8.98	5440	30	3600	9.49	3390	24	2080
Mar-12	9.02	4310	79	2850	<0.01	12.1	30760	est.18	8.71	5260	16	3510	8.84	5980	56	3920	8.72	3870	10	2320
Apr-12	9.02	3620	72	2370	0.01	1.3	13760	est.64	8.75	5360	38	3600	8.89	6010	20	4170	8.86	3800	16	2360
May-12	8.96	4600	35	2970	0.3	1.2	850	<9	8.69	5450	12	3580	8.83	5930	22	3970	8.91	3910	10	2440
Jun-12	8.95	4400	60	2880	0.05	1.2	100	<9	8.71	5490	16	3720	8.81	5910	82	3960	8.9	3920	47	2510
Jul-12	9	3610	45	2210	0.05	1.4	1406	est 36	8.69	5450	8	3600	8.75	6650	11	4460	8.93	3960	11	2460
Aug-12	8.98	4210	36	2660	0.07	1	82	<9	8.73	5530	33	3570	9.03	10100	57	6410	Sampling Ceased			
Sep-12	9.08	5550	43	3630	0.09	1.4	3444	est 18	8.85	5760	53	3640	9.15	14200	84	10000				
Oct-12	9.06	8070	138	5880	0.38	8.3	24066	est 250	8.8	5840	19	3500	No Sample							
Nov-12	9.42	10100	66	6450	0.12	2.4	60165	est.9	8.9	5890	8	3550								
Dec-12	9.47	11100	54	7430	0.06	1.6	241960	<9	8.77	5880	<5	3760								
Average	**9**	**5479**	**55**	**3591**	**0**	**3**	**36880**		**9**	**5543**	**23**	**3568**	**9**	**7648**	**47**	**5126**	**9**	**3704**	**23**	**2276**

Appendix F

Groundwater Monitoring Results

Appendix F Groundwater Monitoring Results

Liddell Coal Monthly Groundwater Monitoring Data - January 2012 to December 2012

	ALV1 Large						*ALV1 Small*						*ALV2 Large*						*ALV2 Small*					
Month	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**
Jan-12	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Feb-12	7.1	1175	3.2	Clear	Nil	Clear	7.6	1363	2.53	Clear	Nil	Clear	7.4	2184	4.10	Clear	Nil	Clear	7.6	2620	3.45	Clear	Nil	Clear
Mar-12	7.0	1198	3.32	Clear	Nil	Clear	7.52	1476	2.66	Clear	Nil	Clear	7.4	1665	4.21	Clear	Nil	Clear	7.6	2720	3.51	Clear	Yes	Clear
Apr-12	7.0	1162	2.39	Clear	Nil	Clear	7.3	1441	2.72	Clear	Nil	Clear	7.2	2244	4.27	Clear	Nil	Clear	7.6	2750	3.66	Clear	Nil	Clear
May-12	7.1	1196	3.41	Clear	Nil	Clear	7.44	1470	2.71	Clear	Nil	Clear	7.5	2510	4.31	Clear	Nil	Clear	7.8	2800	3.75	Clear	Nil	Clear
Jun-12	6.9	916	3.39	Brown	Nil	Slight	7.6	1134	2.73	Clear	Nil	Clear	7.1	1639	4.27	Clear	Nil	Clear	7.6	2110	3.74	Brown	Nil	Slight
Jul-12	6.94	1154	3.16	Brown	Yes	Slight	7.53	1418	2.50	Clear	Nil	Clear	7.13	1991	4.12	clear	nil	clear	7.76	2640	3.54	clear	nil	clear
Aug-12	7.21	1133	3.44	Clear	Nil	Slight	7.99	1390	2.71	Clear	Nil	Clear	7.51	1889	4.32	clear	nil	clear	8.09	2730	3.80	clear	nil	clear
Sep-12	7.16	1187	3.49	Brown	Nil	Slight	7.94	1462	2.76	Clear	Nil	Clear	7.11	2146	4.36	Clear	Nil	Clear	7.63	2890	3.87	Clear	Nil	Clear
Oct-12	7.03	1156	3.72	Orange	Nil	Turbid	7.90	1387	3.13	Clear	Nil	Clear	7.26	2055	4.38	Clear	Nil	Clear	7.92	2830	3.92	Clear	Nil	Clear
Nov-12	7.09	1133	4.10	Clear	Nil	Clear	7.91	1398	3.60	Clear	Nil	Clear	7.44	1881	4.40	Clear	Nil	Clear	7.89	2830	4.02	Clear	Nil	Clear
Dec-12	7.01	1066	4.15	Brown	Nil	Slight	7.79	1327	3.66	Clear	Nil	Clear	7.45	1717	4.43	clear	nil	clear	7.89	2690	4.04	clear	nil	clear

	ALV3 Large						*ALV3 Small*						*ALV4 Large*						*ALV4 Small*					
Month	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**
Jan-12	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Feb-12	7.3	750	4.66	Clear	Nil	Clear	7.4	1596	4.85	Clear	Nil	Clear	7.3	2333	4.99	Clear	Nil	Clear	7.3	5200	5.03	Clear	Nil	Clear
Mar-12	7.1	728	4.76	Clear	Nil	Clear	7.4	1637	4.96	Clear	Nil	Clear	7.0	3080	5.12	Clear	Nil	Clear	7.25	5220	4.99	Clear	Nil	Clear
Apr-12	7.3	796	4.8	Clear	Nil	Clear	7.3	1656	4.99	Clear	Nil	Clear	7.3	2910	5.13	Clear	Nil	Clear	7.4	5210	5.31	Clear	Nil	Clear
May-12	7.3	852	4.8	Clear	Nil	Clear	7.4	1712	4.99	Clear	Nil	Clear	7.1	2700	5.1	Clear	Nil	Clear	7.39	5300	5.37	Clear	Nil	Clear
Jun-12	6.9	678	4.77	Clear	Nil	Clear	7.3	1341	4.96	Grey	H2S	Slight	6.9	1870	5.08	Brown	Nil	Slight	7.4	4000	5.34	Grey	H2S	Slight
Jul-12	7.21	864	4.50	clear	nil	clear	7.39	2125	4.66	clear	nil	clear	7.12	2250	4.75	Brown	nil	slight	7.45	5140	5.25	clear	nil	clear
Aug-12	7.40	781	4.83	clear	nil	clear	7.78	2640	5.02	clear	nil	clear	7.20	2370	5.07	Light Brown	nil	slight	7.82	5070	5.40	clear	nil	clear
Sep-12	7.28	900	4.93	Clear	Nil	Clear	7.70	2850	5.08	clear	Nil	Clear	7.21	2520	5.11	Brown	Nil	Slight	7.76	5430	5.51	Clear	Nil	Clear
Oct-12	7.17	911	4.91	Clear	Nil	Clear	7.74	2870	5.13	Clear	H_2S	Clear	6.86	2538	5.19	Clear	Nil	Clear	7.45	5430	5.63	Clear	Nil	Clear
Nov-12	7.22	920	5.07	Clear	Nil	Slight	7.60	2610	5.30	Clear	Nil	Clear	6.95	2437	5.43	Brown	Nil	Slight	7.50	5280	5.83	Clear	Nil	Clear
Dec-12	7.36	903	5.15	clear	nil	clear	7.58	2111	5.30	clear	nil	clear	6.97	2337	5.46	Brown	nil	slight	7.56	4930	5.74	Brown	nil	Slight

	PGW5 Large (Overburden)						*PGW5 Small (Pikes Gully Seam)*						*ALV7 Large*						*ALV7 Small*					
Month	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**
Jan-12	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Feb-12	7.5	4850	8.39	Clear	Nil	Clear							7.3	1520	6.00	Clear	Nil	Clear	7.2	2103	7.81	Clear	Nil	Clear
Mar-12	7.4	4920	9.84	Clear	Nil	Clear	7.11	5270	9.14	Brown	Nil	Turbid	7.2	1517	5.55	Brown	Nil	Slight	7.2	2123	7.83	Clear	Nil	Clear
Apr-12													7.2	1535	6.16	Brown	Nil	Slight	7.2	2137	8.16	Clear	Nil	Clear
May-12	7.5	5040	10.65	Clear	Nil	Clear	7.35	5380	9.71	Brown	Nil	Turbid	7.2	1595	6.26	Clear	Nil	Slight	7.3	2199	8.29	Clear	H2S	Clear
Jun-12	7.4	3850	10.51	Clear	Nil	Clear	7.2	4050	9.78	Brown	Nil	Turbid	7.1	1223	6.29	Brown	Nil	Slight	7.3	1693	8.37	Cloudy	H2S	Cloudy
Jul-12	7.42	4930	9.86	clear	nil	clear	7.39	5270	9.71	Brown	nil	clear	7.21	1594	6.27	clear	nil	clear	7.27	2209	8.35	clear	H_2S	clear
Aug-12	7.87	4910	10.56	clear	nil	clear	7.60	5140	9.94	Brown	nil	slight	7.59	1589	6.35	clear	nil	slight	7.67	2193	8.56	clear	H_2S	clear
Sep-12	7.78	5260	10.80	Clear	Nil	Clear			10.14				7.16	1689	6.38	Clear	Nil	Clear	7.18	2272	8.59	Clear	Nil	Clear
Oct-12	7.51	5270	10.53	Clear	Nil	Clear							7.28	1667	6.46	clear	Nil	Clear	7.39	2245	8.77	Clear	Nil	Clear
Nov-12	7.58	5110	10.74	Clear	Nil	Clear			10.26				7.17	1641	6.51	Clear	Nil	Slight	7.33	2234	8.93	Clear	Nil	Clear
Dec-12	7.60	4870	10.46	clear	nil	clear			10.21				7.23	1544	6.54	clear	nil	clear	7.31	2110	8.98	Clear	Nil	Clear

	ALV8 Large						*ALV8 Small*						*LBH (Alluvium)*						*LC1 (Coal Measures)*					
Month	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**
Jan-12	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Feb-12	7.9	821	5.72	Clear	Nil	Clear	7.3	1672	6.37	Clear	Nil	Clear	7.1	995	3.62	Clear	Nil	Clear			dry			
Mar-12	7.4	701	5.7	Clear	Nil	Clear	7.1	1708	6.41	Clear	Nil	Clear	7.1	1017	3.72	Clear	Nil	Clear			dry			
Apr-12	7.0	679	5.96	Clear	Nil	Clear	7.0	1716	6.77	Clear	Nil	Clear	7.0	1012	3.75	Clear	Nil	Clear			dry			
May-12	6.7	711	6.03	Clear	Nil	Clear	6.9	1705	6.85	Clear	Nil	Clear	7.1	1030	3.74	Clear	Nil	Clear			dry			
Jun-12	6.9	573	6.00	Cloudy	Nil	Slight	7.2	1326	6.90	Clear	Nil	Clear	6.9	769	3.72	Clear	Nil	Clear			dry			
Jul-12	7.22	788	5.91	clear	nil	clear	7.16	1727	6.82	clear	nil	clear	7.12	972	3.46	clear	nil	clear			dry			
Aug-12	7.92	783	6.07	clear	nil	clear	7.69	1637	7.02	clear	nil	clear	7.32	932	3.78	clear	nil	clear			dry			
Sep-12	7.17	856	6.15	Clear	Nil	Slight	7.31	1780	7.15	Clear	Nil	Clear	7.14	1003	3.86	Clear	Nil	Clear			dry			
Oct-12	7.08	849	6.27	Clear	Nil	Slight	7.37	1780	7.29	Clear	Nil	Clear	7.14	998	3.92	Clear	Nil	Clear			dry			
Nov-12	7.25	829	6.56	Clear	Nil	Clear	7.42	1741	7.53	Clear	Nil	Clear	7.14	994	4.10	Clear	Nil	CLear			dry			
Dec-12	7.13	795	6.59	clear	nil	clear	7.51	1656	7.61	Clear	Nil	Clear	7.09	963	4.13	Clear	Nil	Clear			dry			

	Haz 4 (Coal Measures)						*Haz 6 (Coal Measures)*						*Mt Owen 2 (Coal Measures)*					
Month	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**	**pH**	**Conductivity (uS.cm-1)**	**Depth to Water (m)**	**Colour**	**Odour**	**Turbidity**
Jan-12	---	---	---	---	---	---	---	---	---	---	---	---	---	---	128.5	---	---	---
Feb-12			30.58				7.7	4350	21.71	Clear	Nil	Clear			129.89			
Mar-12			29.68				7.9	4830	20.78	Clear	Yes	Clear			124.94			
Apr-12			30.34				7.9	4460	21.51	Clear	Nil	Clear			126.79			
May-12			31.00				7.9	4390	22.13	Clear	Nil	Clear			128.59			
Jun-12			31.68				7.9	3650	22.95	Brown	Nil	Slight			123.76			
Jul-12			32.18										---	---	126.7	---	---	---
Aug-12			33.00				7.93	4590	24.15	clear	nil	clear	---	---	135.62	---	---	---
Sep-12			33.70				7.96	4660	24.75	Clear	Nil	Clear	---	---	137.69	---	---	---
Oct-12			34.43				7.86	4460	24.67	Clear	Nil	Clear	---	---	140.08	---	---	---
Nov-12							8.14	4780	26.67	Clear	Nil	Clear	---	---	144.3	---	---	---
Dec-12			36.51				8.14	5120	24.32	clear	H_2S	clear	---	---	147.09	---	---	---

Liddell Coal - Six Monthly Groundwater Samples (June 2012)

Date Sampled: **28/06/2012**

ANALYSIS DESCRIPTION	UNIT	LOR	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	Mt Owen Bore	LC1
			a1																		
pH Value	pH Unit	0.01	7.29	7.93	7.6	8.01	7.42	7.8	7.25	7.77	7.8	7.68	7.64	7.77	7.49	7.66	N/A	8.12	7.51	N/A	dry
Electrical Conductivity @ 25°C	µS/cm	1	1130	1400	2110	2730	852	1920	2390	5200	4940	5210	1540	2120	723	1680	N/A	4820	956	N/A	dry
Total Dissolved Solids @180°C	mg/L	1	676	826	1300	1530	548	1230	1600	3230	3420	4830	902	1170	442	922	N/A	3050	626	N/A	dry
Suspended Solids (SS)	mg/L	1	40	47	26	69	28	51	38	110	13	8600	322	56	421	75	N/A	70	46	N/A	dry
Chloride	mg/L	0.5	180	220	329	580	121	358	577	1220	672	827	272	453	74	303	N/A	829	125	N/A	dry
Sulfate	mg/L	0.5	161	214	332	157	72	210	222	320	919	878	190	115	85	137	N/A	707	94	N/A	dry
Hydroxide Alkalinity as CaCO3	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	N/A	<1	<1	N/A	dry
Carbonate Alkalinity as CaCO3	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	N/A	<1	<1	N/A	dry
Bicarbonate Alkalinity as CaCO3	mg/L	1	192	240	366	452	209	314	237	617	915	968	256	387	172	337	N/A	730	242	N/A	dry
Total Alkalinity as CaCO3	mg/L	1	192	240	366	452	209	314	237	617	915	968	256	387	172	337	N/A	730	242	N/A	dry
Silicon	mg/L	0.05	9.68	8.46	10.4	5.46	10.7	11.5	11.8	9.34	5.83	10.2	11.4	13.5	22.8	14.4	N/A	7.11	8.89	N/A	dry
Calcium	mg/L	1	67	54	113	23	38	41	103	78	69	165	83	80	23	65	N/A	56	29	N/A	dry
Magnesium	mg/L	1	26	45	57	29	21	45	80	128	128	165	40	61	13	42	N/A	63	18	N/A	dry
Sodium	mg/L	1	159	219	330	631	128	370	313	971	1010	954	233	346	121	297	N/A	1080	177	N/A	dry
Potassium	mg/L	1	4	4	4	5	2	3	4	9	10	6	2	5	1	4	N/A	10	2	N/A	dry
Aluminium	mg/L	0.01	<0.01	0.7	0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.11	0.01	<0.01	0.02	<0.01	<0.01	N/A	0.04	<0.01	N/A	dry
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	N/A	<0.001	<0.001	N/A	dry
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	N/A	<0.001	<0.001	N/A	dry
Barium	mg/L	0.001	0.085	0.149	0.094	0.05	0.027	0.038	0.187	0.092	0.044	0.086	0.046	0.071	0.018	0.067	N/A	0.084	0.03	N/A	dry
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	<0.0001	N/A	<0.0001	<0.0001	N/A	dry
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	N/A	<0.001	<0.001	N/A	dry
Chromium	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	N/A	<0.001	<0.001	N/A	dry
Cobalt	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	0.004	<0.001	<0.001	<0.001	N/A	<0.001	<0.001	N/A	dry
Copper	mg/L	0.001	<0.001	0.044	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.002	N/A	<0.001	<0.001	N/A	dry
Lead	mg/L	0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	N/A	<0.001	<0.001	N/A	dry
Lithium	mg/L	0.001	0.008	0.047	0.018	0.141	0.006	0.035	0.03	0.135	0.254	0.136	0.007	0.046	0.003	0.021	N/A	0.24	0.002	N/A	dry
Manganese	mg/L	0.001	0.218	0.008	0.009	0.01	0.001	0.082	0.404	0.201	0.076	0.203	0.403	0.118	0.002	0.076	N/A	0.112	0.005	N/A	dry
Nickel	mg/L	0.001	<0.001	<0.001	<0.001	0.004	<0.001	0.001	<0.001	0.001	0.001	0.002	0.008	0.001	<0.001	0.002	N/A	0.006	<0.001	N/A	dry
Rubidium	mg/L	0.001	0.002	0.005	0.001	0.015	<0.001	0.004	0.004	0.009	0.018	0.006	0.001	0.008	<0.001	0.005	N/A	0.014	<0.001	N/A	dry
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	N/A	<0.01	<0.01	N/A	dry
Strontium	mg/L	0.001	0.931	5.61	2.43	3.14	0.603	3.04	2.6	9.53	10.3	8.44	0.98	3.4	0.3	1.33	N/A	7.69	0.419	N/A	dry
Zinc	mg/L	0.005	0.023	0.049	<0.005	0.057	<0.005	<0.005	0.009	<0.005	0.232	0.022	0.051	<0.005	0.009	0.099	N/A	<0.005	0.006	N/A	dry
Boron	mg/L	0.05	0.06	0.09	0.08	0.11	0.08	0.08	0.06	0.19	0.11	0.08	0.07	0.07	0.05	0.07	N/A	0.14	0.08	N/A	dry
Iron	mg/L	0.05	1.7	<0.05	<0.05	<0.05	<0.05	0.048	1.68	0.49	<0.05	0.2	<0.05	0.15	<0.05	0.16	N/A	0.43	<0.05	N/A	dry
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	N/A	<0.0001	<0.0001	N/A	dry
Total Anions	meq/L	0.01	12.3	15.5	23.5	28.7	9.09	20.7	25.6	53.4	56.4	61	16.7	22.9	7.29	18.1	N/A	52.7	10.3	N/A	dry
Total Cations	meq/L	0.01	12.5	16	24.8	31.1	9.24	21.9	25.4	56.9	58.2	63.5	17.6	24.2	7.51	19.7	N/A	55.2	10.7	N/A	dry
Ionic Balance	%	0.01	0.94	1.79	2.64	4.06	0.83	2.73	0.38	3.14	1.53	1.99	2.54	2.71	1.41	4.18	N/A	2.3	1.68	N/A	dry

Liddell Coal - Six Monthly Groundwater Samples (December 2012)

Date Sampled: **21/12/2012**

ANALYSIS DESCRIPTION	UNIT	LOR	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	Mt Owen Bore	LC1
pH Value	pH Unit	0.01	7.25	7.92	7.61	7.96	7.43	7.77	7.21	7.78	7.76	dry	7.54	7.64	7.51	7.67	N/A	8.12	7.34	N/A	dry
Electrical Conductivity @ 25°C	µS/cm	1	1120	1390	1790	2780	950	2170	2580	5170	5020	dry	1600	2170	843	1740	N/A	4970	1010	N/A	dry
Total Dissolved Solids @180°C	mg/L	1	686	810	1050	1560	536	1250	1470	2940	3220	dry	950	1270	536	990	N/A	3170	608	N/A	dry
Suspended Solids (SS)	mg/L	1	94	26	14	10	26	14	30	17	<5	dry	123	16	66	21	N/A	12	<5	N/A	dry
Chloride	mg/L	1	161	195	271	611	122	431	643	1300	723	dry	266	469	84	303	N/A	900	127	N/A	dry
Sulfate	mg/L	0.5	141	192	238	158	79	204	231	316	881	dry	190	119	82	141	N/A	692	90	N/A	dry
Hydroxide Alkalinity as CaCO3	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	dry	<1	<1	<1	<1	N/A	<1	<1	N/A	dry
Carbonate Alkalinity as CaCO3	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	dry	<1	<1	<1	<1	N/A	<1	<1	N/A	dry
Bicarbonate Alkalinity as CaCO3	mg/L	1	207	268	355	508	218	392	288	664	1010	dry	303	424	202	374	N/A	815	250	N/A	dry
Total Alkalinity as CaCO3	mg/L	1	207	268	355	508	218	392	288	664	1010	dry	303	424	202	374	N/A	815	250	N/A	dry
Silicon	mg/L	0.05	10.4	9.21	9.61	5.72	10.1	11.7	12.5	9.4	6.16	dry	11.1	13.5	22.4	13.8	N/A	7.37	9.49	N/A	dry
Calcium	mg/L	1	64	57	78	25	46	34	108	80	77	dry	88	83	31	65	N/A	56	36	N/A	dry
Magnesium	mg/L	1	25	42	41	31	24	46	85	126	137	dry	40	60	17	41	N/A	66	19	N/A	dry
Sodium	mg/L	1	139	184	268	576	120	409	332	865	971	dry	213	302	122	262	N/A	998	163	N/A	dry
Potassium	mg/L	1	3	3	3	5	2	3	4	9	11	dry	2	5	1	4	N/A	9	3	N/A	dry
Aluminium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	dry	<0.01	<0.01	<0.01	<0.01	N/A	0.001	<0.01	N/A	dry
Arsenic	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	dry	0.001	<0.001	<0.001	0.002	N/A	<0.001	<0.001	N/A	dry
Beryllium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	dry	<0.001	<0.001	<0.001	<0.001	N/A	<0.001	<0.001	N/A	dry
Barium	mg/L	0.001	0.084	0.131	0.064	0.046	0.029	0.03	0.172	0.172	0.046	dry	0.044	0.067	0.02	0.061	N/A	0.076	0.028	N/A	dry
Cadmium	mg/L	0.0001	<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	0.0005	N/A	<0.0001	<0.0001	N/A	dry
Caesium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	dry	<0.001	<0.001	<0.001	<0.001	N/A	<0.001	<0.001	N/A	dry
Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	dry	<0.001	<0.001	<0.001	<0.001	N/A	<0.001	<0.001	N/A	dry
Cobalt	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	dry	0.001	<0.001	<0.001	<0.001	N/A	<0.001	<0.001	N/A	dry
Copper	mg/L	0.001	<0.001	0.004	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	0.079	dry	<0.001	<0.001	<0.001	0.01	N/A	<0.001	<0.001	N/A	dry
Lead	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	dry	<0.001	<0.001	<0.001	<0.001	N/A	<0.001	<0.001	N/A	dry
Lithium	mg/L	0.001	0.007	0.036	0.006	0.11	0.005	0.042	0.023	0.022	0.198	dry	0.006	0.036	0.002	0.016	N/A	0.17	0.002	N/A	dry
Manganese	mg/L	0.001	0.217	0.005	0.005	0.029	0.002	0.044	0.362	0.355	0.001	dry	0.073	0.057	0.002	0.003	N/A	0.078	0.007	N/A	dry
Nickel	mg/L	0.001	<0.001	0.002	<0.001	0.003	<0.001	0.002	<0.001	<0.001	0.005	dry	0.003	0.001	<0.001	0.01	N/A	0.003	<0.001	N/A	dry
Rubidium	mg/L	0.001	0.002	0.005	<0.001	0.016	<0.001	0.006	0.004	0.004	0.018	dry	0.001	0.009	<0.001	0.005	N/A	0.015	<0.001	N/A	dry
Selenium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	dry	<0.01	<0.01	<0.01	<0.01	N/A	<0.01	<0.01	N/A	dry
Strontium	mg/L	0.001	0.887	4.9	1.55	3	0.625	3.84	2.49	2.45	10.3	dry	1.02	3.51	0.344	1.24	N/A	7.72	0.4	N/A	dry
Zinc	mg/L	0.005	0.007	0.035	0.005	0.056	0.006	0.018	0.026	0.023	0.312	dry	0.052	0.007	0.011	0.372	N/A	<0.005	0.005	N/A	dry
Boron	mg/L	0.05	0.05	0.08	0.06	0.09	0.07	0.07	<0.05	<0.05	0.08	dry	0.05	0.05	<0.05	<0.05	N/A	0.1	0.07	N/A	dry
Iron	mg/L	0.05	1.88	<0.05	0.05	<0.05	<0.05	0.4	1.62	1.78	<0.05	dry	<0.05	0.18	<0.05	<0.05	N/A	0.32	<0.05	N/A	dry
Mercury	mg/L	0.0001	<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	N/A	<0.0001	<0.0001	N/A	dry
Total Anions	meq/L	0.01	11.6	14.8	19.7	30.7	9.44	24.2	28.7	56.5	58.9	dry	17.5	24.2	8.11	19	N/A	56.1	10.4	N/A	dry
Total Cations	meq/L	0.01	11.4	14.4	19	29	9.54	23.4	26.9	52.2	57.6	dry	17	22.3	8.28	18.1	N/A	51.9	10.5	N/A	dry
Ionic Balance	%	0.01	1.02	1.63	1.81	2.87	0.51	1.9	3.19	3.98	1.14	dry	1.5	3.96	0.98	2.28	N/A	3.94	0.33	N/A	dry

Appendix G

Blast Monitoring Results

Appendix G Blast Monitoring Results

						Chain of Ponds			Burlings			Scrivens		
Date	Time	Event	Location	ID	Source/Trigger	Ground Vibration (mm/s)	Over pressure dB(L)	Waveform Capture	Ground Vibration (mm/s)	Over pressure dB(L)	Waveform Capture	Ground Vibration (mm/s)	Over pressure dB(L)	Waveform Capture
3/1/2012	12:41	LDL0QE	Entrance Pit	E02_MPG_149	Dam 13 EWU	0.18	104.60	Yes	0.02	88.00	Yes	0.02	102.8	Yes
5/1/2012	13:15	LDL0QF	Entrance Pit	E02_ART_118D/E	Dam 13 EWU	0.96	106.40	Yes	0.08	96.10	Yes	0.07	102.5	Yes
6/1/2012	13:18	LDL0QG	South Pit	S1402_LID_146D	Dam 13 EWU	1.07	106.20	Yes	0.07	96.50	Yes	0.05	102.4	Yes
9/1/2012	14:26	LDL0QI	South Pit	S1402_LID_146E	Dam 13 EWU	1.27	106.50	Yes	0.08	103.70	Yes	0.07	110.5	Yes
10/1/2012	13:17	LDL0QL	South Pit	S1602_UPG_137C	Dam 13 EWU	1.96	114.30	Yes	0.06	89.00	Yes	0.04	98.9	Yes
12/1/2012	9:14	LDL0QS	Durham Pit	Durham_141	Ashlea	0.03	98.90	Yes	0.01	86.30	Yes	0.01	86.1	Yes
12/1/2012	13:18	LDL0QT	Entrance Pit	E02_PS_142	Dam 13 EWU	0.23	104.00	Yes	0.08	94.60	Yes	0.13	102.9	Yes
13/1/2012	12:09	LDL0QV	South Pit	S1402_LID_146F	Dam 13 EWU	0.97	102.40	Yes	0.08	97.30	Yes	0.06	96.7	Yes
19/1/2012	13:23	LDL0QY	South Pit	S1502_151&150	Dam 13 EWU	0.97	106.00	Yes	0.12	99.50	Yes	0.09	106.1	Yes
20/1/2012	13:15	LDL0R0	Entrance Pit	E02-ART_152	Dam 13 EWU	0.97	105.80	Yes	0.10	92.80	Yes	0.06	100.6	Yes
25/1/2012	10:34	LDL0R6	South Pit	S1402_LIDB_146G&H and S1403_LIDB_154A	Dam 13 EWU	0.97	103.80	Yes	0.15	97.70	Yes	0.09	103.8	Yes
30/1/2012	15:57	LDL0RB	Entrance Pit	E02_ART_157	Dam 13 EWU	0.97	115.50	Yes	0.02	105.70	Yes	0.02	108.6	Yes
7/02/2012	11:46	LDL0RF	South Pit	S1403_RL16_154B	Dam 13 EWU	0.97	104.00	Yes	0.05	94.90	Yes	0.05	97.3	Yes
9/02/2012	12:52	LDL0RL	Entrance Pit	E02_ART_152B	Dam 13 EWU	0.97	103.10	Yes	0.08	99.80	Yes	0.04	105.5	Yes
10/02/2012	13:36	LDL0RO	South Pit	S13_BAR_155	Dam 13 EWU	0.97	106.20	Yes	0.22	92.72	Yes	0.06	95.27	Yes
14/02/2012	13:10	LDL0RV	South Pit	S1403_LIDB_154D	Dam 13 EWU	0.97	103.90	Yes	0.05	90.00	Yes	0.04	103.8	Yes
15/02/2012	13:41	LDL0RY	Entrance Pit	E02_RL115_145	Dam 13 EWU	0.97	109.80	Yes	0.06	108.50	Yes	0.09	112.3	Yes
16/02/2012	13:19	LDL0S0	South Pit	S1503_MPG_153	Dam 13 EWU	0.97	107.40	Yes	0.04	88.20	Yes	0.04	99.3	Yes
20/02/2012	14:18	LDL0S4	Entrance Pit	E02_RL115_145B	Dam 13 EWU	0.97	102.90	Yes	0.05	87.70	Yes	0.08	98.5	Yes
22/02/2012	16:08	LDL0S6	South Pit	S1503_MPG_153B	Dam 13 EWU	0.97	102.68	Yes	0.03	97.81	Yes	0.02	102.13	Yes
24/02/2012	13:17	LDL0S8	South Pit	S1503_UPG_158A	Dam 13 EWU	0.97	109.40	Yes	0.08	101.80	Yes	0.08	101.8	Yes
28/02/2012	13:18	LDL0S9	Entrance Pit	E02_RL100_156	Dam 13 EWU	0.97	115.10	Yes	0.07	102.70	Yes	0.08	114.1	Yes
2/03/2012	12:55	LDL0SF	South Pit	S1402_LIDB_146I	Dam 13 EWU	0.97	101.80	Yes	0.08	105.20	Yes	0.05	98.2	Yes
6/03/2012	13:07	LDL0SI	South Pit	S1402_LIDB_162A	Dam 13 EWU	1.17	101.60	Yes	0.09	97.80	Yes	0.06	104.9	Yes
9/03/2012	12:39	LDL0SP	South Pit	S1402_LIDB_162B	Dam 13 EWU	0.71	106.90	Yes	0.04	101.70	Yes	0.05	109.5	Yes
9/03/2012	12:56	LDL0SQ	South Pit	S1503_UPG_158B&164	Dam 13 EWU	1.99	127.70	Yes	0.09	101.70	Yes	0.08	111.1	Yes

						Chain of Ponds			Burlings			Scrivens		
Date	Time	Event	Location	ID	Source/Trigger	Ground Vibration (mm/s)	Over pressure dB(L)	Waveform Capture	Ground Vibration (mm/s)	Over pressure dB(L)	Waveform Capture	Ground Vibration (mm/s)	Over pressure dB(L)	Waveform Capture
13/03/2012	13:13	LDL0SU	South Pit	S1503_UPG_158BMisfires	Dam 13 EWU	0.67	97.40	Yes	0.02	87.70	Yes	0.03	87.7	Yes
14/03/2012	13:25	LDL0SX	Entrance Pit	E02_RL90_160	Dam 13 EWU	0.64	105.00	Yes	0.07	101.30	Yes	0.05	110.9	Yes
15/03/2012	13:21	LDL0T0	South Pit	S1402_LIDB_162C	Dam 13 EWU	0.56	100.70	Yes	0.05	90.20	Yes	0.05	102.7	Yes
16/03/2012	13:20	LDL0T3	South Pit	S1402_LIDB_162D	Dam 13 EWU	0.40	100.60	Yes	0.04	86.10	Yes	0.03	95.4	Yes
16/03/2012	13:20	LDL0T7	South Pit	S1503_UPG_158C	Ashlea	0.45	101.20	No	0.02	83.10	Yes	0.02	96.3	No
19/03/2012	11:46	LDL0T6	South Pit	S1402_LIDB_162E	Dam 13 EWU	0.86	104.30	Yes	0.05	94.10	Yes	0.05	104.8	Yes
20/03/2012	13:57	LDL0TA	South Pit	S1402_LIDB_162F	Dam 13 EWU	1.31	106.20	Yes	0.07	101.20	Yes	0.07	101.2	Yes
22/03/2012	16:26	LDL0TC	Entrance Pit	E02_LIDB_165A	Dam 13 EWU	0.50	105.50	Yes	0.04	91.70	Yes	0.05	99.8	Yes
23/03/2012	14:46	LDL0TH	South Pit	S1403_LIDB_162G	Dam 13 EWU	1.15	107.30	Yes	0.06	108.10	Yes	0.1	110	Yes
26/03/2012	13:13	LDL0TK	Entrance Pit	E02_LIDB_165B	Dam 13 EWU	0.56	112.30	Yes	0.05	88.70	Yes	0.06	105.5	Yes
27/03/2012	15:12	LDL0TN	South Pit	S1403_LIDB_162H	Dam 13 EWU	1.00	105.70	Yes	0.06	91.60	Yes	0.07	98.1	Yes
30/03/2012	13:19	LDL0TR	South Pit	S1501-ART-163A	Dam 13 EWU	1.85	107.70	Yes	0.12	94.90	Yes	0.07	104.7	Yes
3/04/2012	13:18	LDL0TU	South Pit	S1401_BAR_161A	Dam 13 EWU	2.39	98.40	Yes	0.23	89.60	Yes	0.11	92.1	Yes
5/04/2012	13:10	LDL0TX	South Pit	S1502_ART_166A	Dam 13 EWU	1.66	110.00	Yes	0.06	96.80	Yes	0.06	103.5	Yes
12/04/2012	13:16	LDL0U6	South Pit	S1502_MPG_167A	Dam 13 EWU	0.72	102.10	Yes	0.02	88.70	Yes	0.03	101.5	Yes
16/04/2012	13:26	LDL0U9	South Pit	S1401_BAR_161B	Dam 13 EWU	1.73	90.86	Yes	0.12	90.86	Yes	0.13	102.47	Yes
17/04/2012	11:07	LDL0UC	Entrance Pit	E02_LIDB_171A	Dam 13 EWU	0.31	103.00	Yes	0.04	95.10	Yes	0.03	101.2	Yes
18/04/2012	13:09	LDL0UH	Entrance Pit	E02_LIDB_171B	Dam 13 EWU	0.43	102.70	Yes	0.05	93.20	Yes	0.03	98.9	Yes
19/04/2012	13:19	LDL0UJ	South Pit	S1502_ART_166C	Dam 13 EWU	2.16	106.80	Yes	0.09	89.40	Yes	0.06	99	Yes
19/04/2012	16:07	LDL0UK	South Pit	S1502_ART_166B PT2	Dam 13 EWU	0.84	104.30	Yes	0.06	92.00	Yes	0.04	94.5	Yes
23/04/2012	12:04	LDL0UN	South Pit	S1503_MPG_167B	Dam 13 EWU	0.63	108.40	Yes	0.02	87.30	Yes	0.02	91.5	Yes
26/04/2012	13:19	LDL0UQ	Entrance Pit	E02_LIDB_171C	Dam 13 EWU	0.65	105.50	Yes	0.09	88.30	Yes	0.06	97.1	Yes
30/04/2012	12:55	LDL0UW	South Pit	S1503_MPG_167C	Dam 13 EWU	0.52	104.90	Yes	0.02	91.10	Yes	0.02	91.5	Yes
30/04/2012	13:29	LDL0UX	Durham Pit	Durham_BAR_159A	Ashlea	0.01	81.50	Yes	0.00	87.30	Yes	0.01	98.7	Yes
1/05/2012	13:12	LDL0V0	Entrance Pit	E02_LIDB_171D	Dam 13 EWU	0.88	105.00	Yes	0.05	88.50	Yes	0.05	98.2	Yes
3/05/2012	15:05	LDL0V2	South Pit	S1402_BAR_174A	Dam 13 EWU	3.43	109.00	Yes	0.19	88.00	Yes	0.17	98.5	Yes

						Chain of Ponds			Burlings			Scrivens		
Date	Time	Event	Location	ID	Source/Trigger	Ground Vibration (mm/s)	Over pressure dB(L)	Waveform Capture	Ground Vibration (mm/s)	Over pressure dB(L)	Waveform Capture	Ground Vibration (mm/s)	Over pressure dB(L)	Waveform Capture
3/05/2012	15:32	LDL0V3	South Pit	S1502_ART_166B & S1503_MPG_167D	Dam 13 EWU	1.20	108.50	Yes	0.04	90.80	Yes	0.04	100.8	Yes
4/05/2012	13:17	LDL0V7	Entrance Pit	E02_LIDB-171E	Dam 13 EWU	0.47	107.80	Yes	0.04	95.70	Yes	0.05	111.6	Yes
8/05/2012	10:50	LDL0VA	South Pit	S1503_MPG_167C_TRIM	Dam 13 EWU	0.09	97.50	Yes	0.01	93.70	Yes	0.01	91.3	Yes
9/05/2012	13:05	LDL0VE	South Pit	S1601_UPG_147A	Dam 13 EWU	1.27	114.80	Yes	0.05	91.60	Yes	0.05	103.2	Yes
10/05/2012	13:14	LDL0VH	South Pit	S1502_ART_166_TRIM	Dam 13 EWU	0.54	104.50	Yes	0.04	91.10	Yes	0.04	107.8	Yes
14/05/2012	13:16	LDL0VN	South Pit	S1502_ART_166_TRIM	Dam 13 EWU	0.20	98.90	Yes	0.01	87.70	Yes	0.01	88.5	Yes
17/05/2012	13:11	LDL0VQ	Entrance Pit	E02_RL75_176B	Dam 13 EWU	0.65	102.10	Yes	0.05	86.10	Yes	0.03	102.4	Yes
17/05/2012	13:30	LDL0VR	Durham Pit	Durham_BAR_169	Dam 13 EWU	0.44	94.80	Yes	0.22	77.40	Yes	0.11	100.8	Yes
21/05/2012	12:38	LDL0VU	Entrance Pit	E03_LEMBC_170 & E03_UPG_173	Dam 13 EWU	2.76	113.40	Yes	0.12	89.60	Yes	0.1	105.9	Yes
23/05/2012	13:30	LDL0VY	South Pit	S1503_ART_168A&B	Dam 13 EWU	3.66	109.20	Yes	0.09	90.20	Yes	0.11	100	Yes
24/05/2012	12:36	LDL0W0	South Pit	S1401_BAR_161C	Dam 13 EWU	1.71	102.00	Yes	0.12	96.50	Yes	2.14	101.2	Yes
28/05/2012	15:39	LDL0W1	Entrance Pit	E02_RL75_176C	Dam 13 EWU	1.05	106.00	Yes	0.05	101.40	Yes	0.08	108	Yes
31/05/2012	13:15	LDL0W4	Entrance Pit	E02_LIDB_175A	Dam 13 EWU	0.45	100.50	Yes	0.08	89.80	Yes	0.05	98.4	Yes
6/06/2012	13:18	LDL0WA	South Pit	S1503_ART_168D	Dam 13 EWU	3.38	102.60	Yes	0.07	100.70	Yes	0.09	106.1	Yes
6/06/2012	13:27	LDL0WB	Entrance Pit	E02_LIDB_175C	Dam 13 EWU	0.78	102.30	Yes	0.04	92.20	Yes	0.04	99.5	Yes
7/06/2012	13:27	LDL0WE	South Pit	S1402_BAR_179	Dam 13 EWU	2.02	102.30	Yes	0.08	89.30	Yes	0.1	98.9	Yes
14/06/2012	13:52	LDL0WH	Entrance Pit	E02_LIDA_175D	Dam 13 EWU	0.77	107.40	Yes	0.03	89.00	Yes	0.04	98	Yes
15/06/2012	13:16	LDL0WI	South Pit	S1402_BAR_184	Dam 13 EWU	1.87	107.10	Yes	0.11	105.30	Yes	0.1	101.6	Yes
20/06/2012	13:32	LDL0WM	Durham Pit	Durham_BAR_159	Ashlea	0.01	80.70	Yes	0.00	86.20	Yes	0.01	80.1	Yes
20/06/2012	12:55	LDL0WL	South Pit	S1503_ART_168C	Dam 13 EWU	2.13	113.60	Yes	0.11	93.90	Yes	0.12	104	Yes
26/06/2012	11:36	LDL0WR	South Pit	S1501_RL25_172A	Dam 13 EWU	1.97	116.50	Yes	0.15	110.00	Yes	0.08	111.4	Yes
27/06/2012	13:15	LDL0WU	South Pit	S1403_BAR_180	Dam 13 EWU	2.32	105.70	Yes	0.24	104.30	Yes	0.17	102.9	Yes
29/06/2012	13:10	LDL0WW	Entrance Pit	E02_BAR_186	Dam 13 EWU	1.77	106.70	Yes	0.11	89.30	Yes	0.13	98.2	Yes
3/07/2012	12:45	LDL0X0	South Pit	S1603_LEMG_181	Dam 13 EWU	1.91	114.90	Yes	0.05	92.50	Yes	0.05	102.7	Yes
4/07/2012	13:25	LDL0X3	South Pit	S1602_MPG_187	Dam 13 EWU	3.00	110.50	Yes	0.20	101.20	Yes	0.09	105.3	Yes
5/07/2012	13:25	LDL0X6	South Pit	S1403_BAR_185	Dam 13 EWU	1.97	107.60	Yes	0.22	100.30	Yes	0.25	106.2	Yes

						Chain of Ponds			Burlings			Scrivens		
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9/07/2012	12:39	LDL0XA	Entrance Pit	E03_UPG_190	Dam 13 EWU	1.02	112.50	Yes	0.14	98.80	Yes	0.05	102.1	Yes
10/07/2012	13:17	LDL0XD	South Pit	S1501_RL25_172/192	Dam 13 EWU	0.81	109.50	Yes	0.08	95.30	Yes	0.05	104.9	Yes
16/07/2012	15:38	LDL0XH	Entrance Pit	E02_LID_194/200	Dam 13 EWU	0.84	101.90	Yes	0.07	93.60	Yes	0.07	104.5	Yes
18/07/2012	13:18	LDL0XJ	South Pit	S1502_RL25_183	Dam 13 EWU	2.42	117.00	Yes	0.07	94.00	Yes	0.09	110.1	Yes
19/07/2012	13:17	LDL0XL	South Pit	S1603_LEMG_188	Dam 13 EWU	2.13	114.10	Yes	0.07	92.70	Yes	0.06	102.1	Yes
24/07/2012	13:18	LDL0XO	South Pit	S1601_UPG_146B	Dam 13 EWU	3.11	114.40	Yes	0.11	91.70	Yes	0.08	100.3	Yes
25/07/2012	13:15	LDL0XQ	South Pit	S1602_Bar_198	Dam 13 EWU	0.68	97.90	Yes	0.08	86.20	Yes	0.05	97.5	Yes
25/07/2012	13:18	LDL0XR	South Pit	S1501_LIDA_197	Dam 13 EWU	1.52	110.30	Yes	0.11	99.90	Yes	0.06	111	Yes
27/07/2012	13:18	LDL0XT	Entrance Pit	E02_BAR_202	Dam 13 EWU	1.39	100.30	Yes	0.12	96.60	Yes	0.19	106.8	Yes
3/08/2012	13:18	LDL0XV	South Pit	S1403_BAR_199	Dam 13 EWU	2.05	105.80	Yes	0.15	109.50	Yes	0.15	106.2	Yes
3/08/2012	13:28	LDL0XW	South Pit	S1601_UPG_147A	Dam 13 EWU	0.94	121.40	Yes	0.06	103.60	Yes	0.02	103.2	No
8/08/2012	13:43	LDL0Y1	South Pit	S1502_LIDA_201/204/205	Dam 13 EWU	2.10	113.20	Yes	0.17	98.90	Yes	0.13	112.4	Yes
8/08/2012	13:53	LDL0Y2	South Pit	S1602_MPG_203/196	Dam 13 EWU	3.30	116.00	Yes	0.10	97.70	Yes	0.08	103.5	Yes
16/08/2012	13:23	LDL0YA	South Pit	Strip1501_LIDA_215	Dam 13 EWU	2.70	102.50	Yes	0.12	90.80	Yes	0.06	97.4	Yes
16/08/2012	13:26	LDL0YB	Entrance Pit	E03_MPG_214	Tiger Chan	0.10	114.80	Yes	0.01	100.10	Yes	0.01	105.1	Yes
21/08/2012	12:17	LDL0YE	Entrance Pit	E02_MPG_217	Dam 13 EWU	0.19	108.00	Yes	0.01	95.50	Yes	0.01	100.9	Yes
21/08/2012	15:02	LDL0YF	South Pit	S1402_BAR_211A	Dam 13 EWU	1.22	103.60	Yes	0.11	89.80	Yes	0.07	102.3	Yes
24/08/2012	9:40	LDL0YM	Entrance Pit	213_BAR_E02	Dam 13 EWU	1.33	101.20	Yes	0.10	102.60	Yes	0.07	106.3	Yes
27/08/2012	13:19	LDL0YP	South Pit	S1502_LIDA_216	Dam 13 EWU	1.29	103.90	Yes	0.10	95.30	Yes	0.05	100	Yes
27/08/2012	13:30	LDL0YQ	South Pit	S1503_LIDA_212/206	Dam 13 EWU	1.29	103.90	Yes	0.10	95.30	Yes	4.83	110.6	Yes
29/08/2012	13:20	LDL0YR	South Pit	S1602_LMEF_226	Dam 13 EWU	0.83	130.00	Yes	0.04	102.60	Yes	0.02	106.2	Yes
3/09/2012	13:30	LDL010	South Pit	S1403_BAR_211B	Dam 13 EWU	0.80	101.40	Yes	0.08	87.90	Yes	0.07	100.9	Yes
3/09/2012	13:36	LDL0Z1	South Pit	S1602_LEMG_191/219	Dam 13 EWU	1.78	123.70	Yes	0.07	91.90	Yes	0.05	104.1	Yes
4/09/2012	13:35	LDL0Z4	Entrance Pit	E02_BAR_218/224A	Dam 13 EWU	1.90	103.60	Yes	0.16	91.00	Yes	0.19	104.5	Yes
7/09/2012	9:19	LDL0ZD	South Pit	S1501_LIDA_220/223	Dam 13 EWU	0.79	109.60	Yes	0.12	94.60	Yes	0.05	104.2	Yes
11/09/2012	13:13	LDL0ZF	South Pit	S1602_LEMD_225	Dam 13 EWU	1.29	116.50	Yes	0.03	93.40	Yes	0.03	99	Yes

						Chain of Ponds			Burlings			Scrivens		
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12/09/2012	13:13	LDL0ZH	South Pit	S1402_BAR_221A	Dam 13 EWU	1.54	102.90	Yes	0.13	88.90	Yes	0.14	107.1	Yes
12/09/2012	13:14	LDL0ZI	South Pit	S1503_LIDA_210	Dam 13 EWU	1.86	106.50	Yes	0.12	96.60	Yes	0.11	104.9	Yes
14/9/2012	13:03	LDL0ZN	South Pit	S1503_LIDA_229/234	Dam 13 EWU	0.98	128.50	Yes	0.05	94.90	Yes	0.04	103.4	Yes
14/9/2012	13:04	LDL0ZO	Entrance Pit	E02_BAR_224C	Dam 13 EWU	0.74	105.20	Yes	0.07	93.60	Yes	0.05	108.80	Yes
19/9/2012	13:18	LDL0ZS	South Pit	S1703_LEMG_232A/219B	Dam 13 EWU	3.18	124.50	Yes	0.07	102.80	Yes	0.07	104.90	Yes
25/9/2012	12:50	LDL0ZU	South Pit	S1703_LEMHG_230	Dam 13 EWU	5.40	121.60	Yes	0.06	102.70	Yes	0.06	97.50	Yes
25/9/2012	12:52	LDL0ZV	South Pit	S1602_LEMC_236	Dam 13 EWU	1.11	106.50	Yes	0.03	104.00	Yes	0.24	98.30	Yes
28/9/2012	9:11	LDL0ZZ	South Pit	S1702_LEMF_233	Dam 13 EWU	6.63	122.80	Yes	0.15	113.70	Yes	0.12	107.50	Yes
3/10/2012	13:14	LDL101	South Pit	S1703_LEMG_232B	Dam 13 EWU	1.11	119.10	Yes	0.04	91.90	Yes	0.03	99.20	Yes
5/10/2012	9:13	LDL106	South Pit	S1403_BAR_221C	Dam 13 EWU	1.68	106.40	Yes	0.17	96.00	Yes	0.18	97.80	Yes
6/10/2012	9:13	LDL109	South Pit	S1602_ART_227	Dam 13 EWU	2.27	107.80	Yes	0.17	98.40	Yes	0.06	98.50	Yes
11/10/2012	9:11	LDL10C	South Pit	S1603_LEMF_237A	Dam 13 EWU	2.17	117.20	Yes	0.06	98.90	Yes	0.05	105.30	Yes
15/10/2012	12:31	LDL10D	South Pit	S1703_LEMGH_231	Dam 13 EWU	3.40	120.50	Yes	0.08	100.30	Yes	0.03	101.30	Yes
17/10/2012	13:12	LDL10H	South Pit	S1503_LIDA_235/241	Dam 13 EWU	1.56	106.50	Yes	0.09	105.20	Yes	0.06	114.40	Yes
18/10/2012	13:09	LDL10J	South Pit	S1702_LEMF_238	Dam 13 EWU	4.18	112.50	Yes	0.08	99.30	Yes	0.07	102.80	Yes
19/10/2012	12:10	LDL10K	South Pit	S1503_LIDA_228	Dam 13 EWU	1.18	104.40	Yes	0.05	79.80	Yes	0.04	97.20	Yes
23/10/2012	12:41	LDL10L	Entrance Pit	E03_MPG_243	Dam 13 EWU	0.84	112.70	Yes	0.04	114.00	Yes	0.04	109.50	Yes
23/10/2012	12:43	LDL10M	South Pit	S1603_LEMF_237B	Dam 13 EWU	1.54	111.80	Yes	0.04	107.10	Yes	0.05	102.50	Yes
25/10/2012	12:39	LDL10P	South Pit	S1703_LEMG_244	Dam 13 EWU	0.85	110.60	Yes	0.02	114.20	Yes	0.02	109.60	Yes
25/10/2012	12:41	LDL10Q	South Pit	S1503_LIDA_210B	Dam 13 EWU	0.87	111.70	Yes	0.05	108.10	Yes	0.05	98.10	Yes
2/11/2012	13:26	LDL10T	South Pit	S1501_BAR_242	Dam 13 EWU	2.25	99.30	Yes	0.24	97.50	Yes	0.12	92.50	Yes
2/11/2012	13:28	LDL10U	South Pit	S1603_LEMD_247	Dam 13 EWU	0.23	106.80	Yes	0.01	102.20	Yes	0.01	109.20	Yes
5/11/2012	13:24	LDL10V	South Pit	S1702_LEMEF_238B	Dam 13 EWU	2.88	129.60	Yes	0.06	99.80	Yes	0.06	100.60	Yes
6/11/2012	13:11	LDL10Y	South Pit	S1501_BAR_248	Dam 13 EWU	1.37	103.20	Yes	0.13	99.50	Yes	0.09	90.90	Yes
6/11/2012	13:12	LDL10Z	South Pit	S1602_LEMD_256	Dam 13 EWU	0.21	109.70	Yes	0.01	96.30	Yes	0.02	96.70	Yes
8/11/2012	12:49	LDL111	South Pit	S1703_LEMEF_237C	Dam 13 EWU	0.32	101.30	Yes	0.01	94.80	Yes	0.02	90.50	Yes

						Chain of Ponds			Burlings			Scrivens		
Date	Time	Event	Location	ID	Source/Trigger	Ground Vibration (mm/s)	Over pressure dB(L)	Waveform Capture	Ground Vibration (mm/s)	Over pressure dB(L)	Waveform Capture	Ground Vibration (mm/s)	Over pressure dB(L)	Waveform Capture
9/11/2012	13:14	LDL113	South Pit	S502_LIDB_249	Dam 13 EWU	1.66	106.90	Yes	0.08	90.50	Yes	0.07	93.00	Yes
14/11/2012	13:15	LDL115	South Pit	S1501_BAR_255	Dam 13 EWU	1.82	104.70	Yes	0.08	104.70	Yes	0.07	97.80	Yes
14/11/2012	13:16	LDL116	South Pit	S1502_LIDB_257	Dam 13 EWU	2.22	99.80	Yes	0.14	90.90	Yes	0.12	91.30	Yes
16/11/2012	12:38	LDL118	South Pit	S1703_LEMF_250/251	Dam 13 EWU	1.09	117.00	Yes	0.04	91.00	Yes	0.04	98.10	Yes
19/11/2012	13:17	LDL11A	South Pit	S1702_LEMF_238C	Dam 13 EWU	0.79	117.00	Yes	0.01	87.00	Yes	0.02	96.50	Yes
21/11/2012	13:18	LDL11C	South Pit	S1502_LIDB_252	Dam 13 EWU	3.26	112.10	Yes	0.19	90.80	Yes	0.16	95.30	Yes
22/11/2012	13:19	LDL11E	South Pit	S1702_LEMF_Treatment	Dam 13 EWU	0.25	106.20	Yes	0.01	104.10	Yes	0.01	106.40	Yes
26/11/2012	12:53	LDL11F	South Pit	S1603_LEMD_253	Dam 13 EWU	0.39	113.70	Yes	0.02	95.10	Yes	0.02	102.70	Yes
29/11/2012	16:27	LDL11G	South Pit	S1502_LIDB_258	Dam 13 EWU	2.85	110.70	Yes	0.15	96.10	Yes	0.26	102.00	Yes
29/11/2012	16:29	LDL11H	South Pit	S1702_LEMF_259	Dam 13 EWU	0.28	111.60	Yes	0.01	93.90	Yes	0.02	92.80	Yes
30/11/2012	12:14	LDL11I	South Pit	S1702_LEMF_261	Dam 13 EWU	0.53	111.80	Yes	0.02	95.30	Yes	0.03	94.50	Yes
6/12/2012	13:32	LDL11L	South Pit	S1502_LIDB_258D	Dam 13 EWU	1.23	107.50	Yes	0.09	84.60	Yes	0.07	92.80	Yes
6/12/2012	13:35	LDL11M	South Pit	S1703_LEMF_254/260	Dam 13 EWU	1.61	113.40	Yes	0.06	93.60	Yes	0.04	95.60	Yes
11/12/2012	13:20	LDL11Q	South Pit	S1603_LEMC_266	Dam 13 EWU	1.05	110.00	Yes	0.04	94.70	Yes	0.03	98.90	Yes
14/12/2012	12:38	LDL11R	South Pit	S1502_LIDB_269	Dam 13 EWU	0.96	104.40	Yes	0.06	84.60	Yes	0.05	90.70	Yes
19/12/2012	13:23	LDL11W	South Pit	S1502_BAR_267	Dam 13 EWU	2.26	97.90	Yes	0.16	97.80	Yes	0.12	94.40	Yes
20/12/2012	12:45	LDL11X	South Pit	S1603_LEMC_265/8	Dam 13 EWU	1.43	117.10	Yes	0.05	105.50	Yes	0.04	106.40	Yes
21/12/2012	12:14	LDL11Y	South Pit	S1502_LIDB_272	Dam 13 EWU	0.38	100.70	Yes	0.04	103.40	Yes	0.03	104.50	Yes
21/12/2012	16:40	LDL120	South Pit	S1702_LEMD_271	Dam 13 EWU	1.46	114.70	Yes	0.03	109.40	Yes	0.04	104.40	Yes
31/12/2012	13:16	LDL126	South Pit	S1702_LEMD_275	Dam 13 EWU	0.98	105.70	Yes	0.01	94.30	Yes	0.02	83.80	Yes

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LIDDELL COAL OPERATIONS

AIR VIBRATION DATA ANALYSIS FOR A BLAST FIRED ON THE 3rd OF AUGUST 2012

REPORT NO LC-1213-030812

Thomas Lewandowski
3rd August 2012

LIDDELL COAL OPERATIONS

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LIDDELL COAL OPERATIONS

AIR VIBRATION DATA ANALYSIS FOR A BLAST FIRED ON THE 3rd OF AUGUST 2012

REPORT NO LC-1213-030812

1. INTRODUCTION

Enviro Strata Consulting was requested to undertake an independent environmental assessment of blast vibration resulting from a blast fired by Liddell Coal on the 3rd of August 2012 at 13:28. The reason for the request was a high level of air vibration measured by the Datamasters system at the Scrivens monitoring station. The Scrivens monitoring station recorded 116.2 dBL, which is in excess of the 115 dBL vibration limit (allowed for 5 % of blasts) specified in the environmental licence conditions.

The report presents detailed analyses of the air vibration data from overburden blast S1601_UPG_147A fired at Liddell Coal Operations on the 03.08.12. The following investigation addresses possible causes of the elevated reading.

2. BLAST DETAILS AND VIBRATION RESULTS

For the location of the blast and monitoring stations' results refer to **Figure 1**. The blast fired on the 03.08.12 was comprised of an overburden blast, with an average hole depth of 11.9 metres. The estimated charge mass was 620 kg. The blast design details are presented in **Table 1**.

Table 1: Blast Design Details – 03.08.12

Parameters	03.08.12 Blast
Blast ID:	S1601_UPG_147A/ Overburden
Hole diameter (mm):	229
Hole Depth (m)	11.9 average
MIC (kg):	620
Burden (m):	6.2
Spacing (m):	7.0
Initiation Design Details:	i-kon, see **Appendix 1**
Stemming Height (m)	3.5
Stemming type:	14/20 mm gravel/aggregate

The environmental record corresponding to the blast period revealed windy conditions. The report indicates an almost westerly wind direction (280 degrees) with a wind speed of approximately 25.5 km/hr (i.e. approx. 6.9 m/s) at the time of the blast, see **Appendix 2**. The vibration measurements and data files recorded during the blast are summarised in **Table 2.**

For completeness, it should be stressed that according to the provided reports, there were no major blast abnormalities such as a face burst or stemming ejection observed, which could otherwise contribute to the elevation in the airblast level.

Table 2: Vibration Monitoring Results and Distance Estimations – 03.08.12 Blast

Monitoring Station	Distance (m)	Air Vibration (dBL)	PPV (mm/s)	Wavetrace	Dat. File
Burlings	7180	103.6	0.06	V	LDL0Xbur
Chain of Ponds	1203	121.4	0.94	V	LDL0Xcha
Dam 13 EWU	842	121.3	0.87	V	LDL0Xewu
HVO Loading	598	127.6	1.36	V	LDL0Xhvo
Lake Liddell	1880	116.0	0.18	V	LDL0Xlak
Saddle Dam	1753	112.6	0.58	V	LDL0Xsad
Scrivens*	5351	116.2*	0.02	V	LDL0Xscr

** In excess of the normal limit of 115 dBL (allowed for 5% of blasts) specified in the environmental licence conditions*

3. MONITORING DATA ANALYSIS

To assess the validity of the Datamasters system, wavetrace records from Scrivens and Lake Liddell Dam monitoring stations were analysed applying the air blast arrival technique. This technique utilises the fact that there are four different types of waves generated during a blast. Each wave travels at a different speed. The following velocities were used for ground vibration waves: 2200 m/s for P wave, 1200 m/s for S wave, and 700 m/s for Rayleigh – surface wave. The air blast wave travels at a speed of 340 - 344 m/s. Analysis of the data is shown in **Appendices 3** and **4**. The time corresponding to the air blast arrival period is marked on each analysed wavetrace.

The Scrivens monitoring station was 5351 metres away from the blast. The analysis of the air vibration record from Scrivens monitoring station indicates gusty wind conditions; refer to **Appendix 3**. The air vibration record is affected by wind gusts demonstrated by pronounced air vibration peaks. The investigated peak of 116.2 dBL occurred approximately 2 seconds before the air blast arrival period and was caused by a strong wind gust. Based on the wavetrace, the estimated maximum air vibration level corresponding to the air blast arrival period was in the order of 103.2 dBL. Due to the windy conditions the measurement reflects not only air vibration caused by the blast but also a substantial wind component.

To validate the above conclusions, regarding wind influence on the recorded data, a supporting analysis from another monitoring station representative for the area (i.e. Lake Liddell Dam) was undertaken, see **Appendix 4.** The Lake Liddell station was approximately 1880 metres from the blast. The inspection of the wavetrace indicates strong wind activities, affecting the whole monitoring period. The estimated air vibration peak for the airblast period was in the order of 111.9 dBL.

In summary, both records indicated similar characteristics of wind influence, providing strong argument in regards to the origin of the high air vibration reading.

4. CONCLUSIONS

At the request of Liddell Coal Management, analysis of air vibration monitoring data from overburden blast S1601_UPG_147A fired on the 3rd of August 2012 at 13:28 was undertaken. The analysis revealed the following:

- The peak air vibration level of 116.2 dBL recorded by the Scrivens monitoring station (5351 metres) was due to a wind gust. The investigated peak occurred before the air blast arrival period. The maximum estimated air vibration level for the Scrivens monitoring station was approximately 103.2 dBL. The conclusion is based on detailed wavetrace analysis.

- An additional analysis of the monitoring data from the Lake Liddell Dam monitoring station (1880 metres) confirmed adequate air vibration levels from the blast i.e. 111.9 dBL. The wavetrace analysis also revealed strong wind activities.

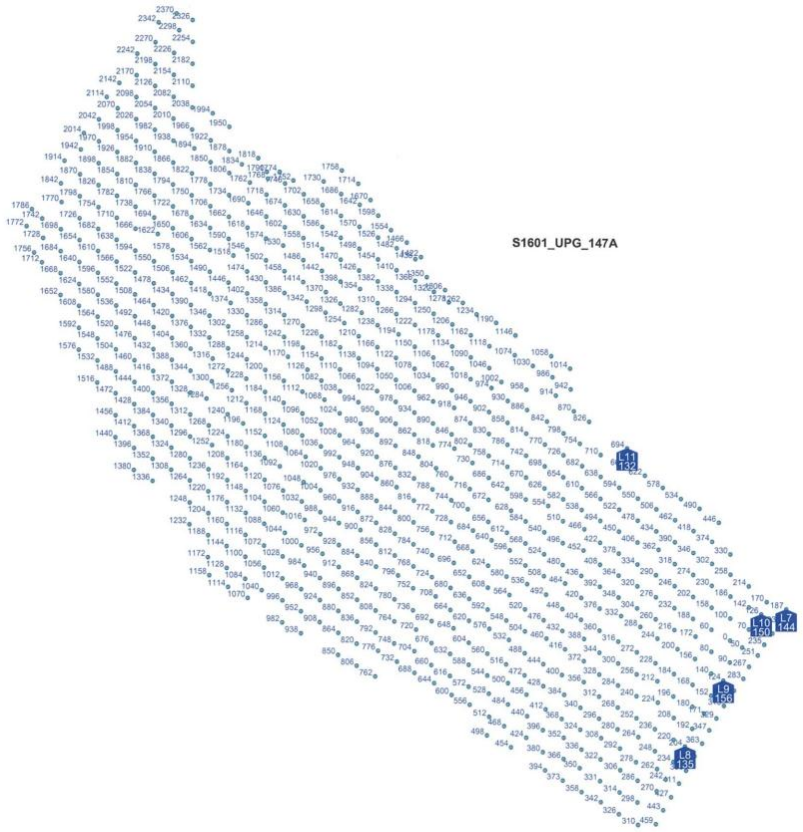
On the basis of the above it can be concluded that the air vibrations generated during the blast were adequate and there was no exceedance of the air vibration limit.

Thomas Lewandowski
7th August 2012

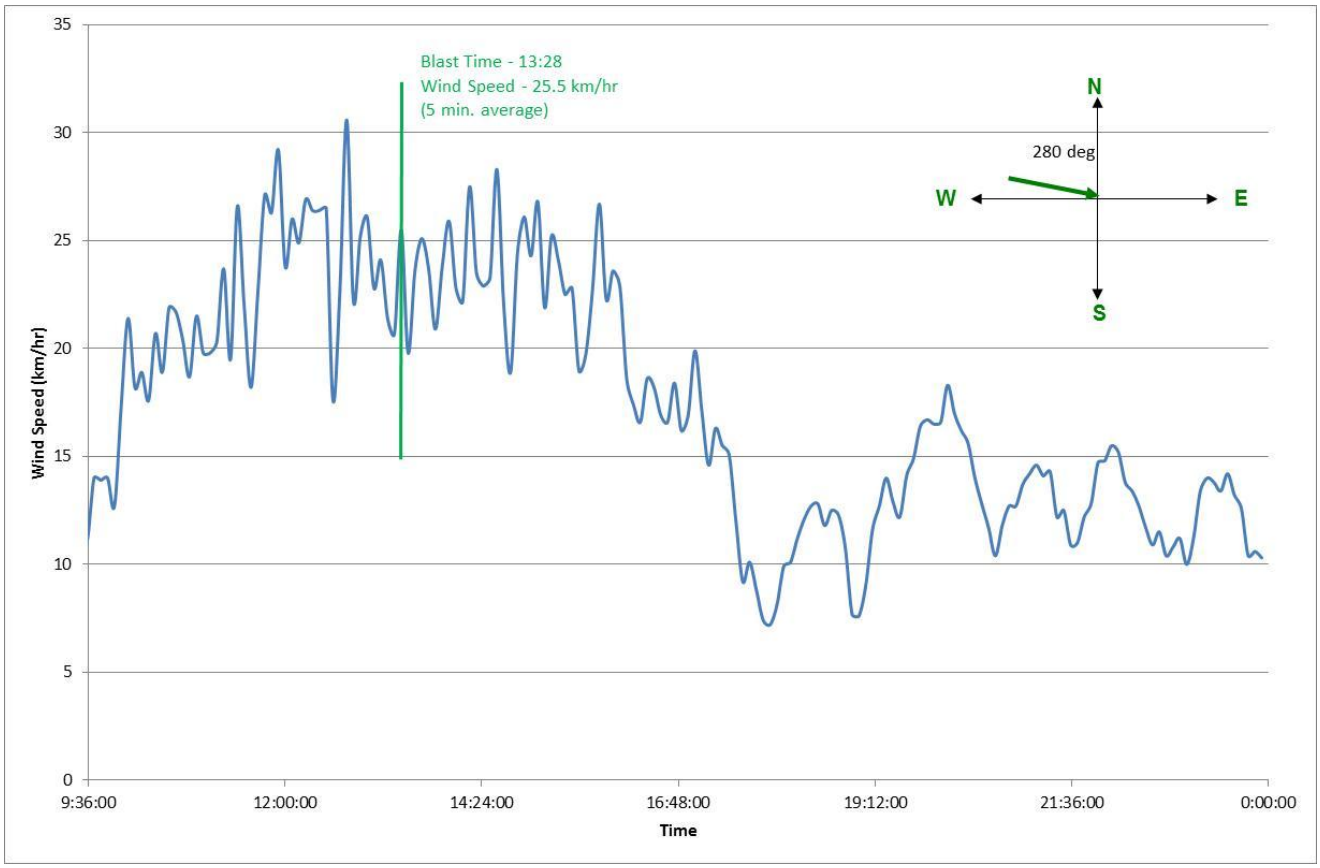
Figure 1 – Location of blast fired on 03.08.12 including monitoring records

APPENDICES

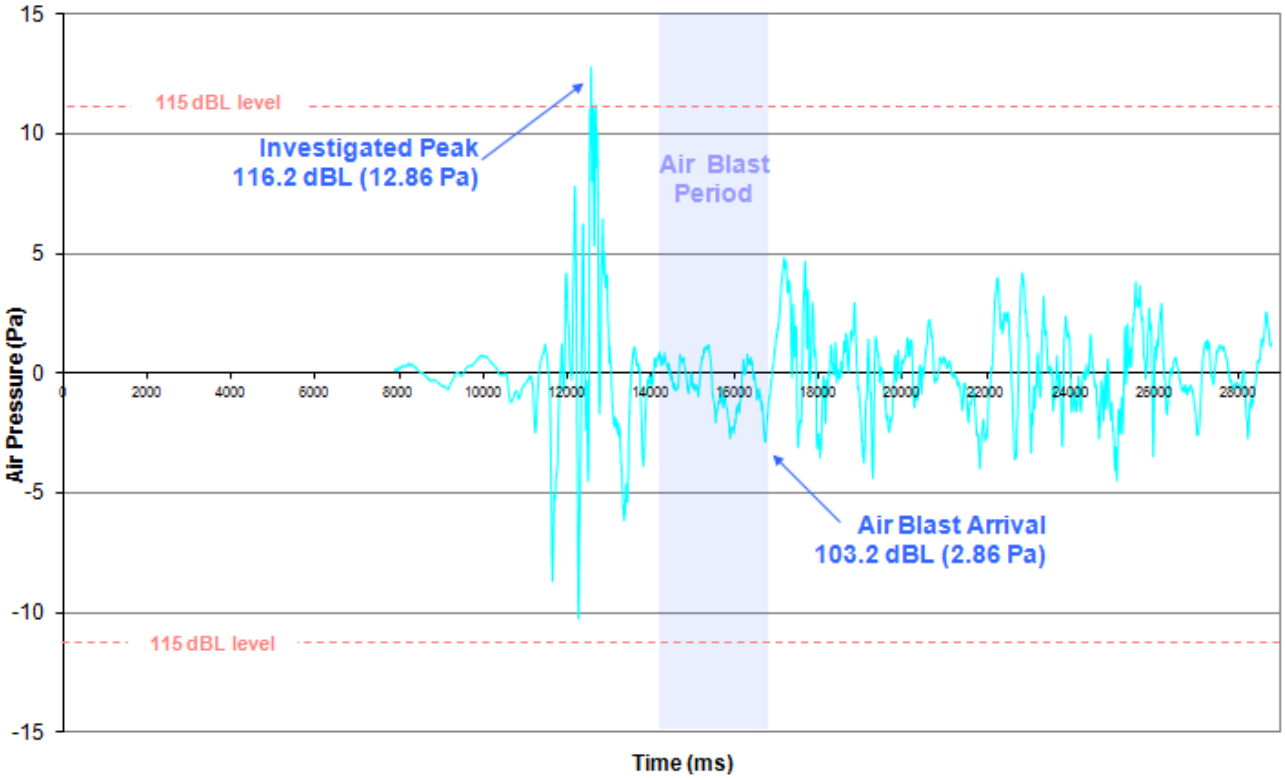
APPENDIX 1 – Initiation Sequence Details – 03.08.12 Blast

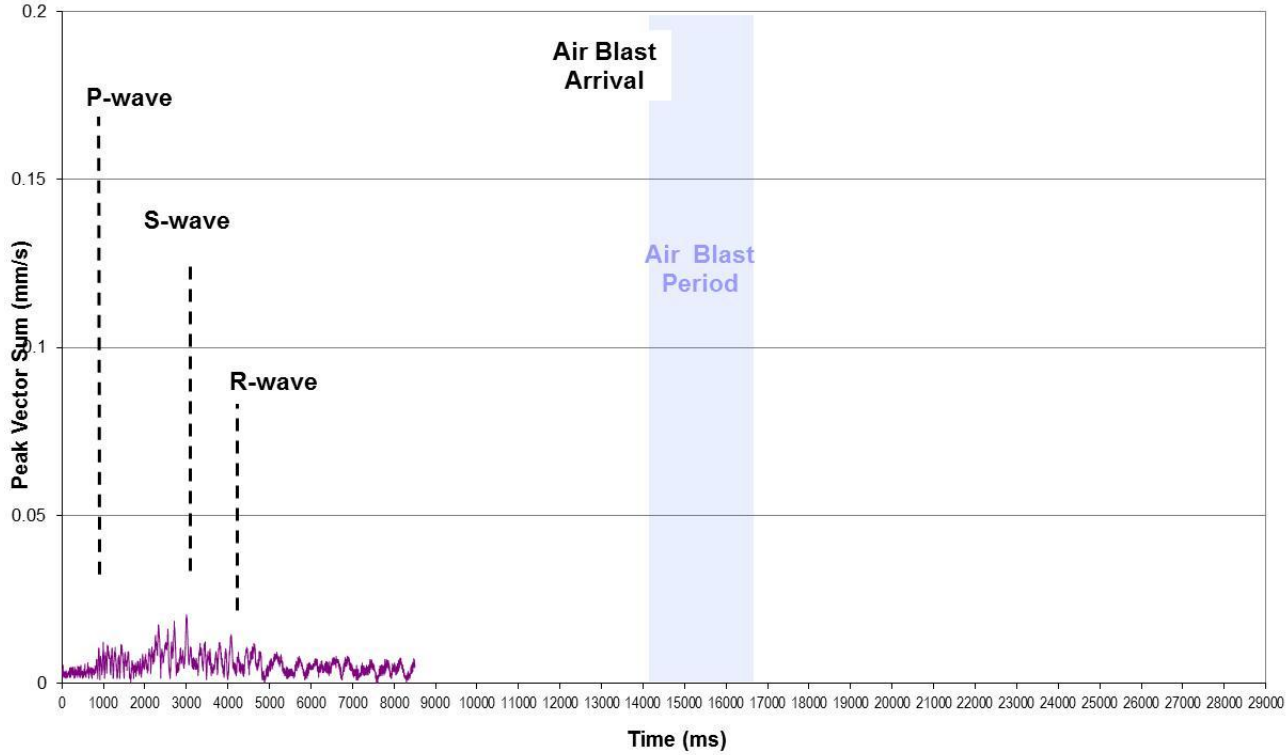


APPENDIX 2 – Average Wind Speed Record – 03.08.12

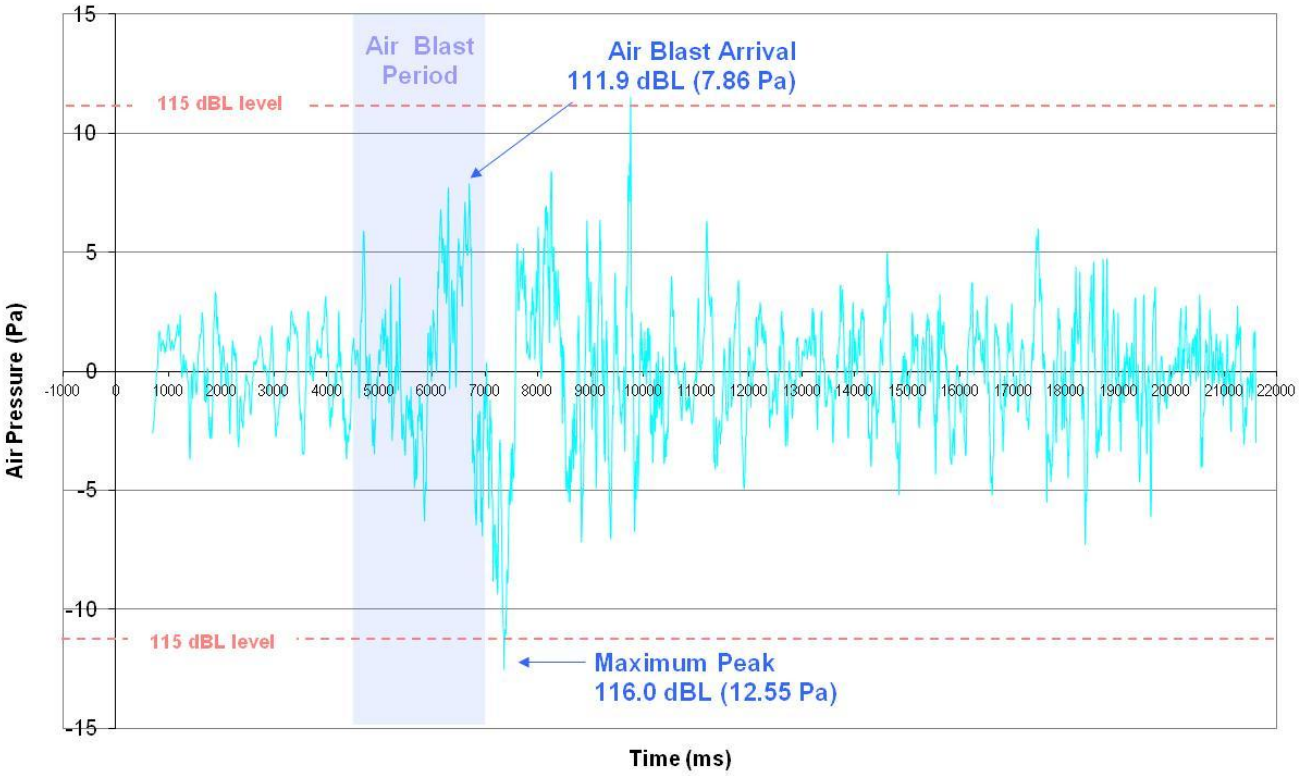


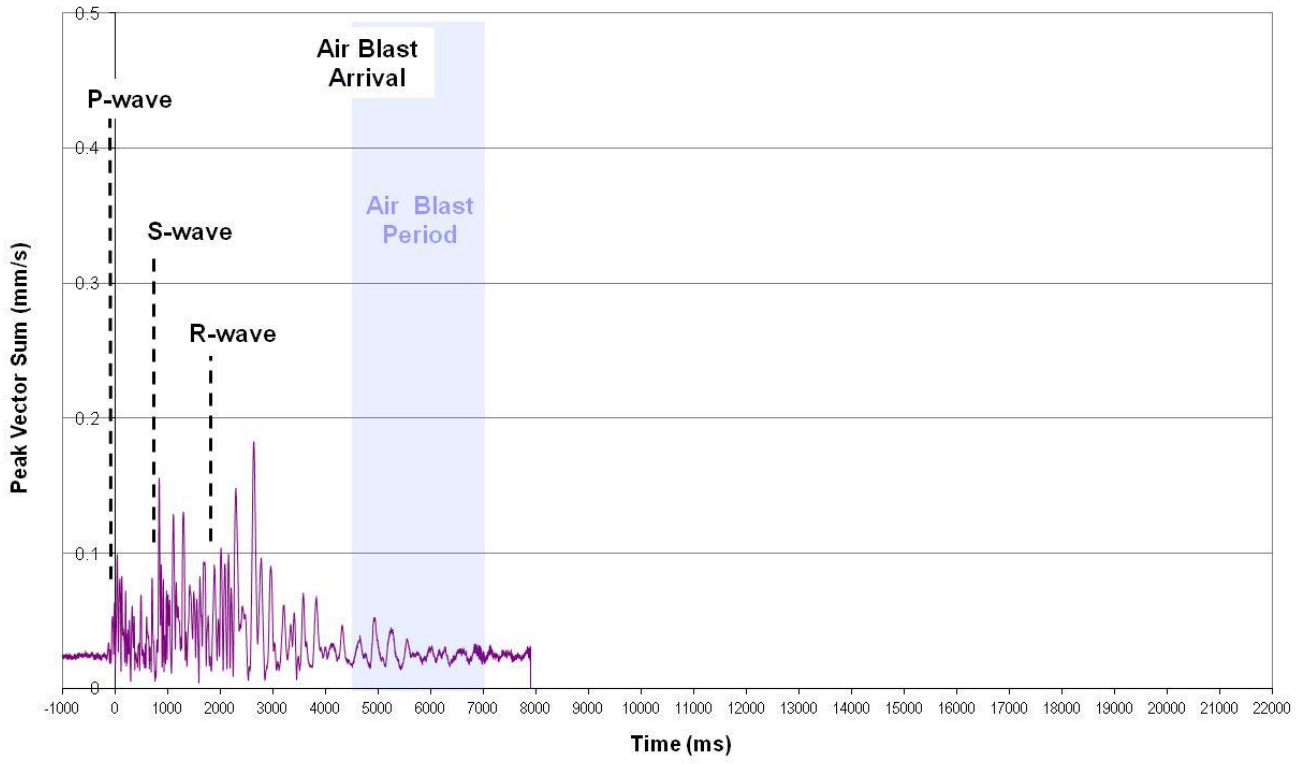
APPENDIX 3 – Wavetrace Data Analysis - Scrivens Station





APPENDIX 4 – Wavetrace Data Analysis – Lake Liddell Dam





Appendix H

Community Newsletter

Appendix H Community Newsletter

Liddell

07

COMMUNITY NEWSLETTER
JULY, 2012

Message from the Operations Manager

Welcome to the seventh edition of the Liddell Coal Operations (LCO) community newsletter, which aims to keep you up to date with the latest from our operation. I am pleased to contribute to it for the first time, since taking over from Tony Galvin as Operations Manager in January this year. Tony has since been promoted to General Manager – Ravensworth Complex.

It has been a challenging time for open cut mining operations in recent years with record rainfalls creating difficult mining conditions and environmental challenges. Nevertheless, our dedicated team at LCO managed to safely meet budgeted coal and overburden targets in 2011, whilst maintaining the high safety and environmental standards anticipated from an Xstrata Coal operation.

Last year our site was awarded the prestigious Xstrata Coal Chief Executive Award for the excellent safety results achieved during the year of the owner/operator transition. We received a $10,000 prize, and donated $5,000 to the Hunter Prostate Alliance and $5,000 to the Hunter Breast Cancer Foundation. This achievement recognised the efforts of the entire team in making LCO a safer place to work. We are still far from being incident free, however, and will continue towards our goal of being a zero injury workplace.

It's a pleasure to report that we continued to support a number of important organisations across the local community in 2011, with monetary and in kind contributions, as detailed in this newsletter.

I would like to take the opportunity to inform you that we are in the process of preparing an Environmental

Ops Manager – David Foster.

Assessment for the proposed modification to our existing development consent. The proposed modification will allow LCO to continue mining within our existing approved footprint until 2028. While the modification is proposed to extend the life of the mine, it is important to note that no change is proposed to the intensity of mining or current hours of work. Further details on the proposed mining extension are contained in this newsletter.

New E&C team

The new year has seen some changes in the Environment and Community department at Liddell Coal Operations. Ben de Somer has taken over from Mel Hawthorne as the Environment and Community Coordinator, while Marty Bower has taken over from Tegan Hancock as LCO's Environment and Community Officer. Environmental management at Liddell has also received a boost with the arrival of Liz Ruppe, who is on a six-month posting at Liddell as part of a two-year graduate program with Xstrata Coal NSW.

Ben, who has been with Xstrata Coal for the past five years, commenced his new role at LCO after a 15 month stint at our Mangoola Coal operation. A Singleton local, Ben is passionate about the environment and the community in which Xstrata Coal, and his young family, reside. Having been raised within an agricultural setting, Ben is looking forward to making a positive contribution towards returning LCO's mined areas to productive pastoral land.

Marty, who recently moved north from Tasmania's remote West Coast, is new to the mining industry after working for four years as a Project Officer with the West Coast Weed and Fire Management Group. In addition to the warmer weather, Marty is enjoying living in the Hunter and working at Liddell Coal Operations, where he looks forward to gaining an increased knowledge of mining and environmental management.

The words 'like a duck to water' come to mind when describing Liz's work ethic and enthusiasm. A recent University of Newcastle graduate in Environmental Science and Management, with a major in Geology, Liddell Coal Operations is the first stop on Liz's road trip to an extensive career with Xstrata Coal.

From left to right: Ben de Somer, Marty Bower, Liz Ruppe.

xstrata coal

Modification project proposal

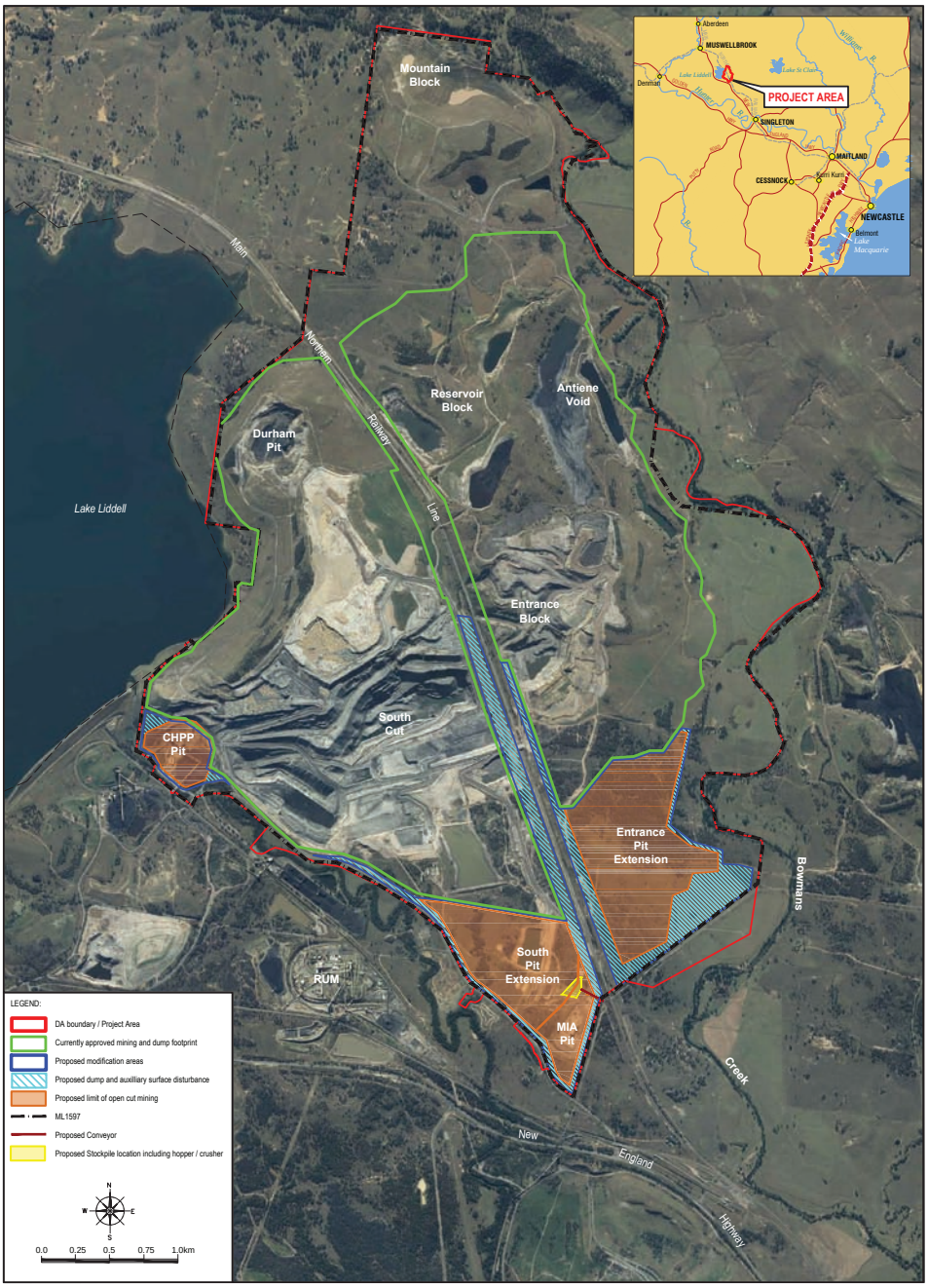
The Llife of Mine planning process at Liddell Coal Operations (LCO) has identified the opportunity to maximise the recovery of coal resources within the existing development consent and mining lease boundaries via the extension of open cut mining activities. The development consent under which LCO currently operates, DA 305-11-01, allows for mining operations to continue until the end of 2023. However, we estimate that coal resources within the approved mining footprint will be exhausted by 2014. LCO is therefore seeking approval to modify its development consent to allow for an extension of mining activities (referred to as the Project).

The primary objective of the Project is to maintain open cut mining operations with a focus on maximising resource recovery, while continuing to operate in an environmentally responsible manner. This in turn will secure ongoing employment at LCO and associated socio-economic flow-on benefits.

The Project proposes to achieve this by extending open-cut mining activities in both the South Pit and Entrance Pit to the south east, beyond the currently approved mining and dump footprint, but still within the development consent boundary for LCO. The possibility of mining coal resources under the current Coal Handling and Preparation Plant infrastructure area (CHPP Pit) and Mine Infrastructure Area (MIA Pit) is also being investigated. The extension area includes provision for auxiliary infrastructure such as powerlines, pipelines and haul roads.

No further changes are proposed to those already approved by the current development consent. No changes are proposed to the approved operating hours, coal handling techniques, coal transportation, or the mining method currently in use at the mine.

An Environmental Assessment of the Project has commenced,



with specialist consultants engaged to undertake a range of environmental studies in the following areas:

- Cultural heritage
- Groundwater
- Surface water
- Soils and land resources
- Air quality
- Flora and fauna
- Noise and blasting
- Greenhouse gas emissions.

These specialist assessments are being undertaken to ensure all potential environmental impacts are identified and appropriate mitigation measures are put in place. The assessments are also being undertaken in accordance with the requirements of the NSW Department of Planning and Infrastructure and other relevant government agencies.

In addition to these specialist studies, the Environmental Assessment will address other aspects of the Project including rehabilitation and mine closure, visual amenity, waste management, and socio-economic aspects of the proposal.

The specialist studies will be completed throughout July. Once the studies are complete further consultation will be undertaken with the community and government to discuss the findings of the assessments.

We are hoping to be able to submit the Project Application and accompanying Environmental Assessment to the Department of Planning and Infrastructure in September this year.

Environment update

Flora and fauna

In the spring of 2010 and summer of 2011, flora and fauna monitoring surveys were conducted at Liddell Coal operations. Several monitoring plots were assessed and compared against each other and previous years' monitoring survey results.

The results of the flora monitoring surveys indicated greater species diversity existed at plots of remnant vegetation compared to plots of rehabilitation sites, which was to be expected. No threatened flora species were recorded.

The fauna monitoring survey returned some positive results indicating fauna species diversity had remained stable and therefore that current mining activities are not likely to be affecting fauna species diversity within the plots. Several threatened species were also recorded during the monitoring surveys and are summarised in the table above right.

In previous years, the threatened Blue-billed Duck (*Oxyurus australis*) has been recorded at site. Consequently, LCO has committed to undertaking habitat enhancement measures at several dams across the site to offset impacts on the Blue-billed Duck. None of this species, however, has been recorded during the recent monitoring surveys.

Common name	Scientific name	Year sighted
Grey-crowned Babbler	*Pomatostomus temporalis temporalis*	2010
Greater Broad-nosed Bat	*Scotorepens ruepellii*	2010
Eastern Cave Bat	*Vespadelus troughtoni*	2011
East Coast Freetail Bat	*Mormopterus norfolkensis*	2011
Eastern Bentwing-bat	*Miniopterus schreibersii oceanesis*	2010 & 2011
Large footed Myotis	*Myotis adversus*	2010 & 2011

Our environmental management guidelines, which cover rehabilitation areas, remnant vegetation, threatened flora and fauna species, flora and fauna habitat, monitoring, native habitat and pasture establishment, can be found in the Landscape Management Plan on our website. (http://www.liddellcoal.com.au/EN/ReportsandPublications/)

Weeds and pest control

Liddell Coal operations' Weed Management Plan assists with the management of weeds across the site. Weed control practices undertaken at LCO include:

- regular site inspections to identify areas of weed infestation and weed species
- 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
- regular maintenance of topsoil stockpiles to manage weed infestation.

Eastern Stone Gecko located during survey.

Weed control works undertaken at LCO during 2011 focused on, but were not limited to, African boxthorn, African olive, blackberry, castor oil plant, galenia, mother of millions, pampas grass, prickly pear and St John's wort.

Seasonal 1080 vertebrate pest control program

Sodium monofluroacetate baits, or '1080' baits as they are commonly known, are used seasonally at Liddell as part of an integrated management approach in the control of wild dogs, foxes and pigs.

Baiting stations, which consist of a small dirt mound imbedded with a 1080 injected bait, are strategically spread across the lease. The bait is tethered using a bamboo skewer. The ground-baiting method used at LCO aligns with the *Code of Practice for Ground Baiting of Wild Dogs* with 1080.

During each seasonal two-week baiting period, each station is checked regularly to monitor bait takes. At the conclusion of the baiting period, baits not taken are removed and are disposed of in accordance the *Pesticide Control Order 2008*.

Prior to each seasonal baiting period, notification letters are posted to immediate neighbouring properties and notification signs are posted at Liddell entrances. The results of Liddell's last four baiting programs can be found in the following table:

Infrared camera shot of a fox taking a 1080 bait.

Season	Bait takes		
	Wild dog	Fox	Pig
Autumn 2011	1	9	0
Winter 2011	1	11	0
Spring 2011	1	8	2
Summer 2011/12	2	12	0

COMMUNITY NEWSLETTER

JULY, 2012

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. The next CCC meeting is to be held on 16 November 2012 at the Liddell Coal offices.

The last meeting was held on 18 May 2012. Items discussed included an update on mine operations, environmental performance and community involvement. Please refer to our website for minutes of the meeting (http://www.liddellcoal.com.au/EN/community/Pages/CommunityMeetings.aspx).

A list of committee members and their telephone contact details are shown right. If there are specific issues you would like to raise at future CCC meetings, please contact us directly or ask one of your community representatives. The Committee also currently has a community representative vacancy. Again, if you are interested in being a part of the CCC, please contact us directly or visit the Muswellbrook Shire Council Website (http://www.muswellbrook.nsw.gov.au/about-council/Committees/Liddell-coal-consultative-committee.htm) to obtain a nomination form.

Community representatives:

Julie Clydsdale

Stephen Oliver

Singleton Shire Council representatives:

Cr Val Scott	65711312
Brian Thomas	65787290

Muswellbrook Shire Council representatives:

Cr Jennifer Lecky	65425792
Craig Flemming	65493775

Liddell Coal representatives:

David Foster	6570 9919
Ben de Somer	6570 9947

Donations and sponsorship during 2011

During 2011, LCO made donations and sponsorships to the following community charities and organisations:

- Lake Liddell Trust
- Hebden Rural Fire Service
- Singleton Amateur Theatrical Society
- Hebden Wild Dog Association
- Singleton Relay for Life (NSW Cancer Council)
- Mercy's Nursing Home
- Lifeline
- Movember Foundation
- MS Society – Sydney to Gong Ride
- Upper Hunter Conservatorium of Music
- Lions Club Ethan's Appeal
- Leukaemia Foundation
- Kurri Kurri Junior Motorcycle Club
- Special Children's Christmas Party
- Upper Hunter Scouts – tree planting at Lake Liddell.

LCO also made donations to many local schools.

In fact, our total contributions across the community amounted to over $30,000.

Liddell Coal Operations aim 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 on how to apply for funding or volunteer support.

For further information contact:

Ben de Somer
Liddell Coal Environment & Community Coordinator
T: (02) 6570 9947
Email: bdesomer@xstratacoal.com.au

Community Response Line
If you have any enquiries or concerns in relation to Liddell Coal Operations, please call the 24 hour community response line on **(02) 6570 9939**.

Blasting Information Line
For information relating to blasting times, please call the 24 hour freecall number **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

www.liddellcoal.com.au

Xstrata 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.

Appendix I

Statutory Plans

Appendix I Statutory Plans

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

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LAKE LIDDELL

ML 1313 ML 1597 ML 1552 CCL 708 CL 708 CC 708

ANTIENE ROAD

DAM 2 DAM 24 DAM 5 DAM 4 DAM 3 DAM 1 DAM 23 DAM 25 DAM 17 DAM 26

SMU1 SMU4

ANTIENE EAST AREA

ANTIENE TAILINGS VOID

ROM COAL PREPARATION PLANT ADMIN. OFFICE PRODUCT STOCKPILE AREA

HUNTER VALLEY COAL LOADING FACILITY

LIDDELL WORKSHOP

OPEN CUT ADMINISTRATION OFFICE

0 250 500 750 1000m

LEGEND

- Liddell Colliery Holding Boundary
- Mining Lease Boundary
- Soil Observation Site
- X26 Soil Profile Site
- Area Stripped January 2012 to December 2012
- Topsoil Removed January 2012 to December 2012

SOIL STRIPPING DEPTHS

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

Drawn: C. Philpott
Date: 10.01.2013
Scale: 1:25,000
Checked: J. Dunlop

LIDDELL OPEN CUT

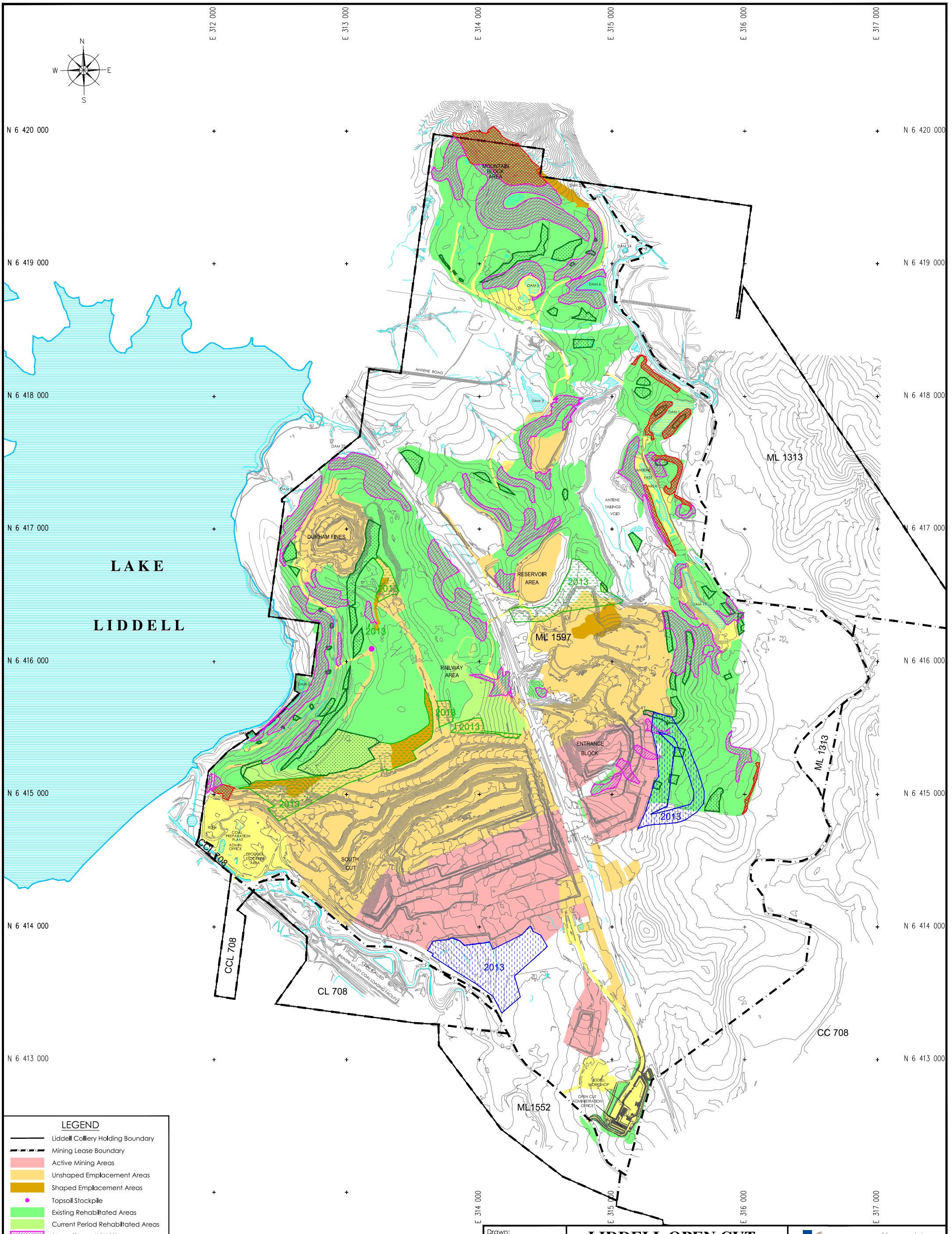
AEMR
Land Preparation

liddell coal operations

Managed by xstrata coal

Drg No: 09045A

Plan No. Plan 3



Drawn:	C. Philpott
Date:	10.01.2013
Scale:	1:25,000
Checked:	J. Dunlop

LIDDELL OPEN CUT

AEMR
Mining Activities and Rehabilitation

liddell coal operations

Managed by xstrata coal

Drg No: 09046A

Plan No. Plan 4