WERRIS CREEK COAL

ANNUAL REVIEW and

ANNUAL ENVIRONMENTAL MANAGEMENT REPORT

2014-2015

Drone view of the eastern pit at Werris Creek Coal Mine towards Werris Creek township

Name of Mine:	WERRIS CREEK No. 2 COAL MINE
Mining Titles/Leases (Leaseholder):	Mining Lease 1563 (Creek Resources Pty Ltd & Betalpha Pty Ltd) Mining Lease 1671 (Werris Creek Coal Pty Limited) Mining Lease 1672 (Werris Creek Coal Pty Limited)
MOP Commencement Date: MOP Completion Date:	01 September 2011 31 August 2018
AEMR Commencement Date: AEMR Completion Date:	01 April 2014 31 March 2015
Name of Mine Operators: Name of Coal Plant Operator:	Whitehaven Coal Pty Limited Whitehaven Coal Pty Limited
Reporting Officer:	Andrew Wright
Title:	Environmental Officer – Werris Creek Coal Pty Limited
Signature:	
Date:	

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(APPENDED TO THIS REPORT)

Plan 3 Land Preparation
Plan 4 Mining Activities
Plan 5 Rehabilitation

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Available to be downloaded from:
http://www.whitehavencoal.com.au/environment/werris_creek_mine_environmental_management.cfm

Appendix 1 Project Approval (PA10_0059)
Appendix 2 Licence and Lease
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4(c) Groundwater Monitoring Results
Appendix 5 Validation Assessment – Stockpiled Contaminated Material – Mitchel Halon Pty Ltd
Appendix 6 Biodiversity Offset Area Annual Monitoring Report – Eco Logical Australia Pty Ltd
Appendix 7 Blast Monitoring Results
Appendix 8a Monthly Attended Noise Monitoring Reports
Appendix 8b Continuous Noise Monitoring Summary
Appendix 9 Monthly Meteorological Data
Appendix 10 Complaints Database

i PURPOSE OF THE REPORT

Werris Creek Coal Pty Limited (WCC) has prepared this report to fulfil the Annual Environmental Management Report (AEMR) requirements of Mining Lease (ML) 1563, 1671 and 1672 (Mining Act 1992) Condition 2 and the Project Approval (PA10_0059) Condition 3 (Schedule 5) for the Werris Creek No. 2 Coal Mine.

This AEMR has been prepared in accordance with the Division of Resources and Energy (formerly Industry and Investment NSW) Director-General's guidelines titled "Environmental Management Guidelines for Industry – Guidelines to the Mining, Rehabilitation and Environmental Management Process", Version 3 dated January 2006, and the provisions within the Project Approval, Condition 3 of Schedule 5 as required for the "Annual Review".

This report provides a detailed review of WCC's environmental management over the annual reporting period 1st April 2014 to 31st March 2015 including performance and forecasts relating to:

- The current Mining Operations Plan (MOP) for the period 1st September 2011 to 31st August 2018;
- PA10_0059 issued by the Acting Deputy Director-General of the Department of Planning and Environment (DP&E – formerly Department of Planning and Infrastructure) on 25th October 2011 and as modified by PA10_0059 MOD1 approved on the 30th August 2012;
- Environmental Protection Licence (EPL) 12290;
- Any other requirements of the Division of Resources and Energy (DRE); Environment Protection Authority (EPA); Office of Environment and Heritage (OEH); NSW Office Of Water (NOW), Liverpool Plains Shire Council (LPSC) and DP&E including other licences and approvals held by WCC;
- Other statutory environmental guidelines and requirements;
- Details of any variations to environmental approvals applicable to the lease area; and
- Where relevant, progress towards final rehabilitation objectives.

ii WERRIS CREEK COAL ENVIRONMENTAL POLICY

WCC has a documented Health, Safety and Environmental policy, of which a copy can be found on the company website.

iii REPORT DISTRIBUTION

This AEMR has been submitted to the administrating authority Division of Resources and Energy:

Mr John Trotter
A/Snr Inspector Environment
Division of Resources and Energy NSW
PO Box 344
HUNTER REGION MAIL CENTRE NSW 2310
516 High Street, MAITLAND NSW 2320

In addition this document has been distributed to the following government departments:

A/Investigations (Lead) Att: **Mr Wayne Jones**
Northern Region
Department of Planning and Environment
PO Box 3145
SINGLETON NSW 2330
Suite 14, Level 1, 1 Civic Avenue, Singleton NSW 2330

A/General Manager Att: **Mr Ron Van Katwyk**
Liverpool Plains Shire Council
PO Box 152
QUIRINDI NSW 2343

Head, Regional Operations Armidale Att: **Mr Robert O'Hern**
NSW Environment Protection Authority
PO Box 494
ARMIDALE NSW 2350

Industry & Investment NSW – Agriculture Att: **Mr Andrew Scott**
Resource Management Officer
4 Marsden Park Road
TAMWORTH NSW 2340

Department of Primary Industries – Office of Water Att: **Mrs Ruth Burton**
Senior Regulatory Officer
PO Box 3720
PARRAMATTA NSW 2124

Werris Creek Coal Mine **Att:** **Mrs Gae Swain**
Community Consultative Committee Chairman

1. INTRODUCTION

This Annual Environmental Management Report (AEMR) is the tenth document submitted for the Werris Creek No.2 Coal Mine and details the environment and community performance of WCC operations for the 12 month period ending 31st March 2015.

WCC is located approximately 4 km south of Werris Creek and 11 km north-northwest of Quirindi in north west slopes and plains region of New South Wales (**Figure 1.1**) and lies within a 910 ha area covered by Mining Lease (ML) 1563, ML1671 and ML1672.

The current Project Approval (PA) 10_0059 limits mining until 31st December 2032. The Mining Operations Plan (MOP) covers a 7 year period from the 1st September 2011 to the 31st August 2018.

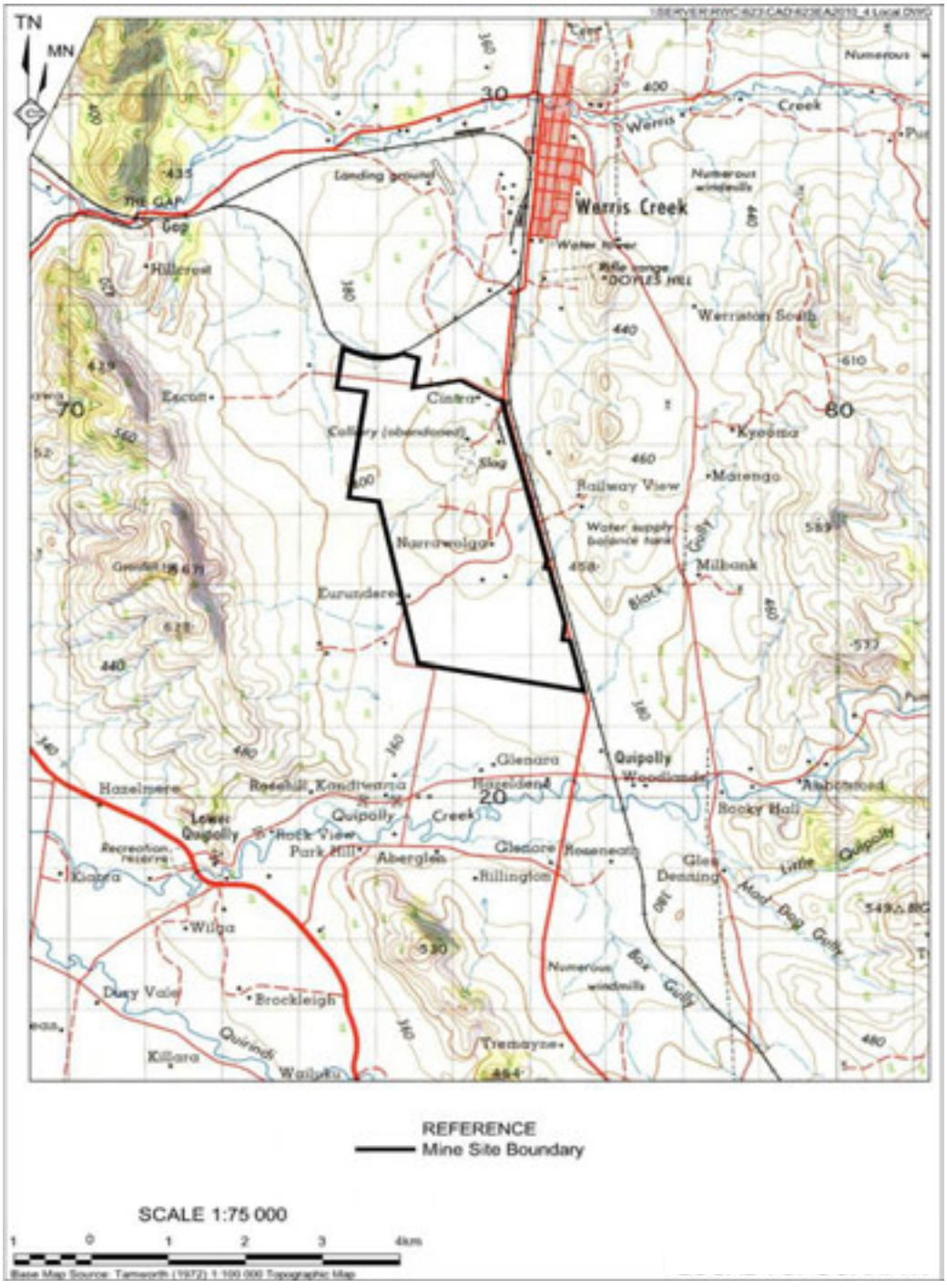


Figure 1.1 WCC Mine Site and Locality

1.1 CONSENT, LEASES AND LICENCES

All applicable consents, leases and licences held by WCC for the 2014-2015 period are identified in **Table 1.1**. A full copy of PA10_0059 is appended in **Appendix 1**, EPL 12290 in **Appendix 2(a)**, ML 1563 in **Appendix 2(b),** ML 1671 in **Appendix 2(c)** and ML 1672 in **Appendix 2(d).**

Table 1.1 Consents, Leases and Licences

Authority	Approval	Number	Issue	Expiry	Comments
Department of Infrastructure, Planning and Natural Resources	Development Consent	DA 172-7-2004	18/02/2005	Notice made for Surrender	A notice was issued for Surrender of DA 172-7-2004 on 25th September 2012.
Department of Planning and Environment (DP&E)	Project Approval	PA10_0059	25/10/2011	31/12/2032	Life of Mine Project allows northerly continuation for entire coal deposit mining up to 2.5Mtpa and 24 hours 7 days per week.
		PA10_0059 MOD1	30/08/2012	31/12/2032	Modification of Biodiversity Offset Area to allow for augmentation of VWD1 to 250ML.
Department of Primary Industries – Division of Resources and Energy (DRE)	Exploration Licence	EL 5993	18/09/2002	17/09/2013	Relinquished and consolidated into ML1672
	Mining Lease	ML 1563	23/03/2005	23/03/2026	Mining Lease granted for 21 years.
		ML 1671	9/03/2012	9/03/2032	Mining Lease granted for 21 years.
		ML 1672	9/03/2012	9/03/2032	Mining Lease granted for 21 years.
	Mining Operations Plan	None	1/09/2011	31/08/2018	MOP approved on 29th November 2011
Environment Protection Authority	Environment Protection Licence	12290	18/04/2005	Anniversary date: 1/04/2015 Review Date: 23/06/2019	Last variation 19th November 2014
Department of Primary Industries – NSW Office of Water (NOW)	Water Access Licence (Water Management Act 2000) Water Works Approval	WAL29506	21/02/2013	Perpetuity	Aquifer – 50ML annual allocation. NOW reference number 90AL822531. Formerly 90BL252588
		WAL32224	19/06/2013	Perpetuity	Aquifer – 211ML annual allocation. NOW reference number 90AL828344. Formerly 90BL255087
		90WA822532	21/02/2013	15/01/2025	Linked to WAL29506. Bore. Formerly 90PT982801
		90WA828345	19/06/2013	25/06/2017	Linked to WAL32224. Excavation. Formerly 90PT982872
Commonwealth Department of Sustainability, Environment, Water, Population and Communities	Environment Protection and Biodiversity Conservation Act Approval	2010/5571	21/12/2011	31/12/2032	Authorises impacts on EPBC listed threatened species and communities and listed migratory species
Dam Safety Committee	Prescribed Dams	Werris VWD1 Werris VWD3 Werris VWD4	18/10/2012 13/12/2012 13/12/2012	Perpetuity Perpetuity Perpetuity	Significant Sunny Day and Flood Consequence

Authority	Approval	Number	Issue	Expiry	Comments
Workcover	Acknowledgement of Notification of Dangerous Goods on Premises	NDG037966	11/12/2014	26/11/2015	4 x 62000L Above Ground Diesel Tanks held by Werris Creek Coal Pty Limited 60,000kg Ammonium Nitrate; 300,000kg Ammonium Nitrate Emulsion; 130000 units Detonator assemblies; 10000kg Boosters and Detonating Cord
	Licence to Store	XSTR200038	5/12/2013	16/12/2018	Licence to Store Explosives Class 5.1AN, 5.1ANE, 1.1D, 1.1B
Liverpool Plains Shire Council	On-Site Sewerage Management System	04/06 05/06 16/13	1/03/2006 1/03/2006 15/05/2013	Perpetuity Perpetuity Perpetuity	2x3000L Septic Tanks & 7x54m absorption trenches at new MIA
	Occupation Certificate	123/2005 88/2005 109/2010	8/02/2007 7/02/2007 12/04/2011	Perpetuity Perpetuity Perpetuity	Original Workshop – now removed Original Office – now removed Explosive Precursor Facility - Orica
	Construction Certificate	109/2010 109-2010-2 104/2005	23/12/2010 27/06/2013 30/05/2005	Perpetuity Perpetuity Perpetuity	Explosive Precursor Facility – Orica New Northern MIA Conveyor gantry, Coal Stockpile Pad

1.1.1 Amendments to Consents, Leases and Licences

Table 1.2 summarises the new or modified consents, leases, licences and management plans obtained by WCC during the period.

Table 1.2 Amendments to Approvals and Management Plans during 2014-2015

Date Issued	Title	Details
(Not Yet Approved)	PA 10_0059	Modification 2 (MOD2) Application made for two minor overburden emplacement changes, agricultural irrigation, coal deshaling plant and SB18.
11th May 2015	MOP Amendment 1	Increase clearing area for Ramp 3.
10th June 2014 21st January 2015	EPBC 2010/5571	Date for Security of Biodiversity Offset Area to be registered changed to 21 December 2014; then changed again to 21 December 2015.
11th December 2014	NDG037966	Annual renewal of Notification of Dangerous Goods.
24th February 2015	90WA822532	Extension of Water Works Approval for WAL29506 (50ML annual allocation) for 10 years.
9th December 2014	Occupation Certificate	For occupation of new Workshop, Portable Office and Facility buildings.
16th June 2014 19th November 2014	EPL12290	Removal of noise monitoring requirements for R7, R9 and R22. Former Pollution Reduction Program U1 & U2 deleted, U3 renamed U1 and a new Pollution Reduction Program U2 for Expose Surface Area.
1st December 2014	Heritage Management Plan	Relocate Narrawolga Axe Grinding Groove Rocks from Temporary Storage Site to Willow Tree Visitor Information Centre.
29th April 2014	Noise Management Plan & Air Quality and Greenhouse Gas Management Plan	First Approved under PA10_0059.

1.2 MINE CONTACTS

The Werris Creek No.2 Coal Mine continued to be managed by Whitehaven Coal under the trading title of Werris Creek Coal Pty Limited (WCC) during the period.

1.2.1 WCC Personnel

All Whitehaven Coal (WHC) management personnel responsible for operational and environmental performance at the WCC mine for this reporting period are listed in **Table 1.3**.

Table 1.3 WHC Management Team at WCC

Name	Title	Contact	Period
Mr Paul Flynn	WHC Managing Director and CEO	02 8507 9700	01/03/2013 – Present
Mr Jamie Frankcombe	WHC Executive Director	02 8507 9700	01/03/2013 – Present
Mr Nigel Wood	WHC General Manager – Open Cut	02 6741 9300	5/03/2012 – Present
Ms Kirsten Gollogly	WHC General Manager – HSEC	02 6741 9300	11/12/2014 – Present
Ms Jill Johnson	WHC Group Manager – Environment	02 6741 9300	11/01/2008 – Present
Mr Rod Hicks	WCC Operations Manager	02 6763 6000	22/12/2014 – Present
Mr Andrew Wright	WCC Environmental Officer	02 6763 6000	01/02/2010 – Present

1.2.2 Support Personnel

In addition to the personnel identified in **Section 1.2.1**, WCC utilise a range of consultants specialising in a wide variety of environmental fields as and when required. Specialist consultants involved in activities at the mine during the reporting period included:

- Eco Logical Australia (ELA) Pty Ltd;
- ALS/ACIRL Pty Limited;
- ENVIRON Pty Ltd;
- Advitech Pty Limited;
- Novecom Pty Limited;
- Mitchel Halon Pty Ltd;
- SLR Pty Ltd;
- TME Earthmoving Pty Ltd; and
- Spectrum Acoustics Pty Ltd.

1.3 ANNUAL AEMR REVIEW & INSPECTION

An Annual AEMR/Annual Review Inspection and Meeting were held with DRE, DP&E and EPA on 10th October 2014. In correspondence dated 15th October 2014, the DRE reviewed the WCC AEMR for 2013-2014 and found that WCC was in compliance with its environmental requirements of the Mining Lease, MOP and the AEMR. DRE noted that rehabilitation had made significant progress but a Rehabilitation Cost Estimate has not been recently prepared. In correspondence dated 13th October 2014, the EPA reiterated issues they have with the management of water runoff from catchments containing coal and dust suppression for Product and ROM Coal Stockpiles. In correspondence dated 24th October 2014, the DP&E raised issues with spontaneous combustion management and

supported the EPA's concerns over surface water in contact with coal. **Table 1.4** outlines the actions identified by the DRE, EPA and DP&E.

Table 1.4 Actions from Annual AEMR Review

Department	Action/Statement	Progress
DRE	Provide a Rehabilitation Cost Estimate using the current DRE tool ('Rehabilitation Cost Calculation Tool V1.12').	Rehabilitation Cost Estimate to be updated with new MOP submission June 2015.
EPA	The spontaneous combustion occuring within the pit needs to be actively managed.	Management is ongoing as required for any new spontaneous combustion outbreaks.
	The mangement of stormwater run-off from the rail loop at the premises and also the ROM needs to be improved as it is currently directed to a sedimentation system. The EPA regards this as coal contact water.	SLR engaged to prepare design storm sizing for coal catchments at WCC. Whitehaven Coal preparing a group wide response back to EPA.
	The EPA encourages the installation of sprinklers for both the ROM and Rail Load Out (RLO) facility and the installation of a water fill point for water carts at the RLO.	Investigation of Train Load Out facility water infrastructure found that existing gravity feed pipeline is inadequate for sprays/water fill point.
DP&E	Requested to continue managing spontaneous combustion through the implementation of best practice to minimise off-site odour in accordance with Condition 18, Schedule 3 of MP10_0059.	Management is ongoing as required for any new spontaneous combustion outbreaks.
	Please review and revise the Surface Water Management Plan incorporating the EPA's advice and resubmit the plan for assessment by 28 November 2014.	Revised Site Water Management Plan submitted but not approved.

1.4 COMPLIANCE REVIEW

In accordance with Project Approval (PA) 10_0059 Schedule 5 Condition 9 and Environment Protection Licence 12290 Condition 9 E1.1; an Independent Environmental Audit and Noise Audit was completed by the endorsed audit team from SLR Pty Ltd on 28th to 30th May 2014 for the period 25th October 2011 to 30th May 2014. The Independent Environmental Audit was the first audit period since MP 10_0059 was approved on 25th October 2011. **Table 1.5** summarises the non-compliance identified during the audit (PA10_0059 – 5; EPL12290 – 2; ML1563 – 1) as well any additional non-compliance that occurred against the key environmental approvals of PA10_0059, EPL12290, Mining Leases (ML1563, ML1671, ML1672) and MOP during the 2014-2015 period. **Table 1.6** outlines the status of the implementation of the Independent Environmental Audit action plan to date.

Table 1.5 Summary of Non-Compliance with Key Environmental Approvals 2014-2015

	PA10_0059	EPL12290	Mining Leases/MOP
Independent Environmental Audit	**Schedule 2 Condition 8b** Coal Transport by Road – WCC was non-compliant as coal was transported through Hunter Valley. **Schedule 2 Condition 10** Buildings constructed to BCA – WCC does not yet have an occupation certificate. **Schedule 3 Condition 1** Noise Criteria – Three night time noise exceedances recorded (R5, R9 and R22) during July 2013 and one night time noise exceedance (R97) during September 2013. **Schedule 3 Condition 16** Dust Criteria – One daily maximum PM_{10} dust concentration >50ug/m^3. **Schedule 3 Condition 22** Water Discharge – There was an uncontrolled discharge on 11 March 2012 from Void Water Dam 3.	**L1.1** Water Discharge – There was an uncontrolled discharge on 11 March 2012 from Void Water Dam 3. **L4.1** Noise Criteria – Three night time noise exceedances recorded (R5, R9 and R22) during July 2013.	**Condition 16 (ML1563)** Water Discharge – There was an uncontrolled discharge on 11 March 2012 from Void Water Dam 3.
2014-2015	**Schedule 3 Condition 1** Noise Criteria – One night time noise exceedance recorded (R96) during September 2014 and one night time noise exceedance (R97) during October 2014.	**L4.1** Noise Criteria – One night time noise exceedance recorded (R96) during September 2014. **O1.1** Activities in Competent Manner – Blast 2nd July 2014 resulted in fume travelling off the EPL boundary. **M2.2** Air Monitoring Requirements Point: 30 – The TEOM did not operate every 6th day on the 30th March 2015.	None

Table 1.6 Status of the Implementation of the Independent Environmental Audit Action Plan

Condition	Action	Due Date/Completed
PA10_0059 Schedule 2 Condition 10	WCC to install emergency lighting and liaise with council regarding the occupation certificate.	Complete. Occupation Certificate109/2010-2 issued 9th December 2014.
PA 10_0059 Schedule 3 Condition 16	WCC to discuss with the DP&E regarding a methodology for upwind/downwind dust monitoring to determine dust source contribution and/or regional dust events.	Completed. DP&E indicated that they are to be notified of any results above the criteria but if monitoring indicates that WCC was not the cause/source of the elevated dust level, then it will not be considered a non-compliance.
PA 10_0059 Schedule 3 Condition 22 EA SoC 2.8 EPL 12290 Condition L4.1 ML 1563 Condition 16	Automated float switch alarm system to determine high water levels of Void Water Dams.	Complete. Void Water Dam 3 and 4 installed in August 2014 and Void Water Dam 1 installed in September 2014.

Condition	Action	Due Date/Completed
EA SoC 14.2	Submit Site Water Management Plan for approval outlining bimonthly groundwater level monitoring.	Complete. Site Water Management Plan submitted 30th January 2015.
PA 10_0059 Schedule 3 Condition 6 EPL 12290 Condition L5 EA SoC 7 ML 1671/1672 Condition 10 ML 1563 Condition 11	WCC to discuss with the DP&E and EPA regarding a third party blasting assessment.	Complete. DP&E and EPA did not wish to comment on third party blasting assessment. Third party blast complaint assessment completed in November 2014.
PA 10_0059 Schedule 3 Condition 27	SLR recommends that WCC progress consultation with the DP&E in order to close out this condition regarding long term security for the offset area.	Email recieved 5th February 2015 indicating that DP&E legal yet to progress their review.
PA 10_0059 Schedule 3 Condition 37	Finalise the construction of the visual bund and revegetate the visual bund.	Action extended into next financial year 2015-2016.
PA 10_0059 Schedule 3 Condition 39 EPL 12290 O1.1 EA SoC 11, 12.8	Develop a waste management plan for the site to document the waste management strategy for the site. Investigate options for implementing a total waste management service which includes the separation of all recyclable material as well as the oily waste. Training on oil spill response, clean up and general waste management is to be undertaken for all staff in the field of operations and maintenance.	Complete. New Waste Management Contract implemented in December 2014 and draft Waste & Hydrocarbon Management Plan developed.

PA – Project Approval; EPL – Environment Protection Licence; EA SoC – Environmental Assessment Statement of Commitments; ML – Mining Lease

2. OPERATIONS DURING THE REPORTING PERIOD

The extent of operations at the WCC mine is presented in **Figure 2.1** as representative of the beginning of the period and **Figure 2.2** as representative of the end of the 2014-2015 period.

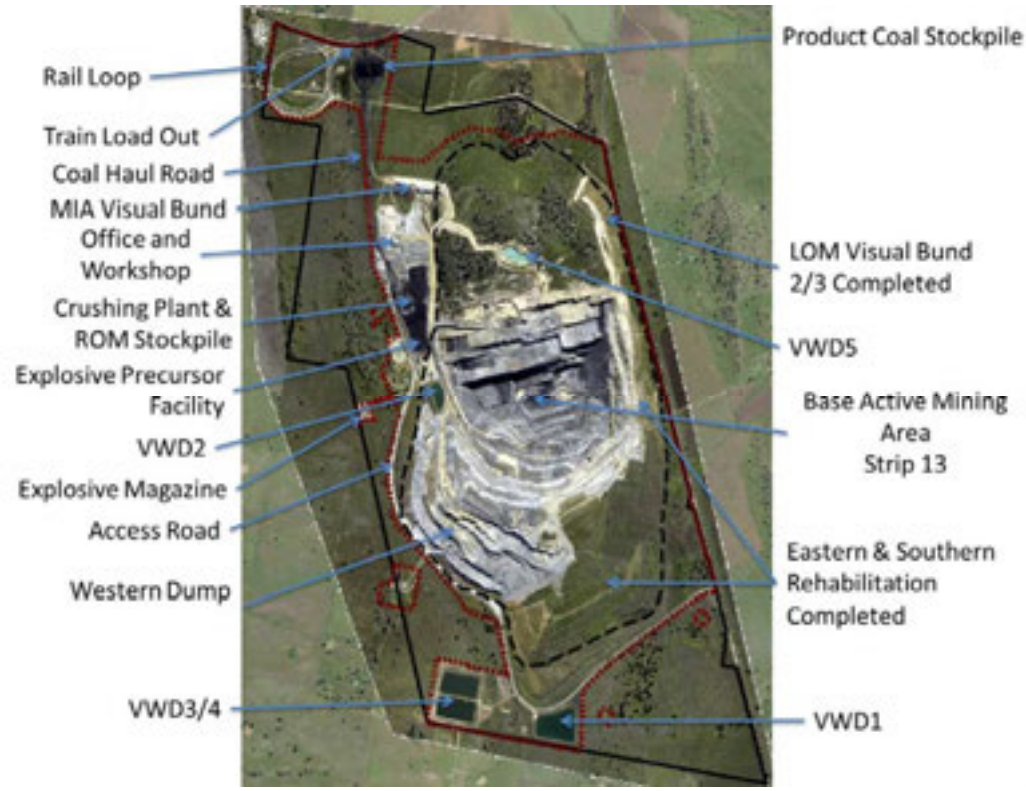


Figure 2.1 Werris Creek Coal Mining Operations as at the start of April 2014 (Aerial May 2014)

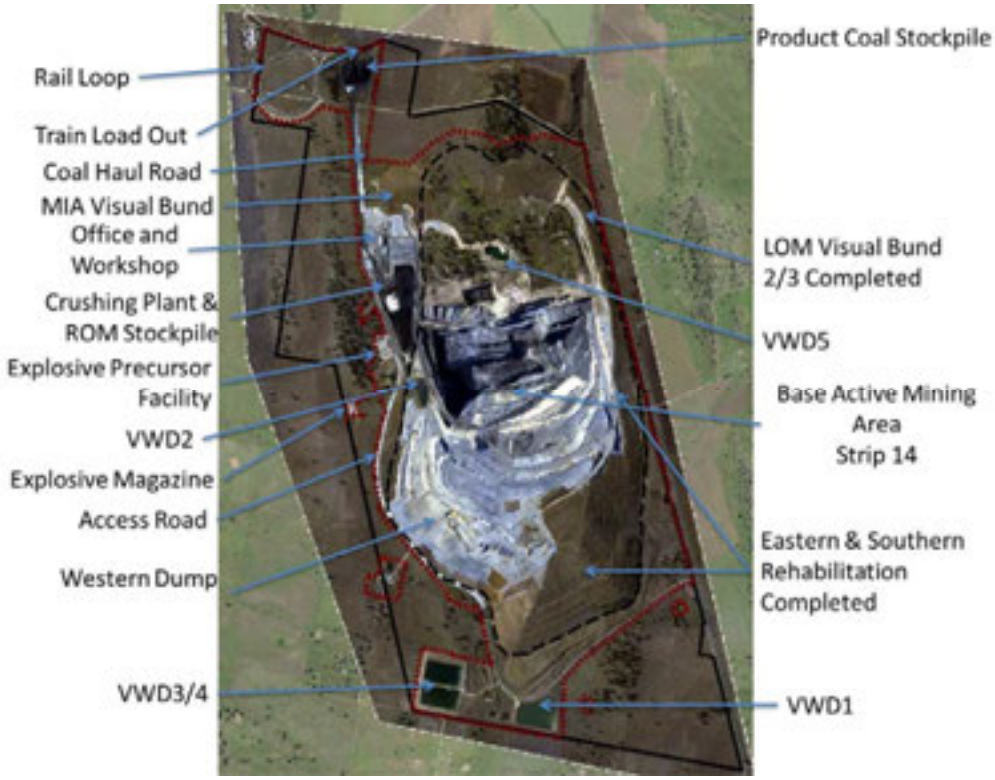


Figure 2.2 Werris Creek Coal as at the end of March 2015 (Aerial March 2015)

2.1 EXPLORATION

2.1.1 WCC Drilling Program

The objective of current and future drilling is to develop a more accurate geological model to assist in production scheduling and coal quality control (Coxhead, 2015). The WCC drilling program during the year ending March 2015 achieved a total meterage of 4,035m (Coxhead, 2015) focussed in front of the highwall. Thirty five open holes were drilled for a total of 3,236m, including redrills. Four partly cored HQ wireline holes were drilled for a total of 557m. Four groundwater monitoring holes were drilled for a total of 242m. All boreholes were geologically logged, and geophysically logged if the hole was not blocked. Raw coal quality parameters were determined for six of the coal cores. The location of drilling for 2014-2015 is outlined in **Figure 2.3**. During the next reporting period, seventeen open holes and three cored holes are planned to be drilled for a total of 2,500m.

2.1.2 WCC Geology

Coxhead (2013) described the geology at WCC Mine as located within the Werrie Basin containing Permian sedimentary and volcanic rocks that unconformably overlie the Middle Cambrian to earliest Permian basement of the Tamworth Belt, Southern New England Orogen. The geology at WCC is an outlier of the Early Permian Willow Tree Formation, which is now recognised as equivalent to the Greta Coal Measures (Dawson, Coxhead and McMinn, 2006), which unconformably overlies the Werrie Basalt.

Two lithostratigraphic units occur within the equivalent Greta Coal Measures (Skeletar Formation and Rowan Formation) and one lithostratigraphic unit from the Maitland Group (Railway View Conglomerate) are recognised in the Werris Creek outlier (**Table 2.1**). The equivalent Greta Coal Measures contains at least nine coal seams, with the formal names of coal members chosen to correspond with the earlier alphabetical seam identification. The coal seams range in depth from as little as 10m at subcrop to an estimated 180m in the centre of the basin. Weathering depths range from 10 – 50m. Individual seam thicknesses are up to 8m but are more commonly in the range 3 - 4m. Underlying the coal measures is the Werrie Basalt, a sequence of deeply weathered basaltic lavas, volcanoclastics and palaeosols.

The Werris Creek coal deposit is contained within a closed syncline whose longitudinal axis is oriented NNW-SSE. Dips near subcrop are up to 60^{o}, but flatten towards the centre of the basin. The irregular upper surface of the Werrie Basalt may have affected deposition of the overlying coal measures. A basement high is thought to be responsible for the thinning of G Coal in places, and up to 40m relief is inferred (Dawson et al 2006). A number of small faults with displacements of up to 2m were recorded in the old underground workings. A complex NNW-trending graben structure traverses the open cut mine, with displacements of up to 5m. Faults are also inferred from boreholes. Dykes were also recorded in the old mine, in the open cut and in boreholes.

The coals at Werris Creek are bituminous, high volatility (VM+/-35% daf), low sulphur (<0.35%) and vitrinite-poor. The coals are non-swelling to very weakly caking. Ash content is generally low to medium (Coxhead, 2015).

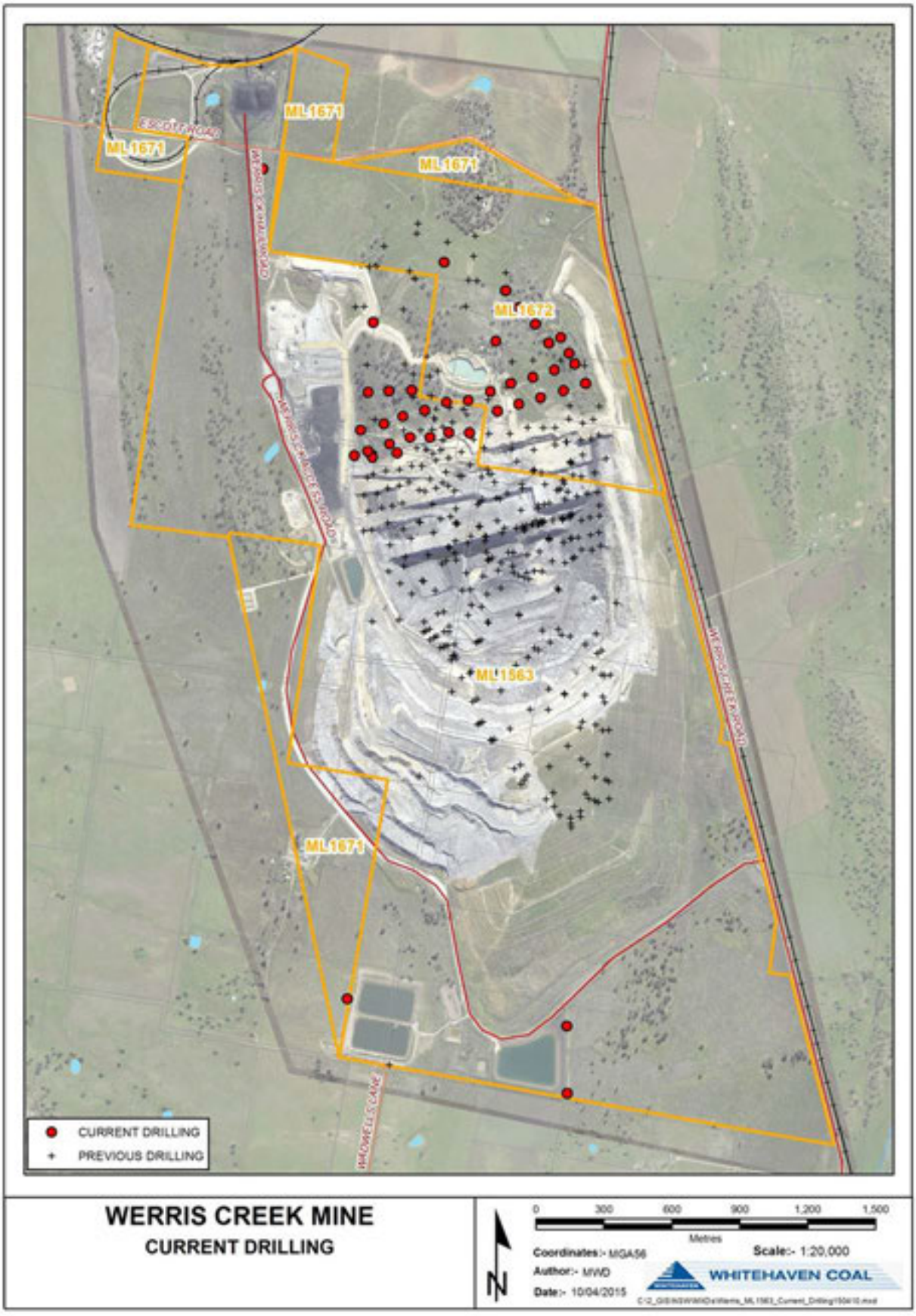


Figure 2.3 Annual Drilling Program for WCC Mine as at the end of March 2015

Table 2.1 Werris Creek Outlier of Greta Coal Measures Proposed Stratigraphic Nomenclature

MAITLAND GROUP	Railway View Conglomerate	Narrawolga Coal Member (formerly Black Seam)
GRETA COAL MEASURES	Rowan Formation	**A**berglen Coal Member
		Britton Coal Member
		Cintra Coal Member
		Doyles Hill Coal Member
		Eurunderee Coal Member
		Friendly Coal Member
		Faithful Coal Member
	Skeletar Formation	**G**lenara Coal Member
WERRIE BASALT		

2.1.3 Resource and Reserve Estimation

The most recent resource statement (Dawson, 2014) identified the coal resource as 25 million tonnes (Mt) (**Table 2.2**).

Table 2.2 Werris Creek Coal Resource Summary

Category	ML 1563 / ML 1671 / ML 1672
Measured	22Mt
Indicated	2Mt
Inferred	1Mt
TOTAL	**25Mt**

The most recent reserve statement (Runge Pincock Minarco, 2014) identified a proved and probable reserve of 18Mt within ML 1563, ML 1671 and ML 1672 (**Table 2.3**). This reserve excludes the coal removed by the former Werris Creek Colliery.

Table 2.3 Werris Creek Coal Reserve Summary

Category	ML 1563 / ML 1671 / ML 1672
Proved Reserves	17Mt
Probable Reserves	1Mt
Proved + Probable	**18Mt**

2.2 LAND PREPARATION

Land preparation activities undertaken by WCC including vegetation clearing and soil stripping during the reporting period were conducted in accordance with the MOP (Amendment 1 approved 11th May 2015 for additional clearing for Ramp 3 development extending the western edge of mining northwards) and the Biodiversity and Offset Management Plan (BOMP).

Vegetation clearing for the 2014-2015 reporting period required 13.1ha of land to be disturbed (**Figure 2.4**) to enable Ramp 3 to be developed. All vegetation clearing was undertaken following a Pre/During/Post Clearing Inspection by an Ecologist in accordance with Section 3.1 of the MOP Amendment 1 and Section 8.1 of the BOMP.

Figure 2.4 Land Disturbance and Vegetation Clearing at WCC Mine since 2013

At the end of the reporting period, the total volume of soil stockpiled decreased from 1,173,105m^3 to 1,070,673m^3. The majority of soil from the 2014 clearing area was stripped but not immediately transported from the prestrip to the rehabilitation area except for 24,648m^3 that was taken to the RL445m dump and stockpiled (#60). The MIA bund footprint had 27,080m^3 of topsoil stripped and then directly used, and an additional 27,080m^3 of topsoil was spread from Stockpile #46 in the rehabilitation of the MIA bund. The western rehabilitation area directly used 50,000m^3 of topsoil and 50,000m^3 of subsoil in 2014-2015 to complete 24.81ha of rehabilitation. Subsoil stockpiles #25 (36,140m^3) and #39 (4,340m^3) and topsoil stockpile #42 (9,870m^3) were exhausted as part of rehabilitation works with the residual soil coming from topsoil stockpiles #12 (18,422m^3) & #53 (21,708m^3) and subsoil stockpiles and #41 (4,350m^3) and #11 (5,170m^3). **Figure 2.5** displays the locations of the soil stockpiles and volumes as at the end of March 2015.

2.3 CONSTRUCTION

No major construction activity was undertaken in 2014-2015. Currently being planned is to establish a second crib/amenity facility within the overburden emplacement footprint that would be outside 500m blast exclusion zone in anticipation when mining encroaches within 500m of current MIA and could be constructed for 2015-2016.

2.4 MINING

PA10_0059 approved mining activities to occur 24 hours per day, 7 days per week if required; however during the period, mining production operated Monday to Saturday 6:00am to 2:40am and on Sundays when overtime was offered. During the 2014-2015 reporting period, a total of 16,217,671bcm of overburden was removed to produce 2,597,369t of ROM coal (EPL 12290 limit of 3,500,000t) at an average overburden to coal stripping ratio of 6.2:1 (**Table 2.4**). In comparison to PA 10_0059 ROM coal production limit of 2,500,000t in a calendar year, ROM coal produced for 2014 was 2,453,744t. The production levels attained in 2014-2015 are the highest achieved by WCC since mining commenced in 2005. Compared to the previous period, coal production increased by 520,563t and overburden handled increased by 96,289bcm as mining operations ramped up production levels to achieve budget target of 2.5Mtpa for 2014-2015 (financial period). Due to the decline in the global coal price and demand, WCC will reduce budget production for the 2015-2016 reporting period to 2.07Mtpa.

Table 2.4 WCC Cumulative Production and Waste Summary since commencement in 2005

	Start of Reporting Period 1st April 2013	At end of Reporting Period 31st March 2014	End of next Reporting Period 31st March 2015
Soil Stripped (m^3)	1,660,203	1,711,931	1,771,931
Soil Used/Spread(m^3)	504,049	658,209	758,209
Waste Rock (bcm)	83,383,188	99,600,859	117,600,859
ROM coal (t)	11,725,547	14,265,932	16,265,932
Product coal (t)	11,725,547	14,265,932	16,265,932

During the period, WCC intersected seven panels of the former underground workings which was the largest amount of underground workings that had to be managed by WCC. **Figure 2.6** presents a view into the former underground workings from the highwall during the period looking down a drive at the intersection with a cut through.

Name	Topsoil	Subsoil_m3	Soil_Origi	Year
25	0	0	Original Mine Development	2005
33	0	124674	Former Stockpiles 15 & 18	2010
11	0	512860	Original Mine Development	2005
13	18200	0	Access Road	2005
36	1030	0	Former Stockpile 19	2010
12	23038	0	Original Mine Development	2010
38	7870	0	Strip 15	2012
40	11560	0	VWD1	2012
39	0	0	Former Stockpile 9	2012
42	0	0	Western Dump Extension	2012
41	0	36360	Former Stockpile 9	2012
46	2430	0	Northern MIA	2013
53	67168	0	Western Dump Extension	2013
51	20156	0	Strip 16/17	2012
52	8303	0	Western Dump Extension	2013
58	0	35985	Former Stockpile 4	2013
57	845	0	Strip 16/17	2012
55	6999	0	Strip 15	2013
54	12726	0	VWD1	2012
34	107311	0	Former Stockpiles 14 & 16 & 17	2010
59	6406	0	Strip 14 (Formerly 37)	2013
45	3345	0	MIA Dam and Road	2013
60	24640	0	Strip 18	2015
TOTAL	360794	709879		

Figure 2.5 WCC Soil Register and Stockpiles for 2014-2015

Figure 2.6 A drive (& cut through) into the former underground workings from the highwall

2.5 PROCESSING AND PRODUCT COAL TRANSPORT

PA10_0059 approved processing activities to occur 24 hours per day, 7 days per week if required; however during the period, coal processing operated Monday to Friday 6:00am to 2:00am and on Sundays when overtime was offered; while train loading operations occurred 24 hours per day, 7 days per week dependent on train scheduling. Coal is segregated at the ROM coal stockpile based on the expected ash content of the coal. The higher ash coal products are processed through the fixed plant crusher at an average 420t/hr using a Front End Loader to feed the hopper of the primary crusher (to <150mm) and subsequently processed through the secondary crusher to <50mm size, this being the specification for export quality coal. Low ash coal products are processed by the mobile crushers at an average 240t/hr straight to <50mm product and then screened. The despatch of product coal from WCC is either railed to the Port of Newcastle or by road to domestic customers. The despatch of coal by rail requires the product coal to be transported by road trucks from the coal processing area to the product coal stockpile area at the train load out facility via the private coal haul road.

Figure 2.7 presents a schematic of coal processed for the reporting period and shows that a total of 2,493,457t coal was processed through the crusher. A total of 3,866t of domestic coal was transported offsite by 139 trucks by road and 42,726t railed offsite by 28 trains, down from the previous period as the contract with the main domestic coal customer concluded during the period. Total coal railed offsite (domestic and export) was 2,430,530t from 376 trains.

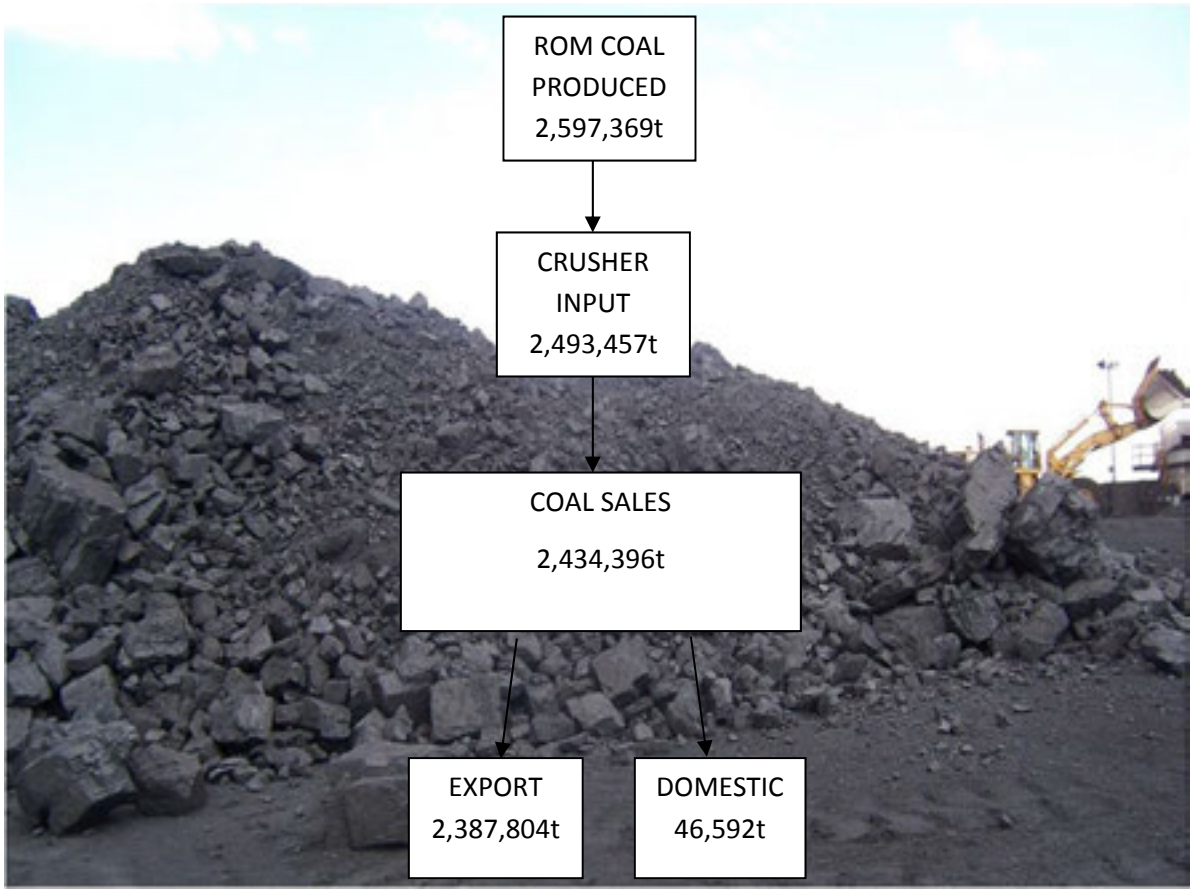


Figure 2.7 Coal Movements and Production Summary for 2014-2015 Period

Note: Difference between crusher input, coal sales and exported volumes reflects product coal stockpiled at either the processing area or the rail siding prior to the reporting period.

2.6 WASTE MANAGEMENT

WCC engaged one company to provide a total waste management contract to service and manage all waste streams generated onsite commencing in December 2014. This improvement initiative will ensure that WCC adopts industry standard waste management practices and improved processes to maintain regulatory compliance while also looking to harness recycling rebates and lower unit waste disposal rates to reduce overall waste management costs. A monthly report is now prepared by the waste contractor outlining quantities of waste disposed and recycled plus also incorporates safety and waste tracking forms into the one document that simplifies the demonstration of environmental compliance as well as improving WCC's ability to identify and understand waste management performance. During the reporting period, a draft Waste and Hydrocarbon Management Plan was developed to document the new waste management system at WCC.

2.6.1 Waste Management

Waste management practices were adopted by WCC for the following waste streams during the period included:

General Solid Waste

- All non-recyclable general solid wastes originating from the administration, workshop, coal processing, train load out and explosive precursor facility are collected in smaller bins (120L)

and transferred to 3m^3 front lift bins (red lids). The front lift bins are collected weekly and disposed of at the Tamworth Waste Management facility;

Cardboard and Co-mingled Recycling

- Recyclable cardboard (predominantly boxes from deliveries) are deposited into the designated recycling cage to be collected weekly by a local start up business linked to the Merinda Aboriginal Corporation for sorting and recycling at their Quirindi depot;
- An improvement initiative as part of the new total waste management contract was to establish co-mingled recycling with a target to increase recycling to 20% by volume diverted from the general solid waste stream to reduce environmental impact and disposal costs. 120L bins are placed around the administration and inside the workshop with larger 1100L bins placed outside the workshop for bulker items and transfer of waste from the smaller bins. The 1100L bins are collected fortnightly for further segregation of recyclables prior to being recycled in Newcastle;

Scrap Metals

- Scrap metal is segregated from other waste and placed within designated 5m^3 swing lift bins that are collected as required by a designated metal recycle sub-contractor from the Hunter Valley. A smaller scrap metal recycling bin is located inside the workshop closer to where waste is generated to divert smaller pieces of scrap metal from the general waste stream;

Hydrocarbons

- Waste oil collected through maintenance work on mining equipment is pumped to a 10,000L bulk waste oil tank and is collected fortnightly by a local sub-contractor for recycling at their Tamworth depot. Waste coolant is also collected through the waste oil system;
- An improvement initiative as part of the new total waste management contract was to establish designated oily rag, oil filter and hydraulic hose bins and divert these streams from general solid waste to reduce potential environmental impact and disposal costs. These 1.6m^3 bins are serviced fortnightly for further management prior to recycling/disposal in Newcastle;
- All other hydrocarbon wastes and spills are captured within the hardstand area around the workshop and fuel farm which directs wash down water and rain runoff to the workshop sump capturing the majority of the solid (sediment) component of the waste water. The water and liquid hydrocarbons then overflow the workshop sump draining to the ceptor (oil/water under/over separator) trapping the hydrocarbons and residual sediment allowing the treated water to pass through. Both the workshop sump and ceptor are maintained and cleaned out fortnightly by contractors with hydrocarbon contaminated silt disposed of onsite within the Bioremediation Area on the RL445m dump (see **Section 3.4**);
- Solvent from the industrial parts washer is maintained and disposed of as required. Empty IBC 1000L pods are collected and recycled as required; however another initiative to occur in the 2015-2016 period will be under the new lubricant contract will be the implementation of bulk tank systems eliminating the need for numerous 1000L pods the hydrocarbon and waste environmental hazards they pose;

Waste Batteries and Tyres

- Waste batteries from maintenance works on mining equipment are stored on a pallet adjacent to the workshop to be collected fortnightly for recycling in Newcastle;
- Light vehicle and road truck tyres are disposed offsite at the time of replacement by the relevant tyre service provider; and
- Large earthmoving mining equipment tyres are not able to be disposed or recycled offsite and are disposed of onsite, buried within the overburden emplacement with survey location recorded;

Sewage

- WCC has a biocycle sewage treatment system servicing the administration facility and a septic system both approved by Liverpool Plains Shire Council that is serviced six monthly using a licensed waste transporter and disposed of at a licence waste facility;

Overburden and Interburden

- All of the overburden and interburden materials are blasted and removed by haul truck for placement in the out-of-pit overburden emplacement area or in the in-pit emplacement area.

Coal Processing Plant Residues

- No wastes are produced from processing the ROM coal through the crushing and screening plant, i.e. all ROM coal is ultimately sold as a product.

2.6.2 Waste Monitoring

Waste disposal data is tracked for general waste, scrap metal and waste oil and **Table 2.5** summarises the data for the 2014-2015 period. Of the three waste streams previously captured, the volume of waste increased in 2014-2015 as expected with the increased production rates.

Table 2.5 Quantities of Waste Generated for 2014-2015

2014-2015	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total	2013-2014
Waste Oil (kL)	2.4	5.0	5.0	17.4	23.0	7.5	28.7	13.9	13.0	16.3	18.3	10.4	**182.5**	**167.7**
Scrap Metal (kg)	7680	6460	660	26970	330	5630	9000	990	7800	3000	4500	7780	**80800**	**59320**
General Waste (m^3)	171	147	141	168	135	129	165	132	99	120	132	111	**1650**	**1596**
Co-Mingled Recycling (m^3)*	-	-	-	-	-	-	-	-	2.2	17.6	17.6	17.6	**55**	**-**
Septic (L)	-	-	-	-	-	-	-	-	-	-	13000	-	**13000**	**-**
Cardboard (kg)	100	125	100	125	100	125	100	100	100	125	125	100	**1325**	**-**
Empty IBCs (kg)	-	-	-	-	900	1380	780	660	0	1980	1200	300	**7200**	**-**
Oily Rags (kg)*	-	-	-	-	-	-	-	-	0	2880	960	2160	**6000**	**-**
Hydraulic Hoses (kg)*	-	-	-	-	-	-	-	-	0	0	1000	0	**1000**	**-**
Batteries (kg)*	-	-	-	-	-	-	-	-	839.2	922	397.5	0	**2158.7**	**-**

2.7 COAL STOCKPILES

The product coal stockpile at the train load out facility is limited to 250,000t of product coal in accordance with PA10_0059 (Schedule 2 Condition 7). At the end of the March 2015, there was 190,475t of Product coal stored at the Train Load-out Facility and 114,189t of ROM coal was stored at the coal processing area.

2.8 WATER MANAGEMENT

Surface water management is based on the separation and segregation of void, dirty and clean water to ensure each stream is appropriately managed based on how to mitigate the potential pollutants in each stream. The definitions of each water stream category are as follows:

- Void Water – the void water catchment area is comprised of the active mining area and overburden emplacement which collects both rainfall runoff and groundwater in the base of the open cut void and needs to be dewatered by pumping to the surface to allow mining of the basal coal seam;
- Dirty Water – the dirty water catchment area comprises of areas previously disturbed by mining such as rehabilitation and soil stockpile areas with the focus on treatment of water quality and subsequent discharge;
- Clean Water – the clean water catchment area is undisturbed by mining activities and allowed to flow offsite without active management required. Clean water upslope of the mining area and to the east of Werris Creek Road is diverted around the outside of mining operations; and
- Contaminated Water – includes potentially hydrocarbon contaminated water runoff from the workshop and fuel farm areas which is treated through an oil/water ceptor and water from ablutions is treated through a septic systems onsite. “Coal contact” water from the ROM Coal Stockpile/Coal Processing area and TLO/Product Coal Stockpile area are also captured by downstream dams and treated through the dirty water system.

The segregation of each water stream is undertaken by diverting clean water away from the active mining (void water) and other disturbed areas (dirty water). Clean water and dirty water is separated and diverted using a series of contours, diversion drains and dams and appropriate erosion and sediment control. Void water is always contained within enclosed pipelines when pumped to the surface and stored within turkeys nest dams segregated from the dirty water system. **Figure 2.8** outlines the void water management system at WCC including the key water management dams and pipelines.

2.8.1 Dirty Water Discharges

WCC maintain three licensed discharge points (LDP) 10, 12 and 14 in accordance with EPL 12290, corresponding to dams SB2 (southern), SB9 (mid) and SB10 (northern) respectively. SB2 and SB9 drain towards Quipolly Creek, while SB10 discharges towards Werris Creek.

WCC is permitted to discharge when the dirty water quality is within the criteria specified in EPL 12290, however if a rainfall event greater than 39.2mm occurs in a consecutive 5 day period then the Total Suspended Solids (TSS) limit does not apply. There were no discharge events during this AEMR period which reflects the below average rainfall experienced in the 12 months to the 31st March 2015 (**Table 2.6**). No volume of water was discharged during controlled discharge events during the period.

Table 2.6 WCC Discharge Event Summary

Date	Dam	pH	EC (µS/cm)	TSS (mg/L)	O&G (mg/L)	Type	5 Day Rain (mm)	Compliance
No Discharges during 2014-2015 reporting period								
Criteria		**8.5**	**N/A**	**50**	**10**		**39.2**	

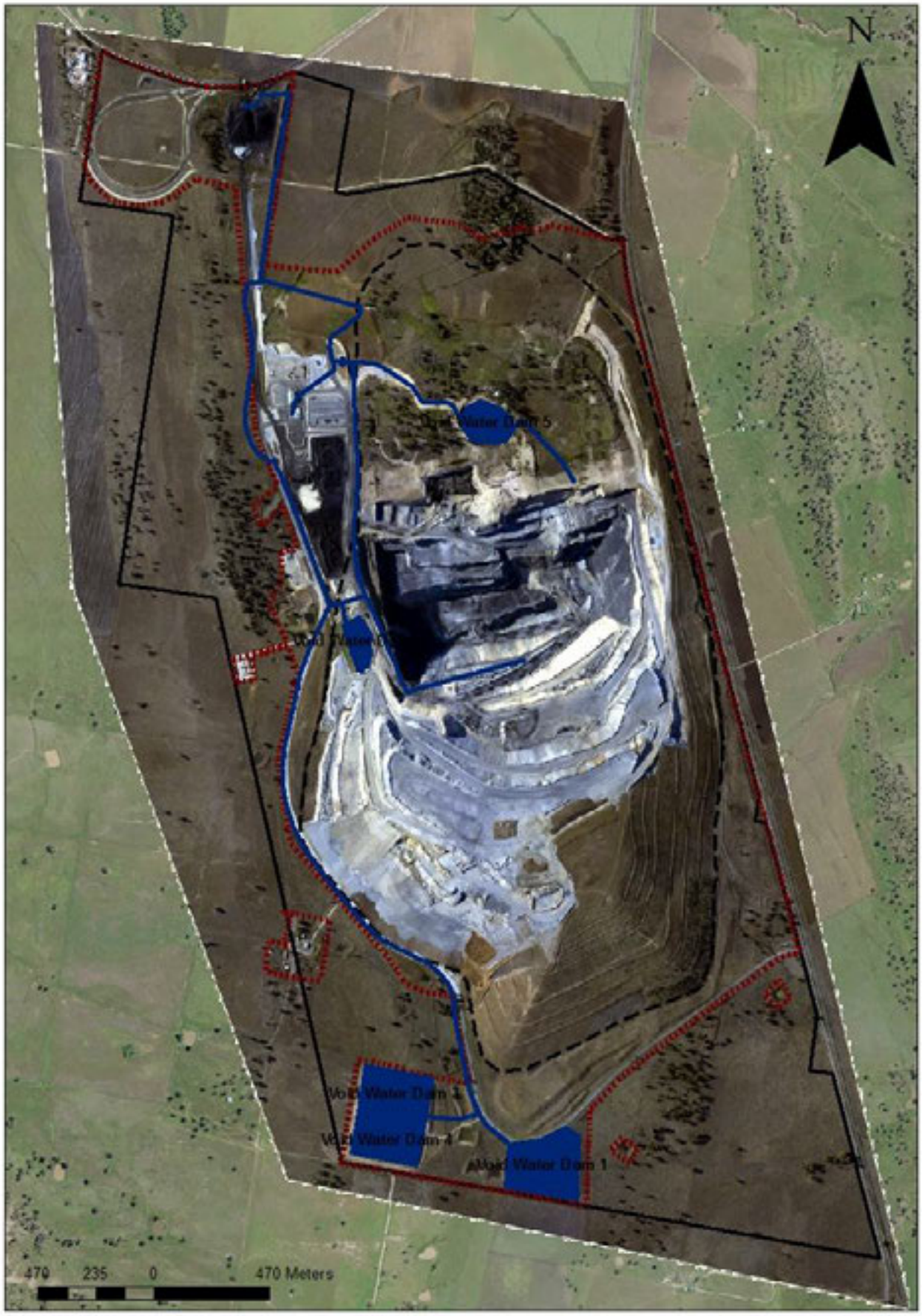


Figure 2.8 WCC Void Water Management System for 2014-2015 Period

2.8.2 Predicted Water Balance

During the reporting period an updated the site water balance (ENVIRON, 2015a and R.W. Corkery & Co, 2015) was prepared for WCC in accordance with the requirements of the draft Site Water Management Plan revising the original surface water assessment (GSS Environmental, 2010) that accompanied the LOM Environmental Assessment. WCC has in recent years operated with the void water dams at or near capacity indicating the original water balance underestimated the inflows to the open cut void from rainfall (due to an increase in strike length of the pit and increased area of overburden emplacement capturing runoff) and the former underground workings (originally planned to be dewatered but water has been used to manage potential spontaneous combustion). In order to more accurately assess the future water management requirements of the WCC:

- groundwater in-flows were predicted using the calibrated groundwater model for WCC previously designed by ENVIRON (2014); and
- the 113 year data set of daily rainfall from the Bureau of Meteorology Station (No. 055062) at Werris Creek Post Office was used to provide the direct rainfall in-flow with inputs from surface runoff were generated by calibrating runoff coefficients against observed variation in void water storage. Three rainfall scenarios were used in the water balance representing a median year (664 mm), 15th percentile year (524 mm) and 90th year percentile (868 mm).

The results for the void water balance and dirty water balance are presented in **Table 2.7** and **Table 2.8** respectively. **Table 2.7** suggests void water additional to dam storage capacity is predicted under both median and high rainfall conditions which would result in the retention of water within the open cut (R.W. Corkery & Co, 2015 and Environ, 2015a). In the event that the evaporator units were removed from operation, the potential surplus could increase to 500MLpa. WCC has prepared an Environmental Assessment seeking modification to PA 10_0059 to allow the offsite use of void water for beneficial agricultural use as an alternative option to mitigate the potential impacts of excess water accumulating in the open cut pit. Predicted deficits during low and median rainfall years are not anticipated to impact on water availability for dust suppression given the existing volume of water currently available at WCC (R.W. Corkery & Co, 2015).

Table 2.7 Predicted Void Water Balance for Year 2015, 2017 and 2020

Inputs / Outputs		Year 2015			Year 2017			Year 2020		
		Median	15th %ile	90th %ile	Median	15th %ile	90th %ile	Median	15th %ile	90th %ile
Inputs	Rainfall/runoff	737	570	1 043	835	643	1 192	792	605	1 130
	Groundwater Inflow	54	54	54	47	47	47	22	22	22
	Input (return) from Underground	67	67	67	-	-	-	-	-	-
	Total	**858**	**691**	**1 164**	**882**	**690**	**1 239**	**814**	**627**	**1 152**
Outputs	Evaporation	408	381	329	428	408	374	409	328	358
	Water use	365	365	365	365	365	365	365	365	365
	Total	**773**	**746**	**694**	**793**	**773**	**739**	**774**	**693**	**723**
Excess (+ve) or Deficit (-ve)		**85**	**-55**	**470**	**89**	**-83**	**500**	**40**	**-66**	**429**

Table 2.8 Predicted Dirty Water Balance for Year 3 of LOM Project

		Avg Yr (ML)	Dry Yr (ML)	Wet Yr (ML)
Inputs	Rainfall Runoff	528	345	733
	Total	**528**	**345**	**733**
Outputs	Evaporation	59	59	59
	Dust Suppression and Crushing/Screening Operations	55	136	0
	Total	**114**	**195**	**59**
	Excess (+ve) or Deficit (-ve)	**+414**	**+150**	**+674**

The dirty water balance (**Table 2.8**) shows that for dry, average and wet years there is an excess of dirty water (GSSE, 2010). If this water cannot be utilised for dust suppression onsite, then it is diverted to sediment basins, which have been constructed to accept and settle the water, before the water is discharged from the licenced discharge points of EPL 12290 (SB2, SB9 and SB10).

The permissible maximum harvestable rights for WCC has been calculated at 63ML based upon the Project Site Area (908ha) and multiplied by the 'Multiplier Value' of 0.07. The capacity of the existing clean water storage dams (9.1ML) that could be utilised for water supply are within the Maximum Harvestable Right Dam Capacity (MDHRC). Therefore, no licences are required for these existing clean water dams with no additional clean water dams proposed.

2.8.3 Stored Water

There were no changes to surface storage dam capacities during the reporting period. The storage (operating) capacity for void water dams (VWD) is 714ML (VWD1 – 250ML, VWD2 – 25ML, VWD3 – 214ML, VWD4 – 145ML and VWD5 – 80ML). The operating capacity of the VWDs is approximately 30cm below the spillway capacity to give an operational freeboard in case of excess pumping or heavy rainfall. WCC mined through the lowest point of the former underground workings during the previous period, which now is resulting in the continuous seepage of water applied to spontaneous combustion areas back into the open cut pit.

Table 2.9 presents an estimate of the volume of stored water in dams at WCC (**Figure 2.9**) at the beginning and end of the 2014-2015 reporting period.

Details for individual storages are presented in **Table 2.10**. 2014-2015 was the second consecutive year in a row of below average rainfall resulting in both the clean and dirty water dams to be almost dry; while WCC has 99ML of void water dam capacity available to store the estimated 50ML of void water in pit as at the end of March 2015.

Table 2.9 Summary of WCC Onsite Water Storage in Dams

	Volumes Held (ML)		
	Start of Reporting Period	**At end of Reporting Period**	**Nominal Storage Capacity**
Clean Water (in Storage Dams)	2.0	0.5	9.1
Dirty Water (in Sediment Basins)	8.5	7.5	71.2
Void Water (in Void Water Dams)	659.2	615.0	714.0
Void Water (in pit)	20.0	50.0	Not Applicable

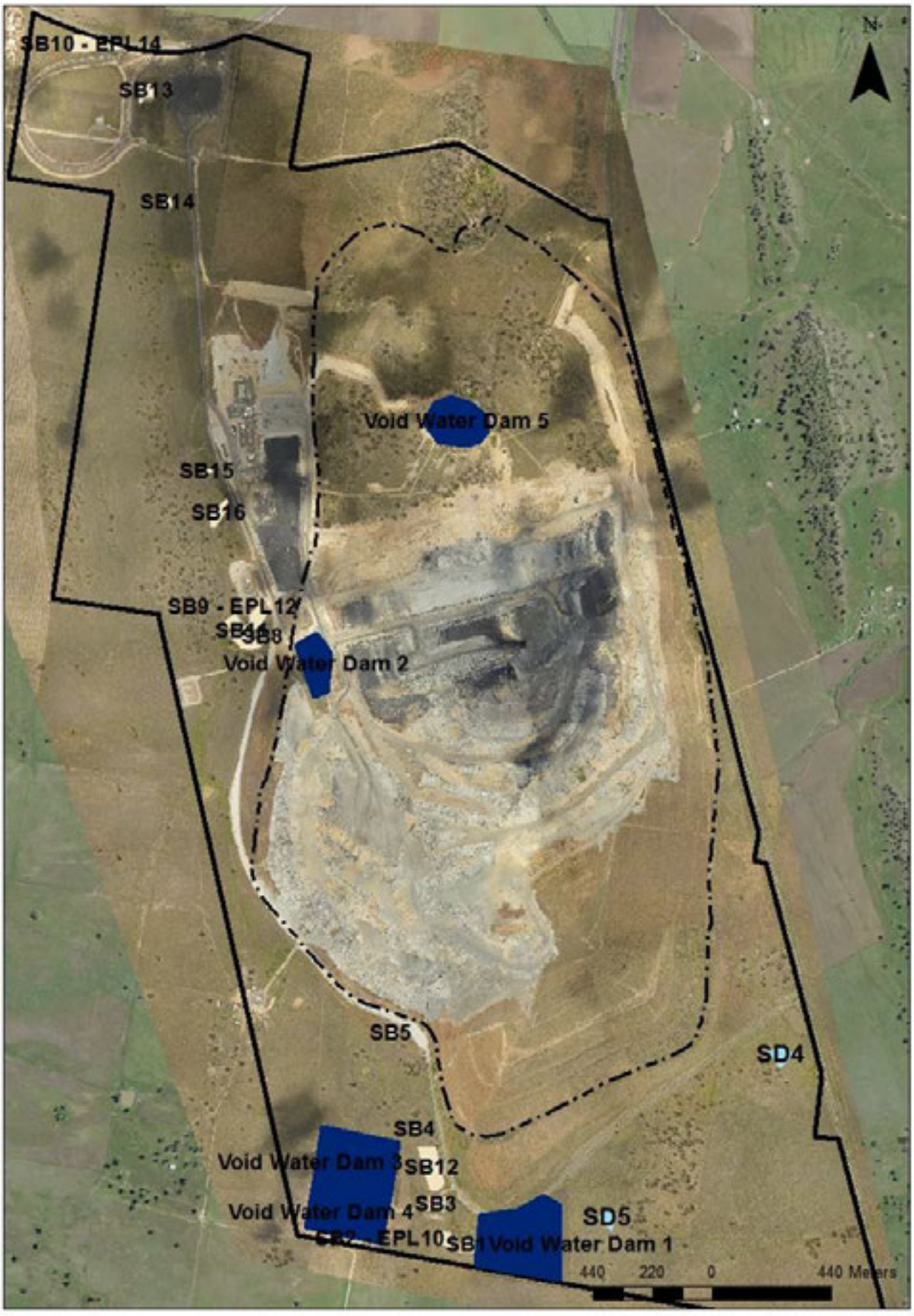


Figure 2.9 Clean, Dirty and Void Water Dams at WCC

Table 2.10 Detail on Individual Clean, Dirty and Void Water Dams Storage Levels

Label	Function	Capacity (ML)	Source of Capacity	Storage @ March 2015 (ML)
Clean Water Storage Dams				
SD4	Clean water capture and use Diversion of Clean water around mine	5.1	Surveyed	0.5
SD5	Clean water capture and use Diversion of Clean water around mine	4.0	Surveyed	0.0
Total Capacity of All Clean Water Dams		**9.1**		**0.5**
Dirty Water Sediment Basins				
SB13	Northern Area – Dirty water capture, treatment and use	3.0	Estimated	0.5
SB14	Northern Area – Dirty water capture, treatment and use	1.9	Surveyed	0.5
SB10	Northern Area – Dirty water capture, treatment and use EPL discharge point (NO. 14)	4.6	Surveyed	0.0
SB11	Middle Area – Dirty water capture, treatment and use	11.0	Surveyed	1.0
SB17	Middle Area –Dirty water capture, treatment and use (Black Water Dam)	4.1	Surveyed	0.5
SB15	Middle Area – Dirty water capture, treatment and use	0.5	Estimated	0.0
SB16	Middle Area – Dirty water capture, treatment and use	4.2	Estimated	3.0
SB8	Middle Area – Dirty water capture, treatment and use	3.0	Estimated	2.0
SB9	Middle Area – Dirty water capture, treatment and use EPL discharge point (NO. 12)	4.0	Partially Surveyed	0.0
SB1	Southern Area – Dirty water capture, treatment and use	7.0	Estimated	0.0
SB3	Southern Area – Dirty water capture, treatment and use	6.5	Estimated	0.0
SB4	Southern Area – Dirty water capture, treatment and use	2.5	Estimated	0.0
SB5	Southern Area – Dirty water capture, treatment and use	1.4	Estimated	0.0
SB12	Southern Area – Dirty water capture, treatment and use	9.0	Surveyed	0.0
SB2	Southern area – Dirty water capture, treatment and use EPL discharge point (NO. 10)	8.5	Surveyed	0.0
Total Capacity of All Dirty Water Dams		**71.2**		**7.5**
Void Water Dams				
VWD1	Void water storage	250.0	Surveyed	210.7
VWD2	Void water storage	25.0	Surveyed	33.3
VWD3	Void water storage	214.0	Surveyed	169.4
VWD4	Void water storage	145.0	Surveyed	146.8
VWD5	Void water storage and MIA Water Supply	80.0	Surveyed	54.8
Total Capacity of Void Water Dams		**714.0**		**615.0**

2.8.4 Water Usage and Consumption

Site water usage and consumption is monitored and calculated monthly using water meters on key pipelines, water fill points and evaporators and also from the survey of void water levels within the pit and VWDs onsite. **Table 2.11** summarises total water inputs and outputs for 2014-2015 reporting period.

Table 2.11 WCC Void Water Usage April 2014 to March 2015

WATER INPUTS				**+1116.9ML**
Void Water		Groundwater Bore (WAL29506)*	0.0ML	
		Rainfall Interception & Runoff[#]	672.0ML	
		Groundwater Intercepted (WAL32224)* [#]	56.0ML	
		Other Groundwater (Spoil, Underground) [#]	30.0ML	
		Recirculated back to Pit/UG	358.9ML	
WATER OUTPUTS				**-1045.0ML**
Void Water	**Total Dust Suppression**		**620.1ML**	
		Haul Roads	438.8ML	
		Crushing Plant**	3.3ML	
		Train Load Out**	8.1ML	
		Pre-Strip Sprinkler[1]	169.9ML	
	Other		**424.9ML**	
		Workshop	32.5ML	
		Recirculated back to Pit/UG Losses[3]	36.2ML	
		Evaporators[2]	322.2ML	
		Inpit Evaporation[#]	34.0ML	
NET WATER				**+71.9ML**

* Volumes presented for the Water Access Licences (WAL) are for the AEMR reporting period and are not comparable with the NOW annual monitoring period July to June; ** Estimated as not metered the entire period; # Based on model for WCC by Environ (2015); 1 – Metered volume of Water for Pre-Strip Sprinkler was 226.5ML adjusted by Environ by 25%; 2 – Estimated volume of Water through Evaporators was 350.2ML adjusted by Environ by 8%; 3 - Recirculated back to Pit/UG Losses estimated by Environ to be 10%.

A direct comparison between the water balance for the 2014-2015 period and for 2013-2014 is discussed below:

- Total void water stored in surface storage dams and in pit decreased by 44.2ML from 2013-2014;
- Total water inputs increased by 53.8ML while total water outputs increased by 50.1ML for 2014-2015 from the previous period;
- Void water was actively recycled in pit during the period via water curtains to manage areas of spontaneous combustion in the former underground workings or other areas of localised spontaneous combustion. Water curtains and/or sprinklers irrigate the void water out above the area of spontaneous combustion allowing the void water to infiltrate into the ground and into the former workings (**Figure 2.10**). Void water used to manage spontaneous combustion for 2014-2015 decreased by 89.3ML. It is believe that the majority of the void water from the management of spontaneous combustion ultimately returns to the pit directly or via the former underground workings except for losses to steam from the void water working on the hot areas (estimated to be 36.2ML for 2014-2015 period);

Figure 2.10 Sprinkler and clay seal to mitigate spontaneous combustion in underground workings

- Rainfall intercepted in pit for 2014-2015 was 672.0ML (from 513mm rainfall). Rainfall intercepted was modelled by Environ (2015b – **Appendix 4b**) to assist in more accurately calculating groundwater intercepted in pit. Environ (2015b) validated the groundwater model determining that rainfall intercepted and recirculated water from spontaneous combustion management was the cause of the excess void water managed in pit and not from the Werrie Basalt aquifer;
- No groundwater was extracted directly from the former underground workings under licence WAL29506 (50ML allocation) because the bore was removed by mining in 2013;
- Pit dewatering increased by 155.8ML from 2013-2014 to 1045.5ML pumped out of pit due to the water being recirculated in pit to manage spontaneous combustion and rainfall runoff;
- Environ (2015b) used the above water usage calculations to validate the groundwater model achieving the best fit with a total of 86.0ML of groundwater intercepted; sourced from the coal measures aquifer/former underground mine workings (24.0ML), seepage from the Werrie Basalt aquifer (56.0ML) and seepage from the overburden (6.0ML). The Groundwater Impact Assessment from the 2010 LOM Environmental Assessment assumed that the former underground workings would be pumped dry and any groundwater intercepted in pit would be seepage from the adjacent basalt aquifer predicted up to 50ML/year. The estimated inflow from the Werrie Basalt aquifer for 2014-2015 was consistent with that prediction; although 6ML higher but is still within an acceptable margin of error for groundwater modelling (*pers. comm*. Fiona Robinson – Environ, 2015). The total groundwater make is within the incidental groundwater licence WAL 32224 allocation of 211ML/year; and

- Water cart dust suppression and evaporator water use (evaporated) increased for 2014-2015 by 99.1ML and 142.2ML respectively (**Figure 2.11**).

Figure 2.11 Two Evaporators in use on VWD3/4 and High Water Level Alarm (left) installed

In summary, WCC for 2014-2015 had to manage 1116.9ML of void water which is higher than the previous period. At the end of the last period, WCC investigated the increased void water managed in pit finding that the source was from high intensity rainfall events and recirculation of void water through the pit for spontaneous combustion management and not from the Werrie Basalt (Environ, 2014). During the current period, WCC undertook a revision of the site water balance based on improved knowledge of rainfall runoff as well as the high volume of water pumped around in pit (Environ, 2015a). While WCC is not detrimentally impacting on local groundwater levels in the Quipolly Alluvium aquifer (Environ, 2015b); WCC does have an excess of void water under median and above average rainfall scenarios (Environ, 2015a) that requires additional void water usage options to be developed to manage business continuity and is subject to a current Project Approval Modification application for the offsite transfer and use of void water for agricultural purposes.

Table 2.12 compares the predicted void water make (input) and usage (output) from the Environmental Assessment Modification 2 (R.W. Corkery & Co, 2015 and Environ, 2015a) for Year 2015 against the actual void water measured onsite during the 2014-2015 period. The predicted water inputs are in line with the actual modelled rainfall and groundwater interception during the period; however due to increased use of void water for spontaneous combustion management has meant that a higher quantity of water was recirculated through the pit. In terms of the predicted water outputs (**Table 2.12**); the water usage estimates were conservatively low (R.W. Corkery & Co, 2015 and Environ, 2015a) so that a reasonable worse case estimate could be produced for the volume of excess void water that could be expected annually (i.e. water cart dust suppression only).

Therefore it is no surprise that the actual void water usage was significantly higher than predicted due to the use of two evaporators and pre-strip dust suppression during 2014-2015.

Table 2.12 Comparison between Predicted and Actual Water Balance

WCC Water Balance (all values in ML)		EA MOD 2 Year 2015 Prediction			Actual 2014-2015
		Median	15th %ile	90th %ile	
Inputs	Rainfall/runoff	737	570	1 043	672
	Groundwater Inflow	54	54	54	62
	Input (return) from Underground	67	67	67	383
	Total	**858**	**691**	**1 164**	**1117**
Outputs	Evaporation	408	381	329	1045
	Water use	365	365	365	
	Total	**773**	**746**	**694**	**1045**
Excess (+ve) or Deficit (-ve)		**+85**	**-55**	**+470**	**+72**

2.9 HAZARDOUS MATERIALS MANAGEMENT

WCC holds a Dangerous Goods Notification (NDG 037966) for the storage and use of diesel in mining equipment and for explosives and related accessories for blasting activities as shown on **Figure 2.12**. Four 62,000L diesel tanks each have double skinned bunding to mitigate any spills in accordance with AS1940. Ammonium Nitrate Mineral Oil (ANMO) and emulsion based bulk explosives are temporarily stored at the Precursor Facility to be used in blasting activities with nonel and electronic detonators used for blast initiation stored separately at the Explosive Magazine. The blasting services contract changed from Orica Mining Service Pty Ltd to LDE Pty Ltd on the 1st January 2014; resulting in a modification to how the dangerous goods were stored onsite. At the precursor facility, ammonium nitrate and emulsion are delivered in road trucks directly loading into augers to allow quick filling of the explosive trucks. There are three magazines, one each for storage of electronic and nonel detonators and the other magazine for boosters. Safety Data Sheets (SDS) are available on the internet for all hazardous materials. Additionally, all contractors are required to supply SDS sheets for any hazardous goods they propose to bring onto the site. Explosives and security sensitive dangerous substances are currently stored in accordance with the Security Plan.

2.10 OTHER INFRASTRUCTURE MANAGEMENT

Whitehaven Coal did not acquire any additional properties during the reporting period. **Table 2.13** details the properties purchased by the company and the subsequent dates of purchase since mining commenced at WCC. Management of other infrastructure (buildings, roads, generators, pumps etc.) and other facilities not specified elsewhere within this AEMR is undertaken on an as-needs basis or in accordance with statutory requirements in order to maintain them in an operationally efficient and safe condition, and which does not result in environmental impacts.

Table 2.13 Whitehaven Coal Properties adjacent to WCC

Property Name		Purchase Date
R1	"Narrawolga"	1st July 2004*
R1	"Eurunderee"	1st March 2005*
R1	"Hillview"	28th July 2006*
R1	"The Colliery"	14th February 2008
R1	"Railway View"	5th June 2008

Property Name		Purchase Date
R1	"Preston Park"	20th October 2008
R1	"Branga"	20th October 2008
R1	"Escott"	7th November 2009**
R19	"WC Railway Cottage"	23rd September 2009
R2	"Cintra"	31st March 2010
R1	"Marengo"	17th May 2010
R4	O'Donnells Quarry	27th October 2010
R15	"Plain View"	7th February 2011
R18	"WC Railway Cottage"	3rd November 2011
R14	"Greenslopes"	20th December 2011
R100	"Banool"	20th December 2011
R65	"Banool" (Subdivision)	20th December 2011
R20	"Tonsley Park"	2nd November 2012

* Whitehaven Coal acquired 100% ownership on 7th July 2010; ** Zeolight Australia property also become a project related property through the purchase of "Escott".

Figure 2.12 Location of Dangerous Goods stored at WCC

3. ENVIRONMENTAL MANAGEMENT AND PERFORMANCE

3.1 AIR QUALITY

3.1.1 Air Quality Criteria and Monitoring Program

The air quality criteria applicable to WCC are specified in Condition 16, Schedule 3 of PA10_0059 and is summarised in **Table 3.1**. The Air Quality and Greenhouse Gas Management Plan (AQGHGMP) (WCC, 2014) was approved by DP&E on 29th April 2014. The assumed background levels prior to the commencement of WCC used in the *"Werris Creek Coal Life of Mine Project Environmental Assessment* (R.W. Corkery & Co. Pty Ltd, 2010) are also outlined in **Table 3.1**.

Table 3.1 Air Quality Impact Assessment Criteria and Background Levels

Pollutant	Averaging Period	AQGHGMP Criteria	Background Level
Total Suspended Particulate (TSP) Matter	Annual	90µg/m^3	30.2µg/m^3 [1]
Particulate Matter < 10 microns (µm) (PM_{10})	Annual	30µg/m^3	Daily Varying
Particulate Matter < 10 microns (µm) (PM_{10})	24 hour	50µg/m^3	15.1µg/m^3 [2]
Particulate Matter < 2.5 microns (µm) ($PM_{2.5}$)	Annual	8µg/m^3	None assumed[3]
Particulate Matter < 2.5 microns (µm) ($PM_{2.5}$)	24 hour	25µg/m^3	None assumed[3]
Deposited Dust	Annual	4g/m^2/month	0.6 g/m^2/month[4]
Deposited Dust (WCC only maximum incremental increase)	Annual	2g/m^2/month	0.6 g/m^2/month[4]

[1] Based on the data set from the OEH air quality monitoring station in Tamworth.

[2] Based on the data set from the OEH air quality monitoring station in Tamworth excluding data from any regional dust events

[3] As $PM_{2.5}$ does not have a recognised impact assessment criterion, no $PM_{2.5\ background}$ concentration was assumed.

[4] Based on annual average at DG1 formerly (WC1) which was considered the best representation of background levels due to its location.

The Air Quality Monitoring Program undertaken by WCC included deposited dust, total suspended particulates (TSP), $PM_{2.5}$ and PM_{10} particulates. A summary of the air quality monitoring network is provided in **Table 3.2** and the locations are shown on **Figure 3.1**. There were no changes to the monitoring network during period.

Table 3.2 Air Quality Monitoring Program

Pollutant	Frequency	Method	Locations
$PM_{2.5}$ & PM_{10}	Continuous	TEOM	"Werris Creek Centre"(2.5TEOM92 & 10TEOM92)
TSP	6 Days	HVAS	"Kyooma" (HVT98)
PM_{10}	6 Days	HVAS	"Kyooma" (HVP98), "Escott" (HVP1), "Glenara" (HVP11), "Tonsley Park" (HVP20)
Dust Fallout	Monthly	Deposited Dust	"Cintra"(DG2), "Railway View"(DG5), "Tonsley Park"(DG20), "Plain View"(DG15), "Marengo"(DG9), "Mountain View"(DG22), "Glenara"(DG11), "Hazeldene"(DG24), "Woodlands"(DG17), "Talavera"(DG96), "Kyooma"(DG98), "Greenslopes"(DG14), Werris Creek South(DG62), Werris Creek Centre(DG92), "Westfall"(DG101), West Street(DG103), "Escott"(DG1), "Eurunderee"(DG3), 8 Kurrara Street(DG34), "Villamagna"(DG106)

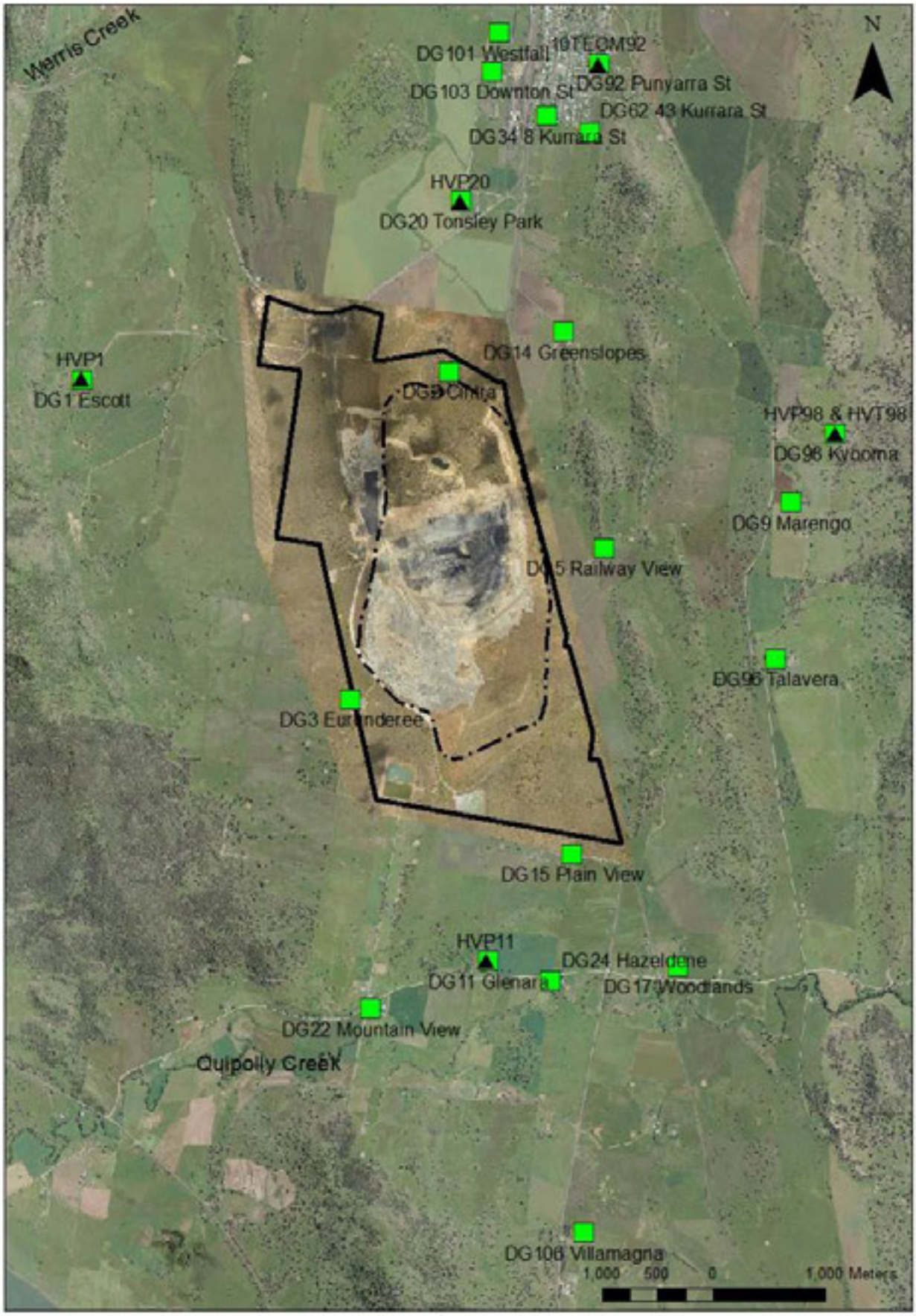


Figure 3.1 Air Quality Monitoring Network for 2014-2015

3.1.2 Control Procedures

As well as aiming to meet the criteria identified above, WCC continues to employ a range of air quality control measures to ensure that activities are carried out in a competent manner in accordance with EPL 12290 Condition O1. WCC utilises water carts as the principle method to minimise air quality impacts from mining and associated activities. Water carts operated during the reporting period included two 50,000L CAT 773 water trucks and one 30,000L Volvo articulated water truck dedicated to the active mining operations area and a second 30,000L Volvo articulated water truck and one 12,000L water cart used at the coal processing and the train load out/product coal stockpile areas (second CAT 773 is planned to replace both Volvo articulated water trucks during 2015-2016). **Table 3.3** compares the water cart water usage for dust suppression since 2008. Overall as the rates of production have increased, so too has the road dust suppression. The increase in water cart dust suppression for 2014-2015 was driven by an increase in coal production as well as managing the excess water in pit.

Table 3.3 Annual Water Cart Road Dust Suppression at WCC

	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Water Cart Dust Suppression (ML)	130.0	154.6	140.3	189.7	388.5	339.7	438.8
Monthly Average (ML)	10.8	12.9	11.7	15.8	32.4	28.3	36.6
Change to Previous Year (+/-ML)	NA	+24.6	-14.3	+49.4	+198.8	-48.8	+99.1

The AQGHGMP outlines further management controls to minimize dust generation on-site as follows:

- Overburden, coal and soil loading activities are not undertaken during periods of adverse weather (high winds or dry conditions). The first adverse weather threshold is triggered at winds greater than 7m/s sending an SMS to the OCE to check for dust generated from mining operations. The second trigger is for winds greater than 9m/s and depending on the exposure of each mining location, and then operations may be suspended to mitigate dust generation.
- Water sprays are used on the coal feed hopper, crusher and at all conveyor transfer and discharge points.
- The extent of disturbed areas (pre-strip clearing and rehabilitation) are minimized to that required for mining operations, with these areas stabilized and revegetated as soon as practicable once no longer required for ongoing operations.
- All personnel are instructed that all vehicles must utilise existing tracks on-site and must be driven to the conditions to minimize trafficable dust generation.
- Prior to drilling, water carts are to be used to create a surface crust and minimize the potential for dust lift-off. Drill rigs utilise a combination of curtains, vacuum extraction and spray water on the cuttings to minimise dust generation.
- Blasting will not be undertaken if on a 5 minute average, wind direction occurs between 180° and 214° (direction of Werris Creek township) or for wind speeds greater than 6m/s unless approved by the Operations Manager.

3.1.3 WCC Mine Dust Deposition Monitoring

Dust deposition gauges are undertaken in accordance with *AS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method*. The dust deposition monitoring requirements for WCC are based on particulate matter that is generated on-site by WCC related activities. Dust deposition results can be influenced by dust sources not from WCC activities and therefore two annual averages are calculated, one with and without the excluded results. Excluded results may include organic matter contamination such as bird droppings, insects, leaves and grass slashing, as well as dust (inorganic) from other sources (non-mining) such as local farmers ploughing paddocks, fires or regional dust storms.

Table 3.4 outlines the annual average deposited dust levels by location for the reporting period. All locations had an annual average below 4.0g/m^2/month except for DG20 ("Tonsley Park" – WCC owned) due to adjacent disturbed land (<100m) impacted by harvesting during September and October and then by a lighting strike on 24th November 2014 resulting in a fire burning the stubble in the paddock. All monthly dust deposition results are provided in **Appendix 3(a)**.

Table 3.4 Insoluble Solids Dust Deposition Results April 2014 to March 2015 (g/m^2/month)

EPL# 12290	ID	Property	Annual Average	Average - Excluded	Minimum	Maximum	AQGHGMP Criteria	EA MOD2 Predicted	# Results Excluded
-	DG1	Escott^	0.7	0.8	0.1	1.4	4.0	-	5
-	DG2	Cintra^	2.5	2.8	1.1	3.8	4.0	-	4
-	DG3	Eurunderee^	1.7	1.5	0.3	6.6@	4.0	-	6
-	DG5	Railway View^	1.8	1.5	0.1	5.7*	4.0	-	5
-	DG9	Marengo^	3.1	0.5	0.1	14.7@	4.0	-	8
#29	DG11	Glenara	1.0	1.0	0.3	2.2	4.0	0.7	2
-	DG14	Greenslopes^	1.2	1.8	0.3	3.4	4.0	1.3	8
-	DG15	Plain View^	2.5	0.8	0.3	21.3@	4.0	0.8	7
-	DG17	Woodlands	1.6	1.0	0.4	7.6@	4.0	0.7	5
-	DG20	Tonsley Park^	4.2	2.5	0.2	10.1@	4.0	1.1	7
-	DG22	Mountain View	2.1	1.6	0.2	8.7@	4.0	0.6	2
-	DG24	Hazeldene	1.3	0.9	0.2	4.8@	4.0	0.7	1
-	DG34	8 Kurrara Street	2.8	1.5	0.1	22.1@	4.0	-	7
-	DG62	Werris Creek South	1.4	0.8	0.1	7.5@	4.0	-	8
#30	DG92	Werris Creek Centre	0.5	0.7	0.1	1.7	4.0	-	8
-	DG96	Talavera	0.9	1.0	0.2	2.5	4.0	0.8	11
#28	DG98	Kyooma	3.1	0.4	0.1	27.3@	4.0	0.7	5
-	DG101	Westfall	1.0	1.0	0.5	2.0	4.0	-	3
-	DG103	West Street	1.1	0.9	0.3	2.5	4.0	-	4
-	DG106	Villamagna	0.5	0.5	0.5	0.5	4.0	-	0

^ Properties owned by Werris Creek Coal;
*Sample contaminated with organic matter from non-mining source (i.e. bird droppings and insects)
@ Sample contaminated from local dust source non-mining related (i.e. fire, farming activities)
Bold = elevated result

Elevated (>4g/m^2/month) and excluded (contaminated) monthly results recorded across the monitoring network over the reporting period are listed as follows:

- April 2014: DG1, DG2, DG5, DG14, DG15, DG17, DG34, DG62, DG92 and DG96 dust results were not representative of mining dust levels as organics were greater than 50% of the sample;
- May 2014: DG9, DG62, DG92 and DG96 dust results were not representative of mining dust levels as organics were greater than 50% of the sample;
- June 2014: DG34 result was 22.1g/m^2/month. DG34 (8 Kurrara St) was substantially higher than any of the other six dust deposition gauge results in Werris Creek town or north of the mine, the dust recorded is not representative of WCC operations. DG3, DG14, DG15, DG17, DG34, DG62, DG96 and DG98 dust results were not representative of mining dust levels as organics were greater than 50% of the sample;
- July 2014: DG1, DG14, DG15, DG17, DG92, DG96, DG98 and DG103 dust results were not representative of mining dust levels as organics were greater than 50% of the sample;
- August 2014: DG1, DG3, DG5, DG9, DG14, DG62 and DG92 dust results were not representative of mining dust levels as organics were greater than 50% of the sample;
- September 2014: DG20 result was 4.3g/m^2/month. DG20 ("Tonsley Park" – WCC owned) was substantially higher than any of the other six dust deposition gauge results in Werris Creek town or north of the mine due to adjacent harvesting activities, the dust recorded is not representative of WCC operations. DG3, DG5, DG9, DG15, DG34, DG62, DG96 and DG103 dust results were not representative of mining dust levels as organics were greater than 50% of the sample;
- October 2014: DG20, DG62 and DG98 results were 5.9g/m^2/month, 7.5g/m^2/month and 27.3g/m^2/month respectively. DG20 and DG62 (Werris Creek Centre) were substantially higher than any of the other five dust deposition gauge results in Werris Creek town or north of the mine, the dust recorded is not representative of WCC operations. DG9, DG11, DG14, DG15, DG34, DG92, DG96, DG98 ("Kyooma"), DG101 and DG103 dust results were not representative of mining dust levels as organics were greater than 50% of the sample;
- November 2014: DG17 and DG20 results were 7.6g/m^2/month and 6.7g/m^2/month respectively. DG3, DG14, DG17 ("Woodlands"), DG20, DG34, DG92, DG96 and DG101 dust results were not representative of mining dust levels as organics were greater than 50% of the sample;
- December 2014: DG3 and DG20 results were 6.6/m^2/month and 7.0g/m^2/month respectively. DG20 was substantially higher than any of the other six dust deposition gauge results in Werris Creek town or north of the mine, the dust recorded is not representative of WCC operations. DG2, DG3 ("Eurunderee – WCC owned), DG9, and DG96 dust results were not representative of mining dust levels as organics were greater than 50% of the sample;
- January 2015: DG9, DG15, DG20 and DG22 results were 7.9g/m^2/month, 21.3g/m^2/month, 10.1g/m^2/month and 8.7g/m^2/month respectively. DG1, DG2, DG5, DG9 ("Marengo" – WCC owned), DG15 ("Plain View" – WCC owned), DG20, DG22 ("Mountain View"), DG96 and DG98 dust results were not representative of mining dust levels as organics were greater than 50% of the sample;
- February 2015: DG9 and DG62 results were 7.1g/m^2/month and 4.3g/m^2/month respectively. DG9 was substantially higher than any of the other two dust deposition gauge results to the

east of the mine, the dust recorded is not representative of WCC operations. DG62 (Werris Creek Centre) was substantially higher than any of the other six dust deposition gauge results in Werris Creek town or north of the mine, the dust recorded is not representative of WCC operations. DG1, DG2, DG11, DG14, DG15, DG17, DG20, DG22, DG34, DG92, DG96 and DG101 dust results were not representative of mining dust levels as organics were greater than 50% of the sample; and

- March 2015: DG9, DG20 and DG24 results were 14.7g/m^2/month, 4.2g/m^2/month, and 4.8g/m^2/month respectively. DG20 was substantially higher than any of the other six dust deposition gauge results in Werris Creek town or north of the mine, the dust recorded is not representative of WCC operations. DG24 ("Hazeldene") was substantially higher than any of the other five dust deposition gauge results in Quipolly or south of the mine, the dust recorded is not representative of WCC operations. DG2, DG3, DG5, DG9, DG14, DG15, DG17, DG34, DG62, DG92, DG96, DG98 and DG103 dust results were not representative of mining dust levels as organics were greater than 50% of the sample.

WCC has undertaken dust deposition monitoring since 2005 and the annual averages since that time are presented in **Table 3.5**. Overall the results for 2014/2015 compared to the previous period are mixed with twelve locations recording higher results and four locations with lower results out of the 20 sites monitored. The higher trend of dust deposition results for the period is consistent with the prevailing weather conditions resulting in below average rainfall recorded for the period. DG2 ("Cintra") is the only location with a clear increasing trend in dust deposition levels which is to be expected given that the distance has decreased to 1km from the main open cut mining area. The conclusion to draw from the historical results is that the coarse particulate generated by WCC mining operations does not adversely impact on the adjacent properties upon which dust deposition monitoring is undertaken and results are generally well below normal amenity guideline levels. Despite that the majority of locations recorded annual averages higher than predicted in the Environmental Assessment for PA 10_0059 Modification 2; this has been driven by the influence of the prevailing climate and the affect that weather conditions have had on dust levels during 2014-2015 which exceeds any subtle effects that WCC activities have on local dust deposition levels.

Table 3.5 Dust Deposition (Excluded) Monitoring Results from 2005 to 2015 (g/m2/month)

ID	Property	Back-ground	EA MOD2 Predicted	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	AQGHG MP Criteria
DG1	**Escott^**	0.6	-	0.6	0.8	0.7	0.5	0.7	-	-	0.8	0.8	0.8	4.0
DG2	**Cintra^**	0.6	-	1.2	1.4	1.1	1.3	1.6	1.4	1.4	1.5	2.0	2.8	4.0
DG3	**Old Colliery/ Eurunderee^**	0.6	-	1.5	2.3	2.9	3.7	2.5	-	-	0.7	0.9	1.5	4.0
DG4	**Hill View^**	0.6	-	0.8	0.9	0.7	0.7	1.2	-	-	-	-	-	4.0
DG5	**Railway View^**	0.6	-	2.0	1.2	0.6	0.7	1.1	1.3	0.9	1.2	0.9	1.5	4.0
DG6	**Southern Boundary^**	0.6	-	5.4	9.4	5.1	4.8	2.3	-	-	-	-	-	4.0
DG9	**Marengo^**	0.6	-	-	-	-	-	1.5	0.7	0.6	0.8	0.8	0.5	4.0
DG11	**Glenara**	0.6	0.7	-	-	-	-	-	1.3	1.2	1.6	0.6	1.0	4.0
DG14	**Greenslopes^**	0.6	1.3	-	-	-	-	-	-	-	0.8	0.7	1.8	4.0
DG15	**Plain View^**	0.6	0.8	-	-	-	-	1.9	0.9	0.9	1.8	1.1	0.8	4.0
DG17	**Woodlands**	0.6	0.7	-	-	-	-	-	-	-	1.5	0.8	1.0	4.0

ID	Property	Back-ground	EA MOD2 Predicted	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	AQGHG MP Criteria
DG20	**Tonsley Park^**	0.6	1.1	1.3	2.3	1.6	0.9	1.3	0.8	0.6	0.9	0.8	2.5	4.0
DG22	**Mountain View**	0.6	0.6	-	-	-	-	-	0.9	0.7	1.3	1.6	1.6	4.0
DG24	**Hazeldene**	0.6	0.7	-	-	-	-	-	-	-	0.8	0.9	0.9	4.0
DG34	**8 Kurrara Street**	0.6	-	-	-	-	-	-	-	-	1.0	0.6	1.5	4.0
DG62	**Werris Creek South**	0.6	-	-	-	-	-	-	-	-	0.6	0.5	0.8	4.0
DG92	**Werris Creek Centre**	0.6	-	-	-	-	-	-	-	-	0.6	0.8	0.7	4.0
DG96	**Talavera**	0.6	0.8	-	-	-	-	-	-	-	0.7	0.6	1.0	4.0
DG98	**Kyooma**	0.6	0.7	-	-	-	-	-	-	-	0.7	0.3	0.4	4.0
DG101	**Westfall**	0.6	-	-	-	-	-	-	-	-	1.2	1.0	1.0	4.0
DG103	**West Street**	0.6	-	-	-	-	-	-	-	-	0.9	0.8	0.9	4.0
DG106	**Villamagna**	0.6	-	-	-	-	-	-	-	-	0.9	0.9	0.5	4.0

Note – none of the annual averages in Table 3.4 contain any contaminated results
^ Properties owned by Werris Creek Coal;

3.1.4 Quirindi Train Dust Deposition Monitoring

WCC continued to monitor dust deposition adjacent to the rail line through the township of Quirindi to determine the proportion of coal dust fall out in recognition of concerns raised by government and community relating to uncovered coal wagons. A total of six (6) dust deposition gauges were installed in September 2011 beside the Main Northern Rail line (shown in **Figure 3.2**).

Figure 3.2 Google Earth Map of Dust Deposition Monitoring Locations within Quirindi Township

Three gauges were set up at equal intervals on the eastern and western sides of the railway at nominal distances of 13m, 20m and 30m away from the rail line to determine rates of dust fall out with distance and the eastern and western gauges to compare the influence of road vs rail transport dust deposition rates. Each sample is analysed under a microscope in the laboratory that estimates the proportion of the dust sample from a source material (i.e. dirt, insects, vegetation, coal). The Quirindi train dust deposition monitoring was undertaken in accordance with *AS 3580.10.1-2003*

with the locations chosen after reviewing the local topography and proximity to trees, buildings and other fugitive dust sources. Data was collected from the installed gauges (labelled DDW13, DDW20, DDW30 and DDE13, DDE20, DDE30) acknowledges the side of the rail line (east or west) and distance from the rail line of each gauge, and is summarised in **Table 3.6**. Full results from the Quirindi train deposited dust monitoring are provided in **Appendix 3(c)**.

Table 3.6 Quirindi Train Dust Deposition Monitoring Results 2014-2015

	DDW30	DDW20	DDW13	Train Line	DDE13	DDE20	DDE30	Guideline
Annual Average	1.3	1.6	1.2		1.5	1.5	1.7	4.0
Average Coal %	14.2%	20.0%	31.4%		18.3%	15.8%	14.5%	-
Average Coal g/m^2/month	0.18	0.32	0.38		0.27	0.24	0.25	-
Minimum	0.4	0.5	0.3		0.2	0.4	0.7	-
Maximum	2.3	3.1	3.0		3.9	3.8	2.9	4.0

Note: All results are in the form of Insoluble Matter (g/m^2/month);

The monitoring continues to indicate that the deposited dust levels adjacent to the Great Northern Rail Line are well below normal amenity guideline levels. As would be expected, the percentage contribution of dust from coal (i.e. coal trains) from this period does demonstrate a clear trend with the highest coal percentage next to the Rail Line and decreases with distance away, both on the eastern and western side.

3.1.5 TEOM and HVAS Monitoring

WCC operated a TEOM (Tapered Element Oscillating Microbalance) in central Werris Creek adjacent to the Water Treatment Plant (and property R92) to monitor real time dust levels in Werris Creek township. Monitoring of PM_{10} dust levels in Werris Creek commenced in April 2012 however the $PM_{2.5}$ component of the TEOM was not operational until September 2012. The TEOM monitors PM_{10} concentrations in accordance with *AS/NZS 3580.9.8: 2008: Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM10 continuous direct mass method using a tapered element oscillating microbalance analyser*. The TEOM is capable of reporting both PM_{10} and $PM_{2.5}$ data available for analysis and operational response 24 hours a day/7 days per week as required.

Detailed air quality monitoring results for $PM_{2.5}$ and PM_{10} over the last 12 months has been included in **Appendix 3(b)** with **Table 3.7** summarising the monthly results. The PM_{10} air quality of Werris Creek township would be described as good with the annual average measured to be 12.3µg/m^3; below the annual criteria of 30µg/m^3. There was only one elevated PM_{10} level measured above the daily criteria of 50µg/m^3 at the Werris Creek TEOM during the period:

- Werris Creek TEOM recorded PM_{10} dust level of 55.5µg/m^3 on the 15th November 2014. This was not an exceedance of the daily PM_{10} criteria because the source of the dust was from a regional dust event which was also measured in the EPA's Tamworth PM_{10} dust monitor recording 66.6µg/m^3 on the same day. The average wind direction between 9am and 4pm on the 15th November was a north westerly (308^o) and as WCC is south south west of Werris Creek town i.e. the mine was downwind and not contributing to the PM_{10} dust levels measured by the Werris Creek TEOM.

The Werris Creek $PM_{2.5}$ annual average was measured to be 7.3µg/m^3 and below the annual criteria adopted in the AQGHGMP (based on the interim guideline published by NEPM). The maximum $PM_{2.5}$

daily dust level during the period was 19.4µg/m^3 (30th May 2014), which is below the daily criteria of 25µg/m^3 adopted in the AQGHGMP as no $PM_{2.5}$ air quality criteria are provided in PA10_0059.

During the period, the Werris Creek TEOM did experience a number of issues particularly with the $PM_{2.5}$ componentry resulting in an elevated $PM_{2.5}$ to PM_{10} ratio requiring regularly maintenance. The TEOM then experienced a technical issue with the cooler in March 2015 and despite numerous repair attempts, the TEOM had to be removed from service on 25th March 2015 and sent to the original equipment manufacturer for specialised repairs. The TEOM was returned to operation on 14th April 2015; however was not operational on the 30th March 2015 and non-compliant with the requirements of EPL 12290 Condition 5 M2.2.

Table 3.7 PM_{10} and $PM_{2.5}$ Monthly Results monitored by Werris Creek TEOM 2014 to 2015

	PM_{10} (µg/m^3)					$PM_{2.5}$ (µg/m^3)				
	Min	**Mean**	**Max**	**Daily Criteria**	**Annual Criteria**	**Min**	**Mean**	**Max**	**Daily Criteria**	**Annual Criteria**
April 2014	7.3	15.1	23.5			4.5	9.7	17.4		
May 2014	8.4	16.9	34.7			6.1	12.2	19.4		
June 2014	5.3	13.1	19.1			4.0	9.7	14.1		
July 2014	3.8	11.6	21.0			1.5	8.3	14.7		
August 2014	1.9	10.2	28.3			0.7	6.7	18.1		
September 2014	0.0	9.2	17.3			0.0	4.5	9.0		
October 2014	6.8	16.6	33.0			4.6	7.8	13.1		
November 2014	3.3	20.0	**55.5**	50	30	3.0	10.2	18.9	25	8
December 2014	1.0	11.8	31.8			0.1	6.5	11.4		
January 2015	0.3	6.8	17.6			0.0	4.9	9.5		
February 2015	0.4	8.5	15.8			0.0	4.0	8.7		
March 2015	4.8	7.9	10.2			1.8	3.5	5.1		
ANNUAL MEAN	**12.3**					**7.3**				
PREDICTED DAILY	25.1					Background + 10				
PREDICTED ANNUAL	15.1					Background + 2				

Bold = elevated result

As presented below in **Table 3.8**, the wind direction from WCC to Werris Creek only occurs 8.2% of the time. Further analysis of the Werris Creek TEOM PM_{10} results was undertaken based two wind directions (wind towards Werris Creek between 182^o and 204^o and wind not towards Werris Creek) and for various wind speeds. **Table 3.8** presents the results of the wind direction analysis showing no significant difference in PM_{10} dust levels (0.7µg/m³) when winds are blowing from WCC to Werris Creek or not. While the annual average for winds towards Werris Creek was marginally higher, this only occurs 8.2% of the time demonstrating that WCC has a negligible impact on Werris Creek dust levels.

Table 3.8 Analysis of Dust Emissions by Wind Direction 2014-2015

	Wind towards Werris Creek - 182^o to 204^o All windspeeds		**Wind away from Werris Creek - Not 182^o to 204^o All windspeeds**	
	µg/m³	**% of time**	**µg/m³**	**% of time**
April 2014	15.1	6.9%	14.5	93.1%
May 2014	16.7	6.3%	16.1	93.7%
June 2014	14.2	3.7%	12.9	96.3%
July 2014	14.9	4.8%	13.4	95.2%
August 2014	9.3	20.0%	11.0	80.0%
September 2014	12.9	9.6%	10.5	90.4%

October 2014	16.6	9.2%	16.1	90.8%
November 2014	19.1	10.9%	19.0	89.1%
December 2014	12.8	5.8%	11.5	94.2%
January 2015	7.9	6.7%	7.4	93.3%
February 2015	9.5	6.6%	8.6	93.4%
March 2015	NA	7.8%	NA	92.2%
ANNUAL AVERAGE	**13.5**	**8.2%**	**12.8**	**91.8%**

NA – TEOM not available in March 2015 due to fault.

High Volume Air Samplers (HVAS) sample collection, changeover and maintenance is undertaken by a specialist contractor (and NATA accredited), Australian Laboratory Services (ALS) based in Gunnedah. The HVAS monitors TSP and PM_{10} concentrations over a six day continuous cycle in accordance with *AS/NZS 3580.9.3:2003 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – Total suspended particulate matter (TSP) – High volume sampler gravimetric method* and *AS 3580.9.6:2003 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM_{10} high volume sampler with size-selective inlet – Gravimetric method*.

Detailed air quality monitoring results as measured by the HVAS for TSP and PM_{10} over the last 12 months has been included in **Appendix 3(b)** with **Table 3.9** summarising the monthly results. The HVAS monitors are located north/east/south/west around WCC to measure dust emissions representative of mining operations regardless of the prevailing wind direction. Consistent with the good PM_{10} air quality measured in Werris Creek during the reporting period, all four PM_{10} and one TSP HVAS averaged below the relevant annual criteria. There were two elevated results recorded during the period:

- HVP11 ("Glenara") recorded a PM_{10} dust level of 62.4µg/m^3 on the 31st October 2014. This was an exceedance of the daily PM_{10} criteria because of a regional dust event that occurred that night which also measured elevated dust levels at the other three HVAS monitoring locations that ran on the 31st October as well as the Werris Creek TEOM and EPA Tamworth PM_{10} dust monitors. Given that the average wind direction between 8am and midnight on the 31st October was a north north westerly, the "Glenara" HVAS would have been downwind of WCC and therefore the mining dust contribution is estimated to have been 20.3µg/m^3 (downwind HVP11 minus upwind HVP20). A regional dust event occurred on Friday night 31st October commencing at 9pm as recorded by the 15 minute (instantaneous) PM10 dust levels measured by the Werris Creek TEOM peaked at 180.3µg/m3 when a westerly wind was gusting up to 26.2m/s (~94km/h). This is supported by the EPA Tamworth PM10 1 hour average peaking at 119.8 µg/m^3 on the same night. This wind storm was coupled with lightning resulting in all mining operations being suspended for 1.8 hours on Friday night; and
- HVP11 ("Glenara") recorded a PM_{10} dust level of 65.6µg/m^3 on the 17th January 2015. This was not an exceedance of the daily PM_{10} criteria because the "Glenara" property was upwind of WCC (moderate to strong south westerly wind) and given the low dust levels recorded at the other three HVAS monitoring locations and at the Werris Creek TEOM indicates a localised dust impact specific to "Glenara". Tonsley Park and Kyooma HVASs plus the Werris Creek TEOM were downwind of WCC and did not record any elevated PM10 dust levels.

Table 3.9 TSP and PM_{10} Monthly Average as monitored by HVAS 2014 to 2015

Period	PM_{10} (µg/m^3)						TSP (µg/m^3)	
	HVP1	HVP20	HVP11	HVP98	Daily Criteria	Annual Criteria	HVT98	Annual Criteria
	Escott	Tonsley Park	Glenara	Kyooma			Kyooma	
April 2013	8.8	14.4	18.2	7.2	**50**	**30**	12.3	**90**
May 2013	6.5	13.0	15.1	8.8			14.1	
June 2013	4.1	6.6	4.9	7.3			9.9	
July 2013	7.4	13.3	26.3	8.3			13.0	
August 2013	6.0	11.0	13.2	6.0			11.4	
September 2013	5.6	13.2	17.0	5.6			11.1	
October 2013	15.3	25.4	23.2	14.4			26.4	
November 2013	19.0	29.9	32.7	16.9			31.6	
December 2013	11.4	10.8	15.1	10.7			19.2	
January 2014	9.9	13.0	22.6	8.0			16.1	
February 2014	8.1	11.3	10.7	5.4			9.9	
March 2014	14.7	17.5	19.8	13.1			26.0	
MEAN	9.8	14.9	18.4	9.3			16.8	
MINIMUM	1.0	2.6	1.3	0.6			1.9	
MAXIMUM	29.7	42.1	**65.6**	25.4			53.9	
EA MOD2 PREDICTED DAILY	-	44.9	34.6	32.2			-	
EA MOD2 PREDICTED ANNUAL	-	19.9	15.9	15.9			32.2	

Bold = elevated result

WCC has undertaken PM_{10} dust monitoring since 2005 and the annual averages since that time are presented in **Table 3.10** including the former HVAS monitoring locations. Comparing annual averages since 2005, there is an increasing trend of PM_{10} dust levels at "Tonsley Park" while "Escott/Eurunderee" dust levels are now declining after peaking in 2010. The central Werris Creek and "Glenara" sites recorded annual averages higher than the previous period.

Table 3.10 PM10 Dust Monitoring Annual Averages since 2005 (µg/m^3)

ID	Property	Background	EA MOD2 Predicted	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	Annual Criteria
10TEOM92	**Werris Creek Centre**	15.1	-	-	-	-	-	-	-	-	13.0	13.7	12.3	**30**
HVP11	**Glenara**	15.1	15.9	-	-	-	-	-	-	-	13.4	17.6	18.4	**30**
HVP98	**Kyooma**	15.1	15.9	-	-	-	-	-	-	-	11.6	9.8	9.3	**30**
HVP1	**Escott/Eurunderee**	15.1	-	13.5	15.4	16.8	16.9	17.7	12.2	11.7	11.9	10.6	9.8	**30**
HVP20	**Tonsley Park**	15.1	19.9	12.1	11.4	12.1	12.1	16.4	11.2	14.0	13.7	16.1	14.9	**30**
-	**Cintra**	15.1	-	-	-	-	-	19.2	13.7	16.9	-	-	-	**30**
-	**Railway View**	15.1	-	11.0	11.5	12.1	11.8	15.0	12.2	17.9	-	-	-	**30**
-	**Old Colliery**	15.1	-	10.5	13.5	16.0	13.6	-	-	-	-	-	-	**30**

Except for "Glenara", the other monitoring locations annual average dust levels for 2014-2015 were less than the previous period and also below the predicted levels in the Environmental Assessment for PA 10_0059 Modification 2. This trend is contrary to that expected due to the below average

rainfall resulting in drier conditions experienced during the period and the likely increased dust emissions from WCC due to the record level of production. Actual dust levels for "Glenara" being higher than predicted is not considered to be significant with the drier and dustier conditions and localized agricultural activities affecting the air quality more than dust generated from mining operations (evidenced by the two elevated 24 hour dust levels during the period that were not related to WCC mining activities). During the period, all HVAS achieved 100% capture however the TEOM did not operate on the 30th March 2015 every 6th day in accordance with requirements of EPL 12290 Condition 5 M2.2.

3.1.6 Review of Air Quality Complaints and AQGHG Annual Review

A summary of dust complaints received by WCC since operations commenced in 2005 is presented in **Table 3.11**. Dust related complaints have also increased since 2010 believed to be due to the increase in scale of mining operations and as a consequence of operations moving closer to the town of Werris Creek; but also in the last two years due to the below average rainfall resulting in drier conditions and higher dust levels in the region. These dust complaints continue despite real time monitoring in Werris Creek indicating that the air quality would be classified as good.

The air quality complaints received during the period were associated with temperature inversions (6), unknown source or not related to WCC activities (6), spontaneous combustion (3), windy conditions (3) and general dust fallout/not a specific event (3). Under specific meteorological conditions (temperature inversions and calm conditions) a dust haze can develop over WCC with dust from normal operations (in particular from excavator load faces) can become trapped under the inversion which under normal conditions would be invisible due to atmospheric dispersion from wind. Inversion trapped dust can become particularly visible in the early mornings when the sunlight is low on the horizon. While these inversion dust haze events are uncommon and of a short duration, they are localised over the mine site and do not impact offsite. However WCC does acknowledge that they could be visually obtrusive to certain community members. WCC has implemented new processes to mitigate inversion dust hazes on the occasions that they appear to be developing with the Open Cut Examiner to divert water carts from road dust suppression (usually well dust suppressed due to low evaporation in early mornings) to water the dustiest excavator load face first to minimise development of the dust haze. Since implementation in Spring 2014 (Spring and Autumn have strongest inversions/greatest lapse rates due warm days and cool nights), the instances of dust haze events have anecdotally reduced.

Specific air quality complaints during windy conditions or handling hot material affected by spontaneous combustion were either dealt with at the time or were being actively managed by the time the complaint was received. Other dust complaints include those that upon investigation were found to be not related to WCC operations or were related to general dust fallout with no specific event identified. These complaints are still recorded in the complaints register with a description of WCC activities, dust management implemented and real time dust levels measured at the time of complaint.

Two odour complaints were recorded over one weekend (6th & 9th March 2015) from the same complainant that were allegedly related to spontaneous combustion. Due to different wind directions present at the time of the complaints and long distances (>4km) between the complainant and WCC, it is not possible to confirm the source of the odour. Spontaneous combustion events did occur at various stages during the period, in particular adjacent to the former underground workings. These instances are managed by the use of water curtains and sprinklers to suppress hot areas plus

uncovering and mining the workings quickly, and dousing any hot coal or ground as soon as practicable (**Figure 2.10**).

Table 3.11 Air Quality related Complaints since 2005

Complaint Issue	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Dust – Mine	1	2	0	3	0	5	7	12	11	21
Dust – Rail Load Out	0	0	0	1	0	0	0	0	3	0
Odour	0	0	0	0	0	0	0	0	5	2
All Complaints (including Air Quality)	**8**	**10**	**7**	**16**	**12**	**52**	**117**	**56**	**93**	**95**

WCC performance against the Environmental Management System air quality related objectives and targets developed from the AQGHGMP for the period 1st April 2014 to 31st March 2015 is outlined in **Table 3.12**. WCC achieved three out of the five targets set for air quality related objectives. Dust complaints and number of dust complainants increased in 2014-2015 compared to 2013-2014 were due to weather (temperature inversions or wind) or ground conditions (former underground working affected by spontaneous combustion). Also during times of prevailing dry conditions, the community's awareness of dust is heightened and the perception that it is because of mining which drives additional dust complaints despite dust monitoring demonstrating that regional ambient conditions control dust levels and that Werris Creek actually has good air quality even during these extended dry periods.

Table 3.12 Dust Objectives and Targets 2014-2015

Activity	Objective	Indicator	Actual 2014-2015	Target 2014-2015	Actual 2013-2014	Actual 2012-2013	Actual 2011-2012
Dust	Complaint	# Complaints	**21**	**13**	14	12	7
		# Complainants	**13**	**8**	9	11	7
	Trafficable Dust	# Exceedances	**0**	**0**	0	0	0
	Overburden Emplacement	# Exceedances	**0**	**0**	0	0	0
	Dust Criteria	# Exceedances	**0**	**0**	0	0	0

Red – Exceeded Full Year Target

As required by PA 10_0059 Schedule 5 Condition 3, WCC as part of this Annual Environmental Management Report undertakes an annual review of its air quality management for 2014-2015. **Table 3.13** summarises the air quality annual review from the discussion above.

Table 3.13 AQGHG Annual Review 2014-2015

Annual Review	Discussion
Monitoring Results	• Criteria PM_{10} measured at "Werris Creek" TEOM and "Glenara" HVAS were above criteria but not an exceedance because WCC was not the source of dust. • Previous Year Dust deposition results were higher in line with prevailing dry conditions; however four out of the five PM_{10} monitoring locations ("Glenara" being the exception) recorded slightly lower dust levels compared to the previous period. • EA Predictions Dust monitoring results are generally within the predictions outlined in Environmental Assessment for PA 10_0059 Modification 2. Four dust

Annual Review	Discussion
	deposition gauges ("Glenara", "Mountain View", "Hazeldene" and "Woodlands") and one HVAS PM10 ("Glenara") on privately owned land recorded annual averages above the levels predicted due to the drier and dustier ambient conditions during 2014-2015.
Complaints	• This Year Dust complaints and number of dust complainants increased compared to 2013-2014 due to weather (temperature inversions or wind) or ground conditions (former underground working affected by spontaneous combustion). • Previous Year During times of prevailing dry conditions, the community's awareness of dust is heightened and the perception that it is because of mining which drives additional dust complaints despite dust monitoring demonstrating that regional ambient conditions influence dust levels rather than WCC operations. Werris Creek actually has good air quality even during these extended dry periods
Compliance	• Criteria and other A number of elevated dust monitoring results were recorded however there were no exceedance of the criteria outlined in AQGHGMP because the levels were not representative of WCC operations. TEOM did not operate on the 30th March 2015 every 6th day in accordance with requirements of EPL 12290 Condition 5 M2.2. • Objectives & Targets WCC achieved three out of the five targets set for air quality related objectives – WCC did not achieve a reduction in complaints from 2013-2014.
Data Trends & Predicted Impacts	Monitoring indicates that dust levels have increased since 2005 as expected, however dust levels are generally below those predicted in the Environmental Assessment and below the relevant air quality criteria.
Improvement Actions	For 2014-2015, there were three air quality improvement strategies: • Prestrip dust suppression from sprinkler application; • Inversion related dust haze management; and • Spontaneous Combustion air quality management. For 2015-2016, there are two air quality improvement strategies: • Dust Deposition Gauge Audit; and • New Bird Deterrents for Dust Deposition Gauges.
Management Plan Review	All management strategies and actions were implemented during 2014-2015.
Management Plan Revision	No update required.

3.1.7 Greenhouse Gas (GHG)

Diesel combustion during the reporting period slightly increased by 1% to 20,614,566L due to the increased intensity of operations to achieve the 2.5Mtpa coal target. Assuming an energy content of Automotive Diesel Oil (diesel) of 38.6 MJ/L and "National Greenhouse Accounts (NGA) Factors" June 2009, the estimated direct Scope 1 GHG emissions from diesel combustion since 2005 are outline in **Table 3.14**.

Table 3.14 GHG Emissions from Diesel Combustion at WCC

	Diesel Fuel Usage kL	Emission Factor t $CO_{2\text{-}e}$/kL	CO_2 Equivalent Tonnes
2005-2006	5,590	2.7	15,093
2006-2007	5,855	2.7	15,809
2007-2008	7,566	2.7	20,428.
2008-2009	6,838	2.7	18,427
2009-2010	9,030	2.7	24,382
2010-2011	12,009	2.7	32,820
2011-2012	13,549	2.7	36,582
2012-2013	12,908	2.7	34,854
2013-2014	20,418	2.7	55,129
2014-2015	20,615	2.7	55,661

The 2014-2015 period was the first full year after mains power was restored to the MIA following relocation in 2013 and thus resulting in the increased in electricity consumption. The "National Greenhouse Accounts (NGA) Factors" June 2009 and a Scope 2 (indirect) emission factor of 0.89 kg CO_2 – equivalents / kWh, the estimated GHG emissions from electricity usage since 2005 is presented **Table 3.15**.

Table 3.15 GHG Emissions from Electricity Consumption at WCC

	Electricity kWh	Emission Factor kg $CO_{2\text{-}e}$/kWh	CO_2 Equivalent Tonnes
2005-2006	300,400	0.94	282.0
2006-2007	754,195	1.068	805.5
2007-2008	948,697	1.06	1,005.6
2008-2009	904,030	0.89	804.6
2009-2010	1,019,149	0.89	907.4
2010-2011	1,506,725	0.89	1,341.0
2011-2012	1,302,197	0.89	1,158.9
2012-2013	1,303,860	0.89	1,160.4
2013-2014	287,375	0.89	255.8
2014-2015	814,899	0.89	725.3

During the Reporting Period, a total of 11,949 tonnes of explosives were used at WCC. Assuming a conversion factor of 0.1778 kg CO_2 – equivalents / kWh, the estimated GHG emissions from explosive combustion in blasting since 2005 is presented **Table 3.16**.

Table 3.16 GHG Emissions from Explosives Combustion at WCC

	Explosive t	Emission Factor kg $CO_{2\text{-}e}$/t	CO_2 Equivalent Tonnes
2005-2006	2,335	0.1637	382.4
2006-2007	3,943	0.1637	645.5
2007-2008	4,442	0.1637	727.2
2008-2009	3,889	0.1778	691.5
2009-2010	6,702	0.1778	1191.6
2010-2011	7,402	0.1778	1316.1
2011-2012	10,140	0.1778	1802.9
2012-2013	7,537	0.1778	1340.1
2013-2014	9,660	0.1778	1717.6
2014-2015	11,949	0.1778	2124.6

The total GHG emissions for WCC increased 2% for 2014-2015 which is in line with the 2% increase in total material movement (coal and overburden). **Table 3.17** presents the total CO_2 equivalent GHG emissions and emissions per unit of production (bulk cubic metre – BCM) since 2005.

Table 3.17 Total GHG Emissions and Emissions per Production Unit by WCC since 2005

	CO_2 Equivalent Tonnes	Total Production BCM	CO_2 Emission per Production BCM
2005-2006	15,757	4,577,326	0.0034
2006-2007	17,260	7,287,924	0.0024
2007-2008	22,161	7,301,296	0.0030
2008-2009	20,423	7,198,677	0.0028
2009-2010	26,481	9,283,707	0.0029
2010-2011	35,477	10,958,235	0.0032
2011-2012	39,544	12,803,395	0.0031
2012-2013	37,354	13,023,197	0.0029
2013-2014	57,102	17,604,815	0.0032
2014-2015	58,511	18,072,935	0.0032

The LOM Environmental Assessment (R.W. Corkery & Co. Pty Ltd, 2010) estimated the Scope 1 and Scope 2 GHG emissions from Diesel Consumption (operations), Explosives and Purchased Electricity would equate to approximately 54,640 CO_2-e tonnes that would be emitted by WCC at an extraction rate of 2.5Mtpa of coal. The 2014-2015 GHG emissions are higher than predicted in the Environmental Assessment due to the overall increasing strip ratio as mining continues deeper but the hill in front of the mine continues to increase in height. However, in future years both aspects will improve to reduce the strip ratio and therefore decrease GHG emissions.

3.2 SURFACE WATER (INCLUDING EROSION AND SEDIMENT CONTROL)

3.2.1 Management

The management of surface water aims to prevent surface water pollution both within onsite dams and offsite water courses. The overall water management strategy is to segregate different water streams onsite based on the potential pollutant in each stream. Segregation of water into the clean, dirty, void and contaminated water streams is also discussed in **Section 2.8**. Potential pollutants of surface waters at WCC include erosion and sedimentation and acid/alkaline water (dirty water), acid/alkaline and saline water (void water) and coal, hydrocarbons and/or nutrients (contaminated water).

Methods for the management of erosion and sediment control at WCC are presented in the LOM MOP and in the draft Site Water Management Plan (SWMP, 2015) and include:

- The segregation of water from clean, dirty or void water catchments and retention of this water as required for pollution control and on-site for dust suppression;
- Sediment Basins (SBs) within the dirty water system are used to collect water and allow sufficient time to enable the settlement of suspended solids prior to discharge;
- Three SBs are licenced discharge points (as per EPL 12290) designed to retain water generated by run-off from a 39.2mm rain event over a 5 day period before overflowing (wet weather discharge) and are to be maintained in a drawn down state. Flocculants are also used where necessary to further clarify the water prior to undertaking a controlled discharge;
- Revegetation is undertaken as soon as practicable of disturbed areas; and

- Installation of contour banks and lined waterways on the final landform following soil application.

Excessively alkaline or acid waters which may accumulate in the SBs of the licenced discharge points, are treated to ensure that the pH of the discharge waters are maintained within the limits nominated by EPL 12290 (between 6.5 and 8.5) to avoid impacting on off-site water quality.

Saline water within the void water system is managed by preferentially using this water for dust and spontaneous combustion suppression onsite and storing the remainder within void water storage dams. Because Void Water Dams 1, 3 & 4 are prescribed dams by the NSW Dam Safety Committee, they have been designed for zero discharge; impermeable ($<1x10^{-9}$m/s); an operating freeboard of 0.3m (marked with dam full level sign) and 0.5m diameter pipe spillway capable of managing a 1 in 10,000 year 5 day storm event. Water collected within the dirty water system which cannot be easily treated to achieve the EPL nominated criteria for pH or suspended solids prior to discharge is also used for dust suppression or transferred to the void water system as a last resort.

The primary source of contaminated water is now coal contact water runoff from ROM and Product Coal Stockpiles and from the workshop which drains to the wash pad sump and is treated by a ceptor (under/over flow oil-water separator). Any oil and sediment is collected by a vacuum truck and treated at the bioremediation area, while the water drains to the contaminated water system.

The WCC surface water monitoring program is summarised in **Table 3.18**, **Figure 3.3** and **Figure 3.4**.

Table 3.18 Surface Water Analysis for Licensed Water Storages

Monitoring Site	Monitoring Frequency	Parameters
Dirty & Contaminated Water Dams Licensed Discharge Points SB2 (EPA 10) SB9 (EPA 12) SB10 (EPA 14)	Quarterly & As soon as practicable after any overflow off-site commences and in any case not more than 12 hours after any overflow off-site commencing	Water quality including, but not limited to, Total Suspended Solids Oil & Grease pH Electrical Conductivity Total Phosphorus Reactive Phosphorus Total Nitrogen Nitrate Nitrogen
Receiving Waters – upstream and downstream WCU (Werris Creek) WCD (Werris Creek) QCU (Quipolly Creek) QCD (Quipolly Creek)	Quarterly & Within 12 hours after any overflow off-site from a sediment dam(s) on the premises occurring.	
Void Water Dams VWD1, VWD2, VWD3 & VWD4	Quarterly	
Clean and Water Dams SD4 &SD5 Offsite Stream BGD (Black Gully)	Quarterly	

3.2.2 Performance

Quarterly sampling of the water stored within the clean, dirty and void water dams (not including discharge water quality - **Figure 3.3**) and within Quipolly and Werris Creeks' (**Figure 3.4**) was undertaken by WCC. The detailed monitoring results are included in **Appendix 4(a)**. **Table 3.19** presents the annual average results recorded at each location.

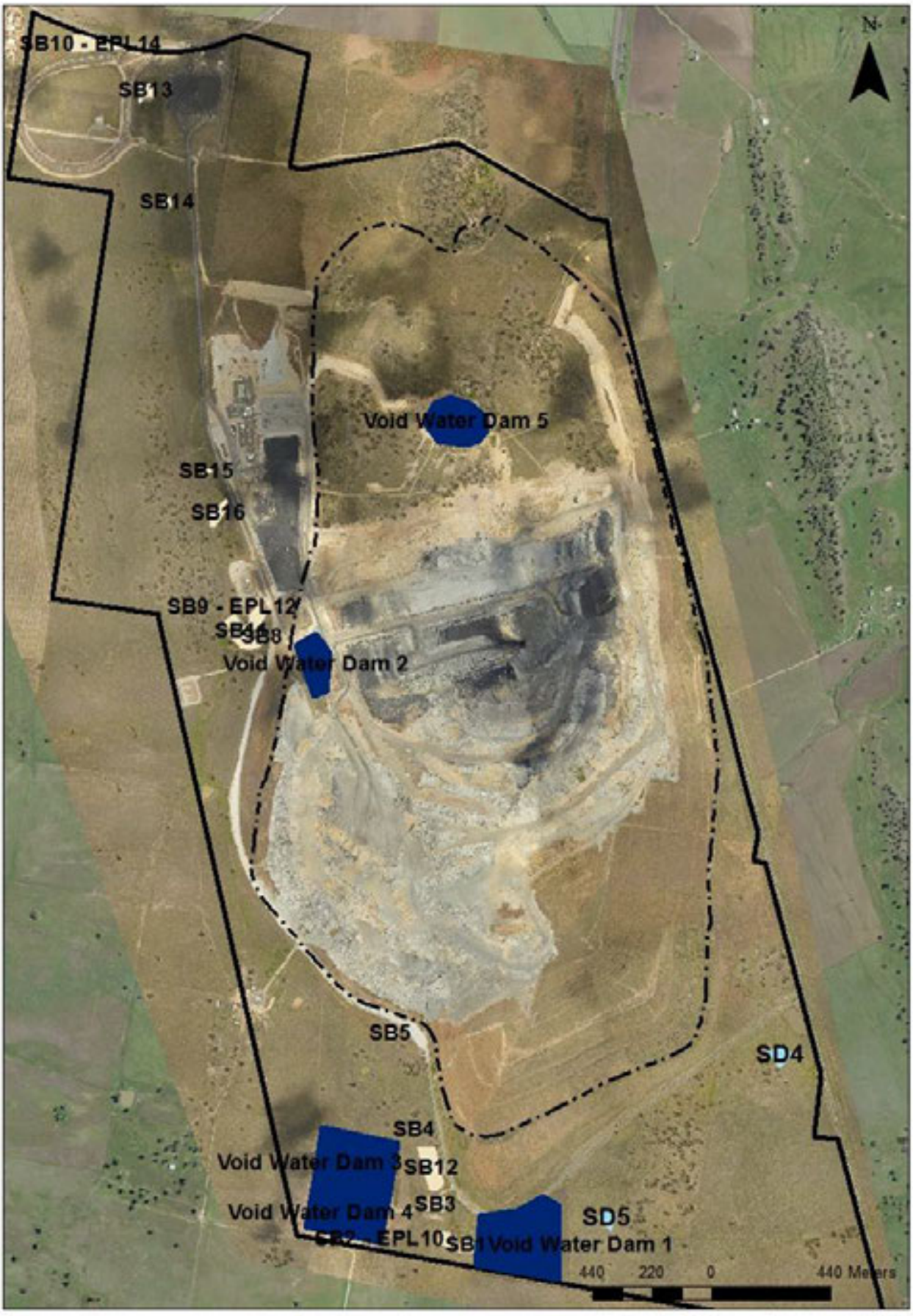


Figure 3.3 Clean, Dirty and Void Water Dams onsite at WCC

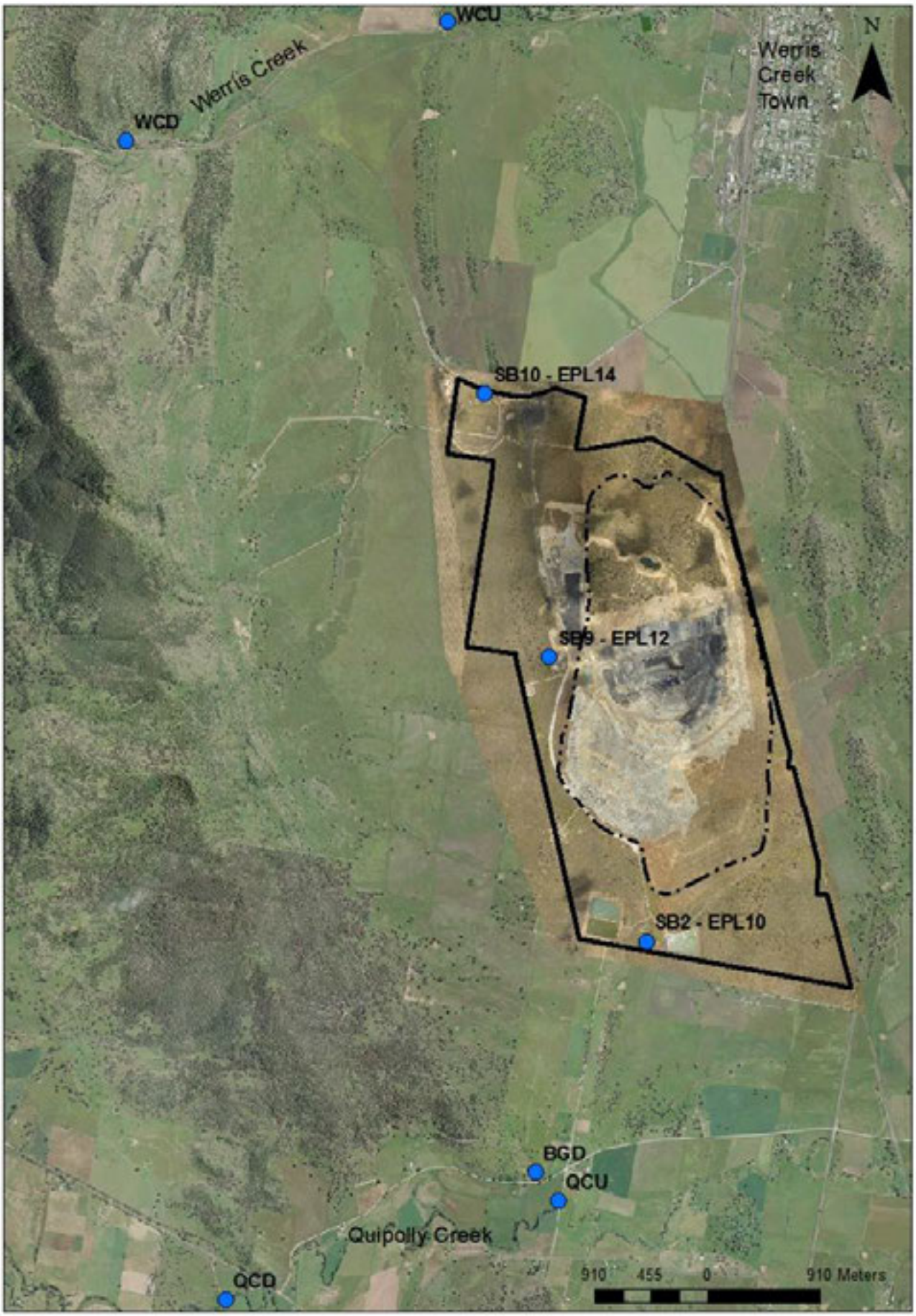


Figure 3.4 EPL12290 Licence Discharge Points and Offsite Creek Water Monitoring Locations

Table 3.19 Quarterly Surface Water for Clean, Dirty & Void Water Dams and Offsite Creeks'

Dam/ Creek	Monitoring Site (EPA No)	Number of Samples	pH	Electrical Conductivity (µS/cm)	Total Suspended Solids (mg/L)	Grease & Oil (mg/L)
VWD1	16	4	8.43	1080	12	<5
VWD2	27	4	8.25	1048	64	<5
VWD3	-	4	8.48	1031	38	<5
VWD4	-	4	8.39	1055	11	<5
SB2	10	2*	9.16	2050	81	<5
SB9	12	2*	8.29	843	318	<5
SB10	14	0*	Dry	Dry	Dry	Dry
SD4	-	4	8.59	406	54	<5
SD5	-	0*	Dry	Dry	Dry	Dry
QCU	25	4	7.95	1563	47	<5
QCD	26	4	8.07	1057	10	<5
WCU	23	0*	Dry	Dry	Dry	Dry
WCD	24	4	8.33	1306	26	<5
BGD	-	0*	Dry	Dry	Dry	Dry

* BGD, WCU, SD5 and SB10 were dry during each quarterly monitoring period. SB2 and SB9 were dry on the last two quarterly monitoring periods.

The quarterly water quality was generally consistent with the previous reporting period, except for SB2 and SB9 recording elevated pH, Electrical Conductivity (EC) and Total Suspended Solids (TSS) levels prior to the dams drying up due to the dry conditions which concentrated through evaporation the remaining water into small pools. Also WCD, QCU and QCD all had elevated EC during the period due the dry conditions limiting runoff to freshen up in stream salinity.

Licensed discharge points SB2, SB9 and SB10 discharge water quality monitoring results and comparison with compliance criteria is discussed in **Section 2.8.1**. During the reporting period there were no offsite discharges (**Table 3.20**)**.** The results of the monitoring following discharge events from previous years illustrate that dirty water from WCC does not have an adverse impact upon surface water quality within Quipolly Creek or Werris Creek. The general trend from previous periods of increasing electrical conductivity and pH from upstream to downstream is unrelated to WCC discharge events as the differences are often well over the water quality results sampled at the licenced discharge dams and reflect the natural conditions of the catchment and predominantly agricultural land use of the area. Dirty water discharged is only a small component of the estimated average Quipolly Creek flow rate of 46ML per day (RCA, 2010). Discharge water quality results from previous periods are consistent with the predicted levels as nominated in the "*Werris Creek Coal Mine Life of Mine Environmental Assessment"* (R.W. Corkery and Co Pty Limited, 2010) in that WCC would not impact on the pH, suspended solids or conductivity of waters discharged from the site.

Table 3.20 Quipolly and Werris Creeks' Discharge Receiving Water Quality

Creek	EPA ID	No. Samples		pH	Conductivity (µS/cm)	Suspended Solids (mg/L)	Grease & Oil (mg/L)
Quipolly Upstream	25	4	Minimum	No Discharge			
			Average				
			Maximum				
Quipolly Downstream	26	4	Minimum	No Discharge			
			Average				
			Maximum				

Creek	EPA ID	No. Samples		pH	Conductivity (µS/cm)	Suspended Solids (mg/L)	Grease & Oil (mg/L)
Werris Upstream	23	0	Minimum	No Discharge			
			Average				
			Maximum				
Werris Downstream	24	0	Minimum	No Discharge			
			Average				
			Maximum				

3.3 GROUNDWATER

3.3.1 Management

The management of groundwater at WCC is undertaken to achieve two separate goals, namely:

- monitoring and measuring potential impacts from mining operations on adjacent aquifers and privately owned bores: and
- dewatering and use of void water (rainfall runoff and groundwater) that is intercepted by mining operations.

WCC currently monitors groundwater in 31 bores and piezometers[1], on the mine site as well as on neighbouring properties, to measure potential impacts on aquifer groundwater quality and groundwater availability. Sources of potential contamination by mining operations to groundwater quality could include hydrocarbon spills and leaks, or changes to pH and EC due to acid rock drainage. **Figure 3.5** displays the conceptual groundwater system at WCC and the interaction between the three key aquifers, i.e. the outlier of Greta Coal Measures, Werrie Basalt and Quipolly Creek Alluvium aquifers, and the underlying basement strata (Temi Formation).

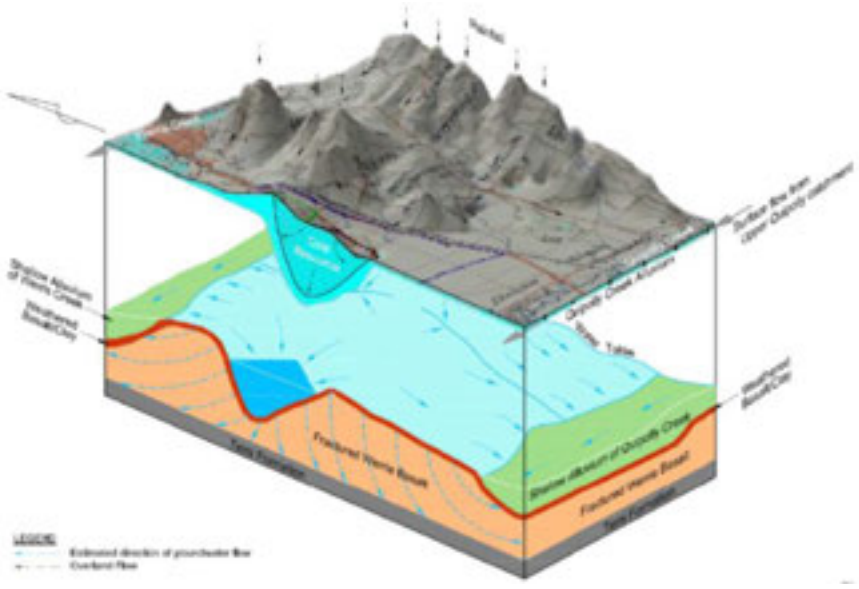


Figure 3.5 Conceptual Hydrogeological Model at WCC (taken from RCA, 2010)

Table 3.21 identifies these three aquifers along with the bores and piezometers monitored within each. The groundwater monitoring program currently implemented by WCC is summarised in **Table 3.22**. **Figure 3.6** illustrates the locations of the bores and piezometers that are monitored including the six piezometers licenced under EPL 12290 (MW1 to MW6 corresponding to EPL ID 17 to 22).

[1] A piezometer is a bore specifically designed to allow for water sampling and monitoring.

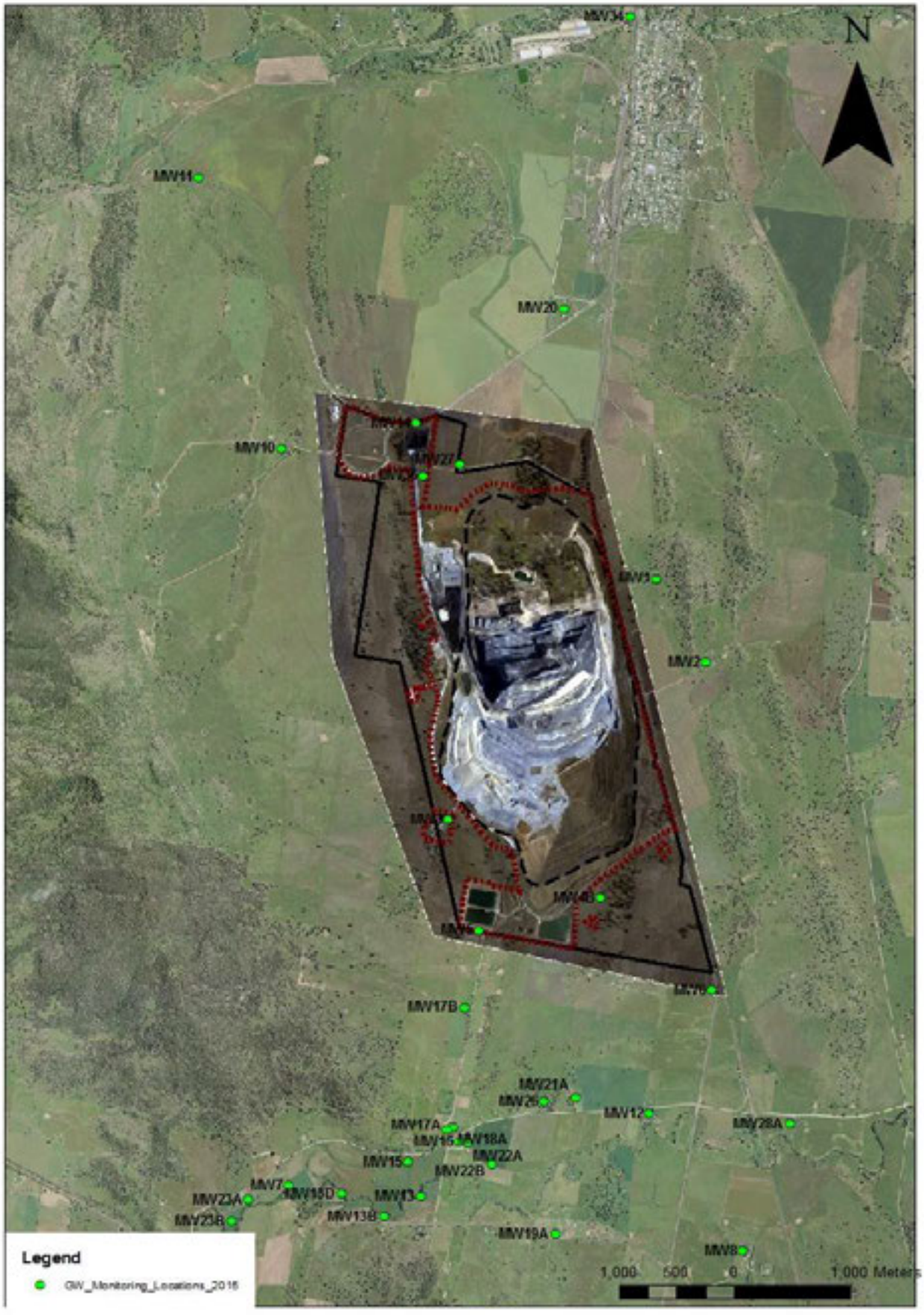


Figure 3.6 WCC Groundwater Monitoring Locations for 2014-2015

Table 3.21 Aquifer Monitoring Locations

Aquifer	Bore/Piezometer
Werrie Basalt	MW1, MW2, MW3, MW4B, MW5, MW6, MW8, MW10, MW14, MW17B, MW19A, MW20, MW27, MW36A, MW36B
Quipolly Creek Alluvium*	MW7, MW12, MW13, MW13B, MW13D, MW15, MW16, MW17A, MW18A, MW18B, MW21A, MW22A, MW22B, MW23A, MW23B, MW26, MW28A, MW32
Currabubula Formation**	MW11

* Includes bores and piezometers in Black Gully, tributary of Quipolly Creek; ** Apart of the Temi Formation

Table 3.22 Groundwater Monitoring Program

Parameters	Frequency	Bore/Piezometers
Standing Water Level	Bimonthly	MW1, MW2, MW3, MW4B, MW5, MW6, MW8, MW10, MW14, MW17B, MW19A, MW20, MW27, MW36A, MW36B, MW7, MW12, MW13, MW13B, MW13D, MW15, MW16, MW17A, MW18A, MW18B, MW21A, MW22A, MW22B, MW23A, MW23B, MW26, MW28A, MW32
Total Nitrogen Nitrate Nitrogen Total Phosphorus Reactive Phosphorus Electrical Conductivity pH	6 Monthly	MW1, MW2, MW3, MW4B, MW 5, MW6
Chloride, Sulfate, Hydroxide Alkalinity, Carbonate Alkalinity, Bicarbonate Alkalinity, Total Alkalinity, Calcium, Magnesium, Sodium, Potassium, Arsenic, Barium, Beryllium, Cadmium, Cobalt, Chromium, Copper, Manganese, Nickel, Lead, Vanadium, Zinc, Mercury Ammonium, Nitrite, Nitrite+Nitrate, TKN, Anions, Cations, Ion Balance, TPH	Annually	MW1, MW2, MW3, MW4B, MW5, MW6, MW8, MW10, MW14, MW17B, MW19A, MW20, MW27, MW36A, MW36B, MW7, MW12, MW13, MW13B, MW13D, MW15, MW16, MW17A, MW18A, MW18B, MW21A, MW22A, MW22B, MW23A, MW23B, MW26, MW28A, MW32, MW11

WCC LOM Environmental Assessment (R.W. Corkery & Co., 2010) outlines the following trigger levels in **Table 3.23** which are compared using the annual monitoring results during the reporting period.

Table 3.23 Groundwater Trigger Levels

Parameter	Measure	Benchmark	Trigger Level
Standing Water Level	Saturated Thickness	Natural Conditions	15% Reduction
Chemistry	EC	Natural Conditions	15% Increase
	pH	Natural Conditions	15% Increase or Decrease

3.3.2 Performance

Performance with respect to groundwater management, the prevention of pollution and the assessment of impacts on groundwater availability to other surrounding users, is assessed through groundwater level and chemistry monitoring. Monitoring focuses on the Werrie Basalt and Quipolly Creek Alluvium aquifers given that these two aquifers have the greatest potential for impact on the environment and neighbouring bore water users.

Table 3.24 presents the groundwater level monitoring data for the last 12 months in the Werrie Basalt and Quipolly Creek Alluvium aquifers. For Quipolly Creek Alluvium, MW12 and MW7 are representative of upstream and downstream aquifer conditions respectively. For Werrie Basalt, MW5 and MW14 are representative of aquifer conditions either side of the watershed between Quipolly Creek in the south and Werris Creek in the north respectively. **Appendix 4(c)** presents detailed groundwater monitoring data since 2005 including the 2014-2015 period. All groundwater sampling and analyses were undertaken by a NATA accredited laboratory.

Table 3.24 Werrie Basalt and Quipolly Creek Alluvium Aquifer Groundwater Levels for 2014-2015

	Site	May 2014		July 2014		Sep 2014		Nov 2014		Jan 2015		Mar 2015		Annual Average	Longterm Average	Record Lowest
		mbgl	%	mbgl	%	mbgl	%	mbgl	%	mbgl	%	mbgl	%			
Werrie Basalt Near WCC	MW1	57.11	-1%	57.58	-1%	58.52	-2%	59.34	-1%	59.87	-1%	**60.82**	-2%	58.87	53.06	**60.82**
	MW2*	28.39	-2%	28.80	-1%	29.61	-3%	30.25	-2%	30.82	-2%	**31.84**	-3%	29.95	26.50	**31.84**
	MW3	16.69	-1%	16.93	-1%	17.34	-2%	17.63	-2%	17.83	-1%	**18.15**	-2%	17.43	15.40	**18.15**
	MW4B	12.49	-3%	12.73	-2%	13.46	-5%	13.99	-4%	14.32	-2%	**14.68**	-2%	13.61	10.52	**14.68**
	MW5	10.08	-2%	10.31	-2%	10.73	-4%	11.02	-3%	11.19	-2%	**11.46**	-2%	10.80	8.68	**11.46**
	MW6	13.24	-1%	13.38	-1%	13.62	-2%	13.81	-1%	13.95	-1%	**14.18**	-2%	13.70	11.77	**14.18**
	MW27*	45.20	1%	47.49	-5%	**52.36**	-9%	52.10	0%	51.32	1%	50.04	3%	49.75	44.95	**52.36**
	MW36A	23.31	-1%	23.41	0%	23.96	-2%	**24.45**	-2%	24.43	0%	24.34	0%	23.84	23.84	**24.45**
	MW36B	22.46	6%	22.8	-1%	23.75	-4%	**24.20**	-2%	24.19	0%	24.04	1%	23.61	23.61	**24.20**
Werrie Basalt	MW8*	17.48	-1%	17.66	-1%	18.07	-2%	18.38	-2%	18.34	0%	18.61	-1%	18.09	15.37	18.71
	MW10	17.05	0%	17.09	0%	17.16	0%	17.11	0%	17.19	0%	17.24	0%	17.14	17.34	20.00
	MW14	18.16	0%	18.21	0%	18.57	-2%	18.97	-2%	**19.39**	-2%	19.21	1%	18.75	16.47	**19.39**
	MW17B*	11.51	-4%	11.47	0%	11.83	-3%	12.15	-3%	12.22	-1%	17.60	-31%	12.80	10.70	18.77
	MW19A*	8.29	-1%	8.4	-2%	8.97	-6%	9.15	-2%	9.10	1%	**9.26**	-2%	8.87	6.92	**9.26**
	MW20*	20.29	-1%	20.39	0%	20.61	-1%	20.67	0%	20.86	-1%	**21.02**	-1%	20.64	19.54	**21.02**
Quipolly Alluvium	MW7*	-	-	-	-	-	-	4.82	-4%	**4.88**	-1%	4.85	2%	4.83	4.45	**4.88**
	MW12*	10.31	-3%	10.65	-3%	11.15	-4%	11.63	-4%	11.85	-2%	**12.24**	-3%	11.31	8.61	**12.24**
	MW13*	4.75	18%	5.86	-19%	6.10	-4%	4.78	28%	6.42	-1%	**6.63**	-3%	5.76	5.07	**6.63**
	MW13B*	4.17	-1%	4.82	-13%	4.51	7%	4.78	-6%	4.91	-3%	**5.15**	-5%	4.72	3.75	**5.15**
	MW13D*	4.82	-1%	4.93	-2%	4.94	0%	5.07	-3%	5.02	1%	5.16	-3%	4.99	4.75	5.30
	MW15*	5.25	-3%	5.37	-2%	5.61	-4%	5.84	-4%	5.92	-1%	**6.15**	-4%	5.69	4.72	**6.15**
	MW16*	6.13	-3%	6.25	-2%	6.63	-6%	6.86	-3%	6.99	-2%	**7.27**	-4%	6.69	5.12	**7.27**
	MW17A*	5.23	-3%	5.41	-3%	5.7	-5%	6.05	-6%	6.09	-1%	**6.32**	-4%	5.80	4.24	**6.32**
	MW18A*	5.07	-4%	5.27	-4%	4.32	22%	5.76	-8%	5.95	-3%	**6.28**	-5%	5.61	4.10	**6.28**
	MW21A*	8.73	-4%	8.96	-3%	9.32	-4%	9.65	-3%	**10.35**	-7%	10.10	2%	9.52	7.07	**10.35**
	MW22A*	6.27	-3%	6.5	-3%	6.78	-5%	6.95	-2%	7.18	-3%	**7.41**	-3%	6.84	5.27	**7.41**
	MW22B*	6.55	-4%	6.7	-3%	7.0	-4%	7.26	-3%	7.44	-2%	**7.68**	-3%	7.12	5.47	**7.68**
	MW23A*	3.92	-1%	4.22	-7%	**4.32**	-2%	4.05	7%	3.94	3%	4.03	-2%	4.08	3.85	**4.32**
	MW23B*	4.4	-3%	4.63	-5%	5.37	14%	4.19	4%	4.19	0%	4.23	-1%	4.34	4.26	4.75
	MW28A*	13.12	-2%	13.27	-1%	13.54	-2%	13.80	-2%	13.95	-1%	**14.26**	-2%	13.66	11.84	**14.26**
	MW32*	4.18	-2%	4.02	4%	4.10	-2%	4.13	-1%	4.26	-3%	4.19	2%	4.15	4.10	4.62

mbgl – meters below ground level is the distance in meters from top of bore to groundwater surface; Red – Greater than 15% change/potential compliance issue; Orange – Change decrease; Green – change increase or no change; **Bold** – record lowest groundwater level measured during the reporting period; e – recording error, usually from pump running at the time of monitoring; * - Indicates bore is used for water extraction unrelated to WCC (i.e. stock and domestic or irrigation).

The bi-monthly groundwater level monitoring results have showed downward trend in groundwater for 2014-2015 as evidenced by the dominate orange colouring in **Table 3.24**; with ten and eight locations at lowest recorded levels in the Quipolly Alluvium and Werris Basalt aquifers respectively.

In accordance the draft Site Water Management Plan, a cumulative sum (cusum) trend analysis was completed to evaluate the effects of seasonal variation on groundwater levels. This approach is used to determine if trends are apparent that are inconsistent with a background trend. The background trend is represented by a monitoring well that is considered to be at a sufficient distance from the Werris Creek Coal Mine to not be influenced by mining operations. Where variations that are inconsistent with background variation are occurring, the cusum analysis exceeds a certain threshold indicating impacts outside of normal seasonal conditions. The cusum analysis (Environ, 2015b) found that four locations within the Werrie Basalt aquifer and two locations within the Quipolly Alluvium aquifer had groundwater trends that were outside of the calculated statistical range for normal seasonal conditions. MW1, MW2, MW6 and MW27 are the four bores/piezometers that are on WCC owned land close to the mining area that have shown downward trends outside of seasonal conditions; while MW12 and MW21a are bores on privately owned land approximately 2km away from the open cut pit.

Environ (2015b) reviewed the groundwater level trends for the Werrie Basalt and Quipolly Alluvium bores/piezometers that triggered trends varying from normal seasonal variations against the relevant background bore for each aquifer. The Werrie Basalt (**Figure 3.7**) background bore MW8 is declining at a faster rate than MW6; however is declining at a slower rate compared to MW1, MW2 and MW27. The fact that the MW8 groundwater level is declining at 5.4km remote from the active mining area demonstrates that there is a deviation from historical measurements occurring attributed to the below average rainfall conditions with the last widespread rise in the groundwater table evident back in 2013. With MW1 (0.6km), MW2 (0.9km) and MW27 (1.9km) on WCC owned land close to the active mining area it can be expected that there could also be a minor influence of aquifer drawdown due to the proximity to mining in addition to the lack of rainfall recharge. The influence of pumping from extractive wells (MW2, MW8 and MW27) also masks the magnitude of groundwater level trends. Environ (2015b) concluded that any drawdown due to mining for MW1, MW2, MW6 and MW27 was consistent with the LOM Environmental Assessment predictions given their proximity to the mining lease.

The rate of groundwater decline for the Quipolly Alluvium aquifer for MW21a and MW12 was consistent with the representative background well MW28 (**Figure 3.8**); mirroring the trend for the Werrie Basalt aquifer that that there is currently a climatic deviation from historical measurements resulting in groundwater levels outside of normal seasonal trends due to the prevailing below average rainfall conditions. The distance of MW21a (3.7km) and MW12 (4.0km) from the current active mining area means that mining drawdown would be negligible compared to the effect that no water has recharged to the Quipolly Alluvium aquifer as Quipolly Creek has not flowed for nearly two years (Environ, 2015b).

Environ (2015b) conclude that if WCC mining activity was impacting on the Werrie Basalt aquifer base flow contribution to the Quipolly Alluvium aquifer then this would be observed for the wells within the system that are spring fed like MW7 and MW13 (**Figure 3.9**) as well as the other bores. The fact that this trend is not evident for MW7 and MW13 (outside of irrigation related drawdown) demonstrates that Werrie Basalt and Quipolly Alluvium aquifers are being significantly impacted by outside normal seasonal below average rainfall conditions currently and not related to mining impacts.

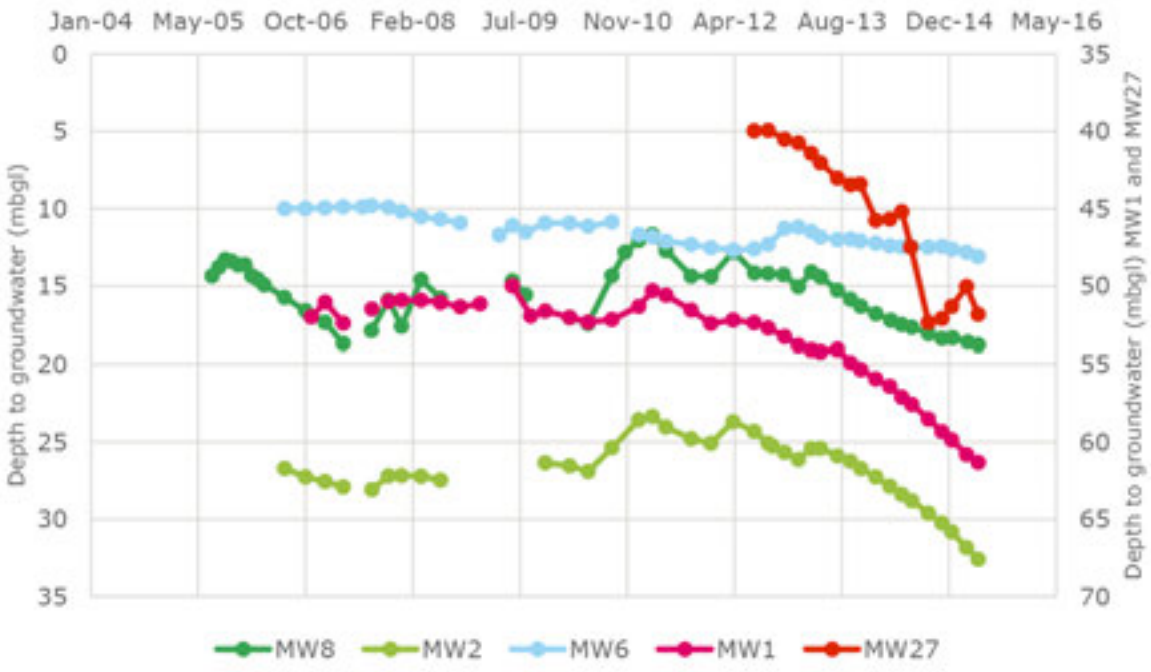


Figure 3.7 Groundwater Level Trends for Werrie Basalt Aquifer

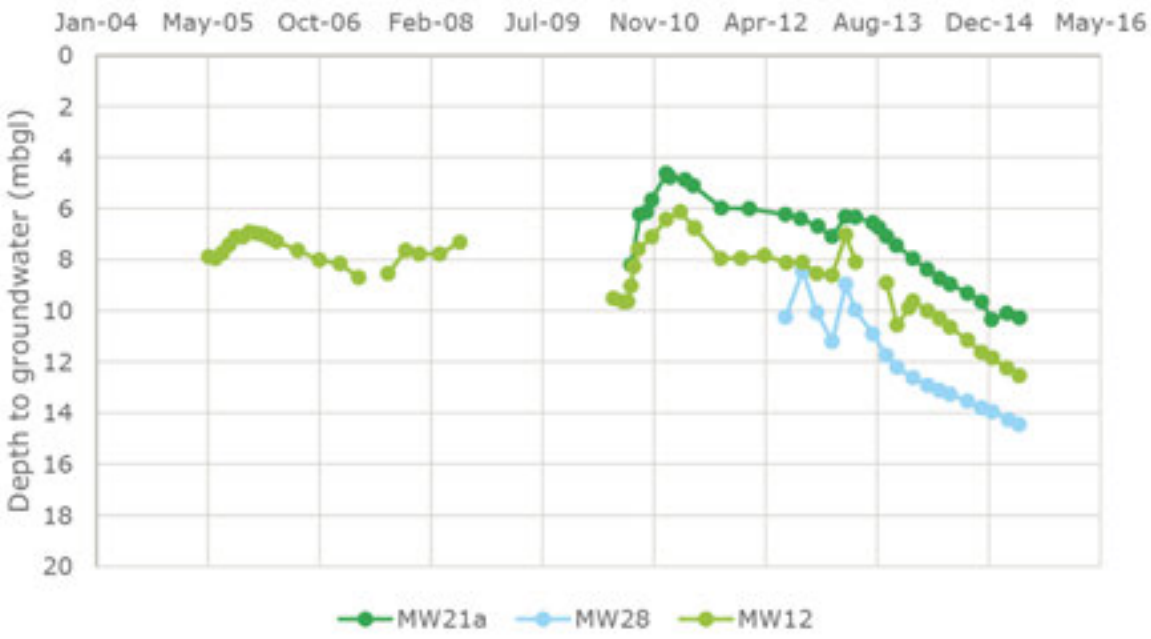


Figure 3.8 Groundwater Level Trends for the Quipolly Alluvium Aquifer

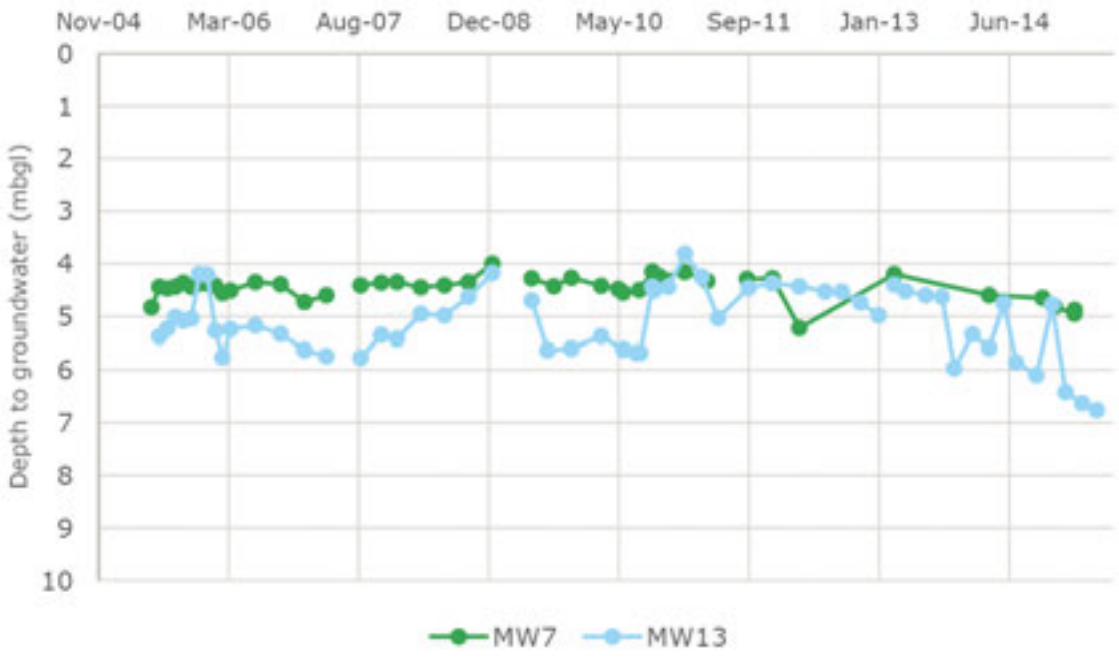


Figure 3.9 Groundwater Level Trends for the Quipolly Alluvium Aquifer

There were no sustained changes in pH or EC greater than 15% within the groundwater response trigger values. All pH and EC results are well within the ANZECC (Agriculture Irrigation and Livestock) criteria within the Quipolly Creek Alluvium and Werrie Basalt aquifer. A number of bores associated with agricultural land have continued to display Total Phosphorus and Total Nitrogen levels above ANZECC Agricultural Irrigation Short and Long Trigger Values. These levels have been consistent since monitoring commenced in 2005 and are more a reflection of the agricultural land use and fertiliser inputs than any impacts from mining operations.

As discussed above for MW1, MW2, MW6 and MW27; no other bores are showing drawdown impacts outside of seasonal conditions as a result of WCC operations. This is consistent with the "*Werris Creek Coal Mine Life of Mine Project*" (R.W. Corkery and Co, 2010) which predicted negligible drawdown (<0.1m) in bores of the Werrie Basalt and Quipolly Alluvium aquifers off the mine site as a result of LOM Project. Also as predicted there have not been any impacts on groundwater quality to date and no groundwater trigger levels were exceeded during the reporting period as per the Groundwater Contingency Plan.

3.3.3 Review of Water Complaints and Water Annual Review

A summary of surface and ground water complaints received by WCC since operations commenced in 2005 is presented in **Table 3.25**. During the period there were six community complaints for groundwater level decline and no complaints for surface water. Four different complainants were all from the Quipolly Valley expressed concern over the decline in the groundwater levels within their bores during the period. Each complainant had a report produced by a hydrogeologist that reviewed the available groundwater data for the relevant bore/property concluding that the cause of the decline is the below average rainfall and the lack of rainfall recharging the aquifers over the period; not just in theirs but across the entire Quipolly Alluvium aquifer which is unrelated to WCC operations.

Table 3.25 Surface Water and Groundwater related Complaints since 2005

Complaint Issue	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Surface Water	1	0	2	0	0	0	0	1	0	0
Groundwater – Level Decline	1	0	0	0	0	3	0	1	0	6
All Complaints (inc Water)	**8**	**10**	**7**	**16**	**12**	**52**	**117**	**56**	**93**	**95**

WCC performance against the Environmental Management System water related objectives and targets developed from the draft Site Water Management Plan for the period 1st April 2014 to 31st March 2015 is outlined in **Table 3.26**. WCC achieved only one of the targets set for water related objectives. As discussed above, the prevailing dry conditions are driving the groundwater level complaints and next year's targets may increase due to the forecast El Nino (dry) conditions increasing the likelihood of ongoing dry weather and groundwater levels to continue to decline leading to more community complaints.

Table 3.26 Water Objectives and Targets 2014-2015

Activity	Objective	Indicator	Actual 2014-2015	Target 2013-2014	Actual 2013-2014	Actual 2012-2013	Actual 2011-2012
Water	Discharge	# Exceedances	**0**	**0**	0	1	0
	Groundwater Level	# Complaints	**6**	**0**	0	1	0

Red – Exceeded Full Year Target

As required by PA 10_0059 Schedule 5 Condition 3, WCC as part of this Annual Environmental Management Report undertakes an annual review of its site water management for 2014-2015. **Table 3.27** summarises the site water management annual review from the discussion above.

Table 3.27 Site Water Management Annual Review 2014-2015

Annual Review	Discussion
Monitoring Results	• Criteria No exceedance of criteria. No dirty water discharges during the period. • Previous Year Water quality results are consistent with the results from the previous period. However groundwater levels have declined due to dry conditions. Analysis by hydrogeologist consultant confirms that the groundwater level decline is not as a result of mining operations. • EA Predictions No surface water or groundwater impacts outside of those predicted in the Environmental Assessment.
Complaints	• This Year Six groundwater level decline related complaints for the period. • Previous Year No water related complaints were received in the previous period.
Compliance	• Criteria and other All water monitoring was in compliance. • Objectives & Targets WCC achieved only one of the targets set for water related objectives.
Data Trends & Predicted Impacts	A review of groundwater intercepted in pit found that the excess void water managed by WCC has been carried over and recycled through the former underground workings from high intensity rainfall events in 2012-2013 and use of the water curtain in 2013-2014.

Annual Review	Discussion
	Groundwater levels continued to decline across the period due to no rainfall recharge from the below average rainfall. No impacts have occurred to groundwater, due to mining, outside of those predicted in the EA.
Improvement Actions	Water management improvement actions undertaken for 2014-2015: • Implement pre-strip dust suppression management as an outcome of new three month rolling short term water strategy for WCC. • Revise site water balance for additional void water management. • Install real time high level and high level alarm sensors in VWD1, VWD3/4 capable of sending SMSs when triggered. • Install new deep nested groundwater piezometer (MW36) and data loggers to improve the resolution of groundwater level trends of bores & piezometers. Water management improvement actions planned for 2015-2016: • Review ability for void water to be used for beneficial agricultural use. • Install additional evaporators as required to increase void water usage.
Management Plan Review	All management strategies and actions were implemented during 2014-2015.
Management Plan Revision	Draft Site Water Management Plan has been amended to include "coal contact" water as contaminated water. Further consultation is required with DP&E and EPA before it can be approved.

3.4 CONTAMINATED LAND

3.4.1 Management

WCC management practices for hydrocarbon management include:

- All bulk hydrocarbons (including fuel, oils, grease – new and waste) are retained at the mine contained within bunded areas (or self bunded tanks) within the contaminated water management system as described in **Section 2.8.**
- Runoff from workshop and fuel farm are captured in a sump and passes through an oil/water separator device known as a ceptor;
- Hydrocarbon-contaminated materials as a consequence of any spillages will be cleaned up appropriately and disposed of at the Bioremediation Area. Fortnightly maintenance of the workshop sump and ceptor with any material removed disposed of within the Bioremediation Area;
- WCC established a Bioremediation Area on the RL445 Dump to manage the contaminated soil from former MIA site. East West (2013) consultants and laboratory prepared a design specification for the Bioremediation Area outlined in the Environmental Guidelines: Solid Waste Landfills (EPA, 1996) and undertook the geotechnical testing confirming that the Bioremediation Area was constructed to that specification;
- Contaminated material at the Bioremediation Area is routinely maintained and turn over to aerate the material to aid bioremediation via volatilisation of any hydrocarbons present; and

- Concrete aprons have been installed at the delivery and fill points of the diesel bowsers at the Workshop Fuel Farm. These bunded areas contain spills around the fill point draining back to the ceptor.

The volume of material currently managed at the Bioremediation Area is 1133m^3; increased from 673m^3 at the end of 2013-2014 of which nearly 694m^3 is from the fill material beneath the former workshop facilities.

3.4.2 Performance

WCC engaged Mitchel Hanlon (2015 – **Appendix 5**) contamination consultants to sample and analyse the material within the Bioremediation Area against the EPA Guidelines for Assessing Service Station Sites (December 1994) and Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites (2000); with the principal contaminate of diesel against the Total Petroleum Hydrocarbon C10-C36 threshold of 1,000mg/kg. A total of 25 samples, 1 duplicate and 1 blank were sent for laboratory analysis on 6th March 2015. The laboratory results found that ten samples exceeded C10-C36 threshold of 1000mg/kg (maximum C10-C36 was 8320mg/kg); but all other metal and hydrocarbon analytes were within the criteria. WCC will increase the frequency that the material at the Bioremediation Area is turned over (**Figure 3.10**) to increase the exposure of the fresh soil to the atmosphere aerating allowing the hydrocarbons present to volatise out over time reducing the contaminate levels back below the threshold.

Figure 3.10 Dozer aerating and turning over contaminated soil in the Bioremediation Area

3.5 BIODIVERSITY

3.5.1 Management

The Biodiversity and Offset Management Plan (BOMP) was approved by DP&E and Department of Environment (formerly DSEWPaC) on the 30th August 2013 and 5th August 2013 respectively in accordance with PA10_0059 Schedule 3 Condition 28 and the EPBC Act Approval 2010/5571 Condition 1. **Figure 3.11** presents the LOM Biodiversity Offset Area (BOA) under PA10_0059 which covers an area of 1,319.49ha which is predominately Grassy White Box Woodland (a part of an Endangered Ecological Communities (EEC) White Box, Yellow Box and Blakely's Red Gum) in varying condition states.

The BOMP has been written to provide a management framework that will lead to an improvement in the condition of native vegetation through specific woodland restoration techniques. These actions will mitigate the impacts of key threatening processes for the vegetation communities being restored and the known or potential threatened species that inhabit the site. The management actions specified within the BOMP include:

- Vegetation Clearing;
- Establishing the Biodiversity Offset Strategy including providing long term security and conservation bond;
- Rehabilitation Area;
- Seed Collection and Propagation;
- Revegetation;
- Habitat Augmentation;
- Weed Management;
- Vertebrate Pest and Overabundant Native Herbivore Management;
- Fencing, Signage and Access Management;
- Narrawolga Axe Grinding Grooves and Aboriginal Heritage;
- Erosion and Sedimentation Management;
- Exclusion of Agriculture and Grazing;
- Fire Management;
- Salinity Management;
- Infrastructure Management and Rubbish Removal; and
- Management of Threatened Flora Species *Digitaria Porrecta*.

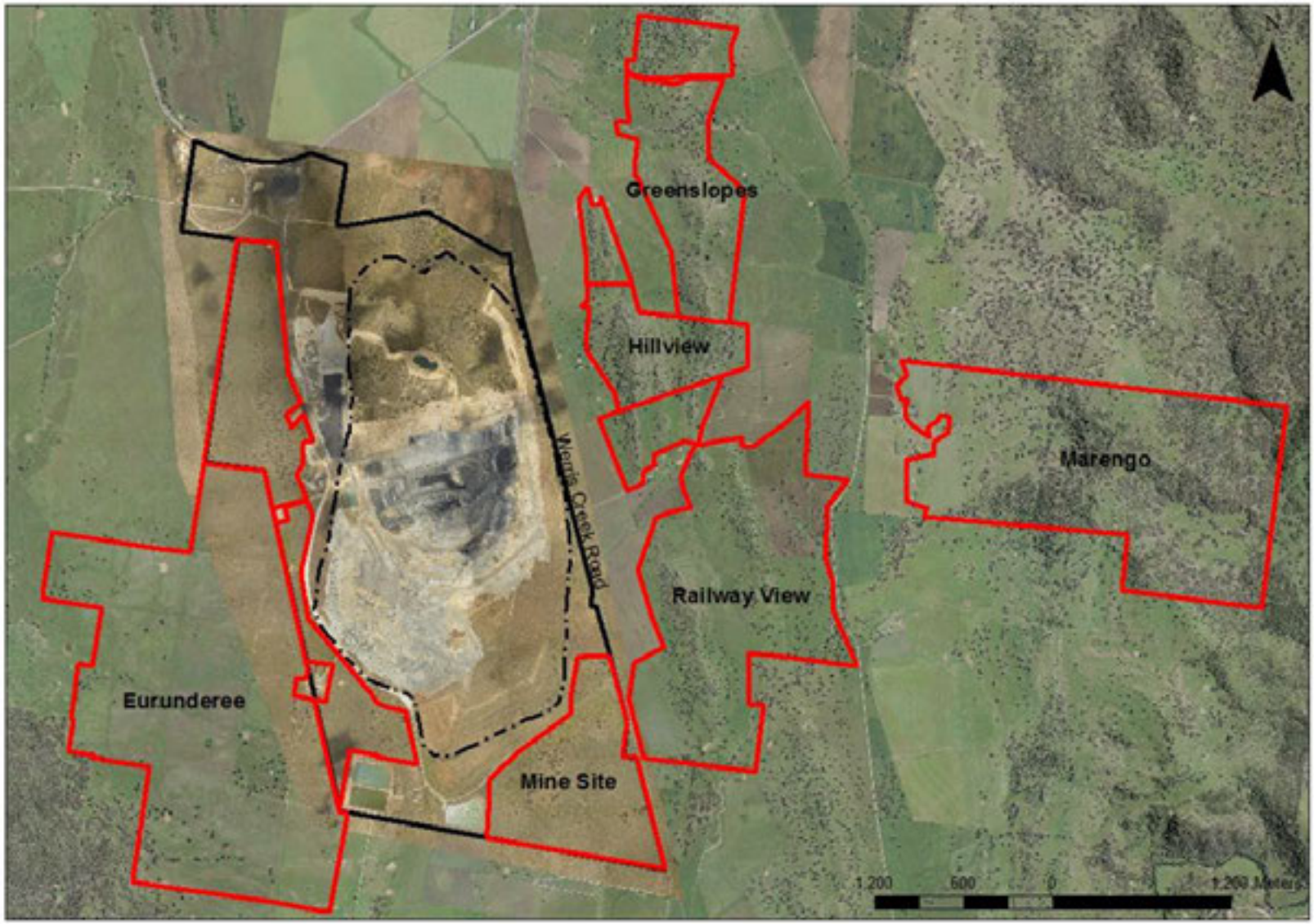


Figure 3.11 WCC Biodiversity Offset Area (shown in red boundary)

3.5.2 Implementation and Performance

The key management actions undertaken by WCC for the BOA over the reporting period have been:

- Weed Management: Predominately herbicide spraying treating environmental and noxious weeds over 1030 ha of the BOA and Rehabilitation areas;
- Fire Management: Controlled burns covering 110ha of the Railway View, Mine Site and Eurunderee BOA in August and September 2014 for both hazard reduction and ecological restoration purposes. Maintenance slashing of fire breaks across the BOA was undertaken during the year;
- Grazing Management: Continued to exclude grazing from the Mine Site and parts of Eurunderee, Railway View and Marengo since December 2010 and the remainder of the BOA since September 2012;
- Fencing Management: Replacement of old boundary fences with new fauna friendly fencing at Railway View (850m) and Marengo (900m) and 3350m of old internal fences within the BOA were permanently removed.
- Revegetation: Replacement planting of 82 trees in Black Gully, North & Flat Paddock of Marengo BOA in March 2015;
- Habitat Augmentation: Placement of rock piles in March 2015 on Marengo BOA;
- BOA Security and Bond: Continued negotiation with DP&E regarding acceptance of Section 88E application of the Conveyancing Act 1919 to register covenants on each land title of the BOA;
- Vegetation Clearing: Ecologists engaged to undertake inspections and monitoring of 13ha of vegetation to be cleared for mining in May 2015;
- Rehabilitation: Completed 27.59ha of new rehabilitation on the post mining landform at WCC and seeded with 70kg of local providence native grass seed collected from the Eurunderee BOA;
- Seed Collection: Collected 30kg of selected native grass species (Kangaroo Grass - *Themeda triandra*, Tall Redleg Grass - *Bothriochloa biloba*, Tall Oats Grass - *Themeda avenacea*) that are highly palatable but now locally uncommon within the BOA likely due to previous history of grazing. Up to 1000 plants will be propagated for Spring 2015 and planted in clusters within the monitoring plots of the BOA and rehabilitation areas;
- Pest Management: Annual sand pad monitoring program identified Eastern Grey Kangaroos as high abundance; foxes as medium abundance (same as the previous year) and rabbits, pig, hare, cats and dogs as scarce. Using this information, WCC increase pest control programs to quarterly across the entire BOA targeting foxes with a poisoned bait (1080) with take rates of 25.9% in Winter 2014, 24.0% in Spring 2014 and 11.8% in Summer 2015 and two shooting programs culling a total of 96 Eastern Grey Kangaroos, 6 pigs, 5 foxes, 5 rabbits and 2 hares; and
- Signage: Native fauna hazard signs were installed along the Mine Access Road adjacent to the BOA during May 2014.

3.5.3 Vegetation Monitoring

An independent ecological consultancy (Eco Logical Australia Pty Ltd – **Appendix 6**) was engaged to undertake the floristic and Landscape Function Analysis (LFA) methods of the annual flora monitor program between 29th September and 3rd October 2014 in accordance with the BOMP. Data was collected from a total of 26 sites (**Figure 3.12**); at analogue sites established in Condition Class 4 vegetation sites (3, 5, 10, 11, 13, 17, 18, 22 and 24), Condition Class 3 vegetation sites (1, 2, 8, 12, 19, 21, 23, 25 and 27), Condition Class 2 sites (7 and 16) and Condition Class 1 sites (6, 9, 14, 15 and 26). Site 4 of Condition Class 3 was not monitored in 2014. Sites 26 and 27 were added during 2014 due to increasing area of rehabilitated land (site 26) and in response to fire management activities (site 27).

Vegetation monitoring methodology consisting of a nested 50m transect (within a 150m transect) and a 50m x 20m plot established for the modified Biometric Assessment Methodology (modified BAM) at each monitoring site. The monitoring in 2014 represents the third monitoring period for sites 13 to 25 established in 2012 and the fifth round monitoring for sites 1 to 12 (excluding Site 4) established in 2010.

The monitoring results of the modified BAM are presented in **Table 3.28** for the key completion criteria for woodland restoration of native species richness and native overstorey cover. Ongoing below average rainfall between 2012 and 2015 has impacted the majority of lower resilience (condition class 1 and 2) monitoring sites that appear to have also been influenced by other localised factors. The poor performance of condition class 1 and 2 sites is not surprising given the history of disturbance over a long period of time compared to the short period (3-5 years) of restoration management. Intact woodland sites (condition class 4) appear to be performing well and are dominated by native species. Areas of Derived Native Grassland (DNG) (condition class 3) generally fall below the performance criteria for the number of native species; however native species cover was generally moderate to high at these sites and exceeded performance criteria (with some exceptions). The more resilient woodland sites improved in condition however the poor quality sites have decreased in condition directly in line with the below average rainfall for the last two years.

LFA monitoring followed the Landscape Organisation and the Soil Surface Assessment (SSA) (Tongway and Hindley, 2004) method used to monitor the soil surface condition of the rehabilitation sites (sites 6, 14 and 26) against the two analogue sites (sites 11 and 17 representing good condition Grassy White Box Woodland within the BOA). In interpreting the LFA results, the Landscape Organisation results are presented as an index, which essentially provides a proportion of the transect occupied by patches - patches being landscape elements that are relatively permanent and provide stable, resource accumulating structures, such as grassy tussocks, ground cover and logs. Therefore, a higher Landscape Organisation index implies a more stable transect that is less prone to erosion. The SSA results go one step further than this and provide an index on stability, infiltration and nutrient cycling for all patch and inter-patch types for the whole of landscape (transect). Although the Landscape Organisation provides an indication of soil surface stability, the SSA results presented for these same sites provides a more accurate picture of how these transects are functioning by way of soil surface stability, infiltration and nutrient cycling.

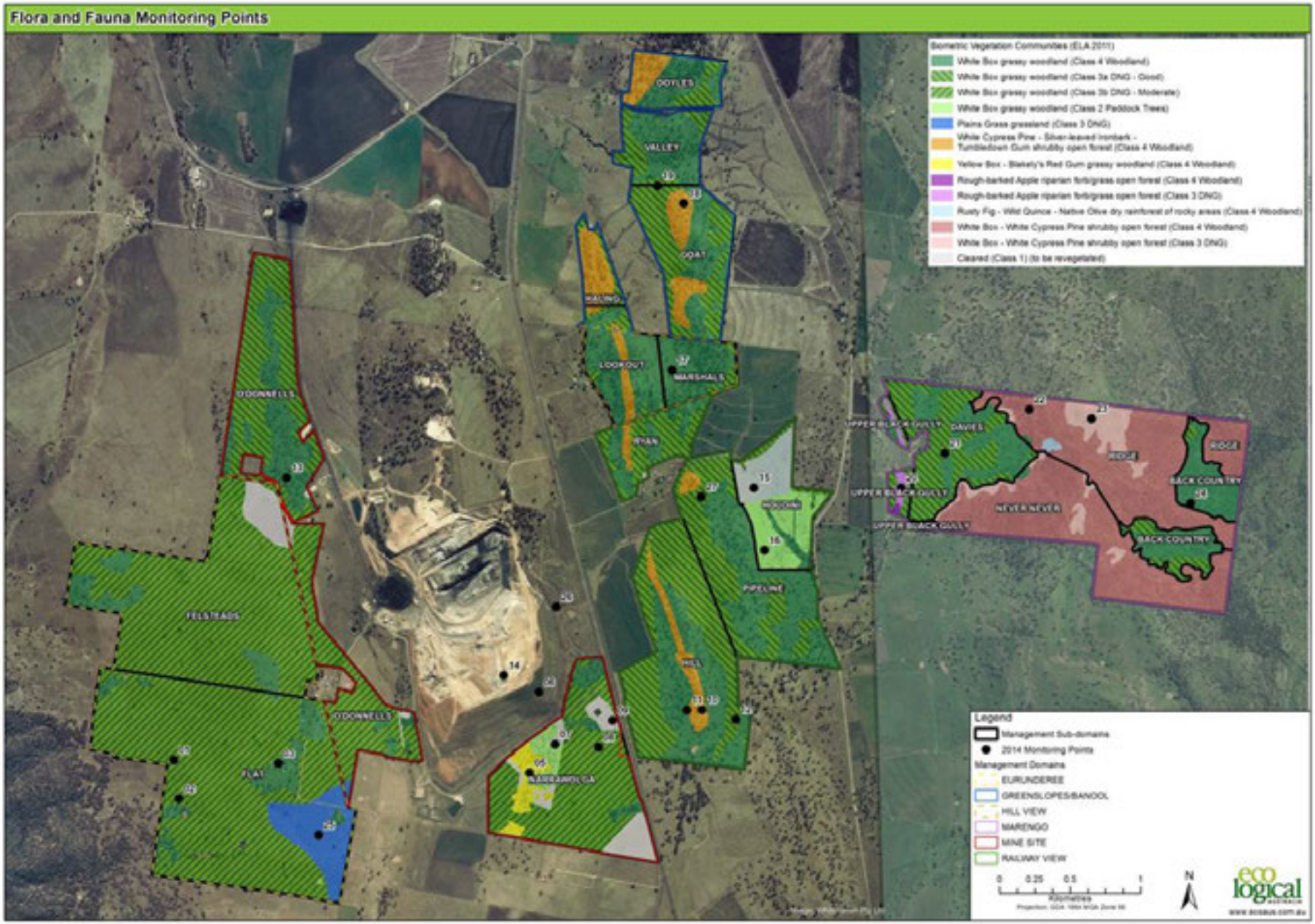


Figure 3.12 Biodiversity Offset Area Annual Monitoring Sites

Table 3.28 Vegetation Monitoring Results compared to Benchmark/Completion Criteria

Biometric Vegetation Type	Site No.	Condition Class	Number of Native Species					Completion Criteria	% Native Cover Overstorey					Completion Criteria	Completion Criteria met 2010 to 2014?
			2010	2011	2012	2013	2014		2010	2011	2012	2013	2014		
White Box grassy woodland	3	4	8	29	15	19	22	23	5	12.5	17.5	19.5	8	6-25	YES*
	11	4	19	24	19	13	21	23	26	24.5	10	20	12.2	6-25	YES*
	13	4	NM	NM	23	23	29	23	NM	NM	8.5	13	4.7	6-25	YES*
	17	4	NM	NM	19	18	18	23	NM	NM	6	15	8	6-25	Partial
	24	4	NM	NM	19	20	25	23	NM	NM	19.5	14	5.6	6-25	YES*
	1	3b	2	8	9	7	12	23	0	0	0	0	0	6-25	No
	2	3b	10	12	9	13	15	23	0	0	0.5	0	0	6-25	No
	4	3b	21	16	NM	NM	NM	23	0	0	NM	NM	NM	6-25	No
	8	3b	2	14	9	6	4	23	0	0	0	0	0	6-25	No
	12	3b	5	13	10	6	4	23	0	0	0	0	0	6-25	No
	19	3a	NM	NM	13	18	14	23	NM	NM	0	0	0	6-25	No
	21	3a	NM	NM	11	18	15	23	NM	NM	0	0	0	6-25	No
	27	3a	NM	NM	NM	NM	23	23	NM	NM	NM	NM	0	6-25	Partial
	7	2	10	10	14	9	8	23	0	0	1.7	0	0	6-25	No
	16	2	NM	NM	3	6	7	23	NM	NM	0	1.5	0.5	6-25	No
Plains Grass grassland on basaltic black earth soils	25	3	NM	NM	7	7	7	17	NM	NM	0	0	0	0	Partial
Rough-barked Apple riparian forb/grass open forest	20	3	NM	NM	6	12	9	25	NM	NM	0	0	0	6-25	No
Yellow Box – Blakely's Red Gum grassy woodland	5	4	9	18	17	14	14	23	5	12	15	4.5	6.7	6-25	Partial*
White Cypress Pine – Silver-leaved Ironbark – Tumbledown Red Gum open shrubby forest	10	4	7	12	14	15	14	30	0	0	0	1	0	6-40	No
	18	4	NM	NM	22	25	31	30	NM	NM	22	5.5	6	6-40	YES*
White Box-White Cypress Pine shrubby open forest	22	4	NM	NM	25	24	30	26	NM	NM	27.5	22.5	6.5	6-25	YES
	23	3	NM	NM	13	14	14	26	NM	NM	0	0	0	6-25	No
Cleared land (Mine Rehab Site)	6	1	3	5	14	13	13	23	0	0	0	2.5	7.5	6-25	Partial
	14	1	NM	NM	6	5	7	23	NM	NM	0	0	0	6-25	No
	26	1	NM	NM	NM	NM	5	23	NM	NM	NM	NM	0	6-25	No
Cleared land (formerly cultivated land)	9	1	5	5	5	4	5	23	0	0	0	0	0	6-25	No
	15	1	NM	NM	2	2	3	23	NM	NM	0	0	0	6-25	No

Red – Site underperforming against performance criteria and requiring targeted and prompt management; Orange – Site is performing poorly but is expected to reach completion criteria in time with continued management in accordance with the BOMP; Green – Site meeting or exceeding performance criteria and requires no additional or targeted management action; NM – Not monitored; * Annual variations above and below Completion Criteria levels due to different perceptions by individuals between years.

As expected both the analogue sites LFA scores were better than the rehabilitation sites. Rehabilitation site 6 (planted in 2008) is remaining stable and is meeting the performance criteria for Landscape Organisation, Infiltration and Nutrient cycling values (**Table 3.29**). However, in terms of stability, site 6 was below the performance criteria, but is considered to be tracking well towards meeting the performance criteria (**Table 3.30**). Rehabilitation site 14 (planted in 2011) and 26 (planted in 2014) had scores below the performance criteria for all measurements. This is expected for young rehabilitation and, in time it is expected that these scores will increase.

Table 3.29 Landscape Organisation for Rehab Sites 6, 14 and 26 and Analogue Sites 11 and 17

Biometric vegetation type	Condition class (site no.)	Target	Landscape Organisation				
			2010	2011	2012	2013	2014
White Box grassy woodland	4 (11)	0.86	1	0.96	0.47	1.0	1.0
	4 (17)		NM	NM	0.44	0.99	0.97
Mine Rehab	1 (6)	0.86	1	0.96	0.88	0.88	1.0
	1 (14)		NM	NM	0.8	0.52	0.56
	1 (26)		NM	NM	NM	NM	0.26

Table 3.30 Soil Surface Assessment for Rehab Sites 6, 14 and 26 and Analogue Sites 11 and 17

Biometric vegetation type	Condition class (site no.)	Target			2010			2011			2012			2013			2014		
		S	I	N	S	I	N	S	I	N	S	I	N	S	I	N	S	I	N
White Box grassy woodland	4 (11)	63	34	30	69	39	36	59	35	30	64	33	26	59	28	27	67	38	34
	4 (17)				NM	NM	NM	NM	NM	NM	51	27	21	63	32	26	67	38	35
Cleared land(Mine Rehab Site)	1 (6)	63	34	30	66	45	36	61	40	27	43	27	17	59	34	25	55	36	31
	1 (14)				NM	NM	NM	NM	NM	NM	39	25	18	49	26	18	53	30	23
	1 (26)				NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	47	27	17

Red – Site underperforming against performance criteria and requiring targeted and prompt management; Orange – Site is performing poorly but is expected to reach completion criteria in time with continued management in accordance with the BOMP; Green – Site meeting or exceeding performance criteria and requires no additional or targeted management action; NM – Not monitored. Note: S = Stability; I = Infiltration; N = Nutrient cycling.

3.5.4 Fauna Monitoring

The fauna monitoring program involved a Winter bird survey over 3 days between the 20th and 22nd August 2014, targeting threatened migratory nectivorous bird species such as the *Anthochaera phrygia* (Regent Honeyeater) and *Lathamus discolor* (Swift Parrot); and a Spring fauna field investigations over 10 days between the 20 and 31 of October 2014 targeting birds, herpetofauna, microchiropteran bats and nocturnal fauna. Twenty-four sites were monitored aligned with the same flora monitoring sites (**Figure 3.12**) with all opportunistic observations were also recorded, including threatened and introduced species. The fauna monitoring collected this year for the first time included species diversity and abundance; with the bird survey method also amended to expand to 150m transects. The objectives of the fauna monitoring methodology are to assess the reestablishment of fauna, particularly targeting the previously recorded threatened species onsite including woodland birds and microbats. These threatened species, as well as other mobile species such as reptiles provide more information on the progress of woodland restoration, particularly in

the first 10 years of restoration activity. **Table 3.31** summaries the fauna monitoring methods with the details and results of the 2014 flora and fauna monitoring (ELA, 2015) provided in **Appendix 6**.

Table 3.31 WCC Fauna Monitoring Methodology

Method	Detail	Requirement per Site
Spotlighting	Pedestrian spotlight survey, 2 nights where appropriate habitat was identified at each site. Targeted nocturnal mammals, birds, reptiles and amphibians.	1 hr spotlighting transect covering 1km distance. Repeated over 2 nights
Call playback	Nocturnal broadcasting of calls, two night at each site in conjunction with spotlighting. Targets nocturnal birds.	5 minutes of broadcasting plus 10 minutes listening.
Bat detection	Anabat recordings to identify microbat species occurring on site. 2 nights at each site	1 detector for 2 nights set for a minimum of 4 hrs
Bird survey	Timed, fixed area surveys for diurnal birds, observing and listening.	20 minutes/transect count morning and dusk over 2 days for Winter and Spring
Herpetological searches	Timed, fixed area, direct searches for reptiles, scanning surfaces, rolling logs and rocks and raking leaf litter.	0.5 hrs/ha searching of microhabitat on 2 separate days.
Nest box searches	None installed	None installed
Dam Inspection – Amphibian	Dams and waterways will be inspected for frogs, once by day and once by night.	3 dams identified
Collection of scats	Collect scats and send to laboratory for analysis of predator and prey species.	Opportunistic.

A total of 119 species were recorded during the 2014 fauna monitoring surveys. These consisted of 73 bird, 20 reptile, 23 mammal and 3 frog species. Ten fauna species listed under the *Threatened Species Conservation Act* 1995 (TSC Act) and/or the *Environmental Protection and Biodiversity Conservation Act* 1999 (EPBC Act) were recorded during the 2014 spring survey period (**Table 3.32**). There were seven threatened or migratory bird species recorded, five of which were listed as vulnerable under the TSC Act and two as a migratory species. The other three threatened species were bats, all listed as vulnerable under the TSC Act of which the vulnerable species *Scoteanax rueppellii* (Greater Broad-nosed Bat) recorded during 2014 surveys had not been recorded during previous fauna monitoring events.

Table 3.32 Threatened species recorded during 2014 fauna monitoring

Scientific name	Species	TSC Act	EPBC Act	Location
Aves				
Chthonicola sagittata	Speckled Warbler	V	-	Site 22
Circus assimilis	Spotted Harrier	V	-	Site 13
Hieraaetus morphnoides	Little Eagle	V	-	Mine Site
Glossopsitta pusilla	Little Lorikeet	V	-	Site 5
Merops ornatus	Rainbow bee-eater	-	M	Sites 18 & 20
Myiagra cyanoleuca	Satin Flycatcher	-	M	Site 20
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	-	Site 23

Scientific name	Species	TSC Act	EPBC Act	Location
Mammalia				
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Site 11 (possible)
Saccolaimus flaviventrus	Yellow-bellied Sheathtail Bat	V	-	Sites 1, 6, 9 , 24 (definite) Site 3 (possible)
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Site 8, 11 (definite) , 10 (probable)

Statistical analysis of bird populations across the BOA sites found in all surveys since 2010, rehabilitated sites have had similar species to those of woodland and DNG but was less similar to cleared land (ELA, 2015). Cleared sites more frequently had Golden-headed Cisticola and Superb Fairy-wren than rehabilitated sites, but more of the rehabilitated sites had Pied Butcherbird, Noisy Miner, and Striated Pardalote (ELA, 2015). Although woodland and rehabilitated sites had similar species in their bird communities, Striated Pardalote and Black-faced Cuckoo-shrike occurred more frequently at woodland sites, and European Starling and Red-rumped Parrot occurred more frequently at rehabilitated sites (ELA, 2015). The higher frequency of European Starling at rehabilitation sites reflect the adjacent disturbance of these sites and continuing to monitor the presence and abundance of this species as an indicator may be informative of change and improvement in the ecological structure and condition of the mine site over time (ELA, 2015). Most other species, including Musk Lorikeet, Crested Pigeon, Australian King Parrot and Laughing Kookaburra occurred at similar frequencies in both habitats (ELA, 2015).

The most widely recorded species of microbat was *Chalinolobus gouldii* (Gould's Wattled Bat). This species was recorded with high confidence at 19 of the 20 sites where bat call recording took place (ELA, 2015). *Mormopterus* sp. 3 (Inland Freetail Bat), *Mormopterus* sp. 4 (South-eastern Freetail Bat), *Nyctophilus* spp. (Long-eared Bats), *Scotorepens balstoni* (Inland Broad-nosed Bat) and *Vespadelus vulturnus* (Little Forest Bat) were also widely recorded and were recorded with high confidence at greater than 75% of sites (ELA, 2015). The total number of recorded bat vocalisations varied widely within vegetation condition classes and habitat types (**Figure 3.13**) (ELA, 2015). The smallest number of bat vocalisations recorded was within a relatively new area of mine rehabilitation and also plains grassland, site 14 and 25 respectively (ELA, 2015). Both sites are some distance from mature trees (which provide insects and are also where many species of bats roost). The highest levels of bat activity were recorded at sites 20 and 11 (ELA, 2015). Site 20 is located within a riparian area and site 11 is located within class 4 White Box woodland.

Mine rehabilitation areas (Sites 6 and 14) differed widely in the amount of bat activity. Bat activity at site 6 (an older area of mine rehabilitation) was similar to many grassland and woodland sites, while site 14 had one of the lowest activity levels of all sites, which may be an indication of improved habitat structure provided by the more structurally developed rehabilitation at Site 6 (ELA, 2015). The number of bat species recorded also varied within habitat types but overall the mean number of bat species per habitat type was similar (ELA, 2015).

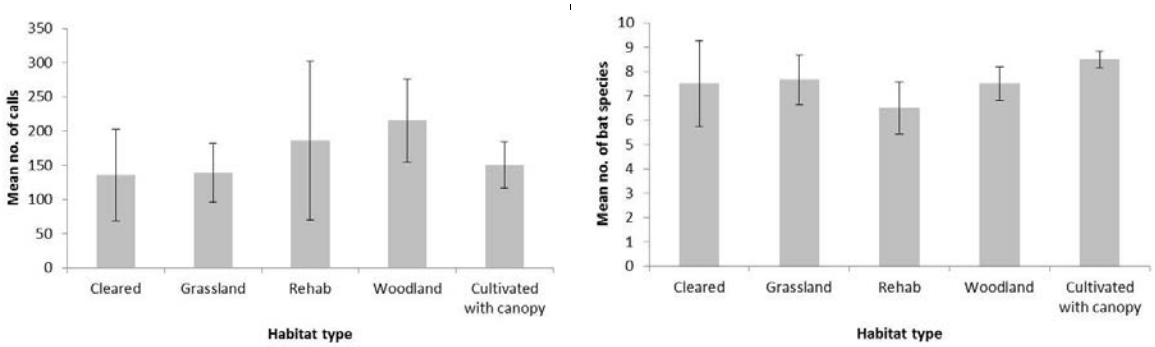


Figure 3.13 Number of Microbat Vocalisations (left) and Species detected within habitat (right)

3.5.5 Biodiversity and Rehabilitation Management Annual Review

WCC performance against the Environmental Management System biodiversity and rehabilitation related objectives and targets from the Biodiversity and Offset Management Plan for the period 1st April 2014 to 31st March 2015 are outlined in **Table 3.33**. WCC achieved both targets for rehabilitation and biodiversity management. The improvement in the number of biodiversity monitoring sites meeting the completion criteria was driven by the condition class 4 sites (higher quality woodland) naturally regenerating both native species richness and overstorey cover. As discussed further in Section 5, WCC completed 27.59ha of the Western Rehabilitation Area during 2014-2015; over 5ha above the annual target in the MOP and overall WCC is ahead of the MOP cumulative rehabilitation target. There were no biodiversity related complaints received during the reporting period.

Table 3.33 Biodiversity and Rehabilitation Objectives and Targets 2014-2015

Activity	Objective	Indicator	Actual 2014-2015	Target 2013-2014	Actual 2013-2014	Actual 2012-2013	Actual 2011-2012
Rehab & Biodiversity	Rehabilitation	Area (ha)	**27.59**	**22.4**	21.31	47.5	24.8
	Completion Criteria	# Monitoring Sites Meeting Criteria 2010 to 2015	**6**	**5**	3	3	2

Red – Exceeded Full Year Target

As required by PA 10_0059 Schedule 5 Condition 3, WCC as part of this Annual Environmental Management Report undertakes an annual review of its biodiversity management for 2014-2015. **Table 3.34** summarises the biodiversity and rehabilitation management annual review from the discussion above.

Table 3.34 Biodiversity Management Annual Review 2014-2015

Annual Review	Discussion
Monitoring Results	• Criteria Six out of 26 sites meet both the native species richness and overstorey cover completion criteria. Additional focus recommended for weed control and overstorey revegetation at monitoring sites 8, 9, 12, 15, 16 and 25. • Previous Year The number of sites meeting the completion criteria increased compared to 2013-2014 due to the more resilient woodland sites improving in condition.

Annual Review	Discussion
	• EA Predictions The status of biodiversity restoration is within that predicted in the Environmental Assessment since woodland restoration commenced only 3 to 5 years ago.
Complaints	• This Year No biodiversity related complaints for the period. • Previous Year Biodiversity related complaints remained the same as the previous period.
Compliance	• Criteria and other Biodiversity and rehabilitation management was in compliance. • Objectives & Targets WCC did achieve both targets set for biodiversity and rehabilitation related objectives due to improvement in the better quality woodland condition and exceeding the target the for area of completed rehabilitation.
Data Trends & Predicted Impacts	The more resilient woodland sites improved in condition however the poor quality sites have decreased in condition directly in line with the below average rainfall for the last two years. The key management actions currently implemented by WCC does demonstrate overall improvement in restoration with the majority of sites exhibiting declines in noxious weeds due to active weed management and pest control programs are showing decrease in the fox population due to 1080 baiting.
Improvement Actions	Biodiversity management improvement actions undertaken for 2014-2015: • Pest control program increased from six-monthly to quarterly. • Harvest the native grass seed of three uncommon species across the rehabilitation and BOA. Biodiversity management improvement actions planned for 2015-2016: • WCC aims to finalise the BOA security depending on DP&E approval. • WCC will commence development of a Seed Production Area (SPA) onsite targeting approximately 6 herbs and forbs that are currently uncommon in BOA but are important species and are easy propagate and sow. The SPA has a two phase development not expected to be in full production until year 3 but the aim is to supply of seed to increase species diversity for the rehabilitation area (20ha/year) and the BOA (70ha/year) generating 100kg/year of seed. • WCC will plant 1000 native grasses of three uncommon species across the rehabilitation and BOA to increase species diversity.
Management Plan Review	All biodiversity management strategies and actions were implemented during the period.
Management Plan Revision	ELA (2015) Annual Biodiversity Monitoring Report recommends revising the Biodiversity Monitoring Program and Completion Criteria.

3.6 WEED MANAGEMENT

3.6.1 Management

WCC weed management strategy focuses control works/programs for noxious weeds as a priority and when resources/budget allows; the control of other environmental weeds present onsite will be undertaken. Periodically WCC will engage a consultant to map weeds across the BOA to monitor changes in infestations and abundance. The first/baseline weed survey was undertaken in March 2013 with the results presented in **Figure 3.14**. Surveillance of weed infestations is undertaken by informal (observation) and formal methods such as the quarterly inspections and weed surveys; with this information used for planning and to set priorities for weed management. WCC utilises only qualified weed control contractors that hold appropriate herbicide accreditation in accordance with the Pesticides Act 1999. In accordance with the legislation, WCC retains copies of the accreditation and daily records of weed control including the targeted weed, herbicide used, location and prevailing weather conditions. WCC also uses non-chemical weed control practices such as manual removal and slashing depending on the weed and season. Other methods such as low intensity ecological burns may be considered in time as part of a fire management program.

3.6.2 Performance

WCC implemented an extensive weed control program with over 1030ha of the BOA and rehabilitations areas treated during the reporting period (**Figure 3.15**). The area identified as sprayed is high reflecting the area treated as mapped by the weed contractor but obviously over estimates the actual area of weed infestation (i.e. distance travelled to spray weeds as individuals or clumps is more than the actual ground covered by the weed plus repeated spraying of the same area across the year). WCC prioritised its weed control program by focusing on the noxious weeds within the Liverpool Plains Local Government Area such St John's Wort, Spiny Burr Grass, Johnson Grass and Scotch Thistle (plus other broadleaf weeds present). **Table 3.35** outlines the weeds targeted by WCC, including location and timing for 2014-2015 reporting period. The dry conditions during the period delayed the usual spraying time for the Spring and Summer growing weeds like St John's Wort and Spiny Burr Grass with areas requiring to be sprayed multiple times (early Spring and late Summer). The areas treated for St John's Wort and Spiny Burr Grass decreased from that reported the previous period as the size of infestations are decreasing reflecting the success of the targeted spraying programs that have been implemented since 2010.

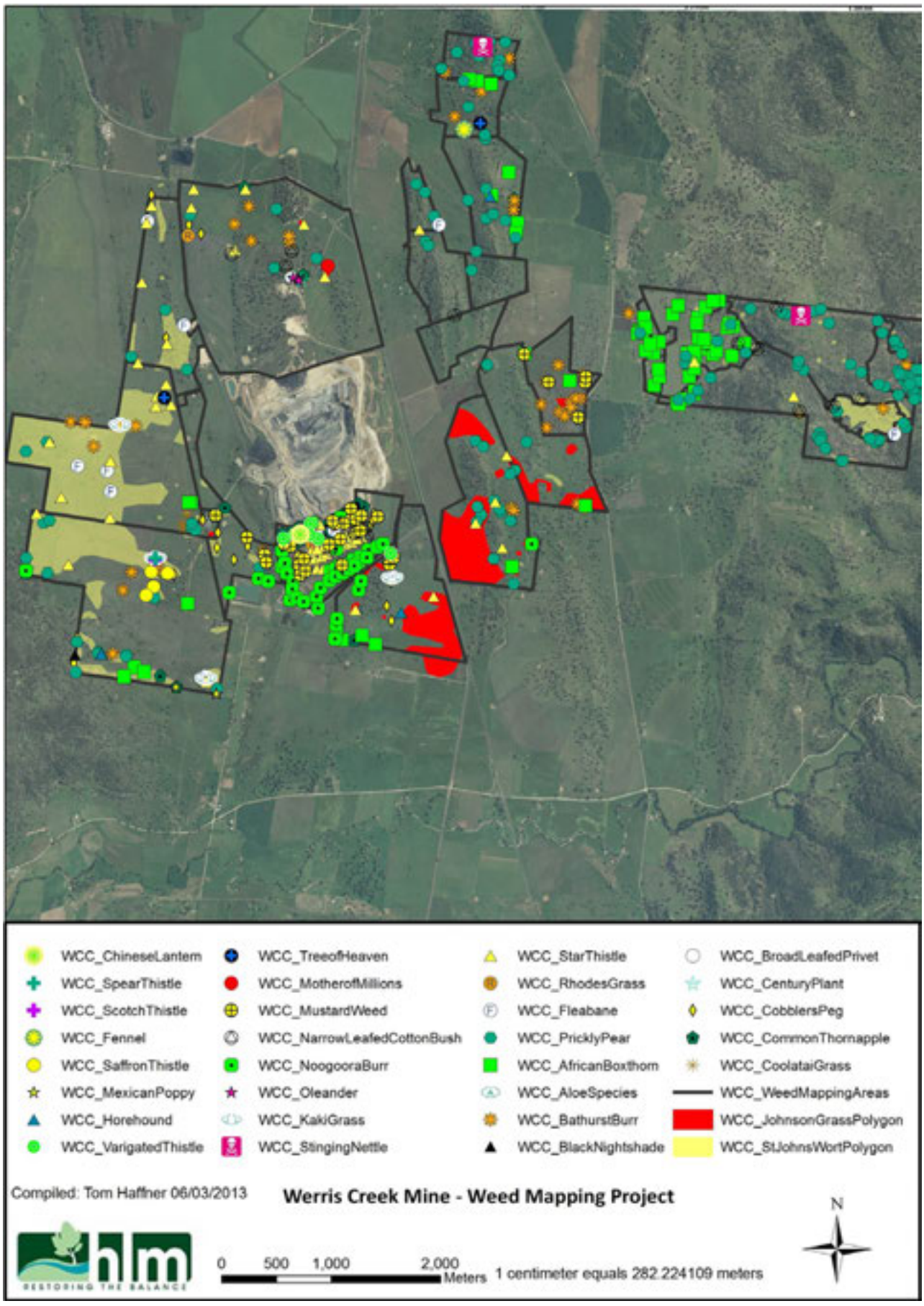


Figure 3.14 2013 Weed Survey showing the distribution of weeds across WCC

Figure 3.15 Weed Management Areas treated across the BOA and Rehabilitation 2014-2015

Table 3.35 WCC Weed Control Program by Location

Weed Name	Scientific Name	Noxious	Period	Location (ha)						
				Rehab	Mine Site	Hill view	Green slopes	Eurunderee	Railway View	Marengo
Spiny Burr Grass	*Cenchrus incertus*	W4	October 2014 to January 2015	13.0	3.4	-	-	-	-	-
St John's Wort	*Hypericum perforatum*	W4	April 2014 to February 2015	-	-	5.0	-	115.5	32.2	71.0
Prickly Pear	*Opuntia stricta*	W4	April 2014 to November 2014	-	-	4.4	6.2	-	67.9	46.1
Noogoora Burr	*Xanthium pungens*	W4	May 2014 and January 2015	-	-	-	-	-	38.8	-
Bathurst Burr	*Xanthium spinosum*	W4								
Patersons Curse	*Echium plantagineum*	W4	May 2014	-	-	-	-	-	13.6	-
African Box Thorn	*Lycium ferocissimum*	W4	-	-	-	-	-	-	-	-
Johnson Grass	*Sorghum Halepense*	W4	April 2014 to February 2015	49.7	-	-	-	-	60.6	-
Scotch Thistle	*Onopordum acanthium*	W4	April 2014 to February 2015	246.3	156.5			37.5	30.1	30.2
Saffron Thistle	*Cathamus lanatus*	-								
St Barnabys Thistle	*Centaurea soltitialis*	-								
Turnip Weed	*Rapistrum rugosum*	-								

The annual biodiversity monitoring measures the presence of noxious weeds and exotic species cover for each monitoring site across the BOA and rehabilitation. **Table 3.36** outlines the performance since 2010 with exotic species cover at the majority of monitoring sites reflecting the general reduction in the presence of weeds across the BOA. However for 2014, 20 out of the 24 sites did have an increase in exotic species cover mostly likely due to the dry conditions providing limited opportunity for hardy broadleaf weeds and non-native grasses to grow while other vegetation coverage was decreasing. Noxious weeds were detected within 8 monitoring plots at sites 1, 2, 3, 8, 9, 11, 13 and 23. Noxious weeds had disappeared from sites 10, 16 and 25 where they were detected in the previous year.

Table 3.36 WCC Exotic Species Cover and Noxious Weeds Present in BOA

Biometric vegetation type	Condition class (site no.)	Performance criteria	Exotic species cover					Noxious species				
			2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
White Box grassy woodland	2 (7)	Noxious and environmental weeds are under control within rehabilitation or biodiversity offset areas	88	84	26	54	88	-	-	-	-	-
	2 (16)		-	-	8	86	72	-	-	-	XO	-
	3 (1)		90	72	70	54	50	-	-	-	HP	OA
	3 (2)		88	36	28	24	40	-	XO	-	HP	OA, HP
	3 (8)		94	50	46	20	52	-	-	-	-	OA
	3 (12)		76	67	82	34	60	-	-	-	-	-
	3a (19)		NM	NM	8	16	34	-	-	-	-	-
	3a (21)		NM	NM	20	6	60	-	-	-	-	-
	3a (27)		NM	NM	NM	NM	42	-	-	-	-	-
	4 (3)		70	22	4	4	14	EP, HP	-	-	HP	HP
	4 (11)		80	40	6	12	26	EP	-	XS	HP	HP
	4 (13)		NM	NM	8	6	62	-	-	-	HP	EP
	4 (17)		NM	NM	2	2	34	-	-	-	-	-
	4 (24)		NM	NM	0		0	-	-	-	-	-
Yellow Box – Blakely's Red Gum grassy woodland	4 (5)		78	32	30	30	44	-	-	-	-	-
White Cypress Pine – Silver-leaved Ironbark – Tumbledown Red Gum open shrubby forest	4 (10)		88	70	30	20	76	EP	EP	-	HP	-
	4 (18)		NM	NM	0	0	14	-	-	XS	-	-
White Box-White Cypress Pine shrubby open forest	4 (22)		NM	NM	0	0	16	-	-	-	-	-
	3 (23)		NM	NM	6	14	54	-	-	-	HP	HP
Plains Grass grassland on basaltic black earth soils	3 (25)		NM	NM	72	20	26	-	-	-	HP, EP	-
Rough-barked Apple riparian forb/grass open forest	3 (20)		NM	NM	70	52	80	-	-	OS	-	-
Mine Rehab	1 (6)		50	94	18	26	80	-	-	-	-	-
	1 (14)		NM	NM	24	40	60	-	-	HP	-	-
	1 (26)		NM	NM	NM	NM	52	-	-	-	-	-
Cleared land (formerly cultivated land)	1 (9)		94	40	64	70	68	-	-	HP	-	OA
	1 (15)		NM	NM	12	96	96	-	-	-	-	-

NM – Not monitored; EP = Echium plantagineum (Paterson's Curse), HP = Hypericum perforatum (St. Johns Wort), OA = Onopordum acanthium (Scotch Thistle), OS =Opuntia stricta (Prickly Pear), XO = Xanthium occidentale (Noogoora Burr).

3.7 BLASTING

3.7.1 Blast Criteria and Control Procedures

The blast criteria for WCC outlined in **Table 3.37** was established in accordance with PA10_0059 (Schedule 3 Conditions 6 to 13) and EPL 12290 (Conditions L5 and M7) and specify the following:

Table 3.37 WCC Blast Criteria

Location	Airblast Overpressure (dB(Lin Peak))	Ground Vibration (ppv(mm/s))	Allowable Exceedance
Any residence on privately-owned land	115	5	5% of the total number of blasts over a period of 12 months
	120	10	0%
All public infrastructure	-	50	0%

In addition to the above blasting criteria, there are other administrative compliance criteria that WCC must adhere to:

- Blasts can only be fired between 9am to 5pm Monday to Saturday*;
- No blasting on Sundays or Public Holidays*;
- Limited to one blast per day*; and
- Limited to 15 blasts per month*.

* Both PA 10_0059 and EPL 12290 contain exemptions which are discussed in the Blast Management Plan.

The Blast Management Plan was approved by DP&E on the 14th January 2014 which outlines the blast management controls implemented by WCC which are summarised in **Table 3.38** in order to mitigate the risks associated with blasting. The location of blast monitoring sites were determined in accordance with the Blast Monitoring Program as outlined in **Table 3.39** and locations identified in **Figure 3.16**.

Table 3.38 Blast Management Strategies and Controls

Measure	Timing
Property Acquisition and Private Agreement	As required
Pre-Blast Design assessment identify specific blast hazards requiring further controls	Prior to Design
Blast Design to minimise overpressure, vibration and fume impacts	Prior to Drilling
Predictive Vibration Site Law to target design vibration levels to be below 0.8mm/s (revised down from 1mm/s in November 2014) to avoid community complaints	At design
Burden Profiling to prevent face bursts and overpressure and fume impacts	Prior to Loading
Prior to drilling, good drill pad preparation prevents dust generation. During drilling the drillers log subsurface information such as coal seam, broken ground and underground locations to mitigate overpressure or fume impacts	Prior to and During Drilling
Shotfirer Inspections includes surface and subsurface checks such as dipping hole depth, temperature, gamma and video camera logging of holes	Prior to Loading
Loading Explosives and Detonators to ensure that the right depth/quantity of explosives are used. The blast design should have selected the correct explosives product to match ground conditions such as wet/water, broken and or soft ground and length of time the product will	Prior to Loading

Measure	Timing
be in the ground.	
Stemming Height and Quality ensure that the right depth/quantity of stemming is used to contain the energy of the explosives and the stemming quality ensures that the material locks together to contain the energy in the ground.	Prior to Loading
Initiation Sequence is designed to prevent overpressure and vibration re-enforcement impacts by modifying the time that each individual blast hole is detonated in milliseconds.	Prior to Firing
Sleeping Shots are left in the ground for the minimum time practicable up to 5 days and no longer than 7 days with Operations Manager approval.	Prior to Firing
Blast Times and Frequency in accordance with the conditions of EPL 12290 and PA 10_0059.	At Firing
Blast Notification included on Whitehaven Coal website providing up to date information of the next scheduled blast.	Prior to Firing
Road and Rail Closure process to notify Council, ARTC, emergency services to protect infrastructure and public safety.	Prior to Firing
Blast Phase Design and Environmental Risk Analysis form is completed for each shot to identify at phase of the blast from design to firing what the risk of overpressure, vibration, dust and fume impacts is likely and needs to managed.	Prior to Firing
Pre-Blast Weather Check to mitigate overpressure, dust and fume events from impacting on Werris Creek community.	Prior to Firing
Pre-Blast Planning at 9am meetings discussing how the forecasted weather conditions could impact on the blast.	Day of Firing
Structural Inspections of private property following claims of damage.	After Complaint
Post Blast Results Review and Reporting. Incident Investigation, Fume Tracking and Analysis	Post Firing

Table 3.39 WCC Blast Monitoring Program

Monitor Type	Purpose	Property/Location Description	Frequency	Direction from WCC	Distance (km)
Permanent	Community	R11 “Glenara”	Every Blast	South	3.2
Permanent	Community	R98 “Kyooma”	Every Blast	East	2.9
Permanent	Community	R62 Werris Creek South	Every Blast	North East	3.7
Permanent	Community	R92 Werris Creek Middle	Every Blast	North East	4.4
Portable	Infrastructure	Railway Culvert #406-099	Every Blast with 500m of Rail Line	East	0.3

Note: Grey shading indicates blast monitoring will be undertaken infrequently

3.7.2 Blast Monitoring Results

During the reporting period, a total of 142 shots were fired by WCC. As from the 1st January 2014, Whitehaven Coal modified the contractual arrangements regarding blasting from the previous contractor (providing engineering design, shotfiring and explosives) to an in house WCC Drill and Blast Engineer and a crew of Shotfirers with a new contractor supplying explosives only. Whitehaven Coal made the change to improve control over blasting management and performance. The number of blasts increased by over 50% from the previous reporting period due to a reduction in the size of shots in response to mitigating the number of and significant blast incidents and complaints but still producing the blasted inventory to a achieve a coal production rate of 2.5Mtpa. Detailed blast monitoring results are included in **Appendix 7** with a summary by month presented in **Table 3.40**.

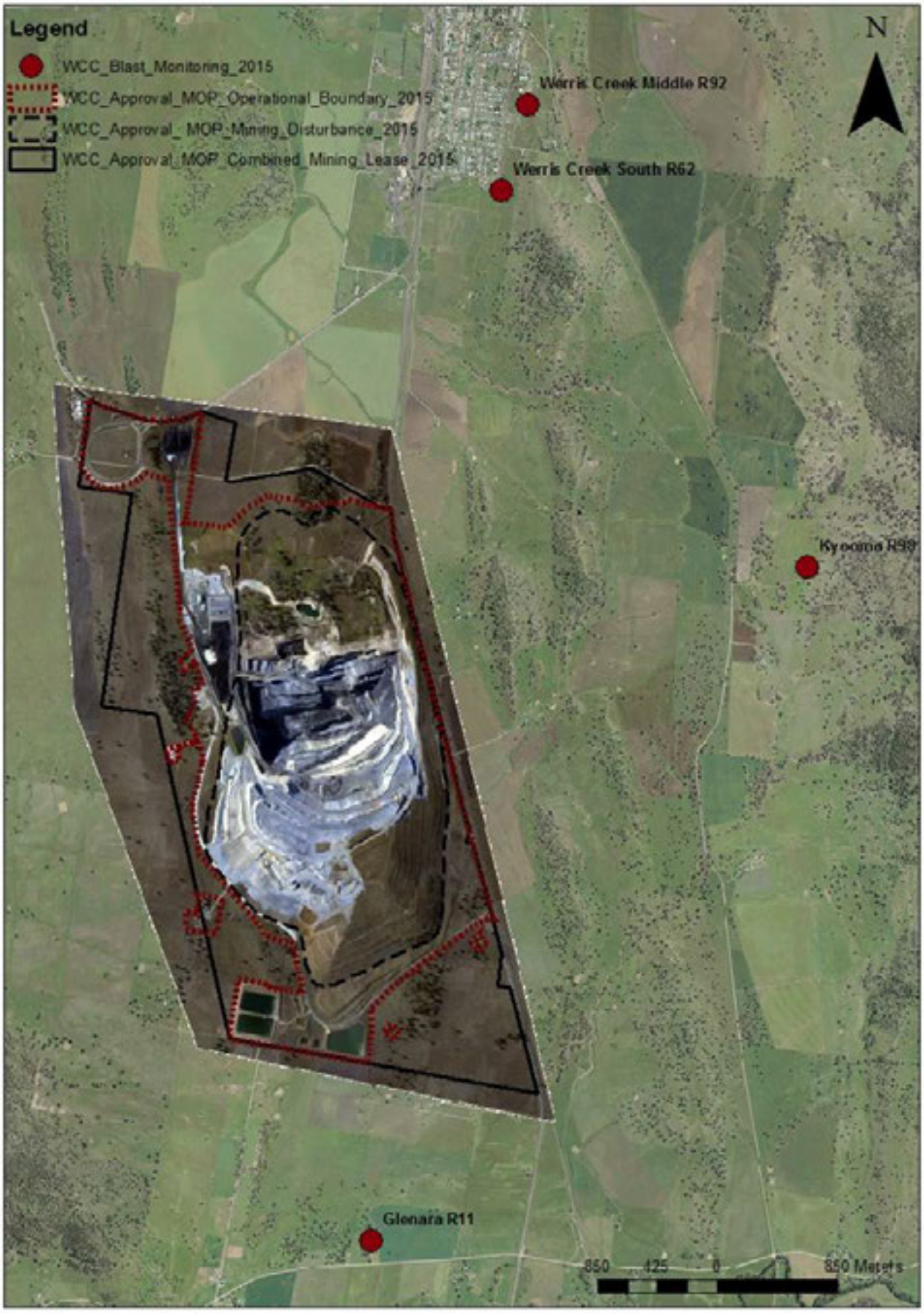


Figure 3.16 WCC Blast Monitoring Program

Table 3.40 WCC 2014-2015 Blast Monitoring Results Summary

Month	Blasts		Glenara R11		Kyooma R98		Werris Creek South R62		Werris Creek Mid R92	
			mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)
April 2014	5	Ave	0.17	101.8	1.18	102.0	0.49	101.9	0.31	96.6
		Max	0.25	104.7	1.71	108.8	0.83	111.9	0.48	109.3
May 2014	9	Ave	0.21	98.8	1.27	96.6	0.46	94.3	0.30	91.2
		Max	0.29	110.5	2.42	109.4	0.85	98.9	0.56	97.4
June 2014	9	Ave	0.15	100.4	0.86	100.1	0.33	94.7	0.22	95.1
		Max	0.26	107.0	1.83	108.2	0.46	103.4	0.37	102.5
July 2014	11	Ave	0.13	101.5	0.59	100.2	0.29	95.9	0.23	96.4
		Max	0.27	108.3	1.26	110.8	0.68	108.7	0.49	105.1
August 2014	15	Ave	0.15	96.8	0.51	98.1	0.31	94.9	0.21	95.2
		Max	0.45	110.1	1.69	111.8	1.02	104.7	0.48	109.3
September 2014	13	Ave	0.13	100.4	0.58	102.5	0.34	98.7	0.24	98.7
		Max	0.22	105.7	0.96	118.3	0.53	107.7	0.45	113.5
October 2014	16	Ave	0.16	98.6	0.69	100.7	0.36	98.3	0.21	100.0
		Max	0.34	106.4	2.15	109.4	0.63	110.8	0.39	111.9
November 2014	14	Ave	0.13	100.5	0.62	100.2	0.27	99.5	0.15	98.3
		Max	0.26	113.2	1.05	107.6	0.45	108.7	0.28	113.4
December 2014	8	Ave	0.16	102.3	0.71	102.5	0.35	100.8	0.26	102.2
		Max	0.24	106.7	1.23	106.6	0.53	110.1	0.42	113.6
January 2015	16	Ave	0.12	97.8	0.49	100.0	0.24	96.0	0.17	97.6
		Max	0.26	104.4	0.99	111.7	0.46	102.7	0.36	111.5
February 2015	14	Ave	0.13	102.7	0.58	102.3	0.28	100.3	0.17	100.4
		Max	0.32	112.9	1.00	112.3	0.46	110.4	0.29	107.6
March 2015	12	Ave	0.18	100.9	0.94	101.0	0.38	101.0	0.25	98.6
		Max	0.30	111.3	1.90	115.3	0.83	108.3	0.47	106.1
Annual	**142**	**Ave**	**0.15**	**100.0**	**0.71**	**100.5**	**0.35**	**97.8**	**0.21**	**98.1**
		Max	**0.45**	**113.2**	**2.42**	**118.3**	**1.02**	**111.9**	**0.56**	**113.6**
Criteria	**180**	**5%**	**5.00**	**115.0**	**5.00**	**115.0**	**5.00**	**115.0**	**5.00**	**115.0**
		Max	**10.00**	**120.0**	**10.00**	**120.0**	**10.00**	**120.0**	**10.00**	**120.0**

Yellow – Blast result above WCC Objective and Target level of 115dBL or 0.8/1.0mm/s (Werris Creek South only).

There were no blasting exceedances (>120dBL or >10mm/s) at privately owned properties for the reporting period 2014-2015 There were four instances of elevated blast results greater than the blasting targets of 115dB(L) and 1mm/s during the period (subsequently revised to 0.8mm/s after November 2014 for Werris Creek South only) as outlined below:

- On 6th August 2014 blast #58 S15_B3-5_RL330_TSB generated an actual vibration of 1.02mm/s and was higher than predicted and target level of 1mm/s. Blast generated a single peak frequency of 12.9Hz. Weather conditions were a moderate north westerly 336° @ 3.7m/s & no inversion present. Parameters used to predict vibration were based on single hole trial for the G Seam Interburden. Part of the eastern thru seam blast was in the G Seam Interburden while the remainder of the shot was in other strata. While not expected to exceed 1mm/s, the prediction was only 2% off the 50 percentile and within the 95% percentile which is statistically acceptable. Action taken was to review the parameters used to calculate the blast vibration prediction;
- On 5th September 2014 blast #72 S14_B16-B18_RL330 resulted in an overpressure reading of 118.3dBL above the 115dBL criteria. Weather conditions were strong south easterly 135° @ 6.9m/s & no inversion present that was fired with the Operations Manager approval. Wind gusts at the time of blast (up to 8.9m/s) have resulted in an elevated overpressure reading

for the blast but below the maximum criteria. Winds were blowing away from Kyooma towards the mine so unlikely to have been from a blast related airblast. WCC followed the procedure correctly for blasts when winds speeds are between 6 and 8m/s however winds could have been locally stronger at Kyooma (but not affecting other monitors) resulting in an overpressure >115dBL.;

- On 4th March 2015 blast #35 S16_B7-B8_CSeam_RL350 resulted in an overpressure reading of 115.3dBL above the 115dBL criteria. Weather conditions were strong north westerly wind (309o) @ 7.5m/s & no inversion present that was fired with the Operations Manager approval. Wind gusts at the time of blast (up to 11.4m/s) were blowing towards Kyooma have resulted in an elevated overpressure reading for the blast but below the maximum criteria of 120dBL. WCC followed the procedure correctly for blasts when winds speeds are between 6 and 8m/s however winds could have been locally stronger at Kyooma (but not affecting other monitors) resulting in an overpressure >115dBL; and
- Blast #41-2015 (S14_B7-B10_RL290_TSB) fired at 1:59pm on Friday 13th March 2015 was a shot on the eastern side and at a lower elevation in pit. Weather conditions were a strong south easterly wind (140o) @ 6.9m/s with no inversion present that was fired with the Operations Manager approval. Pre-Blast Environmental Risk Analysis identified this blast as having a medium risk of vibration impact. Actual blast vibration was 0.83mm/s and above the predicted vibration of 0.7mm/s and above the anecdotal threshold for vibration complaints of 0.5mm/s and blast vibration target of 0.8mm/s.

There was one blast related non-compliance (Condition 4 – O1.1 of EPL 12290) during the period on the 2nd July 2014 generating fume that travelled off the mine site but did not result in any offsite impacts. WCC fired a production blast #45 on Wednesday 2nd July 2014 at 1:05pm (S15_B12-B16_330_EXT) with the fume cloud generated travelling north-north west above the ground surface, across Escott Road (a closed, private road owned by WCC) and off the Mine site at 1:25pm, at a height of approximately 50m above the ground surface. The blast fume cloud dispersed at 1:41pm over the "Cintra" property owned by WCC. WCC was not able to establish whether there was a definitive cause, however the “Incident Investigation Report into the Blast Related Fume Incident" prepared by Safety Wise Solutions Pty Ltd (the Investigation Report) identified the following potential contributing factors to this incident:

- The particular geology/strata did not have a history of generating fume that could have been expected; nor predicted the amount of fume generated by the Blast when it was initially designed.
- No faults or dykes were identified in the drill logs. Broken ground was identified in 27 holes from the drill logs with the Drill and Blast Engineer extending the stemming zone to 6m to cover the area of broken ground. The initial blast design planned to use XL100 hybrid explosive product, which was to be loaded into the dry holes. However, for the wet holes, an alternative water-resistant explosive product with 70% emulsion was used to increase the explosive density so that it would be heavier than water and displace any water present in the blast holes. GPE70 was developed to have a similar formulation to XL100, but GPE70 was recommended for use in the wet conditions as the Mobile Manufacturing Unit (MMU) truck was available and suited to pumping the explosive down a blast hole through the water using a hose.

- The timing for shot S15_B12-B16_330_EXT was approved to minimise any adverse results (particularly vibration). Videos of the Blast recorded the extent of the fume generated by the Blast from the perspective of the pit as well as from an offsite location to the north of the mine. Werris Creek Coal employees were also present to check on tenants of properties owned by Whitehaven Coal and other neighbours to verify that nobody had been exposed to the fume cloud.
- The key measures implemented to date based on the recommendations in the Investigation Report include the preparation of an updated Blast Design Checklist which draws on the learnings from the Blast, including augmented measures relating to dynamic water management and the recordings of slumps on loaded holes, and the introduction of a policy of having a dewatering truck present onsite at all times when loading holes where dynamic or static water is present.

In addition, the Licensee has gone beyond the recommendations in the Supplementary Report with new blast management measures having been implemented through a site-specific Blast Fume Management Procedure. The centrepiece of this Procedure is that the sleep time for all blasts is to be five days, with provision for an extension up to a maximum of seven days in total with the approval of the Operations Manager.

The average blast vibration results at Werris Creek South (representative of privately owned properties in southern Werris Creek) were below the levels predicted in the LOM Environmental Assessment (R.W. Corkery and Co Pty Limited, 2010) (**Table 3.41**). While the two instances of elevated overpressure greater than 115dB(L) at "Kyooma" during the period were higher than the Environmental Assessment predicted levels of 115dB(L); given the one off nature of these overpressure events due to wind gusts at the time of the blast, this is outside of the LOM Environmental Assessment prediction because the blasting predictions were made using a formula based on average blast results (blasts that performed as expected) and not worst case.

A comparison of blast results since blast monitoring commenced in Werris Creek in 2010 is presented in **Table 3.41**. The results for Werris Creek South monitoring site demonstrate that the average and maximum vibration levels have decreased over time despite the mining operations advancing a further 430m closer to town since 2010 and reflects the effort and focus made by WCC to mitigate blasting impacts on the community of Werris Creek.

Table 3.41 WCC Blast Results from 2010 to 2015

Month	Results	2010-2011		2011-2012		2012-2013		2013-2014		2014-2015		LOM EA	
		mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)
Glenara R11	Ave	0.10	114.7	<0.37	<109.9	0.21	104.5	0.22	98.9	0.15	100.0	-	-
	Max	0.10	114.7	<0.37	<109.9	0.48	111.0	0.53	109.7	0.45	113.2		
Kyooma R98	Ave	NM	NM	NM	NM	NM	NM	0.70	98.9	0.71	100.5	-	-
	Max	NM	NM	NM	NM	NM	NM	2.42	108.8	2.42	118.3		
Werris Creek South R62	Ave	0.48	95.6	0.44	101.5	0.42	99.8	0.41	100.2	0.35	97.8	1.20	110.0
	Max	0.51	99.8	1.45	113.2	0.87	111.0	1.19	119.0	1.02	111.9		
Werris Creek Mid R92	Ave	NM	NM	NM	NM	NM	NM	0.18	99.3	0.21	98.1	-	-
	Max	NM	NM	NM	NM	NM	NM	0.45	107.8	0.56	113.6		
Tonsley Park R20	Ave	0.68	102.2	0.81	101.6	0.91	102.2	0.95	102.1	NM	NM	1.90	115.0
	Max	1.32	113.3	1.98	113.1	2.14	114.9	3.39	121.0	NM	NM		
Talavera R96	Ave	NM	NM	0.56	102.5	0.31	105.3	0.25	104.2	NM	NM	1.30	111.0
	Max	NM	NM	0.56	111.0	0.67	113.4	0.53	115.8	NM	NM		
Greenslopes R14	Ave	0.59	106.7	0.69	102.9	NM	NM	NM	NM	NM	NM	2.60	118.0
	Max	1.07	110.1	2.19	115.8	NM	NM	NM	NM	NM	NM		

Month	Results	2010-2011		2011-2012		2012-2013		2013-2014		2014-2015		LOM EA	
		mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)
Cintra R2	Ave	0.87	108.0	1.19	106.7	NM	NM	NM	NM	NM	NM	-	-
	Max	2.39	118.0	3.75	117.4	NM	NM	NM	NM	NM	NM		

NM – Not monitored.

In addition to the Blast Fume Incident on 2nd July 2014; WCC monitored, recorded and ranked any fume events generated from blasts in accordance with DP&E directions and AEISG (2011) guidelines. The changeover in systems and personnel from the previous blast contract may have contributed to the fume performance in the reporting period outlined in **Table 3.42**.

Table 3.42 WCC Fume Events Generated from Blasts between 2011 to 2015

Complaint Issue	2011-2012	2012-2013	2013-2014	2014-2015
Total Number of Blasts	84	82	90	142
Number of Blast Fume Events	31	17	13	41
Fume Level 5	0	0	0	1
Fume Level 4	1	1	0	1
Fume Level 3	2	0	0	7
Fume Level 2	9	6	1	19
Fume Level 1	19	10	12	13
Fume Level 0	53	65	77	101

WCC acknowledges that the management of blast fume needs to improve following the overall performance during 2014-2015. This reporting period recorded the highest number of fume events since 2011. System improvements undertaken following the Blast Fume Incident on 2nd July 2014 included recording all blast fume events as environmental incidents and also preparing a fume tracking spreadsheet developed to assist investigation and analyse common contributing causes to fume events. This tool identified certain strata/ground conditions were more conducive to fume generation and lead to the development of the site specific Blast Fume Management Procedure as required by DP&E. Common causes attributed to fume generation that were subject to continuous improvement during the period:

- Pre-Split Shots – timing leading to blast hole preconditioning;
- Wet Ground – dynamic water, pump explosive product, powder factor, timing leading to blast hole preconditioning and long sleep time;
- Weathered Ground – weak geology resulting in a lack of confinement; and
- Underground Workings – weak/cracked geology resulting in a lack of confinement

The Blast Fume Management Procedure has implemented a limit to the sleep time of shots to 5 days (or up to 7 days with the Operations Manager approval). When blasting in areas known to have higher frequency of fume events; the Procedure outlines further controls such as increased wind arcs to avoid downwind impact zones including the near neighbours to the Mine and Werris Creek Road.

3.7.3 Blast Management Annual and Complaint Review

A summary of blasting complaints received by WCC since operations commenced in 2005 is presented in **Table 3.43**. Blasting related complaints have been the most common community complaint resulting from WCC operations since the mine commenced in 2005.

Table 3.43 WCC Complaint Issues from 2005 to 2015

Complaint Issue	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Blast – Vibration & Overpressure	3	4	1	2	7	22	68	9	47	47
Blast – Fume & Dust	0	0	0	0	2	3	2	1	5	10
Blast – Other including Damage	0	0	0	0	0	0	1	4	3	2
All Complaints (including blast)	**8**	**10**	**7**	**16**	**12**	**52**	**117**	**56**	**93**	**95**

Historically, blasting complaints have accounted for just under half of all complaints received by WCC, however that increased in 2011-2012 to 61% of all complaints with the majority generated from four individual blasts (3rd & 16th June 2011 and 3rd and 17th August 2011). However for 2012-2013, the number of blasting complaints significantly decreased due to improved management and control of air blast impacts, revision of the pre-blast weather check process and no blasting in the G Seam Interburden which was a major source of complaints in 2011-2012. Prior to October 2014, WCC increased the size of blasts (arrival of larger mining equipment in June 2013) which potentially increases the number of blasts with vibration levels above the community perception/complaint threshold leading to more complaints. The number of blast related complaints increased in 2014-2015 due primarily to the large blast vibration and fume event on 2nd July 2014 (20 complaints for both vibration and fume). This one incident over shadowed the significant reduction in complaints for the last six months of the period (October to March) with only five complaints in total received compared to 54 complaints in the first half of the period.

The significant reduction in community complaints between October 2014 and March 2015 was achieved through additional blast design controls that were identified either through the Blast Fume (2nd July 2014) Incident Investigation Report and a Third Party Blast Complaint Assessment (action out of the Independent Environmental Audit in May 2014). The additional blast design controls implemented around September/October 2014 were:

- Five day sleep time for shots to minimise fume generation which also limits the maximum size of blasts and can lead to a reduction in the duration and vibration of the blast;
- The predicted vibration target was lowered to 0.8mm/s from 1mm/s given a blast vibration over 0.8mm/s achieved complaints for greater than 90% of the blasts;
- Blast initiation sequences (timing) that were quicker (17-42ms per hole) reduced the blast waveform frequency to below 10Hz. Quicker timing was preferred also to mitigate fume generation but also because slower timing meant that frequencies in the range of 10-15Hz were being measured in Werris Creek which is in the range of natural resonance of structures and can be perceived by residents as exaggerated shaking although measured levels are low;
- Most blasts are fired at 1pm however for blasts with elevated risk of community impacts; the firing times were moved as required to avoid times that community members would be at home for lunch; and
- An Environmental Risk Analysis Checklist was developed based on AEISG (2011) Fume Risk Assessment; however modified to incorporate other blast design aspects that also can have environmental impacts such as vibration, overpressure and dust. For each blast, a risk level for environmental and community impacts are identified and either the blast design is modified to mitigate/reduce potential impacts or additional controls are identified and implemented as required.

Until 2010, the majority of complaints relating to the mine (including blasting) were from Quipolly residents and a single receiver located to the east of the mine; however since 2010, complaints have been dominated by Werris Creek residents with over 80% of complaints. The likely reason for the increase in the number of complaints and complainants is because WCC is moving closer to Werris Creek, which has a larger and denser residential population of 1800 people than compared to the rural Quipolly area. WCC recognises that the number of complainants has also increased and that there is a shift towards Werris Creek residents making blast complaints that requires further management by WCC.

A review of multiple blasting complaints and blast locations identified in **Table 3.44** found that there was a trend for blasting complaints from particular areas of the pit. For example, blasts in the upper horizons of the pit (above RL385m and including the A and Black Seam) are resulting in overpressure complaints. Blasts deeper in pit (RL385m and below including the basal G Seam Interburden) have resulted in vibration complaints. WCC is continuing to work with the Drill and Blast team to ensure that every blast design takes into account the learning's from previous blast investigations but also looking at continuous improvement. The run of blast complaints between June and October 2014 (dominated by the Blast Fume Incident 2nd July 2014) was a result of a management direction for larger blasts to minimise production delays; that since October the management direction has changed to limiting the size of blasts to mitigate potential community concerns.

Table 3.44 WCC Blasting Complaints by Blast Event/Location since 2011

Period	Blast Location	Blast Type	# Complaints	Likely Blast Impact
January 2011	Strip 11_385	Overburden	2	Overpressure
January 2011	Strip 9_300	Interburden	2	Vibration
February 2011	Strip 9_GCoal	Interburden	2	Vibration
May-June 2011	Strip 9_300	Interburden	2	Vibration
June 2011	Strip 11/12_385	Overburden	31	Overpressure
August-September 2011	Strip 10_GCoal	Interburden	23	Vibration
September 2011	Strip 11_385	Overburden	3	Overpressure
January 2011	Strip 11_350	Interburden	2	Vibration
Dec 2011, Jan&Feb 2012	Strip 12_Aseam	Overburden	4	Overpressure
April 2012	BlackSeam4	Overburden	1	Overpressure
July 2012	Strip 14_385	Overburden	1	Overpressure
October 2012	Strip 15_385	Overburden	1	Overpressure
February 2013	Strip 16_385	Overburden	6	Vibration
April 2013	Strip 11_GCoal	Interburden	5	Vibration
June 2013	Strip 16_385	Overburden	2	Overpressure
July 2013	Strip 16_Blackseam	Overburden	11	Overpressure
July-September 2013	Strip 13_350/300/DE UG	Interburden	16	Vibration
September 2013	Strip 13_Rocks	Secondary	1	Overpressure
December 2013	Strip 12_GCoal	Interburden	1	Vibration
December 2013	Strip 17_Trim	Overburden	6	Vibration
January 2014	Strip 15_350	Interburden	5	Vibration
April-May 2014	Strip 13_GCoal	Interburden	12	Vibration/Fume
June-October 2014	Strip 15/16/17_RL330/370	Interburden	34	Vibration/Fume

WCC performance against the Environmental Management System blasting related objectives and targets developed from the Blast Management Plan for the period 1st April 2014 to 31st March 2015 is outlined in **Table 3.45**. WCC did not achieve any of the five targets set for blast related objectives. Unfortunately there was a blast exceedance during the period (Blast Fume Incident 2nd July 2014) that also directly resulted in the number of complaints and complainants to increase above the

planned target. Despite the disappointing performance from blasting for the period; the improvements and refinements to procedures have directly improved blasting outcomes for the second half of the period and gives WCC confidence for an overall improvement in blasting performance in 2015-2016 given the new blast management structure will have had over 12 months in place to bed down the new systems and processes around drill and blast.

Table 3.45 Blasting Objectives and Targets 2014-2015

Activity	Objective	Indicator	Actual 2013-2014	Target 2014-2015	Actual 2013-2014	Actual 2012-2013	Actual 2011-2012
Blasting	Complaint	# Complaints	59	50	55	14	71
		# Complainants	24	21	23	11	35
	Overpressure	All >115dBL	2	0	2	0	2
	Vibration	Werris >0.8mm/s	2	0	2	1	1
	All Exceedance	# Exceedances	1	0	0	1	1

Red – Exceeded Full Year Target

As required by PA 10_0059 Schedule 5 Condition 3, WCC as part of this Annual Environmental Management Report undertakes an annual review of its blasting management for 2014-2015. **Table 3.46** summarises the blasting management annual review from the discussion above.

Table 3.46 Blasting Management Annual Review 2014-2015

Annual Review	Discussion
Monitoring Results	• Criteria Two blasts recorded overpressure >115dB(L) and two blast recorded vibration >0.8mm/s. No exceedance of maximum criteria of 120dB(L) or 10mm/s at privately owned properties during the period. • Previous Year Average blast vibration levels at Werris Creek South decreased by 15% although mining is occurring closer to town. • EA Predictions Average blasting levels are consistently below those predicted in the Environmental Assessment.
Complaints	• This Year 59 blasting related complaints for the period. • Previous Year Slight increase in blasting complaints from 2013-2014 but still below the number of complaints received in 2011-2012.
Compliance	• Criteria and other One blasting non-compliance (Blast Fume Incident 2nd July 2015) during the period. • Objectives & Targets WCC achieved none of the five targets related to blasting objectives.
Data Trends & Predicted Impacts	The number of blasting complaint's increased this period and WCC is aware that as mining progresses closer to Werris Creek town, that residents are likely to become more sensitive to blast impacts. Average blast vibration results for Werris Creek South monitor demonstrate that actual vibration levels have decreased since 2010.
Improvement Actions	Blast management improvement actions undertaken for 2014-2015: • continue to implement the blast notification system and community consultation in regards to blasting as well as implement the previous identified system improvements.

Annual Review	Discussion
	• 5 day sleep time and Blast Fume Management Procedure. • Blast timing and frequency monitoring and analysis of impacts. • Blast vibration prediction design target of 0.8mm/s. • Blast Phase Design and Environmental Risk Analysis Checklist. Blast management improvement actions planned for 2015-2016: • Update pre-blast weather assessment criteria on a shot by shot basis rather than have one wind direction criteria that encompasses the whole pit.
Management Plan Review	All blast management strategies and actions were implemented during the period.
Management Plan Revision	Draft Blast Management Plan was amended to incorporate procedural changes that occurred following Blast Fume Incident 2nd July 2014 Investigation Report and Third Party Blast Complaint Assessment. Finalise changes to Blast Management Plan in 2015-2016.

3.8 OPERATIONAL NOISE

3.8.1 Management

WCC has noise criteria based on the Project Specific Noise Criteria in PA10_0059 and EPL 12290 that has been updated to reflect additional property acquisitions and private agreements negotiated by Whitehaven Coal. **Table 3.47** outlines the noise criteria for private properties without private agreements while **Table 3.48** displays the noise criteria for private properties with private agreements.

Table 3.47 LOM Project Noise Criteria

Location		Day $L_{Aeq,15minute}$	Evening/Night $L_{Aeq,15minute}$	Night $L_{A1(1min)}$	Long Term $L_{Aeq,15minute}$	Acquisition $L_{Aeq,15minute}$
R12	"Quipolly Railway Cottage"	38	38	45	35	40
R24	"Hazeldene"	37	37	45	35	40
R96	"Talavera"#	38	37	45	35	40
All other privately-owned land		35	35	45	35	40

"Talavera" property was listed in the EA under its previous property name of "Millbank"

Table 3.48 Properties with Private Agreements Noise Criteria

Location		Noise Works Criteria dB(A) Leq	Noise Acquisition Criteria dB(A) Leq
R8	"Almawillee"	40	45
R10	"Meadholme"	40	45
R11	"Glenara"	40	45
R21	"Alco Park"	40	45
R98	"Kyooma"	40	45
R7	83 Wadwells Lane	40	45
R9	"Gedhurst"	40	45
R22	"Mountain View"	40	45

The noise monitoring program incorporates both attended and real time monitoring as outlined in **Figure 3.17**.

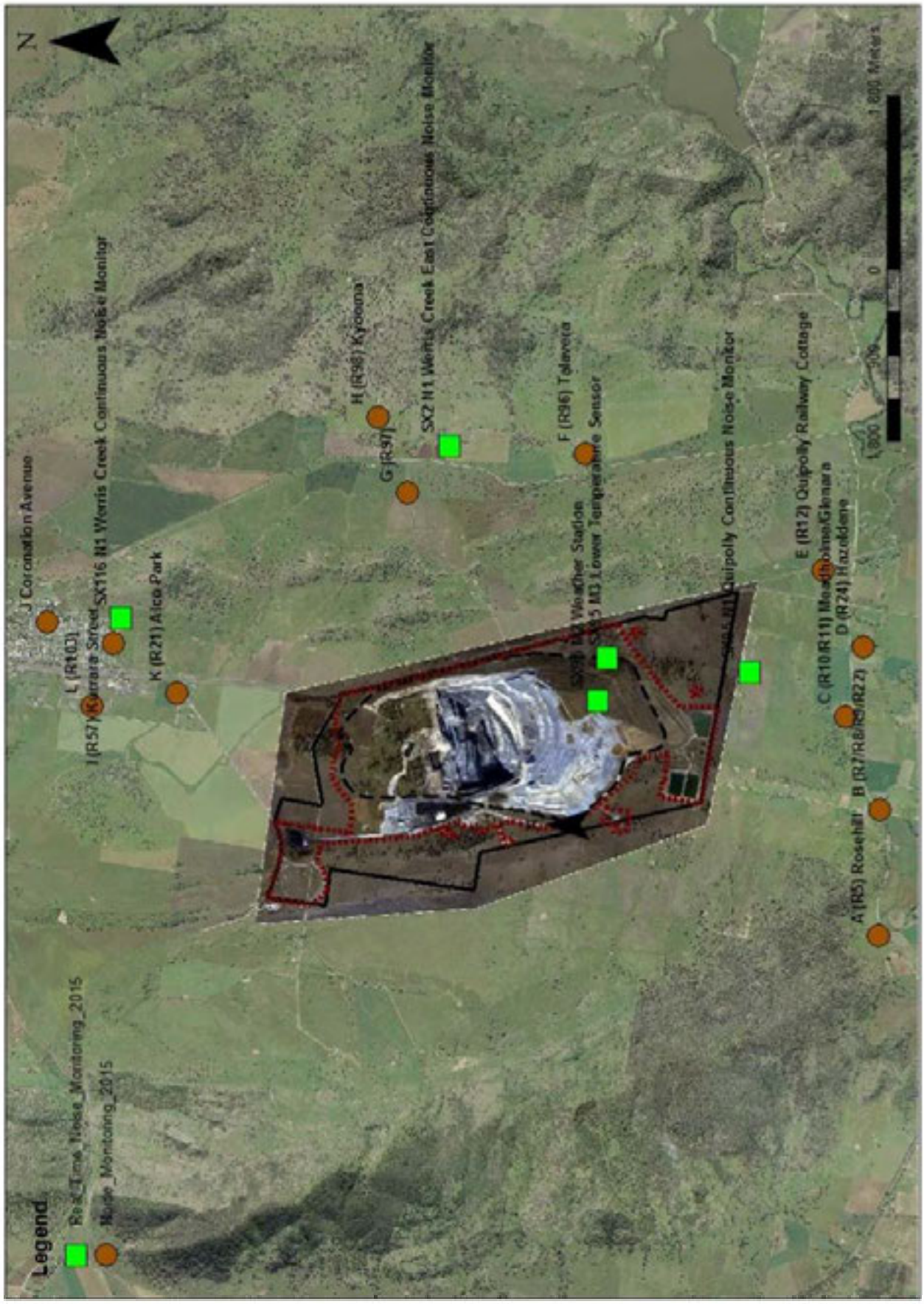


Figure 3.17 WCC Attended and Continuous Noise Monitoring and Weather Station Locations

In accordance with EPL 12290 Condition L6.1, the noise criteria apply to mining noise levels measured under all meteorological conditions except for "adverse weather" defined as:

- Wind speeds greater than 3 metres/second at 10 metres above ground level; or
- Temperature inversion conditions up to +12°C/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
- Temperature inversion conditions greater than +12°C/100m.

The Noise Management Plan approved by DP&E on 29th April 2014 outlines the noise management measures undertaken by WCC to mitigate potential noise impacts and comprises the following actions:

- Negotiate private agreements with private landholders for noise impacts or as a last resort, acquire private properties either privately or through acquisition processes outlined in PA10_0059. Three new private agreements were obtained during the period with the owners of "Gedhurst", "Mountain View" and 72 Wadwells Lane;
- Noise attenuation of haul trucks so that CAT XQ793s achieve a sound power level of 115dB(L) and CAT 785s achieve 117.7dB(L). CAT XQ793s were commissioned from June 2013 while the final CAT 785 to be partially attenuated was completed in March 2014;
- A dedicated 'Noise Control Operator' to continually monitor real time noise levels and inform OCE if the dominant noise source is mining which then the OCE would modify or partially suspend mining operations to achieve 35dB(A) noise goal;
- Real time noise monitoring in locations representative of Quipolly and Werris Creek communities. A third continuous noise monitor was added to monitor locations representative of privately properties to the east (named Werris Creek East) of WCC in response to noise exceedances in this area;
- Real time meteorological monitoring can identify adverse weather conditions such wind direction/speed and temperature inversions using the weather stations on the overburden emplacement area separated by vertical distance of 80m (as approved in EPL 12290);
- Daily noise reduction mine planning as discussed at the daily meeting based on the noise generation risks of the current location of mining activities and using forecast weather conditions;
- Routine testing to confirm that regular and preventative maintenance of mining equipment maintain the sound power levels within a couple of decibels of the relevant levels outlined in the Noise Management Plan;
- Bunding or other physical barriers close to noise sources to create obstructions to the noise propagation towards receivers (i.e. visual bunds and highwalls);
- Use of operational noise controls such as minimising revs and the use of noise minimising alarms and horns; and
- Rail spur noise mitigation includes train speeds restricted to 15kph on the rail spur, minimising coal drop heights into wagons and maintaining coal within the loading bin at all times.

WCC has tracked the number of hours of production time lost from mitigating potential noise impacts using the Noise Control Operator and Real Time Noise Monitoring management measures outlined above. The sum of all individual items of plant that ceased operations in 2014-2015 for a total of 92.7 hours (**Table 3.49**) which is significantly down from 2013-2014 lost production of 976.3 hours. This is likely due to the full attenuation of the truck fleet in March 2014 as well as mild winter weather resulting in weaker temperature inversions than previous years, and mining the basal G Seam at the bottom of the pit (most noise protected) during winter.

Table 3.49 Production Time Lost due to potential Noise Impacts

Period		Hours of Production Time Lost due to potential Noise Impacts											
		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
2014-2015	Excavators	0.0	0.0	0.0	8.8	0.0	0.0	0.0	0.3	5.7	10.5	0.0	4.0
	Trucks	0.0	0.0	0.0	11.4	0.0	0.0	0.0	0.0	34.2	0.0	0.0	0.0
	Other	0.0	0.0	0.0	4.5	0.0	4.8	0.0	0.0	2.5	6.0	0.0	0.0
TOTAL	92.7	0.0	0.0	0.0	24.7	0.0	4.8	0.0	0.3	42.4	16.5	0.0	4.0

3.8.2 Attended Noise Monitoring

The results of routine attended noise monitoring conducted on a monthly basis by Spectrum Acoustics Pty Limited are outlined in **Table 3.50** with full reports provided in **Appendix 8a**. The noise levels reported are for WCC mining operations only and exclude other ambient or environmental noises. The strategic acquisition or negotiating private agreements with adjacent properties and the effective implementation of real time noise monitoring by the Noise Control Operator have been effective at mitigating noise impacts from mining operations. Unfortunately attended noise monitoring did identify two occasions that resulted in exceedances of the noise criteria during 2014-2015 and broke a run of 12 months without a noise exceedance (**Table 3.51**). There was no exceedance of the LA1 (1 minute) criteria during the period. The noise exceedance events are discussed below:

- On 29th September 2014, R96 ("Talavera") recorded a mining related noise of 38dB(A) located 2.5km east of the closest active mining area at WCC. The resulting exceedance at R96 was +1dB(A) above the evening/night period noise criteria of 37dB(A). The weather conditions were noise enhancing with a source to receiver north westerly wind 328° @ 1.8m/s with a temperature inversion (+10.5°C/100m).
- On 16th October 2014, R97 (vacant land) recorded a mining related noise of 38dB(A) located 1.5km east of the closest active mining area at WCC. The weather conditions were noise enhancing with a light south easterly wind (153°) @ 2.0m/s with a temperature inversion (+7.9°C/100m). The EPA responded stating that this was not an EPL 12290 noise exceedance because there was no residence on the property.

Both exceedance events occurred under near worse case complying weather conditions of strong temperature inversions and light winds. Due to the two noise exceedances recorded during Spring, WCC hired a third real time noise monitor to be located to the east of mine and will be monitored and managed using the same Noise Control Operator procedure used for Quipolly and Werris Creek real time noise monitoring that is currently undertaken every night shift.

Table 3.50 WCC Noise Monitoring Results for 2014-2015

Receiver	Decibels – dB(A) Leq 15 minute													
	Period[1]	Criteria[2]	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
R5 "Rosehill"	Day	35	IA	IA	IA	IA	IA	IA	#IA	#IA	#23	IA	IA	#IA
	Night	35	29	IA	IA	IA	IA	24	#IA	#IA	IA	#IA	#25	#IA
R8"Almawillee"* R7 83 Wadwells Lane*	Day	40	#24	IA	IA	FA	19	FA	#IA	#25	#FA	23	FA	#IA
	Night	40	33	FA	27	28	IA	28	#IA	#32	FA	#IA	#25	#IA
R9 "Gedhurst"* R22 "Mountain View"*	Day	40	#26	IA	IA	FA	19	FA	#IA	#25	#FA	FA	FA	#IA
	Night	40	35	FA	27	28	IA	28	#IA	#32	FA	#IA	#25	#IA
R10 "Glenara"* R11 "Meadholme"*	Day	40	#22	IA	IA	IA	20	25	#FA	#27	#25	FA	#IA	#IA
	Night	40	31	FA	IA	28	IA	#31	#IA	#33	IA	#IA	#IA	#IA
R24 "Hazeldene"	Day	37	#22	IA	IA	23	IA	27	#24	#28	#24	FA	IA	#FA
	Night	37	33	26	30	27	25	34	#IA	#25	IA	#IA	#IA	#IA
R12 "Railway Cottage"	Day	38	IA	IA	IA	IA	IA	IA	#IA	#IA	#23	#IA	#FA	#IA
	Night	38	31	IA	25	33	#IA	33	#IA	25	IA	IA	#IA	#IA
R96 "Talavera"	Day	38	IA	IA	IA	IA	IA	FA	#26	#IA	#FA	#IA	IA	#FA
	Night	37	31	20	26	28	#24	**38**	#29	32	29	28	#IA	#24
R97	Day	35	IA	FA	FA	22	FA	IA	#28	#23	#IA	26	#25	#26
	Night	35	22	IA	22	IA	IA	FA	**38**	#35	25	#27	#IA	#27
R98 "Kyooma"*	Day	40	IA	IA	FA	IA	21	IA	#IA	#24	#IA	FA	FA	#IA
	Night	40	26	27	29	21	#IA	36	#35	#33	32	**#37**	#IA	#29
R57 Kurrara St	Day	35	IA	FA	IA	IA	FA	IA	#IA	#IA	#IA	IA	IA	#IA
	Night	35	26	24	IA	IA	IA	#IA	27	#IA	25	#IA	#IA	#IA
Coronation Ave	Day	35	IA	IA	IA	IA	IA	IA	#IA	#IA	#IA	IA	IA	#IA
	Night	35	IA	IA	IA	IA	IA	IA	#27	#25	24	#IA	#IA	#IA
R21 "Alco Park"*	Day	40	23	FA	29	IA	27	IA	28	#25	#IA	FA	#FA	#IA
	Night	40	22	26	IA	IA	30	#IA	#31	#23	IA	#IA	#IA	#30
R103	Day	35	IA	FA	#25	IA	IA	IA	24	#IA	#IA	IA	#IA	#IA
	Night	35	25	24	IA	IA	#IA	IA	#26	#IA	IA	#IA	#IA	#IA

1 – EPL12290 allows WCC to combine monitoring of evening and night periods together; 2 – Criteria is a combination of private agreement and PA10_0059/EPL12290 noise criteria; # - Adverse weather conditions enhancing noise emission not applicable to noise criteria as described in **Section 3.8.1**; * Non-project related property due to private agreement or WCC acquired property; IA – WCC specific noise is inaudible; FA – WCC specific noise is barely/faintly/occasionally audible <20dB; **Bold** – elevated result.

Table 3.51 Observed Trends in Noise Exceedance Events

	Annual Reporting Period (April to March)									
	2005 to 2006	2006 to 2007	2007 to 2008	2008 to 2009	2009 to 2010	2010 to 2011	2011 to 2012	2012 to 2013	2013 to 2014	2014 to 2015
Number of noise exceedance events	2	46	23	3	1	1	0	0	4	2

Table 3.52 provides a summary of the annual average WCC only attended noise monitoring results measured under assessable weather conditions for the day and night periods for each attended noise monitoring location over the last four years. The arithmetic mean used here for the logarithmic values of noise (decibels) is only to demonstrate a year on year comparison at each location relative to the previous year and not for any other mathematic purpose. For example, the 2012-2013 period had eleven noise measurements with average noise levels lower and six locations with average higher noise levels than 2011-2012 period. Similarly the 2013-2014 period had thirteen noise measurements with average noise levels lower and five locations with average higher noise levels than 2012-2013 period. For the 2014-2015 period, fifteen noise monitoring locations had average noise levels lower and only five locations had average higher noise levels than the 2013-2014 period. At a high level, the attended noise monitoring over the four year period demonstrates a trend that

the majority of locations have experienced decreasing WCC contributed noise levels. This comparison is limited due to the exclusion of data where WCC noise levels were either inaudible or were measured under non-assessable weather conditions. The attended noise monitoring indicates that WCC is likely to achieve its long term night time noise goal of 35dB(A) (PA10_0059 Schedule 3 Condition 4e). While this analysis is limited, it is consistent with the observed trends in the continuous noise monitoring (**Section 3.8.3**) and noise complaints (**Section 3.8.4**) correlating with the implementation of Noise Control Operator/Real Time Noise Monitoring and Truck Attenuation noise management measures has been effective at reducing noise impacts.

Table 3.52 Annual Average WCC Attended Noise Monitoring Results for 2011-2015

Decibels – dB(A) Leq 15 minute																										
Period	R5 "Rosehill"		R8"Almawillee"* R7 83 Wadwells Lane*		R9 "Gedhurst"* R22 "Mountain View"*		R10 "Glenara"* R11 "Meadholme"*		R24 "Hazeldene"		R12 "Railway Cottage"		R96 "Talavera"		R97		R98 "Kyooma"*		R57 Kurrara St		Coronation Ave		R21 "Alco Park"*		R103	
	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N
2011-2012	31	33	31	32	31	32	30	30	39	25	-	28	21	30	-	30	-	33	32	26	-	34	-	33	-	-
2012-2013	-	25	24	33	24	31	30	30	29	29	30	31	24	27	23	26	25	28	-	34	-	32	26	35	-	-
2013-2014	21	36	22	32	22	32	32	28	-	30	-	28	23	27	19	36	23	34	-	33	-	32	-	35	-	32
2014-2015	-	27	21	29	19	30	23	30	25	29	-	29	-	29	24	27	21	29	-	26	-	24	27	26	24	25

D = Day period; N = Night period; Green = Equal or decrease in noise levels from the previous period; Orange = Increase in noise levels from previous period; - = no audible noise level measured during period under assessable weather conditions.

3.8.3 Continuous Noise Monitoring

WCC undertook continuous (real time) noise monitoring in two locations for the full period 2014-2015 representative of the Quipolly and Werris Creek communities (**Figure 3.17**) and a third continuous noise monitor since November 2014 representative of properties to the east of WCC (named Werris East). Two of the continuous noise monitoring units are on trailers run by solar panels to operate a sound level meter, processor and communication equipment capable of providing data in near real time via an external website (SentineX Repository), while the third hired unit is not set up on a trailer.

The Quipolly continuous noise monitor (known as SentineX 95) was located at the "Meadholme" property (R10) until 11th November 2014 when it was relocated to "Plain View" property (R15 – Whitehaven owned) due to excessive shading of solar panels by trees and noise masking by the breeze in the trees on windy days. "Plain View" is the nearest property to WCC (1.1km closer than R10) and therefore would be the most potentially impacted Quipolly property by noise and therefore if WCC can achieve compliance at R15; then mining noise levels should be compliant at all other Quipolly properties.

The Werris Creek continuous noise monitor (known as SentineX 116) is located adjacent to a residence (R62) in town representative of other residences the on the southern side of Kurrara St which are the closest and most exposed to potential mining noise impacts to the north of WCC. The Werris Creek continuous noise monitor is located at the eastern end of Kurrara St to mitigate rail noise sources from the Great Northern Rail Line and Werris Creek Rail Yard located only 600m to the east.

The Werris East continuous noise monitor (known as SentineX 2) is located at the "Marengo property" (owned by Whitehaven) approximately halfway between the three privately owned

properties located to the east of WCC – "Kyooma" (R98), "Talvera" (R96) and R97 (no residence). The Werris East continuous noise monitor is not as significantly impacted by road and rail noise as SentineX 95 and 116; and therefore is most representative of mining noise impacts from WCC.

The continuous noise monitoring system is capable of analysing a range of statistical noise levels from LA1 to LA90 but is also able to a frequency filter the LAeq noise levels to exclude higher frequency noise levels (i.e. insects and wind) to produce a Low Frequency (LF) noise level that is more representative of industrial noise sources (including mining but also other heavy industries such rail transport) compared to the ambient/environmental noise sources that can increase ambient levels.

An analysis of the continuous noise monitoring data was compiled by Advitech Environmental (2015a – **Appendix 8b**) with **Figure 3.18** summarising the monthly median night time LAeq LF (mining and industrial noise only) noise levels for Quipolly, Werris Creek and Werris East. Presenting the night time noise levels better reflects the noise contribution from mining operations (but still includes other low frequency ambient noise) that is drowned out by environmental and other ambient noise during the day time. The most notable difference is that Werris Creek noise levels are significantly higher than Quipolly due to the dominate noise sources of urban and rail (transport and yard); Quipolly has WCC as the constant night time noise source in between significant intermittent road and rail noise; while Werris East is representative of rural environment being much quieter than the other two locations without significant road and rail noise impacts. A downward trend was evident across 2013-2014 with the progressive roll out of noise attenuated trucks. The downward trend continued for Werris Creek in 2014-2015 but not for Quipolly due relocation of SentineX 95 closer to WCC and therefore higher mining noise levels. The influence of seasonal changes can be seen with noise levels higher in winter (inversions) and lower in summer.

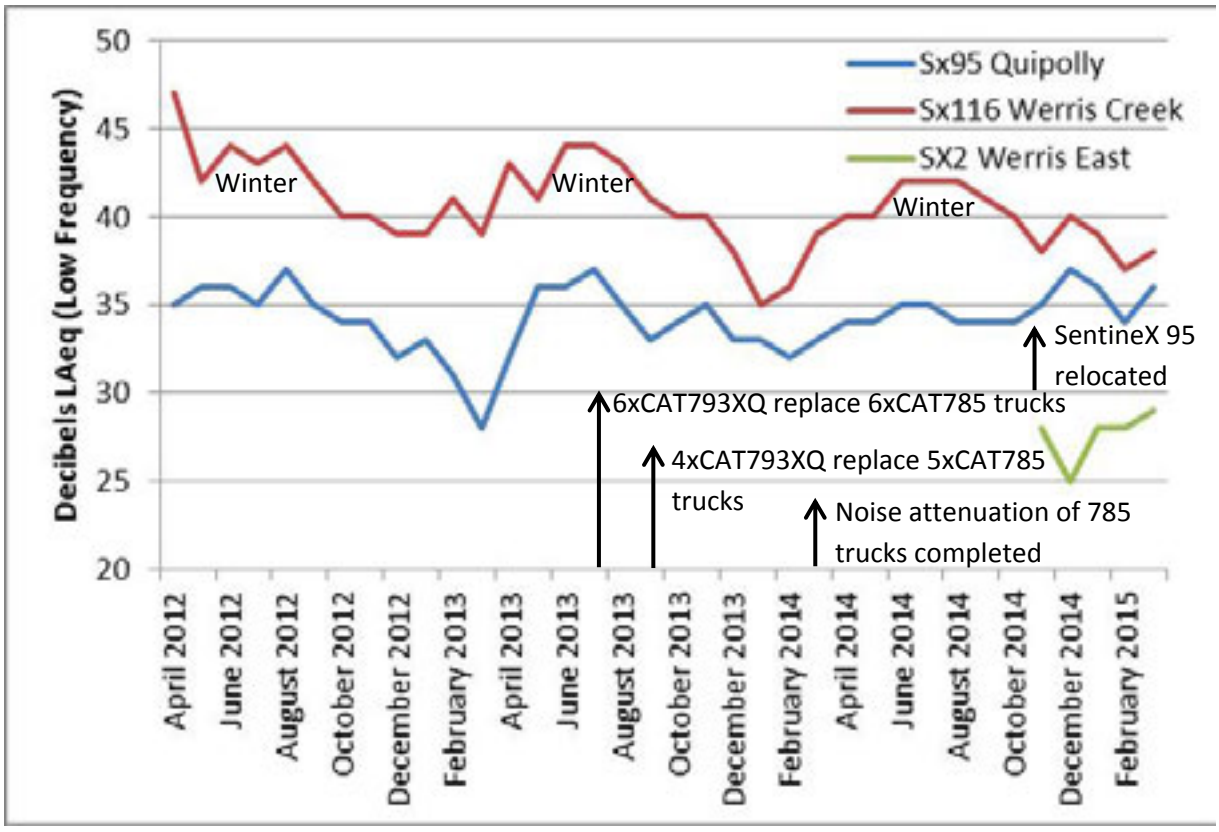


Figure 3.18 WCC Monthly Median Night Time Continuous Noise Levels for 2012-2015

Table 3.53 presents a comparison between 2012-2013, 2013-2014 and 2014-2015 night time only noise levels during assessable weather conditions. Because the data includes ambient noise sources (particularly Werris Creek), it cannot be directly compared with the noise criteria. The continuous noise monitoring for LAeqLF indicates that WCC is achieving its long term night time noise goal of 35dB(A) (PA10_0059 Schedule 3 Condition 4e) for the Quipolly and Werris East residences despite the change in location of the SentineX 95 continuous noise monitor closer to WCC.

Table 3.53 Annual Summary of Continuous Noise Monitoring Data

	Evening/Night Only dB			2012-2013	2013-2014	2014-2015
Decibels – dB(A) Leq 15 minute	Quipolly – SentineX 95 (Sx95)	LA1	Min	42	43	39
			Med	55	55	52
			Max	69	71	64
		LAeq	Min	31	31	31
			Med	39	39	38
			Max	50	51	49
		LAeqLF	Min	28	29	27
			Med	34	34	35
			Max	40	40	39
		L90	Min	22	22	23
			Med	32	31	30
			Max	42	43	43
	Werris Creek – SentineX 116 (Sx116)	LA1	Min	45	44	45
			Med	53	51	57
			Max	60	57	68
		LAeq	Min	38	37	35
			Med	45	43	43
			Max	50	49	49
		LAeqLF	Min	34	33	30
			Med	42	40	40
			Max	47	46	45
		L90	Min	30	31	26
			Med	38	37	35
			Max	43	42	42
	Werris East – SentineX 2 (Sx2)	LA1	Min	-	-	39
			Med	-	-	49
			Max	-	-	62
		LAeq	Min	-	-	30
			Med	-	-	39
			Max	-	-	47
		LAeqLF	Min	-	-	19
			Med	-	-	28
			Max	-	-	40
		L90	Min	-	-	24
			Med	-	-	34
			Max	-	-	41

3.8.4 Noise Management Annual and Complainants Review

A summary of noise complaints received by WCC since operations commenced in 2005 is presented in **Table 3.54**. Since 2005, noise complaints previously represented over a quarter of all complaints received by WCC until the previous reporting period where noise complaints fell to represent only 11% of the total complaints in 2013-2014 and again further falling in 2014-2015 to only 4% of total complaints during the period. Achieving full attenuation of the entire truck fleet at WCC during 2013-2014 coincides with the significant reduction in noise complaints. These three noise

management measures together have achieved no noise complaints from any Quipolly residents for the last two reporting periods. Unfortunately Werris Creek community now accounts for the majority of noise complaints and there is a risk that noise complaints could increase as WCC operations move closer to the town. However the results demonstrate that noise management through the successful implementation of the three noise management measures over 2014-2015 can achieve a reduction in noise complaints gives WCC full confidence that noise impacts can be mitigated going forward.

As mentioned above, the total number of noise complaints has been reducing each year since 2012. However one individual Werris Creek complainant still registers noise complaints allegedly relating to the Rail Load-Out Facility however these complaints are found to be actually in relation to train shunting and other rail activities in the Werris Creek Rail Yard, which is a separate facility within Werris Creek township itself, and is unrelated to WCC operations. The two noise complaints relating to mining operations occurred during periods on early mornings with southerly winds towards Werris Creek and mining noise was audible after commencing operations at 6am after the night shift finished at 2:30am, but on each occasion noise levels were found to below the 35dB(A) criteria.

Table 3.54 WCC Noise Complaints since 2005

Complaint Issue	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Noise – Mine	1	3	4	10	4	6	15	15	2	2
Noise – Rail Load Out	0	0	0	0	0	7	17	6	9	2
All Complaints (inc. Noise)	**8**	**10**	**7**	**16**	**12**	**52**	**117**	**56**	**93**	**95**
From the one Werris Creek Complainant - Noise	0	0	0	0	0	7	17	6	7	2
From the one Quipolly Complainant - Noise	0	0	0	0	0	2	11	12	0	0

WCC performance against the Environmental Management System noise related objectives and targets developed from the NMP for the period 1st April 2014 to 31st March 2015 is outlined in **Table 3.55**. WCC achieved three out of the four targets set for noise related objectives. Unfortunately the two noise exceedance were outside the planned target. The number of noise complaints related to the mining noise from the open cut achieved the target of 2 (a 10% reduction on 2013-2014), which is a significant reduction in noise complaints from earlier periods. Implementation of the real time noise monitoring and the noise control operator process has been successful in reducing noise complaints, all the while WCC has ramped up the production rate. By setting the Quipolly continuous noise monitor trigger level at 35dB(A) ensures that WCC is using its best endeavours to achieve PA10_0059 MOD1 Schedule 3 Condition 4(d) long term noise goal.

Table 3.55 Noise Objectives and Targets 2014-2015

Activity	Objective	Indicator	Actual 2014-2015	Target 2014-2015	Actual 2013-2014	Actual 2012-2013	Actual 2011-2012
Noise	Noise Criteria	# Exceedances	**2**	**0**	4	0	0
	Open Cut Complaints	# Complaints	**2**	**2**	2	15	15
	Train Load Out Facility Complaints	# Complaints	**2**	**8**	9	6	17
	Complaints	# Complainants	**2**	**2**	3	4	5

Red – Exceeded Target.

As required by PA 10_0059 Schedule 5 Condition 3, WCC as part of this Annual Environmental Management Report undertakes an annual review of its noise management for 2014-2015. **Table 3.56** summarises the noise annual review from the information above.

Table 3.56 Noise Management Annual Review 2014-2015

Annual Review	Discussion
Monitoring Results	• Criteria Two exceedances of the NMP noise criteria were identified from attended noise monitoring during the reporting period. • Previous Year Attended noise monitoring and the Werris Creek continuous noise monitor demonstrate a year on year decrease in noise levels. • EA Predictions Mining noise at R96 and R97 was higher than the Project Specific Noise Level predicted in the EA. In both occasions, worse case meteorological conditions exacerbated by source to receive wind directions resulted in the minor exceedances of the EA predictions.
Complaints	• This Year Only four noise complaints were received for 2014-2015. • Previous Year The total number of noise complaints has reduced due to attenuation of the truck fleet during the reporting period.
Compliance	• Criteria and other Two exceedances of the NMP noise criteria were identified from attended noise monitoring during the reporting period. • Objectives & Targets WCC achieved three out of the four targets set for noise related objectives. WCC did not achieve a zero noise exceedances.
Data Trends & Predicted Impacts	Attended WCC (mining) only noise levels demonstrate a year on year decrease in noise levels at a majority of noise monitoring locations since the commencement of the LOM Project. Except for the measured noise exceedances that occurred under individual location specific worse case conditions; WCC (mining) only noise levels are below the longterm noise goal.
Improvement Actions	Noise management improvement actions planned for 2014-2015: • Third continuous noise monitor at Werris East was installed in November 2014 to be representative of properties to the east of WCC in response to recent noise exceedances. • Three new private agreements signed with local residents. Noise management improvement actions planned for 2015-2016: • Monthly review/analysis tool developed for continuous noise monitoring data.
Management Plan Review	All management strategies and actions were implemented during 2014-2015.
Management Plan Revision	WCC needs to update NMP due to the submitted Environmental Assessment for PA 10_0059 MOD2 for two minor changes in overburden emplacement requiring the noise model to be updated for 18 operating trucks due to long hauls and calibration of the noise model in response to attended noise monitoring measuring noise levels higher than original predicted in the LOM Environmental Assessment.

3.9 VISUAL AMENITY

3.9.1 Management

Various mining activities and/or features of WCC are visible from local and distant vantage points including the elevated residences in Werris Creek to the north-east, residences to the south in Quipolly and from Werris Creek Road.

Management controls to minimise the potential visual and light related impacts include:

- Tree screen plantings along the eastern (Werris Creek Road side) and south-east perimeter of WCC and the eastern and southern margins of the train load-out area;
- Undertaking activities in accordance with the various management plans applicable to the mine, all of which incorporate safeguards which indirectly reduce visual impact;
- Minimising the extent of land disturbance / clearing in advance of mining;
- Progressive rehabilitation of disturbed areas;
- Sympathetic positioning and direction of lights to avoid them impacting on local residences in accordance with AS 4282:1997;
- Acquisition of a number of properties to the east, north and west of operations;
- Instructing rail operator contractors locomotive headlights to be low beam when on the rail siding;
- Installation of lighting at the train loading facility in accordance with AS 1680.2.4:1997 and their use only when the facility is in operation; and
- Lighting monitoring camera established on the southern edge of Werris Creek township facing the mine site to monitor in real time and provide a daily summary of lighting emissions for feedback to production personnel to mitigate potential impacts and also to verify community complaints.

3.9.2 Performance

WCC has acquired all adjacent properties with direct views into the open cut pit. As a consequence, the potential for visual impacts (in pit) from the operation on surrounding landholders has been removed. Management of visual impacts has therefore moved further afield to focus on receptors that have views of the overburden emplacement in Quipolly, Werris Creek and Werris Creek Road.

During the reporting period, WCC completed 27.59ha of rehabilitation along the western rehabilitation area and another 13.5ha of temporary rehabilitation on the MIA Bund. A tree screen along Werris Creek Road was planted in 2005 while an additional visual bund was completed and planted with wattles and White Box tubestock in September 2010. The road side tree screen is quiet prominent and becoming increasingly effective at mitigating views of mining operations (**Figure 3.19** and **Figure 3.20**). WCC anticipated that visual amenity issues will arise with approval of the LOM Project allowing the northward continuation of mining from the current position 4km south to 2.6km south of Werris Creek. The visual amenity bund will provide a visual and acoustic barrier to mining operations in the later years of the LOM Project with two thirds of the bund now built and rehabilitated. The tree screen planted in front of the bund in 2010 with a combination of wattles and

White Box and to date growth rates have been excellent over four year since being planted (**Figure 3.21**). The remainder of the visual amenity bund will be constructed in the 2015-2016 period.

Figure 3.19 View of WCC Eastern Rehabilitation from Werris Creek Road view towards the south

Figure 3.20 Werris Creek Road Tree Screen and Visual Screen view towards the north

Figure 3.21 WCC LoM Visual Bund and Tree Screen planted to the east of "Cintra"

During the reporting period, WCC received zero complaints relating to lighting impacts which is down from the previous period of eight visual amenity complaints (**Table 3.57**). The lighting camera has given WCC management confidence that lighting impacts are being appropriately managed by being able to verify what, if any, mine lighting is visible from Werris Creek. The reduction in lighting complaints is in part due to improvements to the lighting camera with the latest image able to be reviewed in near real time providing improved awareness on site and feedback (**Figure 3.22**) and also additional improvement projects. WCC also had the external fixed lights at the Train Load Out independently assessed as being compliant to AS4282:1997 Control of the Obtrusive Effects of Outdoor Lighting as well as replacing dozer headlights from LED/HID to standard original equipment manufacturer specified lights that are still safe to operate but are not as illuminesent. Of the 42 complaints received since 2010, 40 complaints have come from the one complainant located in Werris Creek.

Table 3.57 Summary of Visual Amenity Complaints since 2010

Visual Amenity Complaints	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Lights (Mine)	13	10	2	3	0
Lights (Rail Load Out)	2	3	4	5	0
All Complaints	52	117	56	93	95
From the one Werris Creek Complainant	13	13	6	8	0

Figure 3.22 Werris Creek Lighting Monitoring Camera facing towards WCC

3.10 HERITAGE MANAGEMENT

3.10.1 Predicted Impacts from LOM Project

The LOM Environmental Assessment determined that the LOM Project would not result in any future adverse impacts on Aboriginal cultural heritage. The impact associated with the removal of the remnant features of the former Werris Creek Colliery is considered to be minor, as the historic sites do not meet the NSW Heritage Office (2001) criteria for high significance sites (even at a local level) (Landskape, 2010).

3.10.2 Monitoring Program

WCC previously undertook quarterly inspections of the only known significant Aboriginal heritage item onsite – the "Narrawolga" Axe Grinding Grooves. One unknown historic heritage item was unearthed on night shift 20th March 2015 while mining the former underground workings (**Figure 3.23a&b**).

Figure 3.23 a left Duckbill Loader helped to the surface by an Excavator & b right at the surface

3.10.3 Management Measures

An amendment to the Heritage Management Plan was approved on the 1st December 2014 following a request from the Nungaroo Local Aboriginal Land Council and the Liverpool Plains Shire Council Aboriginal Advisory Committee to relocate the Narrawolga Axe Grinding Groove Rocks from WCC to the Willow Tree Visitor Information Centre for public display. A Care Agreement was signed between Gordon Nean (Custodian on behalf of Nungaroo Local Aboriginal Lands Council) and Office of Environment and Heritage on the 19th January 2015 for the transfer of Aboriginal objects for safe keeping under the National Parks & Wildlife Act 1974, and WCC relinquished future management and responsibilities. This replaced the previous commitment of returning the rock artefacts to the rehabilitation area at the end of mining. No previously unknown Aboriginal sites or artefacts were discovered during 2014-2015.

The Heritage Management Plan outlines additional heritage management actions related to items associated with the former underground and these have been completed. All other known items related to the former underground mine had minimal historical value and will be destroyed in the course of mining. If any previously unknown heritage items related to the former underground mine or are of aboriginal origin are found, WCC will have an archaeologist assess the historical significance of each identified item.

3.10.4 Management Performance

The Narrawolga Axe Grinding Groove Rocks were relocated from the temporary storage facility at WCC (**Figure 3.24**) to the Willow Tree Visitor Information Centre on 15th April 2015. The relocation project was the culmination of 13 months of planning including:

- Ten sandstone boulders with 43 axe grinding grooves (AHIP #2588) originally relocated from the mining footprint at WCC in 2007;
- Detailed consultation with Liverpool Plains Shire Council and Nungaroo Local Aboriginal Lands Council both during the preparation of the amended Heritage Management Plan, prior to and also during the relocation day;
- Specialist lifting contractors recommending slings to cradle the rocks to prevent damage (**Figure 3.25**);

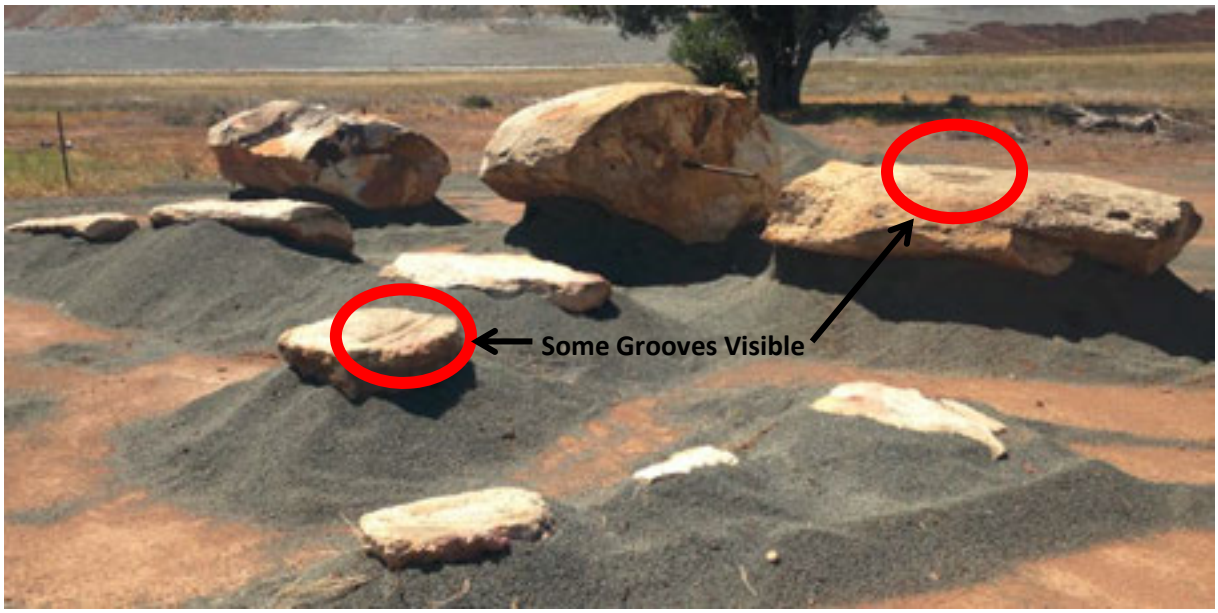


Figure 3.24 Narrawolga Axe Grinding Grooves Temporary Storage Location on Eurunderee

Figure 3.25 65t Crane undertaking a controlled lift of 8t artefact rock

- Earthwork contractors for site preparation and advise on transportation strategies;
- Geotechnical engineer identifying joint planes to avoid, and other less competent areas; and
- Archaeologists developing management strategies, completing regulatory paperwork and documenting relocation.

The Narrawolga Axe Grinding Grooves rocks will become an integral part of the tourist attraction "The Kamilaroi: A Highway and a People Project". The Willow Tree Visitor Information Centre is located near to the junction of the New England and Kamilaroi Highways and will promote the fact that the Kamilaroi Highway is the only highway in NSW named after an Aboriginal nation. Advitech (2015b) documented the relocation and completed an updated site card; with eight of the rocks successfully transferred but one rock fracturing not impacting any grooves and another rock fracturing during transport due to being damaged previously during the 2007 relocation. The new site at Willow Tree Visitor Information Centre will be officially opened in 8th July 2015 as part of Naidoc Week (**Figure 3.26**).

In accordance with the Heritage Management Plan, the Liverpool Plains Shire Council Heritage Advisor was contacted following the discovery of the potential historical heritage item. The Heritage Advisor indicated that it was possibly be a Duckbill Loader (circa 1940s to 1950s) representative of the early mechanisation phase of coal mining in NSW and potentially significant due to the fact it is rare for loaders of this era have been uncovered. It was recommended that the Duckbill Loader be donated to the Gunnedah Rural Museum for conservation. WCC plans to transport the loader to the museum as part of it coal mining heritage display in the next reporting period.

WCC did receive one heritage complaint and no heritage non-compliances during the period and achieved the one heritage related objective and target. The heritage complaint was in relation to the fact that there had been no watering of Narrawolga grinding groove rocks as per 2007 Heritage Management Plan, increasing the risk of rocks breaking during the relocation. WCC consulted with Liverpool Plains Shire Council and Nungaroo Local Aboriginal Lands Council determining that watering of the rocks could actually increase the likelihood of damage and therefore is not required. WCC complied with all management strategies and actions in the Heritage Management Plan. Up until the relocation, the quarterly inspections did not identify any changes in the condition of the Narrawolga axe grinding groove rocks during the period; with no aboriginal groups requesting to inspect the site prior to the relocation.

3.11 SPONTANEOUS COMBUSTION

3.11.1 Propensity

Self Heating Temperature (SHT) determinations for the B to G seams at the Werris Creek Coal Mine were undertaken during the preparation of the "*Werris Creek Coal Mine Life of Mine Project Environmental Assessment* (R.W. Corkery and Co., 2010)" and showed the:

- Coal from the B, C and G seams to have a theoretical high spontaneous combustion potential;
- Coal from the D, E and F seams to have a theoretical medium spontaneous combustion potential; and

The overburden and interburden have a very low spontaneous combustion potential due to their low percentage of inorganic sulphur and the absence of unoxidised coal.

Figure 3.26 Narrawolga Axe Grinding Grooves Rocks at Willow Tree Visitor Information Centre

3.11.2 Occurrence and Management

WCC has a Spontaneous Combustion Management Plan that all operators work to if spontaneous combustion occurs in coal stockpiles at either the rail load-out facility or coal processing or within the open cut area (i.e. former underground workings). This management plan also outlines the identification of spontaneous combustion, the preventative actions to reduce occurrences of spon comb, the correct handling and remediation procedures and reporting of spontaneous combustion.

There were a number of instances of spontaneous combustion on site during the reporting period, particularly in relation to the former underground workings and the adjacent ground. The particular area of the former underground workings known as Panel 1 has previously been on fire and mining potentially exposes hot ground to oxygen requiring additional management (i.e. water curtains and sprinklers) to suppress the hot ground prior to mining. The coal associated with the former underground workings has the propensity for self heating and spontaneous combustion can occur when the former underground workings are being mined. Two odour complaints (6th and 9th March 2015) were recorded during the period that were allegedly in relation to spontaneous combustion. Due to different wind directions present at the time of the complaints and long distances (>4km) between the complainant and WCC, it is not possible to confirm the source of the odour. However instances of spontaneous combustion are managed by the use of water curtains or sprinklers to suppress hot areas plus uncovering and mining the workings quickly and soaking any hot coal immediately. Smaller areas of spontaneous combustion can occur in the dumps or coal stockpiles but are attended to as soon as practicable. On each occasion of odour from spontaneous combustion, it was unlikely to contain harmful levels of SO_2 or H_2S because no alarms from personal gas detectors of employees occurred at the time of each complaint.

3.12 FIRE MANAGEMENT

3.12.1 Management

The exclusion of grazing and agriculture from the BOA will aid restoration of the woodland vegetation communities; however, if not adequately managed, increasing biomass and fuel loads may create a fire hazard and create an imbalance between fire tolerant and fire sensitive species. The objectives of fire management across the BOA are:

- The protection of human life and safety;
- WCC mining operation asset protection and business continuity;
- Other infrastructure and rural asset protection on WCC owned land and adjacent private property; and
- Protection and maintenance of biodiversity within the BOA.

To achieve these objectives, WCC commissioned a bushfire consultant to develop a Fire Management Strategy (FMS) to quantify current BOA fuel loads and determine what management actions are required. The FMS outlines the management actions to be implemented by WCC including hazard reduction, ecological burns and maintenance of firefighting capabilities for the period 2013 to 2015.

3.12.2 Performance

During 2014-2015, management measures included the maintenance of fire breaks and tracks/access across the entire BOA. The second annual ecological burn program was undertaken in Winter 2014 in accordance with the BOMP targeting areas adjacent to Whitehaven Coal assets on Railway View and the WCC mine site. Planning for the controlled burns commenced in May 2014 between a fire consultant/contractor and the NSW Rural Fire Service. Preparation for the burns was undertaken between June and August 2014 including slashing perimeters, removing fences, installing buffer zones around sensitive vegetation, coarse woody debris and stag trees to minimise the loss of any resources or revegetation. The control burns were managed by NSW Rural Fire Service with the fires lit on 2nd and 3rd August 2014 and 6th September 2014 covering 110.8ha of the BOA (**Figure 3.27**).

To achieve both the hazard reduction and ecological benefits; cool burn techniques were used which involves burning on cool days and into the wind which also improves safety during the activity (**Figure 3.28**). This technique combusts the organic matter above the ground but does not scorch the ground leaving some ground cover from which the grasses will regenerate from (**Figure 3.29**). The timing of the winter burns is after the native grasses have seeded but before the native herbs and forbs germinate and flower. Fire is useful for removing biomass and weeds giving natives a competitive advantage and more access to resources to hopefully improve woodland restoration outcomes. WCC exceeded the annual controlled burn target of 100ha; catching up on the shortfall from the only 60ha burnt in 2013. During the period, a stubble fire ignited by a lightning strike burnt 100ha on the Cintra property and rail maintenance on the Great Northern Rail Line burnt a 7ha patch on the Greenslopes property adjacent to the BOA.

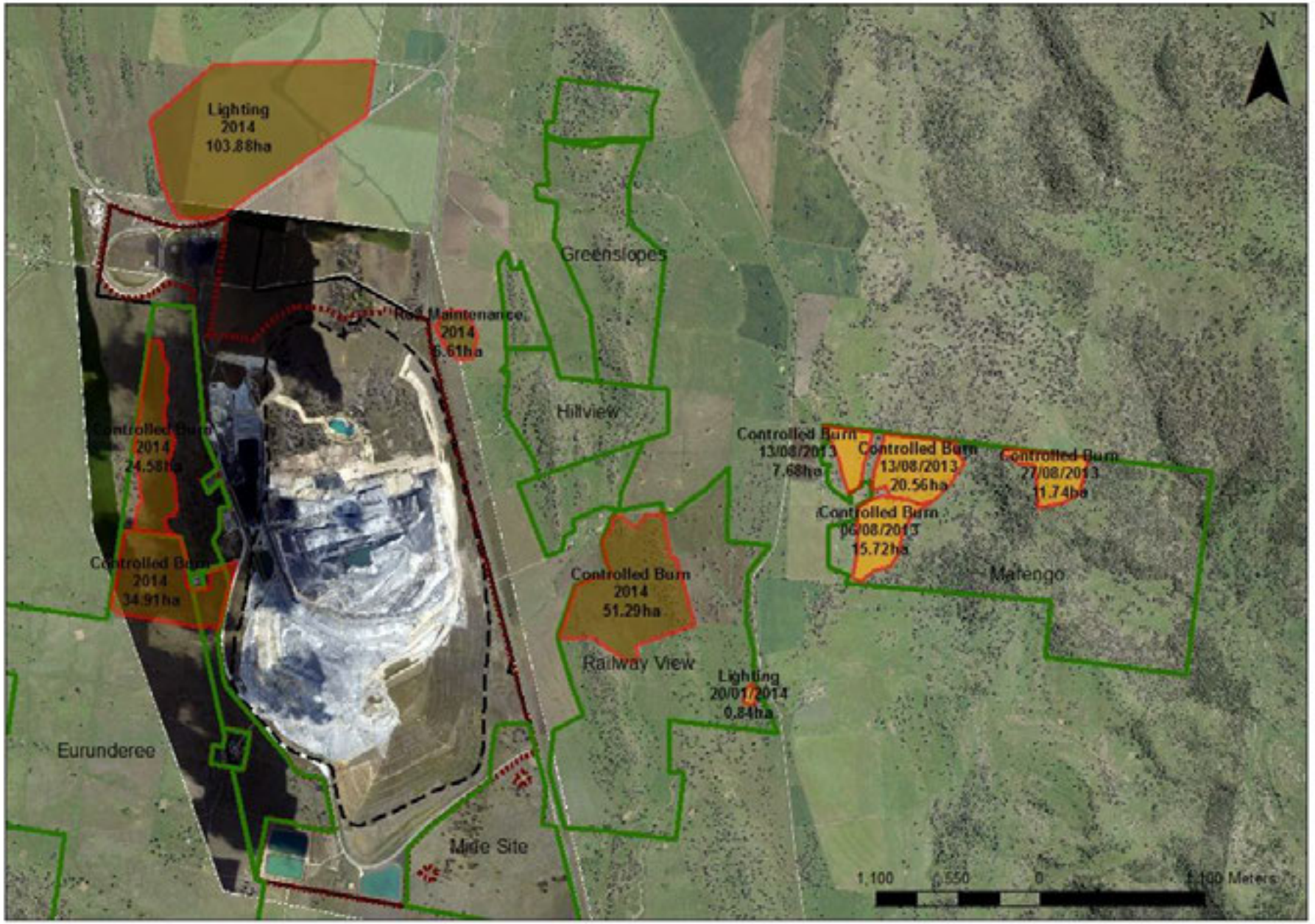


Figure 3.27 WCC BOA Ecological Burns and Other Fires between 2013 to 2015

Figure 3.28 NSW Rural Fire Service patrolling the edge of the Eurunderee BOA Controlled Burn

Figure 3.29 Cool burn leaves grasses unburnt at ground level and does not scorch revegetation

3.13 MINE SUBSIDENCE

Mine subsidence associated with the former underground colliery is managed by WCC by implementing a risk assessment and exclusion zones for areas with shallow cover either on natural surface or where the workings will be intersected as the mining operations progressively head north. Previous survey investigations have been undertaken to ascertain the positioning and location of the underground bord and pillar operations. Internal procedures have been implemented and are enforced to remove the possibility of any vehicles or persons entering areas where old mine shafts or ventilation shafts may occur.

3.14 METHANE DRAINAGE / VENTILATION

Methane drainage/ventilation is not considered an issue at WCC.

3.15 PUBLIC SAFETY

3.15.1 Management

WCC is located 4 km south of Werris Creek township and is accessed from Werris Creek Road. The access road into the mine is locked when no mine-related personnel are on site. The site is fenced and appropriate signs are installed with regular security patrols present on weekends.

Trucks carrying product coal to the Train Load Out Facility are required to travel at low speed through the intersection with Escott Road, after giving way to any approaching traffic travelling along Escott Road. Gates are positioned on either side of Escott Road and are locked to prevent public access outside of operational hours. Visitors to the mine are required to report to the mine office and unauthorised personnel are not permitted to move around the mine area unaccompanied. WCC conducts site visits as required for approved visitors. Procedures are in place to ensure the area around each blast site is clear of personnel and that all surrounding residents are advised in advance of proposed blasts.

3.15.2 Performance

There was one incidence of unauthorised access on site during the period with protestors chaining themselves to the Escott Road gates and placing a banner off the truck loading bin at the Coal Processing plant. Whitehaven Coal has now leased and negotiated the purchase of the Escott Road reserve from Liverpool Plains Shire Council. Escott Road is now a private road with only Zeolite Australia employees and customers, “Cintra” and “Escott” tenants permitted to use the road.

3.16 FERAL ANIMAL CONTROL

3.16.1 Management

WCC have devised a strategy for the management of vertebrate pest and overabundant native herbivore species based around routine monitoring of vertebrate pests and native herbivores in accordance with the BOMP. Vertebrate pest management in the BOA will focus on foxes and feral pigs, however other pests are likely to be present periodically and their control will be undertaken if practical. These species have the potential to have detrimental effects on the biodiversity of the BOA. Vertebrate pests are known to impact upon native species diversity through competition with native predators and through predation of native fauna, including birds (threatened and non-threatened woodland birds), small mammals and reptiles. Feral pest and native herbivore

management is to be undertaken in a responsible and humane fashion. Surveillance of pests is undertaken by informal (observation); quarterly inspections and annual sand pad monitoring using this information for planning and to set priorities for pest management. WCC utilises only qualified contractors that hold appropriate pesticide accreditation in accordance with the Pesticides Act 1999. In accordance with the legislation, WCC retains copies of the accreditation and records of pest control program.

3.16.2 Performance

WCC undertook the annual sand pad monitoring program in November 2014 across the BOA at the locations presented in **Figure 3.30**. Annual sand pad monitoring program involves placing a 3m wide row of fatty orange sand across tracks or other areas of concentrated movement by fauna to get footprints in the sand that can be used to identify what species are present. The results of the annual sandpad monitoring identified that both the Eastern Grey Kangaroos (Macropod) and Foxes did not change as high and medium abundance respectively from the previous winter; with all other pest abundance as scarce (**Table 3.58**) based on NSW DEC and CSIRO (2005) sandplot methodology abundance ratings for ground-dwelling vertebrates in NSW.

Figure 3.30 Annual Sandpad Monitoring Locations for 2014

Table 3.58 Results of Annual Sandpad Monitoring

Target Species	% Plot Nights Winter 2012	Abundance Score Winter 2012	% Plot Nights Winter 2013	Abundance Score Winter 2013	% Plot Nights Spring 2014	Abundance Score Spring 2014
Fox	48.8%	High	21.3%	Medium	23.3%	Medium
Macropod	41.6%	High	29.3%	High	35%	High
Rabbit	3.5%	Low	4%	Low	1.6%	Scarce
Pig	1.2%	Scarce	0%	Scarce	-	-
Hare	0%	Scarce	4%	Scarce	-	-
Dog	0%	Scarce	0%	Scarce	0%	Scarce
Cat	-	-	-	-	1.6	Scarce

Based on the results of the sandplot abundance scores, WCC coordinated three vertebrate pest control programs in June 2014 (**Figure 3.32**), November 2014 (**Figure 3.33**) and February 2015 (**Figure 3.34**) focusing on 1080 baiting targeting foxes and shoot/cull program for overabundant Kangaroos across the BOA. The results for the fox control programs with a poisoned bait (1080) take rate of 25.9% in Winter 2014, 24.0% in Spring 2014 and 11.8% in Summer 2015 (**Figure 3.31**). The decrease in the bait take rate is expected over time due to constant pressure from consistent seasonal programs that were increased to quarterly frequency during the year. There was a high population of foxes across the WCC BOA due to no coordinated control programs prior to 2012. However the BOMP pest management strategies have successful to date with the annual sandpad monitoring indicating that the fox population is declining, which is a positive result for woodland restoration of the BOA. A total of 45 and 51 Eastern Grey Kangaroos were also culled from the two shooting programs in Winter 2014 and Summer 2015 respectively (**Table 3.58**). An open range shoot was undertaken on 22nd and 23rd December 2014 focusing on wild pigs on the Marengo BOA after monitoring cameras picked up several pigs coming into water with 6 pigs, 2 foxes and 2 hares destroyed. Another open range shoot on 7th April 2015 shot another 3 foxes and 3 rabbits.

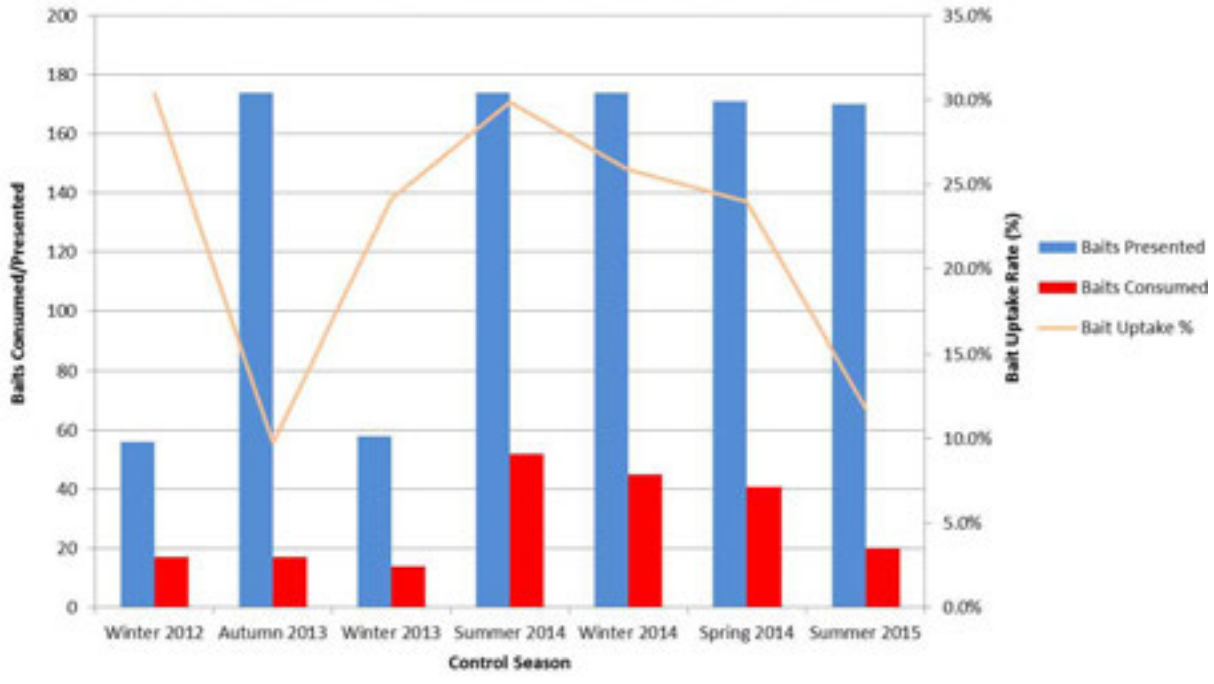


Figure 3.31 Annual Trends in the Fox Baiting (1080) Program since 2012

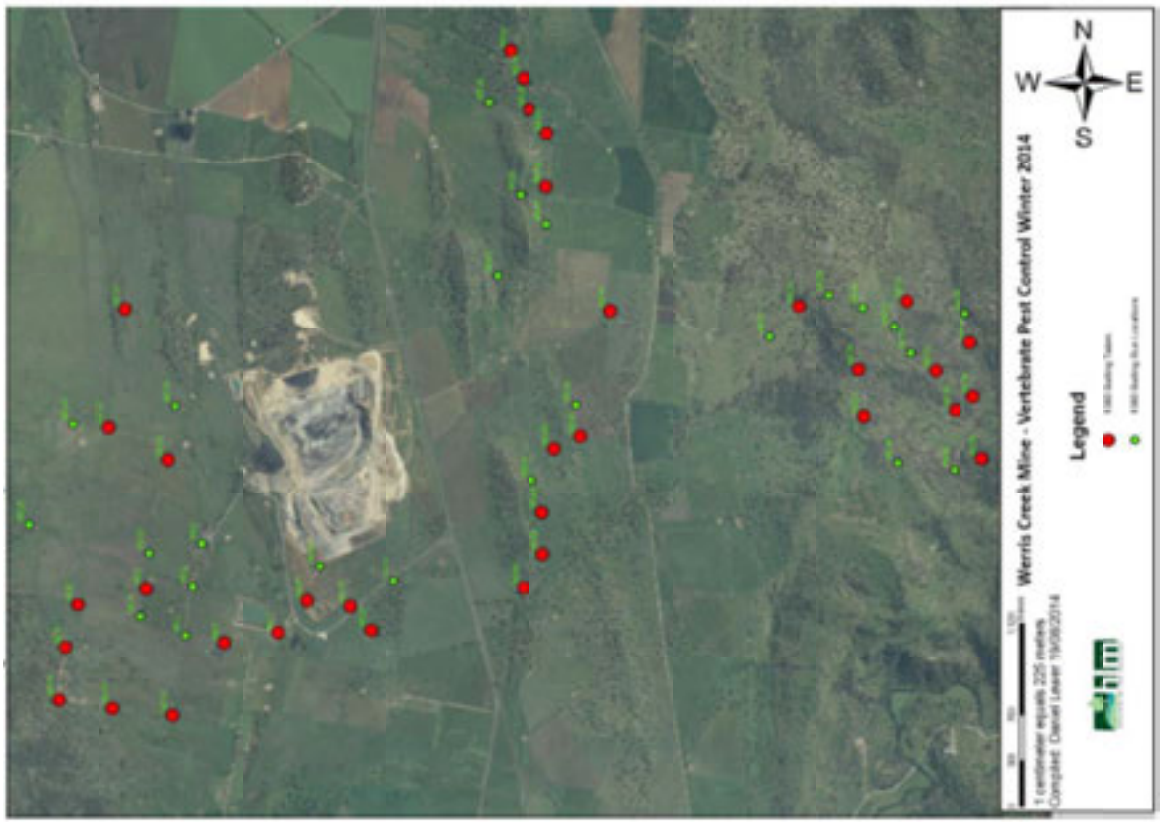


Figure 3.32 Fox Baiting (1080) Program Winter 2014 across WCC BOA

Red Circle – Bait Taken; Green Circle – Bait station with no takes recorded.

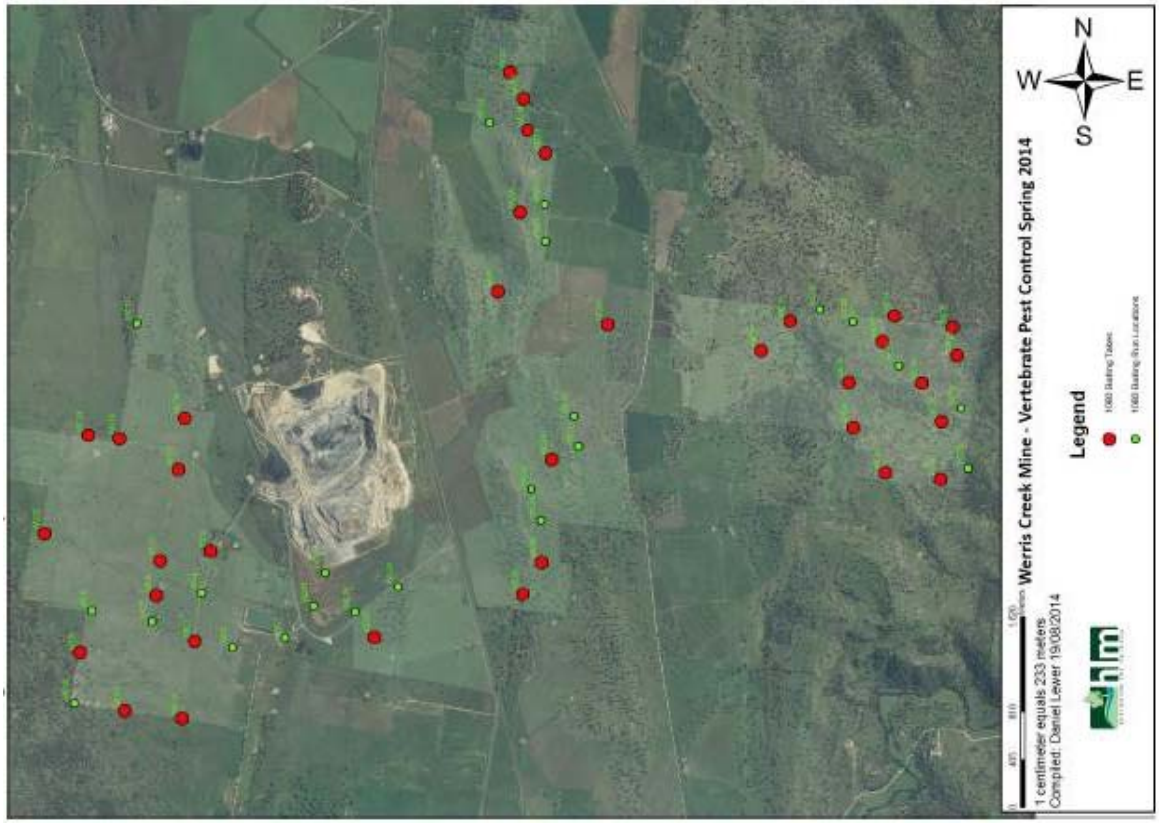


Figure 3.33 Fox Baiting (1080) Program Spring 2014 across WCC BOA

Red Circle – Bait Taken; Green Circle – Bait station with no takes recorded; Yellow Plus Sign – Pig Free Feed Sites.

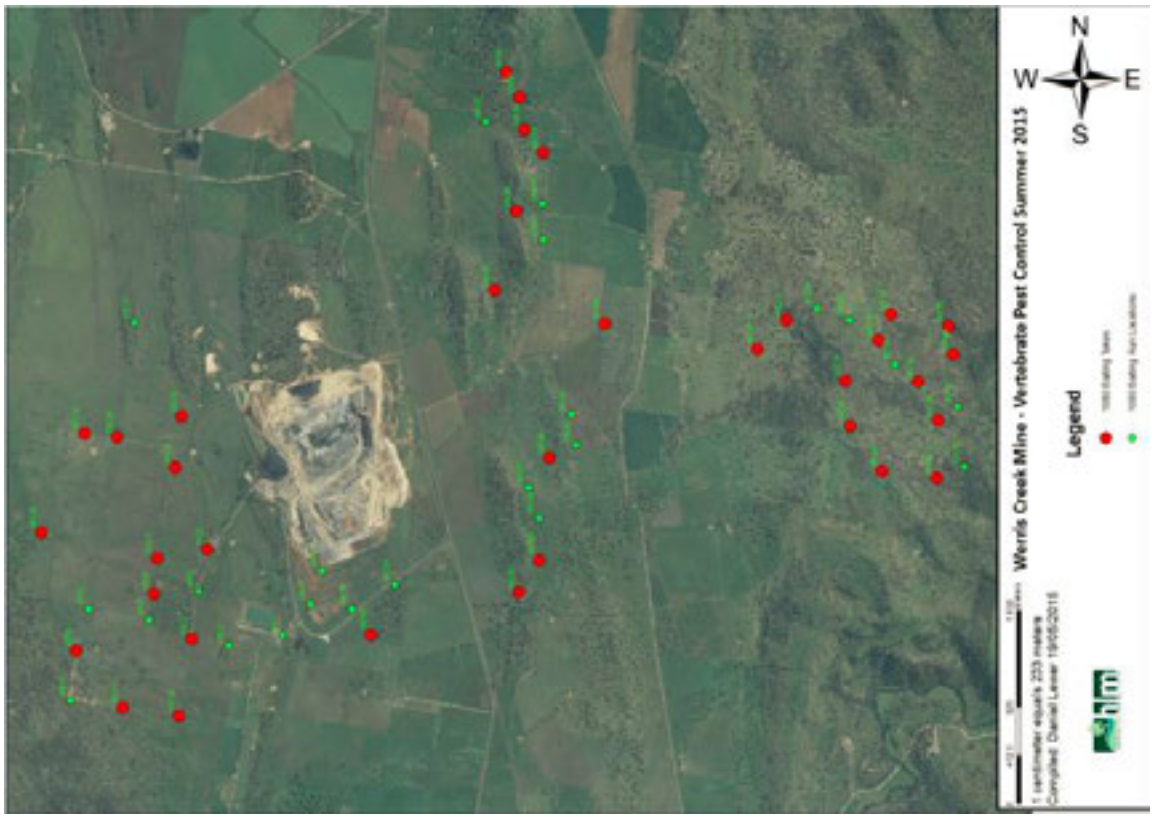


Figure 3.34 Fox Baiting (1080) Program Summer 2015 across WCC BOA

Red Circle – Bait Taken; Green Circle – Bait station with no takes recorded; Yellow Plus Sign – Pig Free Feed Sites.

3.17 METEOROLOGICAL MONITORING

WCC maintains an on-site weather station identified as "M2" (EPL 12290 EPA ID #9) located on the top level of the overburden emplacement (at final rehabilitated landform surface RL445m) as well as "M3" (EPL 12290 EPA ID #31) lower level temperature sensor (base of overburden emplacement area at RL373m). The direct measurement of the temperature difference between M2 and M3 over 80m is the method approved in EPL 12290 for WCC to measure temperature inversions.

In addition, WCC also maintains "mini" weather stations associated with the Continuous Noise Monitors ("M1"). "M2" is the main weather station utilised by WCC on a 10m mast which continuously monitors the meteorological parameters in **Table 3.59**.

Table 3.59 WCC "M2" Weather Station Meteorological Parameters

Parameter	Unit	Frequency	Period	Method	Serial	Calibrated/ Inspected
Rainfall	mm/h	Continuous	15 minute	AM-4	-	2/09/2014
Wind Speed @ 10m	m/s	Continuous	15 minute	AM-2 & AM-4	F7157	26/08/2014
Wind Direction @ 10m	°*	Continuous	15 minute	AM-2 & AM-4		
Temperature @ 2m	°C	Continuous	15 minute	AM-4	1409-3140	30/09/2014
Temperature @ 10m	°C	Continuous	15 minute	AM-4	1404-3121	27/05/2014
Sigma Theta @ 10m	-	Continuous	15 minute	AM-2 & AM-4	Not Applicable	Not Applicable
Solar Radiation	W/m^2	Continuous	15 minute	AM-4	1010	2/09/2014
Barometer	hPa	Continuous	15 minute	-	-	2/09/2014

Parameter	Unit	Frequency	Period	Method	Serial	Calibrated/ Inspected
Humidity	%	Continuous	15 minute	-	1405-8989	27/05/2014
Location Siting	-	-	-	AM-1, AM4 & EPL 12290 Special Method 2	Not Applicable	Not Applicable

* Degrees clockwise from true north.

"M2" weather station operates in accordance with EPL 12290 (including AM-1, AM-2, AM-4 and Special Method 2) and *AS 2923 -1987: Guide for measurement of horizontal wind for air quality applications*. The weather station maintenance and inspection is undertaken 6 monthly by a dedicated contractor and calibration of monitoring equipment is undertaken annually. **Table 3.60** summarises the rainfall and temperature records measured at WCC and compares the results with the longer term meteorological records for the Quirindi Post Office (1882-2010) approximately 11km away. **Table 3.61** presents the annual rainfall measured at WCC since 2005. **Appendix 9** provides the monthly summarises of meteorological data collected at WCC.

Over the 12 month period to the end of March 2014, WCC only recorded 513mm of rain which was the second lowest annual rainfall recorded since 2005 but only 15mm more than the lowest rainfall which was recorded last reporting period and nearly one-third below the long term annual average (**Table 3.61**). The 2014-2015 period was on average 0.3^{o}C cooler than the previous period with no prevailing trend (November hotter than average but December cooler than average). However the effect of the drier conditions over the last two years can be seen throughout this document, notably as increased regional dust levels (**Section 3.1**); no dirty water discharge events (**Section 2.8.1**); decreasing groundwater levels (**Section 0**); and declining condition of biodiversity (**Section 3.5.3**).

Figure 3.35 provides the monthly wind roses measured at WCC. The windiest time of the year is from July to November; with the typical seasonal pattern of dominant north westerly winds June to October (Winter) and dominant south easterly winds December to April (Summer).

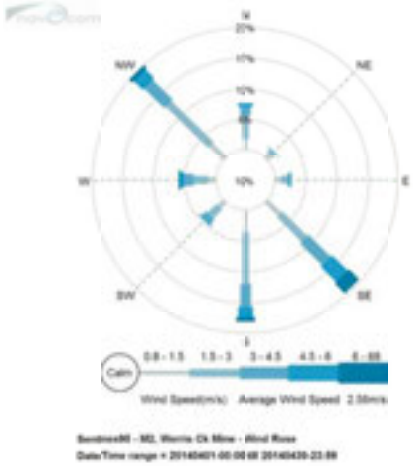
Table 3.60 Rainfall and Temperature Records for 2014-2015 Period

		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total
Rainfall* (mm)		32.4	25.4	46.4	27.6	40.2	38.8	7.6	31.2	145.2	74.6	17.2	34.2	513.4
BOM Average (mm)		41.6	44.2	51.1	48.3	44.8	46.6	59.8	65.8	80.0	80.5	65.6	53.5	682.2
Temperature	**WCC Min (^{o}C)**	8.3	4.1	1.9	1.0	2.4	5.0	5.6	10.4	12.8	11.9	12.6	10.6	1.0
	WCC Avg (^{o}C)	18.8	15.0	11.4	10.5	11.6	15.1	20.4	23.9	23.1	23.7	23.3	22.6	18.3
	WCC Max (^{o}C)	28.8	24.4	18.8	20.0	19.1	28.2	35.5	43.0	35.6	33.3	33.3	36.1	43.0
	Q BOM Max (^{o}C)	25.0	20.5	16.6	15.9	17.9	21.5	25.2	28.5	31.1	32.2	31.3	29.3	24.6
	Q BOM Min (^{o}C)	8.9	5.0	2.8	1.6	2.4	5.0	8.7	12.0	14.7	16.4	16.1	13.5	8.9
Average Lapse (^{o}C/100m)		+1.3	+2.3	+1.6	+2.2	+1.8	+1.7	+1.5	-0.3	-1.0	-0.5	-0.8	+3.6	-
90% Lapse (^{o}C/100m)		+6.4	+8.5	+7.5	+8.8	+8.6	+8.6	+9.6	+5.9	+2.9	+4.8	+0.5	+7.1	-

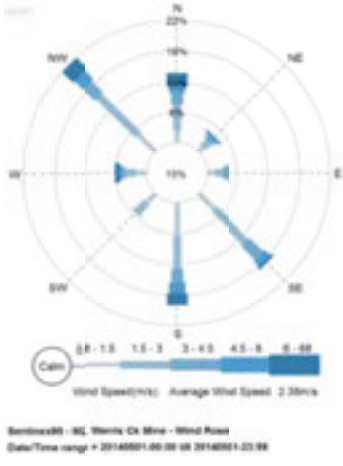
Note: BOM Average is the Quirindi Post Office Bureau of Meteorology long term monthly and annual rainfall average for 1882 to 2014. Q BOM Max and Min are Quirindi Post Office Bureau of Meteorology long term monthly and annual minimum and maximum temperatures for 1907 to 2013. * Rainfall is a compositive of the Sentinex meterology stations of onsite with noise trailer data.

Table 3.61 WCC Annual Average Rainfall since 2005

	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Annual Rainfall (mm)	591	559	753	869	605	817	794	786	498	513



April 2014



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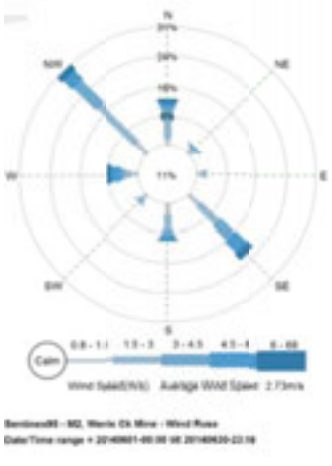

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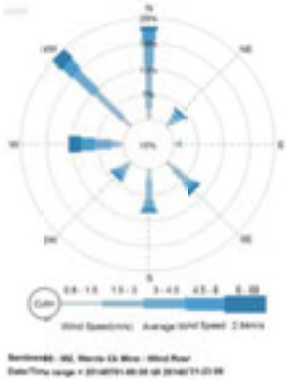

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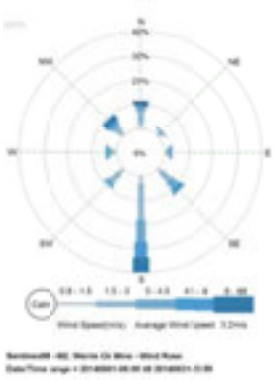
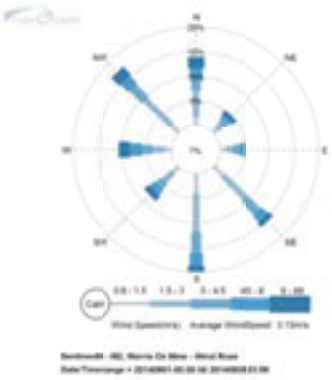


August 2014



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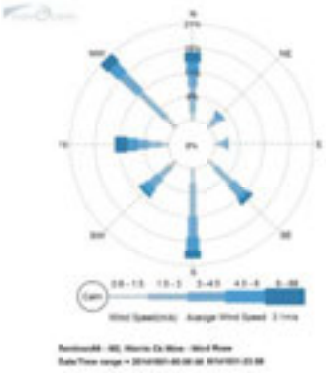

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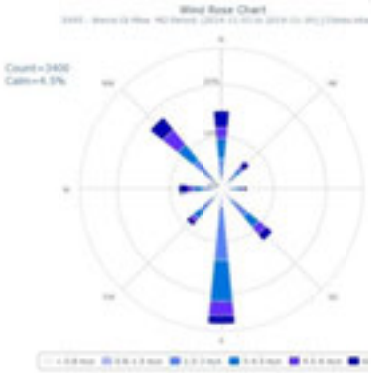

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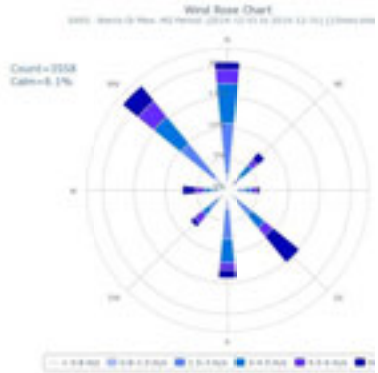

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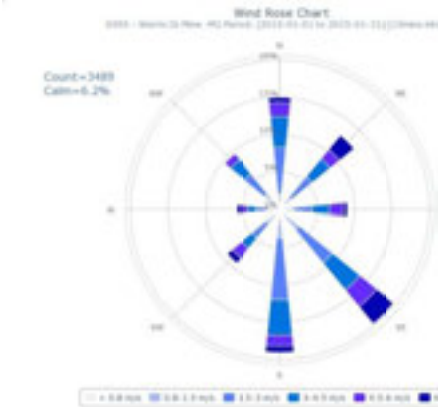

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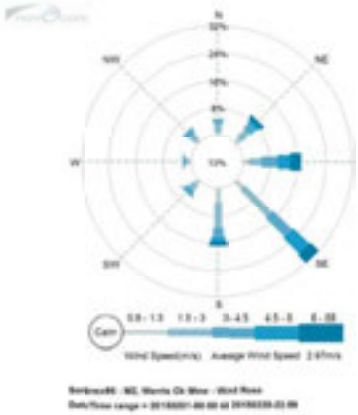

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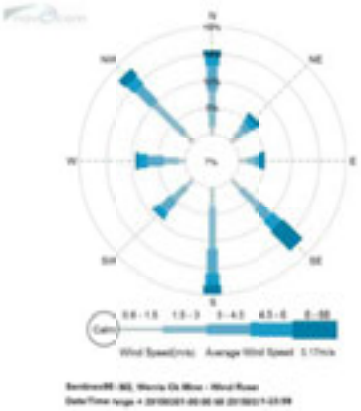

March 2015

Figure 3.35 WCC Windroses for April 2014 to March 2015

4. COMMUNITY RELATIONS

4.1 COMMUNITY COMPLAINTS

WCC maintains a designated community telephone complaints line (02) 6768 7001 which is regularly published via Whitehaven Coal website, community newsletters, in the local newsletter (the 'Werris Creek Flyer') and signposted on the front entrance to the mine site.

There were 95 complaints received by WCC for the 2014-2015 period, which was a slight increase from the previous year (**Figure 4.1**) but still down on the 2011-2012 period. Since the mine commenced in 2005, the trend of complaints has increased as the scale of mining operations increased and the decreasing distance to the nearest major town of Werris Creek with a population of nearly 1800 people. Complaint numbers increased in 2010, when the height of the overburden emplacement expanded increasing the height by 35m and progressed towards Werris Creek Road resulting in an increased visibility and awareness by Werris Creek residents to WCC operations. The overall increase in the number of community complaints has been driven by the increasing number of blasting complaints from 14 complaints in 2012-2013 to 55 complaints in 2013-2014 and to 59 complaints in 2014-2015; but is still below the 71 blasting complaints received in 2011-2012 (**Table 4.1**).

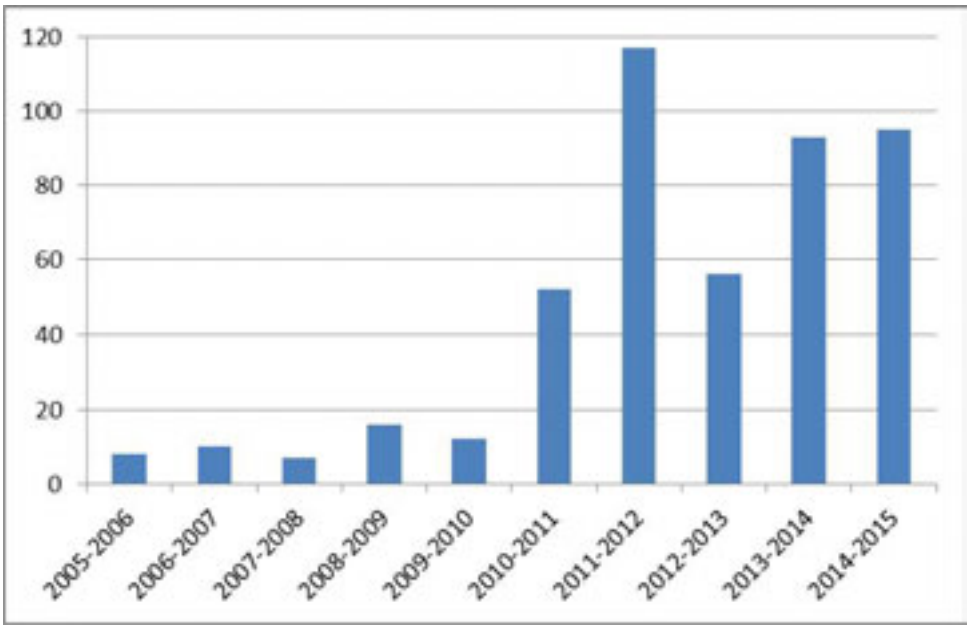

Figure 4.1 Total Number of Complaints Received by WCC from 2005 to 2015

The trend in location of complainants changed from Quipolly residents to Werris Creek residents as mining has moved away from Quipolly and closer to Werris Creek town. The increase in the number of complaints is also explained by the exposure of mining operations to the higher population density of Werris Creek residents, rather than the lower population of Quipolly. For four out of the last five reporting periods, Werris Creek residents have represented over 80% of the community complaints (**Figure 4.2**). All immediately adjacent properties have been acquired by WCC and hence, no complaints from adjacent properties have been recorded since 2008.

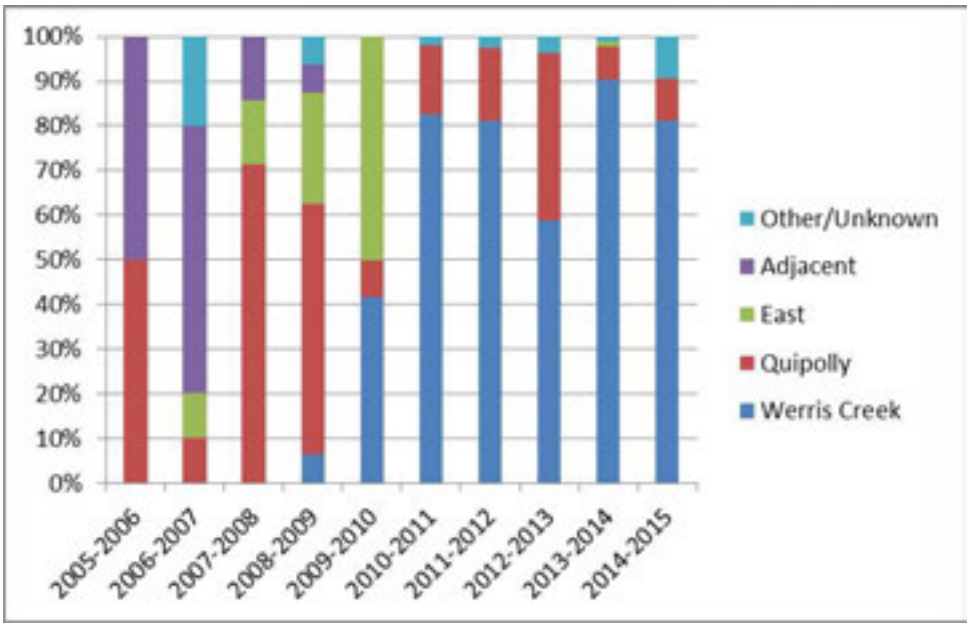

Figure 4.2 Locations of Complaints Received by WCC 2005 to 2015

Table 4.1 WCC Complaint Issues from 2005 to 2015

Issue	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Blast - Vibration/Overpressure	3	4	1	2	7	22	68	9	47	47
Blast - Dust/Fume	-	-	-	-	2	3	2	1	5	10
Blast/Other	-	-	-	-	-	-	1	4	3	2
Noise - TLO	-	-	-	-	-	7	17	6	9	2
Noise - Mine	1	3	4	10	4	6	15	15	2	2
Lights - Mine	1	1	1	-	-	13	10	2	3	0
Lights - TLO						2	3	4	5	0
Dust - Mine	1	2	-	3	-	5	7	12	11	21
Dust - TLO	-	-	-	1	-	-	-	-	3	0
Groundwater Level	1	-	-	-	-	3	-	1	-	6
Surface Water	1	-	2	-	-	-	-	1	-	0
Site Security	-	-	-	-	-	2	-	-	-	0
Trains	-	1	-	-	-	-	1	-	-	0
Complaints Line	-	1	-	-	-	-	8	-	-	0
Road	-	-	-	-	-	-	1	-	-	2
Clearing	-	-	-	-	-	1	-	1	-	0
Odour	-	-	-	-	-	-	-	-	5	2
Groundwater Contamination	-	-	-	-	-	-	-	-	-	0
Heritage	-	-	-	-	-	-	-	-	-	1
Number of Issues Raised*	**8***	**12***	**8***	**16***	**13***	**64***	**125***	**56**	**93**	**95**

* Number of complaints does not equal the number of issues raised as one complaint can raised multiple issues; TLO –Train Load Out Facility

As discussed above, there was an increase in the number of blasting related complaints during 2014-2015 mainly due to the large blast vibration and fume event on 2nd July 2014 (20 complaints for both vibration and fume). This one incident over shadowed the significant reduction in blasting complaints for the last six months of the period (October 2014 to March 2015) with only five complaints in total received compared to 54 complaints in the first half of the period.

WCC has endeavoured to address and respond to each complaint appropriately (where possible). In particular, the most common complaints have been in relation to blasting (**Section 3.7.3**), air quality

(**Section 3.1.3**) and groundwater (**Section 3.3.3**), with the improvement strategies undertaken by WCC to address community concerns over these impacts included in the relevant sections of this report. For specific complaint details and actions taken refer to the Complaint Database for 2014-2015 in **Appendix 10**.

4.2 COMMUNITY LIAISON

There have been thirty four Community Consultative Committee (CCC) meetings held since WCC commenced operations in 2005 with details of the meetings held summarised in **Table 4.2**.

Table 4.2 Community Consultative Committee Meetings since 2005

AEMR Reporting period	No. of meetings	CCC meeting dates	No. Of Attendees
1 June 2005 - 31 March 2006	2	23 June 2005 13 October 2005	11 (5 community representatives) not recorded
1 April 2006 - 31 March 2007	1	22 August 2006	9 (3 community representatives)
1 April 2007 - 31 March 2008	4	14 June 2007 28 August 2007 13 December 2007 21 February 2008	7 (2 community representatives) 6 (1 community representatives) 10 (6 community representatives) 9 (5 community representatives)
1 April 2008 - 31 March 2009	4	5th June 2008 4th September 2008 17th February 2009 12th March 2009	9 (4 community representatives) 8 (4 community representatives) 10 (4 community representatives) 7 (3 community representatives)
1 April 2009 - 31 March 2010	3	29th July 2009 19th November 2009 11th March 2010	7 (3 community representatives) 10 (5 community representatives) 9 (4 community representatives)
1 April 2010 - 31 March 2011	4	27th May 2010 16th September 2010 25th November 2010 24th February 2011	10 (4 community representatives) 10 (5 community representatives) 10 (4 community representatives) 4 (2 community representatives)
1 April 2011 – 31 March 2012	4	26th May 2011 1st September 2011 24th November 2011 20th March 2012	10 (4 community representatives) 10 (3 community representatives) 6 (2 community representatives) 9 (4 community representatives)
1 April 2012 – 31 March 2013	4	31st May 2012 30th August 2012 22nd November 2012 28th February 2013	8 (4 community representatives) 8 (4 community representatives) 6 (3 community representatives) 9 (4 community representatives)
1 April 2013 – 31 March 2014	4	27th June 2013 29th August 2013 21st November 2013 27th February 2014	7 (2 community representatives) 7 (3 community representatives) 7 (3 community representatives) 9 (4 community representatives)
1 April 2014 – 31 March 2015	4	29th May 2014 25th September 2014 4th December 2014 26th February 2015	8 (3 community representatives) 7 (3 community representatives) 7 (3 community representatives) 10 (3 community representatives)

During the 2014-2015 reporting period meetings were held every quarter for a total of four CCC meetings. The meetings were well attended with the three community representatives present at every meeting and the two community representative vacancies remaining unfilled during the period despite requests for applicants. The meetings continue to have strong representation from the Liverpool Plains Shire Council (a Councillor and the Director of Environment) and with the community representatives; are all willing to participate in each meeting.

CCC members are provided with the quarterly environmental monitoring data for the previous three months before each meeting and an agenda is circulated with a number of mine related topics discussed with enthusiasm during the meetings. Before every meeting a tour of the mine is undertaken.

During the 2014-2015 reporting period, WCC released two community newsletters updating the community on the status of WCC operations including:

- Use of Evaporators during the drought;
- Blast Fume Incident 2nd July 2015;
- Community Enhancement Fund Annual Update;
- Ongoing decline of Quipolly Alluvium groundwater and development of a WCC Water Fact Sheet;
- Project Approval Modification including the proposal for allowing beneficial agricultural use of void water;
- New Blast Notification Process; and
- CCC Community Representative Vacancy.

In addition to the Community Consultative Committee process, WCC has also continued to have community meetings open to Werris Creek residents. The community meetings are held at the Werris Creek Tennis and Bowling Club with the most recent meeting on 17th September 2014 (with 18 community attendees), with the scheduled March 2015 meeting delayed due to the NSW election. The local NSW Member of Parliament for Tamworth acts as the meeting facilitator after receiving a petition from Werris Creek residents and actively coordinated the first community meeting in 2013. At these meetings Whitehaven Coal management update the attendees on the current status of operations and future plans for WCC as well as providing a feedback session to allow residents an opportunity to discuss any issues with management. WCC also coordinated a bus tour of the mine on Saturday 11th October 2014 with 101 participants taking the opportunity to have a guided tour of the mine.

4.3 EMPLOYMENT STATUS, DEMOGRAPHY, SOCIO-ECONOMIC CONTRIBUTIONS

4.3.1 Employment Status and Demography

WCC currently employees 139 full-time equivalent personnel; of which 60 full-time employees live locally in the Liverpool Plains Shire including Quirindi, Werris Creek, Willow Tree, Wallabadah, Currabubula and Spring Ridge. The majority of the regular contractors are also based in Werris Creek, Quirindi, Tamworth and Gunnedah. Since 2011 expansion of operations to achieve 2.5Mtpa coal production; the local community benefitted with an additional 50 employees either from locals or new people who have moved into the area to take up employment.

4.3.2 Social and Economic Contributions

WCC has contributed to the local and regional communities, firstly through the provision of permanent employment (including training opportunities) for residents within the Liverpool Plains Shire (Werris Creek, Quipolly and Quirindi) and within the wider region (local government areas of Tamworth and Gunnedah). Employing locally and within the region ensures that the flow-on benefits

to the socio-economic setting, i.e. through wages, viability of other businesses, remain within the local area and region.

In additional to the direct social and economic contribution, during the past 12 months WCC has contributed over $19,000 to events and services in the local area including:

- Westpac Rescue Helicopter;
- Quirindi Public School;
- Walhollow Public School;
- Werris Creek & District Pre-School;
- Werris Creek Lions Club;
- Quirindi Show Society;
- Spring Ridge Rural Fire Brigade;
- Children's Charity Network; and
- Werris Creek Scouts.

The relocation of the Narrawolga Axe Grinding Grooves to the Willow Tree Visitor Information Centre as a public attraction during the period was supported by WCC directly contributing over $23,000 to the Liverpool Plains Shire Council as well as WCC covering the other earthworks, relocation and consultant costs incurred in planning and preparation of the project. WCC has demonstrated through these contributions its ongoing commitment to the social and economic well-being of the local communities within which the mine is located.

4.3.3 Community Enhancement Fund

WCC Life of Mine (LOM) Project was approved by the DP&E conditioning the establishment of a Community Enhancement Fund (CEF) based on the proposal agreed between Liverpool Plains Shire Council (Council) and Whitehaven Coal. The aim of the CEF is for Whitehaven Coal to support community projects in Liverpool Plains Shire for the benefit of the local community in particular the Werris Creek township.

The WCC Project Approval 10_0059 Schedule 1 Condition 15 outlines the CEF requirements:

COMMUNITY ENHANCEMENT
The Proponent shall establish and operate a Community Enhancement Fund for the project to the satisfaction of the Director-General. This fund must:

(a) be established and operated in consultation with Council and the CCC;
(b) be directed towards providing benefits to the local communities affected by the project;
(c) provide for the expenditure of at least $300,000 (indexed to CPI) over 6 calendar years (2012 to 2017), and include at least $200,000 of expenditure within the town of Werris Creek; and

be operating from the end of April 2012, unless the Director-General agrees otherwise.

Following consultation with Council and the CCC in 2012, DP&E approved on 25th July 2012:

- a CEF funded to $300,000 over a 6 calendar year period commencing May 2012;
- The CEF will be indexed to CPI calculated on the monies not spent against the balance of the $300,000 at the end of each calendar year to provide an ongoing balance for the beginning of

the next calendar year. This balance will be confirmed in writing by WCC at the beginning, or shortly thereafter, of each calendar year; and

- Two thirds of the CEF will be spent in the Werris Creek township.

The most recently updated Community Project Schedule (CEF v5) approved by CCC (meeting on 26th February 2014) and Council (in correspondence dated 25th May 2015) is outlined in **Table 4.3**. Two projects were completed during the period with funding provided to Werris Creek & District Preschool and installation of lift and early warning evacuation alarm for the Australian Railway Museum (**Figure 4.3**), the premier tourist attraction of Werris Creek.

Table 4.3 Community Enhancement Fund Project Schedule approved in 2015

YEAR	CEF Project Schedule	COST
2010	CEF established by Werris Creek Coal	$300,000
2010	Grand Piano for Royal Theatre, Quirindi	-$20,000
2012	2012 CPI 2.2% Increase	$6,160
2013	2013 CPI 2.7% Increase	$7,726.32
2013	Skate Park, Werris Creek	-$65,294.90
2014	Disabled Lift at Australian Railway Museum, Werris Creek	-$64,705.10
2014	Werris Creek Preschool Garden Items for Upgraded Sandpit, Werris Creek	-$755
	Sub Total (Funds Remaining)	**$163,131.32**
2014	2014 CPI 1.7% Increase	$2773.23
2014	Early Warning Evacuation Alarm, Australian Railway Museum, Werris Creek	-$30,000*
2014	Miscellaneous carpentry at Australian Railway Museum, Werris Creek	-$6,000*
2014	Additional Public Seating in Single Street outside CBD, Werris Creek	-$7,000*
2015	Upgrade or New Playground, Werris Creek	-$70,000
2016	Various playground improvements in Villages, Liverpool Plains Shire	-$50,000
2017	Nil	-$0
	Unallocated Funds	**$2904.55**

* Projects Committed but Yet To Be Invoiced.

Figure 4.3 New Disabled Lift and Fire Alarm System for 2nd Storey Expansion of Railway Museum

5. REHABILITATION

DRE approved the WCC LOM MOP on the 29th November 2011 as meeting the Mining, Rehabilitation and Environmental Management Plan guidelines and subsequently approved Section 4 and 5 of the LOM MOP relating to rehabilitation activities as the Rehabilitation Management Plan (RMP) on 2nd May 2012 in accordance with Condition 43 of PA 10_0059. The LOM MOP/RMP outline the objectives, domains, completion criteria, methodology, targets, processes, activities and conceptual decommissioning relating to rehabilitation management at WCC.

WCC's rehabilitation objectives focus on restoration of native woodland vegetation, specifically Grassy White Box Woodland. The restoration of this woodland community would compensate for those areas disturbed by the mine development, linking with other woodland in the Biodiversity Offset Area (BOA), and provide a greater area and more diverse native fauna habitat and wildlife corridors.

WCC rehabilitation objectives are divided into three specific categories below and in **Table 5.1**, outlining the specific objectives associated with each category consistent with the LOM MOP/RMP and "*Environmental Assessment for WCCM LOM Project*" (R.W. Corkery & Co, 2010):

- integrated landscapes;
- sustainable growth and development; and
- final land use.

Table 5.1 WCC Rehabilitation Objectives

Integrated Landscapes
• To provide a vegetation corridor across WCC owned land and Quipolly Creek Catchment linking with sub-regional habitat corridors; • To reduce the visibility of mine-related activities from adjacent properties, Werris Creek and the local road network; • To create a final landform sympathetic to the surrounding topography; and • To provide a low maintenance, geotechnically stable and safe landform with minimal erosion.
Sustainable Growth and Development
• To achieve a soil profile capable of sustaining the specified final land use; and • To establish native vegetation with the species diversity commensurate to each relevant vegetation community.
Final Land Use
• To re-instate an area of Rural Land Capability Class III commensurate with the agricultural land use on and around the Mine Site; • To re-instate woodland vegetation communities commensurate with the remnant woodland vegetation disturbed by mining and associated activities; and • Undertake habitat augmentation to improve and promote corridors for fauna movement linking adjacent remnant woodland vegetation with the rehabilitation on the Mine Site.

Rehabilitation will consist of two final land uses including:

- Class III land capability agricultural land; and
- Native vegetation communities including:
    - Grassy White Box Woodland (GWBW) (equivalent to the NSW Threatened Species Act Endangered Ecological Community "White Box Yellow Box Blakely's Red Gum Woodland" and also Commonwealth Environmental Protection and Biodiversity Conservation Act Critically Threatened Ecological Community "White Box-Yellow Box-

Blakely's Red Gum (Box Gum) Grassy Woodland and Derived Native Grassland" made up of the vegetation communities "White Box Grassy Woodland of the Nandewar and Brigalow Belt South Bioregions" and "Yellow Box-Blakely's Red Gum Grassy Woodland of the Nandewar Region");

- Shrubby White Box Woodland (SWBW) (not listed as endangered, vegetation community "White Cypress Pine – Silver-leaved Ironbark – Tumbledown Gum Shrubby Open Forest of the Nandewar and Brigalow Belt South Bioregions"); and
- Brigalow Woodland (equivalent to the NSW Threatened Species Act Endangered Ecological Community "Brigalow-Belah Woodland" and also Commonwealth Environmental Protection and Biodiversity Conservation Act Endangered Ecological Community "Brigalow Woodland" made up of the vegetation community "Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions").

Woodland areas will include habitat augmentation and corridors for fauna movement linking with adjacent areas associated with the BOA. Rehabilitation strategies have been developed to target achieving sustainable final land uses as identified above by restoring within rehabilitation areas:

- Soil/growing medium;
- Endemic vegetation communities; and
- Augmenting rehabilitation areas with habitat.

5.1 INFRASTRUCTURE

No infrastructure construction was undertaken during the period. No major infrastructure activity is planned for 2015-2016; however a second temporary crib/amenity facility is being planned for the overburden emplacement that would be outside 500m blast exclusion zone as mining encroaches within 500m of the current MIA.

5.2 REHABILITATION PERFORMANCE AND STATUS

During the reporting period, WCC completed an additional 26.33ha of new woodland rehabilitation plus seeding an adjacent 1.26ha of previously temporary rehabilitation to also become woodland rehabilitation along the western rehabilitation area; with another 13.08ha of temporary rehabilitation completed on the MIA Bund (**Figure 5.1**). The western rehabilitation area exceeded the MOP/RMP rehabilitation commitment for 2014-2015 of 22.4ha resulting in WCC being ahead of the cumulative target for woodland rehabilitation of the overburden emplacement (MIA Bund excluded) by +9.41ha. As at March 2015, WCC had completed 142.69ha of rehabilitation since 2005 (**Table 5.2**).

Figure 5.1 New Rehabilitation Completed at WCC during 2014-2015

Table 5.2 WCC Actual Rehabilitation Program compared to MOP/RMP Commitments

Period*			Woodland Vegetation Community			Agriculture Class 3 (ha)	Temporary Rehab (ha)	ANNUAL TOTAL (ha)	CUMULATIVE TOTAL (ha)
			GWBW(ha)	SWBW(ha)	Brigalow (ha)				
Actual Rehabilitation	2008-2009		14.31	0.0	0.0	0.0	-	14.31	14.31
	2009-2010		-5.12**	0.0	0.0	0.0	-	-5.12	9.19
	2010-2011		23.93	0.0	0.0	0.0	-	23.93	33.12
	2011-2012		16.84	0.0	0.0	0.0	-	16.84	49.96
	2012-2013		40.98	0.0	0.0	0.0	3.28	44.26	94.22
	2013-2014		2.84	0.0	0.0	0.0	4.96	7.80	102.02
	2014-2015		**27.59**	**0.0**	**0.0**	**0.0**	**13.08**	**40.67**	**142.69**
Target/LOM MOP	**Year 3**	**2014 - 2015**	**22.4**	**0.0**	**0.0**	**0.0**	**-**	**22.4**	**120.2**
	Year 4	2015 - 2016	23.5	0.0	0.0	0.0	-	23.5	143.7
	Year 5	2016 - 2017	15.1	0.0	0.0	0.0	-	15.1	158.8
	Year 6	2017 - 2018	24.0	0.0	0.0	0.0	-	24.0	182.8
	Year 7	2018 - 2019	14.3	0.0	0.0	0.0	-	14.3	197.1
TOTAL			193.4	0.0	3.7	0.0	-	197.1	197.1
REMAINING***			188.1	180.0	0.0	47.9	-	408.2	408.2

Note: Rehabilitation data was transferred from AUTOCAD to ARCGIS program and the rehabilitation area values were amended;
* Period aligns with WCC's annual statutory reporting dates 1st April to 31st March; ** Approval of DA 172-7-2004 MOD 5 for an extension to the eastern emplacement required 5ha of existing rehabilitation to be re-disturbed; *** Remaining rehabilitation to be completed beyond this MOP period prior to during mine closure. **BOLD** compares the actual 2014-2015 rehabilitation with the LOM MOP targets for 2014-2015. Grey Shading are the values as per the approved RMP (MOP Section 4&5).

Seven simplified rehabilitation condition categories have been used as a basis to determine the quality and development of the rehabilitation (not just quantity) that has been completed since 2005. The seven rehabilitation condition categories are:

- Temporary Rehabilitation (TEMP) – Rehabilitation has been topsoiled and seasonal cover crop sown;
- Woodland Condition 1 (WOOD1) – Revegetation of native woodland overstorey (Over) species has been sown or planted and growth of canopy height is less than 5m;
- Woodland Condition 2 (WOOD2) – Native woodland ground cover (NGC) species (most likely native grasses) have either been sown, planted or colonised the site less than 50% ground cover;
- Woodland Condition 3 (WOOD3) – Both WOOD1 and WOOD2 have occurred;
- Woodland Condition 4 (WOOD4) – Revegetation of native woodland overstorey species has been sown or planted and growth of canopy height is less than 5m and the native woodland ground cover species have either been sown, planted or colonised the site greater than 50% ground cover;
- Woodland Condition 5 (WOOD5) – Revegetation of native woodland overstorey species has been sown or planted and average canopy height is between 5m and 20m and the native woodland ground cover species have either been sown, planted or colonised the site greater than 50% ground cover; and
- Woodland Condition 6 (WOOD6) – Revegetation of native woodland overstorey species has been sown or planted and average canopy height greater than 20m and the native woodland

ground cover species have either been sown, planted or colonised the site greater than 50% ground cover.

Figure 5.2 and **Table 5.3** summarises the condition of the woodland revegetation completed to date with the rehabilitation goal to move from left to right across the table; the far right column representing a tall canopy of woodland overstorey species (i.e. White Box) dominated by native ground cover species (i.e. native grasses). The 50% native ground cover criteria was taken from the relevant completion criteria performance indicator for Liverpool Plains Grass Grassland which had the highest biometric benchmark for all the woodland vegetation communities being restored at WCC (**Table 5.10**). The development of the rehabilitation over 2014-2015 is positive despite the below average rainfall, the majority of the woodland rehabilitation demonstrates increases in the higher quality/condition categories towards the right on **Table 5.3** consistently for the different ages of revegetation. **Table 5.4** summarises the individual rehabilitation programs, including the revegetation methodology, implemented for those areas completed in the reporting period.

Table 5.3 Condition of Woodland Rehabilitation as at end of 2014-2015

Period*	TEMP (ha)	WOOD1 (ha)	WOOD2 (ha)	WOOD3 (ha)	WOOD4 (ha)	WOOD5 (ha)	WOOD6 (ha)
	Temporary Rehabilitation	Over<5m	<50% NGC	Over<5m & <50% NGC	Over<5m & >50% NGC	Over>5to20m& >50% NGC	Over>20m & >50% NGC
2008-2009	-	-	-	-	-	9.19	-
2009-2010	-	-	-	-	-	-	-
2010-2011	-	-	-	1.18	12.00	1.40	-
2011-2012	-	-	-	0.00	22.43	-	-
2012-2013	3.28	-	13.11	27.87	3.76	-	-
2013-2014	4.96	0.00	-	2.84	-	-	-
2014-2015	13.08	-	27.59	-	-	-	-
TOTAL	**21.32**	**0.00**	**40.70**	**31.89**	**38.19**	**10.59**	**0.00**

Over = Overstorey Vegetation; NGC = Native Groundcover; Green – Equal or increase in area from previous period; Orange - Decrease in area from previous period.

Table 5.4 WCC Rehabilitation Program Summary 2014-2015

Domain:	3	**Sub Domain:**	TEMP	**Reveg Date:**	December 2014	**Area:**	9.12ha
Name:	MIA Visual Bund		**Land Use:**	Vegetation Community	**Seed/Plant:**	Cover Crop	
Description/Methodology: Shaping was completed in November 2014. Topsoil was applied to 0.4m depth using topsoil from the stripping of soil in the bund disturbance area and Stockpile #46 in November 2014. D11 dozer undertook final trim and Jap Millet cover crop was sown at 10kg/ha in December 2014. **Status/Progress:** December was a wet month so excellent grass cover has established.							
Domain:	3	**Sub Domain:**	TEMP	**Reveg Date:**	December 2014	**Area:**	3.96ha
Name:	MIA Visual Bund Soil Stockpile		**Land Use:**	Vegetation Community	**Seed/Plant:**	Cover Crop	
Description/Methodology: Soil stripping was completed in October 2014. D11 dozer undertook final trim and Jap Millet cover crop was sown at 10kg/ha in December 2014. **Status/Progress:** December was a wet month so excellent grass cover has established.							
Domain:	3	**Sub Domain:**	WOOD2	**Reveg Date:**	April 2015	**Area:**	24.81ha
Name:	Western Rehabilitation Zone A to C		**Land Use:**	Vegetation Community	**Seed/Plant:**	Grassy White Box Woodland species	
Description/Methodology: Shaping was completed in March 2015. Topsoil and subsoil was applied to 0.2m depth each using subsoil from Stockpiles #25, #39, #41 and #11 and topsoil from Stockpiles #42, #12 and #53. D6, D5 dozers & 30t excavator undertook final trim and contour bank construction in April 2015. Local providence native grass seed collected onsite was sown at 4kg/ha bulked out with an oats cover crop at 10kg/ha using a tractor broadcast spreader in April 2015. **Status/Progress:** Above average rain in April and May 2015 have resulted in good germination and groundcover of oats. Overstorey revegetation (hikos) will need to be planted in the coming period with planting preparation involving a peg and pre-dug hole to be established.							

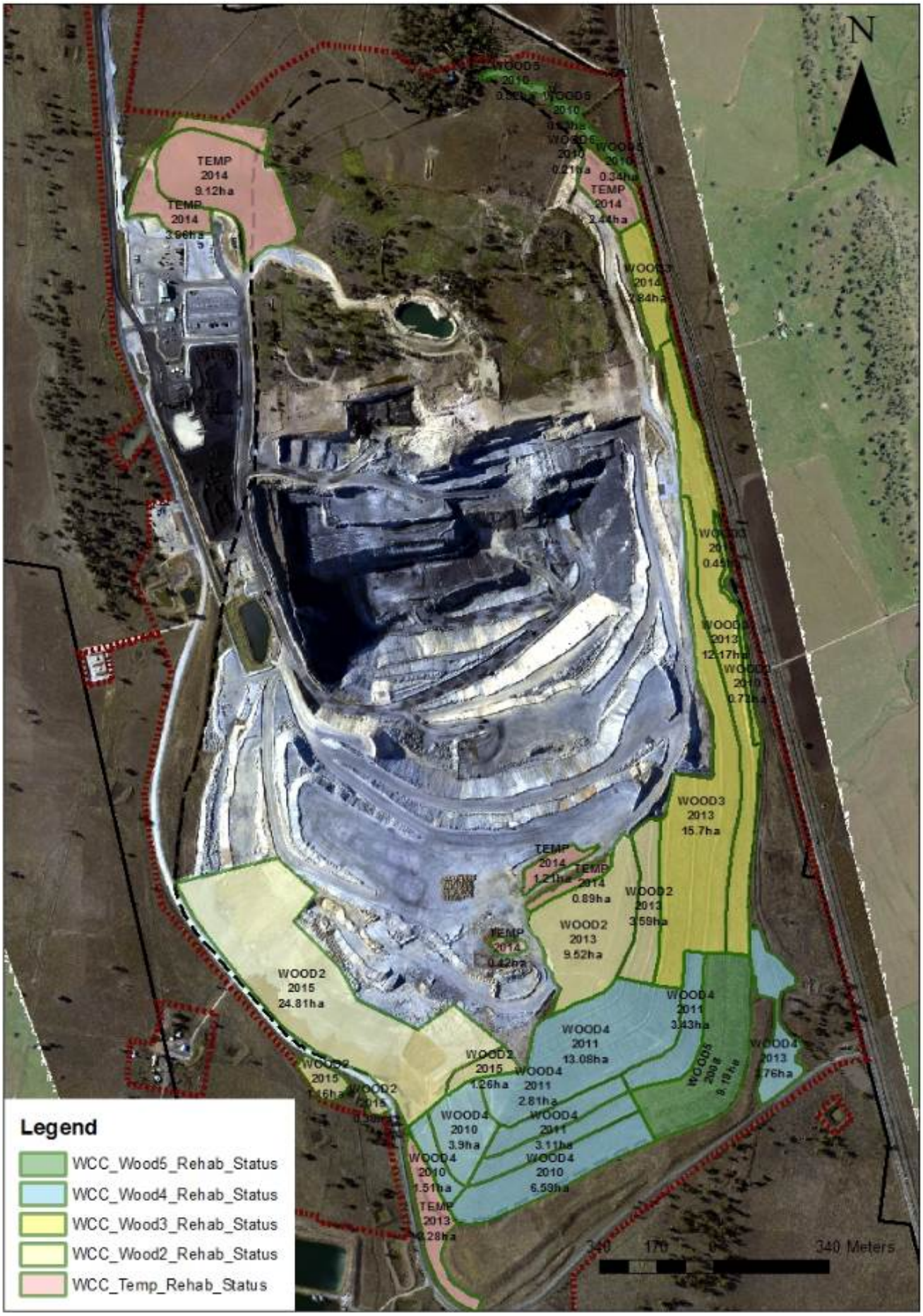

Figure 5.2 WCC Rehabilitation Status as at the end March 2014

Domain:	3	Sub Domain:	WOOD2	Reveg Date:	April 2015	Area:	1.16ha
Name:	Western Rehabilitation Zone A/ adjacent to Eurunderee BOA	Land Use:	Vegetation Community	Seed/Plant:	Grassy White Box Woodland species		
Description/Methodology: The stockpile was completely extracted in April 2015. The residual subsoil from Stockpile #41 was blended and shaped with the natural surface topsoil using a D6 to undertake the final trim. Local providence native grass seed collected onsite was sown at 4kg/ha bulked out with an oats cover crop at 10kg/ha using a tractor broadcast spreader in April 2015. **Status/Progress:** Above average rain in April and May 2015 have resulted in good germination and groundcover of oats. Overstorey revegetation (hikos) will need to be planted in the coming period with planting preparation involving a peg and pre-dug hole to be established.							
Domain:	3	Sub Domain:	WOOD2	Reveg Date:	April 2015	Area:	0.36ha
Name:	Western Rehabilitation Zone A/ adjacent to Eurunderee BOA	Land Use:	Vegetation Community	Seed/Plant:	Grassy White Box Woodland species		
Description/Methodology: The stockpile was completely extracted in April 2015. The residual subsoil from Stockpile #39 was blended and shaped with the natural surface topsoil using a D6 to undertake the final trim. Local providence native grass seed collected onsite was sown at 4kg/ha bulked out with an oats cover crop at 10kg/ha using a tractor broadcast spreader in April 2015. **Status/Progress:** Above average rain in April and May 2015 have resulted in good germination and groundcover of oats. Overstorey revegetation (hikos) will need to be planted in the coming period with planting preparation involving a peg and pre-dug hole to be established.							
Domain:	3	Sub Domain:	WOOD2	Reveg Date:	April 2015	Area:	1.26ha
Name:	Western Rehabilitation Zone C, D & E	Land Use:	Vegetation Community	Seed/Plant:	Grassy White Box Woodland species		
Description/Methodology: The area was shaped in March 2011, with topsoil and subsoil applied to 0.2m depth each in June 2011 from soil stockpiles 10, 11, 14 and 25. The area harrowed and sown with Jap Millet cover crop in September 2011 which was repeated in 2013 enabling a good native grass coverage to become established. D6, D5 dozers & 30t excavator undertook final trim and contour bank construction in April 2015. **Status/Progress:** Good groundcover already established. Overstorey revegetation (hikos) will need to be planted in the coming period with planting preparation involving a peg and pre-dug hole to be established.							

Due to the dry conditions that prevailed for the majority of the period, maintenance planting of woodland overstorey species in existing rehabilitation was limited to just 15.7ha of the eastern rehabilitation area (upgrading rehabilitation condition from WOOD2 to WOOD3)(**Table 5.5**). **Table 5.6** outlines the disturbance status (**Figure 5.3**) and maintenance works undertaken by WCC for 2014-2015. Due to the good condition of existing rehabilitation, contour banks and soil stockpiles did not require any repairs to be undertaken during the period (**Table 5.7**). As outlined in **Section 3.5**, the rehabilitation sites still need a high level of weed control to manage mostly broadleaf weeds (thistles) and a couple of noxious weeds to improve the native grasses density and resilience/competition, with approximately 309ha of the rehabilitation area sprayed during the period indicating that between two and three repeat weed treatments were undertaken.

Table 5.5 WCC Rehabilitation Maintenance Revegetation 2014-2015

Domain:	3	Sub Domain:	WOOD3	Reveg Date:	March 2015	Area:	15.7ha
Name:	Eastern Rehabilitation Zone B to D	Land Use:	Vegetation Community	Seed/Plant:	Grassy White Box Woodland species		
Description/Methodology: The area was originally sown with an oats cover crop and native grass seed collected onsite in March 2013. Planting preparation was undertaken March 2015 with 0.3m deep holes dug with a mattock and back filled to create a basin for increased surface water retention. Approximately 400 trees (hikos) were planted at a loose 15mx15m aiming to replicate a 50 stem/ha density. GWBW overstorey species ratio planted was White Box, Yellow Box, Blakely's Red Gum and Rough Barked Apple at 3:1:1:1. **Status/Progress:** Cooler temperatures of Autumn have ensured survival with above average rain falling in April and May 2015.							

Table 5.6 Rehabilitation Summary

	Area Affected (hectares)			
	This Report Period (as of 31/3/2015)	**Last Report Period (as of 31/3/2014)**	**Next Report Period (estimated) (as at 31/03/2016)**	
A: MINE LEASE AREA				
A1 Mine Lease(s) Area	910			
B: DISTURBED AREA				
B1 Infrastructure area (other disturbed areas to be rehabilitated at closure including facilities, roads, soil stockpiles, dams)	104.3	137.2	105.0	
B2 Active Mining Area (excluding items B3 - B5 below)	101.4	73.9	100.0	
B3 Waste emplacements, (active/unshaped/in or out-of-pit)	76.5	119.6	100.0	
B4 Tailings emplacements, (active/unshaped/uncapped)	0	0	0	
B5 Shaped waste emplacement (awaits final vegetation)	48.0	30.5	30.0	
ALL DISTURBED AREAS	330.2	361.2	335.0	F1
C: REHABILITATION PROGRESS				
C1 Total Rehabilitated area (except for maintenance)	142.7	105.5	167.7	F2
D: REHABILITATION ON SLOPES				
D1 Less than or equal to 10 degrees	142.7	105.47	167.7	
D2 10 to 18 degrees	0	0	0	
D3 Greater than 18 degrees	0	0	0	
E: SURFACE OF REHABILITATED LAND				
E1 Pasture and grasses	0	0	0	
E2 Native forest/ecosystems	121.4	93.78	157.7	
E3 Plantations and crops	0	0	0	
E4 Other (include nonvegetative outcomes)	21.3	11.69	10.0	

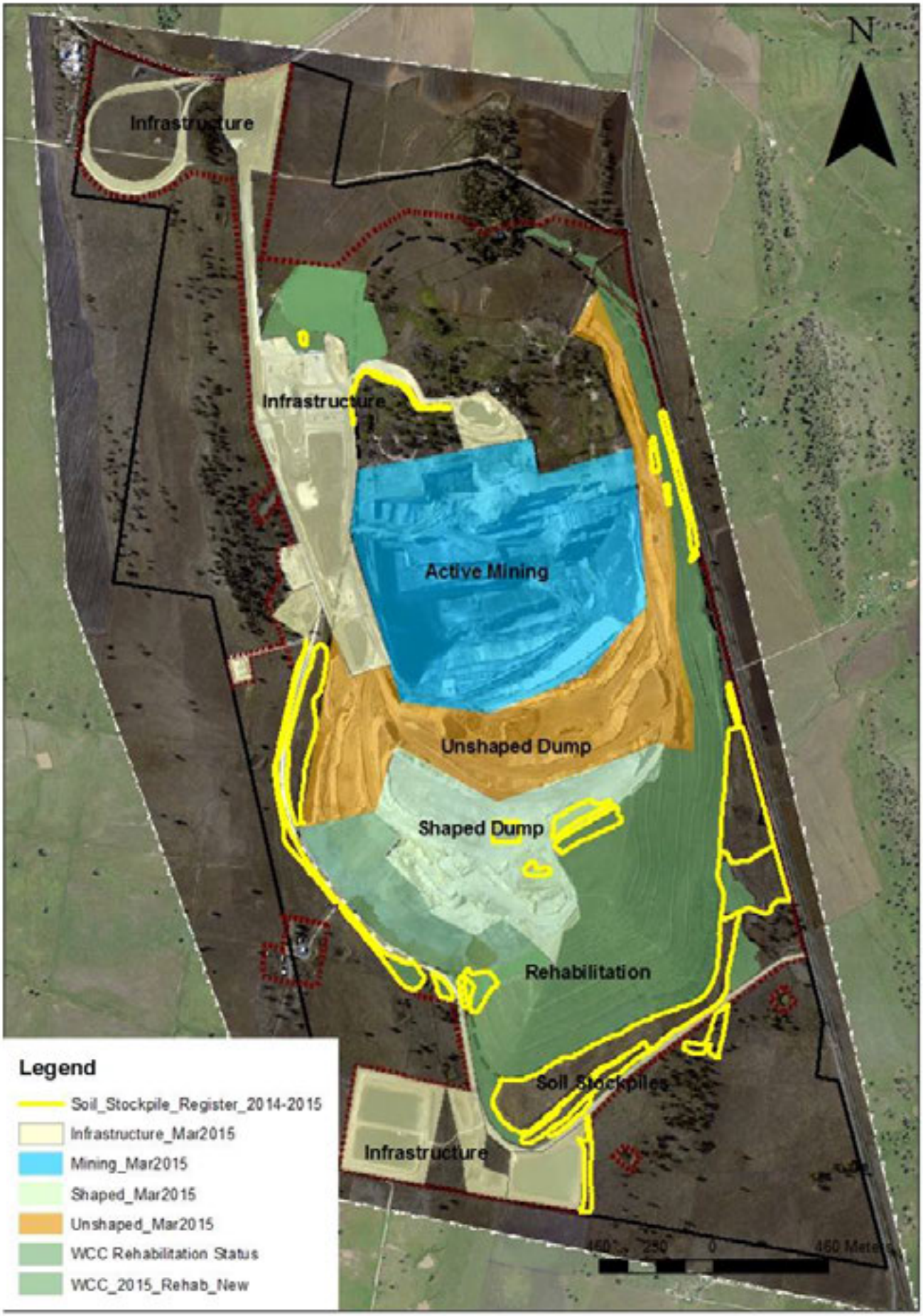

Figure 5.3 WCC Disturbance Status as at March 2015

Table 5.7 Maintenance Activities on Rehabilitated Land

	Area Treated (ha)		
Nature of Treatment	**Report period**	**Next period**	**Comment/control strategies/ treatment detail**
Additional erosion control works (drains re-contouring, rock protection)	0	As required	None
Re-covering (detail - further topsoil, subsoil sealing etc)	0	As required	None
Soil treatment (detail - fertilizer, lime, gypsum etc)	0	As required	None
Treatment/Management (detail - grazing, cropping, slashing etc)	0	As required	None
Re-seeding/Replanting (detail - species density, season etc)	15.7	As required	See **Table 5.5**
Adversely Affected by Weeds (detail - type and treatment)	309	As required	St Barnabys Thistle, Johnsons Grass, Spiny Burr Grass (**Section 3.6**)
Feral animal control (detail - additional fencing, trapping, baiting etc)	0	As required	No fox baiting on rehabilitation but in surrounding BOA (**Section 3.16**)

5.3 REHABILITATION METHODS

WCC rehabilitation methods have been developed to restore woodland vegetation communities while also achieving minimal erosion and mitigating weed infestations. After the soil has been respread, a seasonal cover crop is sown as soon as practicable to stabilise the soil and prevent erosion and out compete potential colonising weed species. If native grass seed is available or has been harvested onsite, the cover crop seed will be used to bulk out the native grass seed and sown at the sametime.

The actual methods used for the second revegetation stage will be determined for each campaign, however the current method is based on a “top down” restoration strategy of planting overstorey tubestock or hiko species at the required woodland densities. Indicatively, the overstorey species are planted into holes 0.15-0.3m deep by either a mechanical auger, pottiputki or mattock and depending on the conditions, a native tree fertiliser pill and water saving crystals may be added. The hole is back filled to create a basin for increased surface water retention and each plant is watered in with 1L at time of planting (depending on the conditions). The overstorey species are planted at loose spacings between 10mx10m and 15mx15m aiming to replicate between 30 to 100 stem/ha typical woodland density. The ratio of key overstorey species utilised range from White Box/Yellow Box dominant (also Blakely’s Red Gum and Rough Barked Apple) for the lower elevations on the overburden emplacement (known as Zone A) to White Box/Tumbledown Gum dominant (also White Cypress Pine and Iron Barks) on the upper elevations of the overburden emplacement (known as Zone F and RL445 plateau).

The third revegetation stage focuses on re-establishing lower storey woodland vegetation species. This will be undertaken by a number of methods such as encouraging native seed germination from the soil seed bank, allow native seed to disperse (by wind) into the rehabilitation from adjacent areas, direct seeding (either broadcast or hand sown) or planting native grasses between the established overstorey species. Herbicide spraying will be used to limit weed and exotic grass competition and timing used to encourage the establishment of native grasses, herbs & forbs and shrubs.

Subject to commercial availability and seasons, seed and/or tubestock/hikos of local provenance species outlined in **Table 5.8** of the key 23 species (but not limited to) being revegetated to meet the required native species richness outlined in the NSW EPA biometric vegetation community benchmark for the Namoi Catchment Area (http://www.environment.nsw.gov.au/biobanking/VegTypeDatabase.htm DECCW, 2008), NSW Scientific Committee final determination (http://www.environment.nsw.gov.au/determinations/BoxgumWoodlandEndComListing.htm DECCW, 2011) and the Commonwealth Department of Sustainability, Environment, Water, Populations and Communities policy statement and species list (http://www.environment.gov.au/epbc/publications/box-gum.html DSEWPaC, 2011) for Grassy White Box Woodland. A summary of the NSW OEH biometric vegetation community benchmark is included in **Table 5.10**.

Table 5.8 Grassy White Box Woodland Species List

Over/Mid Storey Species		Lower Storey Species	
1. White Box	*Eucalyptus albens*	11. Queensland Red Grass	*Bothrichloa macra*
2. Yellow Box	*Eucalyptus melliodora*	12. Queensland Blue Grass	*Dichanthium sericeum*
3. Blakely's Red Gum	*Eucalyptus blakelyi*	13. Wallaby Grass	*Austrodanthonia racemosa*
4. Rough Barked Apple	*Angophora floribunda*	14. Plains Grass	*Austrostipa aristiglumis*
5. Kurrajong	*Brachychiton populneus*	15. Wire Grass	*Aristida ramosa*
6. White Cypress Pine	*Callitris glaucophylla*	16. Barbed Wire Grass	*Cymbopogon refractus*
7. Tumble Down Red Gum	*Eucalyptus dealbata*	17. Slender Rats Tail Grass	*Sporobolus creber*
8. Native Olive	*Notelaea microcarpa*	18. Slender Bamboo Grass	*Stipa verticillate*
9. Blackthorn	*Bursaria spinosa*	19. Windmill Grass	*Chloris truncata*
10. Rosewood	*Aectryon oleifolius*	20. Kangaroo Grass	*Themeda australis*
		21. Tufted Bluebell	*Wahlenbergia communis*
		22. Yellow Berry Bush	*Maytenus cunninghamii*
		23. Sticky Daisy Bush	*Olearia elliptica*

5.4 REHABILITATION MONITORING

The LOM MOP/RMP outlines the various rehabilitation monitoring programs undertaken include:

- Quarterly Visual Inspections;
- Annual Soil Analysis;
- Vegetation Monitoring;
- Fauna Monitoring;
- Land Capability Assessment; and
- Photo Monitoring.

The results of quarterly visual inspections, vegetation monitoring and fauna monitoring is discussed in **Section 3.5** as the rehabilitation area has been integrated with the biodiversity monitoring program. No land capability assessment has been completed to date as no rehabilitation for an agricultural land use has been completed to date.

Annual soil analysis monitoring was completed during the period with 33 samples taken from soil stockpiles, rehabilitation and biodiversity offset areas. **Table 5.9** summarises soil analysis results and where applicable whether the Rehabilitation/BOA sites met the completion criteria. Sampling of soil stockpiles, BOA and rehabilitation areas found the soil to be neutral to alkaline with all soil samples

pH increasing in comparison to the 2014 samples. While BOA samples remained within the completion criteria range of pH 5 to 8.5; the four rehabilitation samples increased outside of the range. Further monitoring of the trends over time will determine whether soil amelioration is required, however as all soil samples pH increased probably reflects the influence of climate on soil rather than the rehabilitation soils performing poorly at this stage.

Table 5.9 Annual Soil Analysis Results for pH levels

Soil	Sample ID	pH				Completion Criteria	Criteria Met?
		2015	2014	2013	2011		
Stockpile	11 (Subsoil)	8.6	8.1	-	8.6	-	-
Stockpile	12 (Topsoil)	8.3	7.4	-	8.1	-	-
Stockpile	13 (Topsoil)	8.9	7.6	-	-	-	-
Stockpile	33 (Subsoil)	9.3	8.3	8.3	8.9	-	-
Stockpile	34 (Topsoil)	9.3	8.4	9.0	8.7	-	-
Stockpile	40 (Topsoil)	-	8.0	-	-	-	-
Stockpile	41 (Subsoil)	8.9	-	-	-	-	-
Stockpile	53 (Topsoil)	8.4	7.5	-	-	-	-
Stockpile	55 (Topsoil)	7.5	6.5	7.5	-	-	-
Stockpile	58 (Subsoil)	8.6	7.2	-	-	-	-
Stockpile	59 (Topsoil)	7.6	-	-	-	-	-
Stockpile	60 (Topsoil)	7.1	-	-	-	-	-
BOA	3	6.9	-	-	-	5.0 - 8.5	YES
BOA	4	6.6	-	6.6	7.2	5.0 - 8.5	YES
BOA	5	7.2	6.0	6.7	-	5.0 - 8.5	YES
BOA	7	6.9	6.6	-	-	5.0 - 8.5	YES
BOA	8	7.5	7.4	7.7	-	5.0 - 8.5	YES
BOA	9	6.6	6.2	-	-	5.0 - 8.5	YES
BOA	10	7.1	-	-	-	5.0 - 8.5	YES
BOA	11	6.9	-	-	-	5.0 - 8.5	YES
BOA	12	6.1	-	-	-	5.0 - 8.5	YES
BOA	15	7.1	-	6.9	-	5.0 - 8.5	YES
BOA	16	7.4	-	6.8	-	5.0 - 8.5	YES
BOA	17	6.9	-	-	-	5.0 - 8.5	YES
BOA	18	6.8	-	-	-	5.0 - 8.5	YES
BOA	19	6.8	-	-	-	5.0 - 8.5	YES
BOA	20	7.3	-	-	-	5.0 - 8.5	YES
BOA	21	6.4	-	-	-	5.0 - 8.5	YES
BOA	23	6.4	-	-	-	5.0 - 8.5	YES
BOA	24	7.2	-	-	-	5.0 - 8.5	YES
BOA/Rehab	6/South East Zone B	8.8	8.0	8.8	8.9	5.0 - 8.5	No
BOA/Rehab	14/South Zone E	9.0	8.0	8.9	-	5.0 - 8.5	No
BOA/Rehab	26/East Zone A	9.0	8.3	8.7	-	5.0 - 8.5	No
Rehab	East Zone F	-	-	8.5	-	5.0 - 8.5	YES
Rehab	West Zone A	8.6	7.9	8.7	8.7	5.0 - 8.5	No

Routine photo monitoring of the rehabilitation is undertaken by WCC from four established locations to the east, south east, south west and west of the rehabilitation areas. **Figure 5.4a** displays the photopoint (south east) one month after planting in July 2008 and **Figure 5.4b** shows progress after nearly six years in March 2014. The key change observed in **Figure 5.5** for 2015 is the development of

revegetation canopy cover with it now difficult to see the grass cover through the trees compared to 2014. In addition, the revegetation on the upper slopes of the rehabilitation is now visible with the trees growing (planted in November 2011) above the grass height.

Figure 5.4 South East Rehabilitation Area a (left) July 2008 and b (right) March 2014

Figure 5.5 South East Rehabilitation Area at end of March 2015

Figure 5.6a displays the photopoint (south west) during contour bank and erosion maintenance in March 2010 and **Figure 5.6b** shows the status in March 2014. From **Figure 5.7**, there is a good coverage of native grasses with revegetation now visible both on the lower slopes (planted between October 2010 and February 2011) and upper slopes (planted November 2011).

Figure 5.6 South West Rehabilitation Area a (left) March 2010 and b (right) March 2014

Figure 5.7 South West Rehabilitation Area at end of March 2015

Figure 5.8a displays the photopoint (east) just after the initial cover crop was sown in March 2013 and **Figure 5.6b** shows the status in March 2014. From **Figure 5.9** it is evident that there is a good ground cover established with coarse woody debris habitat structures already in place. The revegetation planted during the 2014-2015 period is not visible yet.

Figure 5.8 Eastern Rehabilitation Area a (left) March 2013 and b (right) March 2014

Figure 5.9 Eastern Rehabilitation Area at end of March 2015

Figure 5.10 outlines the progress of the western rehabilitation area soil spreading and contour bank establishment during March 2015.

Figure 5.10 Western Rehabilitation Area at end of March 2015

5.5 COMPLETION CRITERIA

The LOM MOP/RMP outlines the completion criteria for the rehabilitation and biodiversity offset areas to achieve the designated final land uses for WCC, i.e. that they would be sustainable and self-supporting beyond mine closure. The completion criteria have been broken into categories aligned to the WCC rehabilitation objectives (**Table 5.1**):

- Integrated Landscapes;
- Sustainable Growth and Development; and
- Land Use.

Separate completion criteria have been established for the two different final land uses proposed for WCC of class III land capability agriculture and woodland vegetation communities. **Table 5.10** summarises the completion criteria for each woodland land use vegetation community; as no rehabilitation has been completed yet for an agricultural land use. The completion criteria have partially been based on NSW EPA biometric vegetation community benchmark indices. **Table 5.10** also compares against the data from **Table 3.28** and **Table 5.9** measured through the rehabilitation and biodiversity monitoring programs to quantify progress against the completion criteria and the trend towards being able to "sign off" on the final land uses.

Table 5.10 WCC Completion Criteria for Woodland Vegetation Communities

Rehabilitation Objective	Completion Criteria	Performance Indicator	Completion Criteria Met?
Integrated Landscapes	The landform morphology fits in with the surrounding landscape.	Overburden emplacement rehabilitation slopes are at or less than 10° for out-of-pit emplacement area and less than18° for final void.	YES
	The area does not represent an erosion hazard.	Erosion does not exceed 0.3m (gully) deep.	No
Sustainable Growth Development – Woodland Ecological Community	Appropriate native plant species richness is present for the restored ecological community.	Native plant species numbers (per 400m²): • Box Gum Woodland: 23 • Other Woodland: 30 • Brigalow Woodland: 20	Partial 7/26
	Appropriate density/structure of native overstorey species is present.	Native overstorey cover range between: • Box Gum Woodland: 0-25% • Other Woodland: 6-40% • Brigalow Woodland: 0-25%	Partial 10/26
	Appropriate density/structure of native mid storey species is present.	Mid Storey cover range between: • Box Gum Woodland: 0-5% • Other Woodland: 6-25% • Brigalow Woodland: 0-5%	Partial 22/26
	Appropriate native groundcover is present.	Bare ground and litter does not exceed: • Box Gum Woodland: 55% • Other Woodland: 55% • Brigalow Woodland: 65%	Partial 23/26
Land Use	The land use is sustainable and consistent with the intended land use.	Establish areas of rehabilitation consistent approval conditions. Land use classifications to include: • Rehabilitation of GWBW. • Rehabilitation of Brigalow Woodland. • Agricultural land. • Biodiversity Offset Area.	Partial No Agricultural Rehabilitation
	No hazards that are inconsistent with intended land use.	The site is free of safety or environmental hazards including: • holes, tunnels or unstable areas; • mining infrastructure or debris; or • Hazardous materials.	YES
	Soil pH is representative of the intended land use.	pH levels are within the range generally acceptable for plant growth (5.0 to 8.5) until data from analogue sites is available.	Partial 19/23
	Exotic/weed vegetation out competing natives or impacting on intended land use.	Noxious and environmental weeds are under control within rehabilitation or biodiversity offset areas	No
	Feral pests are not impacting on intended land use.	Feral pests are under control within rehabilitation or biodiversity offset areas	No

As expected, while progress is being made towards achieving a woodland vegetation land use; WCC still has a long way to achieve the completion criteria.

5.6 REHABILITATION TRIALS AND RESEARCH

No trials were undertaken during the period.

5.7 MINE CLOSURE

The LOM MOP/RMP discusses at a high level the rehabilitation management procedures for the ultimate closure of WCC and the final void. Currently, WCC is approved to cease mining operations in 2031 and therefore at this stage mine closure planning is conceptual in detail covering the cessation of mining and management of the final void to mitigate potential safety risks as well as any potential environmental impacts.

The LOM MOP/RMP identified five distinct domains across WCC requiring different management strategies to rehabilitate and return to a post-mining land use. Based on the analysis of constraints and opportunities, the preferred final land use options for each domain are summarised in **Table 5.11**.

Table 5.11 WCC Rehabilitation Domains and Final Land Use Options

Domain	Description	Final Land Use
D1	Infrastructure Areas	Woodland Vegetation Community or Land Capability Class III Agriculture*
D2	Water Management Infrastructure	Woodland Vegetation Community
D3	Mining and Overburden Emplacement (Rehabilitation) Areas	Woodland Vegetation Community
D4	Final Void Area	Woodland Vegetation Community
D5	Biodiversity Offset Area and Other Buffer Lands	Woodland Vegetation Community or Land Capability Class III Agriculture*

* Final Land Use decision between Woodland Vegetation Community or Land Capability Class III Agriculture will be determined on a location basis based upon the adjacent land use.

6. ACTIVITIES PROPOSED IN THE NEXT AEMR PERIOD

This section summarises the activities and management outcomes as part of the continuous improvement of environmental management, maintaining compliance and improving consultation with neighbours and the local community. Achievements documented for the 2014-2015 period:

- Community consultation included four WCC CCC meetings; three community newsletters distributed to Quipolly and Werris Creek residents; two public meeting held in Werris Creek; one Water factsheet developed; four community bus tours of WCC were held;
- The following Management Plans or documents were approved:
    - Heritage Management Plan; and
    - Biodiversity and Offset Management Plan.
- Completed 142.7ha of rehabilitation since 2005 with WCC now ahead of the MOP target of 120.2ha;
- Implemented a new total waste management contract to improve waste recycling and regulatory compliance through improved reporting;
- Controlled burns in Winter 2014 for hazard reduction and ecological purposes resulted in 110.8ha of the Eurunderee, Railway View and Mine Site BOA's burnt which was above the annual 100ha target;
- Permanent relocation of the Narrawolga Axe Grinding Groove Rocks to the Willow Tree Visitor Information Centre in accordance with the Nungaroo Local Aboriginal Lands Council and Liverpool Plains Shire Council request to establish a tourist attraction for the start of the Kamilaroi Highway;
- Water management improvement actions undertaken for 2014-2015 included installing high water level alarms for Void Water Dams 1, 3 & 4 capable of SMS messages to key site personnel when triggered; implemented three month rolling short term water strategy for WCC to quantify and manage excess void water and revised the site water balance to identify additional longer term void water management options for excess void water; installed new deep nested groundwater piezometer (MW36) and data loggers to improve the resolution of groundwater level and quality trends of bores & piezometers within the groundwater monitoring network; and a second Evaporator commenced operation to improve the management of excess void water onsite;
- Blast management improvement actions undertaken for 2014-2015 included implementation of the new blast SMS and email notification system and continued community consultation and meetings in regards to blasting impacts; implement 5 day sleep time and the Blast Fume Management Procedure; analysis of blast timing and monitoring resulting frequencies in relation to blasting impacts; lowered the blast vibration prediction design target to 0.8mm/s and implemented a new Blast Phase Design and Environmental Risk Analysis Checklist to improvement management and reduce community complaints;
- Air quality management improvement actions undertaken for 2014-2015 included prestrip dust suppression from sprinkler application, inversion related dust haze management and spontaneous combustion air quality management;

- Biodiversity management improvement actions undertaken for 2014-2015 included the pest control program increased from six-monthly to quarterly and harvesting native grass seed of three uncommon species across the rehabilitation and BOA for future revegetation;
- Noise management improvement actions planned for 2014-2015 included a third continuous noise monitor for Werris East was installed in November 2014 to be representative of properties to the east of WCC to improve operational noise management in response to recent noise exceedances and three new private agreements signed with Quipolly residents; and
- The three yearly Independent Environmental Audit was undertaken in May 2014 with only five non-compliances against PA 10_0059 identified out of 75 conditions (93.2% compliance) and only a further five other minor non-compliances identified for the other environmental approvals.

WCC targets for the 2015-2016 period:

- Obtain approval for PA 10_0059 MOD2 application to allow minor overburden emplacement extensions, dry coal processing, offsite void water for agricultural beneficial use and new visual bund licenced discharge point for dirty water management;
- Obtain approval for a minor MOP Amendment 1 (of 2011 MOP) and a new MOP approval (2015-2022) to the new MREMP guidelines;
- Align monitoring with the new closure/completion criteria outlined in the new MOP approval and update the Biodiversity and Offset Management Plan to the new DP&E guidelines;
- Undertake a preliminary mine closure risk assessment to identify key knowledge gaps prior to development of a mine closure plan in 2017 approximately five years from closure;
- Donate the duck bill loader uncovered from the former underground colliery to the Gunnedah Rural Heritage Museum for preservation of the coal mining heritage item;
- Update pre-blast weather assessment criteria on a shot by shot basis rather than have one wind direction criteria that encompasses the whole pit;
- Secure the tenure of the BOA onto the land title with the approval of DP&E and Department of Environment. Implement recommendations from biodiversity monitoring for additional strategies to reduce the presence of exotic species and targeted overstorey revegetation at BOA monitoring sites 8, 9, 12, 15, 16 and 25 to improve restoration of woodland vegetation communities. Develop a Seed Production Area (SPA) onsite targeting 6 herbs and forbs that are currently uncommon in BOA for revegetation. Plant 1000 native grasses of three uncommon species across the rehabilitation and BOA to increase species diversity;
- Secure a third Evaporator and negotiate transfer of water to adjoining offsite properties for beneficial agricultural use to improve the management of excess void water onsite;
- Undertake a dust deposition gauge audit and install new bird deterrents for dust deposition gauges;
- Continued community liaison, support, involvement and education with respect to the Mine's activities; and
- Continued compliance with all statutory conditions of consent, leases, licence and approvals.

PLANS

(APPENDED TO THIS REPORT)

Plan 3 Land Preparation
Plan 4 Mining Activities
Plan 5 Rehabilitation

APPENDICES

Available to be downloaded from:
http://www.whitehavencoal.com.au/environment/werris_creek_mine_environmental_management.cfm

Appendix 1	Project Approval (PA10_0059)
Appendix 2	Licence and Lease
2(a)	Environment Protection Licence 12290
2(b)	Mining Lease 1563
2(c)	Mining Lease 1671
2(d)	Mining Lease 1672
Appendix 3	Air Quality Monitoring Results
3(a)	Deposited Dust Monitoring Results
3(b)	Tapered Element Oscillation Microbalance and High Volume Air Sampler Results
3(c)	Quirindi Dust Sampling Results
Appendix 4	Water Quality Monitoring Results
4(a)	Surface Water Monitoring Results
4(b)	Groundwater Modelling Reports – Environ Pty Ltd
4(c)	Groundwater Monitoring Results
Appendix 5	Validation Assessment – Stockpiled Contaminated Material – Mitchel Halon Pty Ltd
Appendix 6	Biodiversity Offset Area Annual Monitoring Report – Eco Logical Australia Pty Ltd
Appendix 7	Blast Monitoring Results
Appendix 8a	Monthly Attended Noise Monitoring Reports
Appendix 8b	Continuous Noise Monitoring Summary
Appendix 9	Monthly Meteorological Data
Appendix 10	Complaints Database

RAILWAY
E 274,000
E 275,000
E 276,000
N 6,526,000
N 6,525,000
N 6,524,000
N 6,523,000
N 6,522,000
SB10
EPA14
SD13
RAIL LOOP
RAIL LOAD OUT & STOCKPILE PRECINCT
SD10
COAL HAUL ROAD
ESCOTT ROAD
M.I.A. VISUAL BUND
ACOUSTIC BUND
GREAT WERRIS
WORKSHOP
ADMINISTRATION
VWD5
RUN OF MINE (ROM) COAL STOCKPILE PRECINCT
SB15
EXPLOSIVES RELOAD AREA
ACTIVE MINING AREA
SB9
EPA12
SB8
VWD2
EXPLOSIVES MAGAZINE
MAIN SITE ACCESS
NORTHERN CREEK
ROAD
RAILWAY
EMPLACEMENT AREA
SB5
SB4
VWD3
VWD4
SB3
SB2
EPA10
VWD1
SD5
SD4
N
S
E
W

LEGEND

- LEASE BOUNDARY - COMBINED
- CURRENT EXTRACTION LIMIT
- MINING DISTURBANCE BOUNDARY
- MINING OPERATIONAL BOUNDARY
- BIO-DIVERSITY OFFSET AREA
- WATER STORAGE
- TOPSOIL STOCKPILE
- TOPSOIL STRIPPING AREA
- INFRASTRUCTURE AREA

SOIL MAPPING UNIT STRIP DEPTHS

- AREA 1 -NIL STRIPPING DEPTH
- AREA 2 - 300mm STRIPPING DEPTH

PLAN 3
LAND PREPARATION
WERRIS CREEK MINE

File Ref: *W:\Survey\Environmental\AMER plans\2015\2015 AEMR Plans 3, 4 & 5.dwg*

Date: *June 25, 2015* *Approved by:*

0 Meters 50 100 150 200 250 300 350

SCALE 1:4000

E 274,000
E 275,000
E 276,000
N 6,526,000
N 6,525,000
N 6,524,000
N 6,523,000
N 6,522,000
RAILWAY
SB10
EPA14
SD13
RAIL LOOP
RAIL LOAD OUT & STOCKPILE PRECINCT
ESCOTT ROAD
SD10
COAL HAUL ROAD
M.I.A. VISUAL BUND
ACOUSTIC BUND
WORKSHOP
ADMINISTRATION
VWD5
GREAT WERRIS NORTHERN CREEK ROAD
RUN OF MINE (ROM) COAL STOCKPILE PRECINCT
SB15
EXPLOSIVES RELOAD AREA
SB9
EPA12
SB8
ACTIVE MINING AREA
VWD2
EXPLOSIVES MAGAZINE
MAIN SITE ACCESS
EMPLACEMENT AREA
RAILWAY
SB5
SB4
VWD3
VWD4
SB3
SB2
EPA10
VWD1
SD5
SD4
MAIN SITE ACCESS

LEGEND

- LEASE BOUNDARY - COMBINED
- MINING DISTURBANCE BOUNDARY
- CURRENT EXTRACTION LIMIT
- MINING OPERATIONAL BOUNDARY
- BIO-DIVERSITY OFFSET AREA
- WATER STORAGE
- TOPSOIL STOCKPILE
- REHABILITATED AREA
- INFRASTRUCTURE AREA
- PROPOSED WASTE EMPLACEMENT
- PROPOSED MINING AREA
- PROPOSED STRIPPING AREA

PLAN 4
PROPOSED MINING ACTIVITY WERRIS CREEK MINE

File Ref: W:\Survey\Environmental\AMER plans\2015\2015 AEMR Plans 3, 4 & 5.dwg

Date: June 25, 2015 Approved by:

0 Meters 50 100 150 200 250 300 350

SCALE 1:4000

RAILWAY
E 274,000
E 275,000
E 276,000
N
W
E
S
SB10
EPA14
SD13
RAIL LOOP
RAIL LOAD OUT & STOCKPILE PRECINCT
ESCOTT ROAD
N 6,526,000
SD10
COAL HAUL ROAD
M.I.A. VISUAL BUND
ACOUSTIC BUND
WORKSHOP
ADMINISTRATION
VWD5
GREAT WERRIS
N 6,525,000
RUN OF MINE (ROM) COAL STOCKPILE PRECINCT
SB15
EXPLOSIVES RELOAD AREA
ACTIVE MINING AREA
SB9
EPA12
SB8
VWD2
EXPLOSIVES MAGAZINE
MAIN SITE ACCESS
NORTHERN CREEK ROAD
N 6,524,000
EMPLACEMENT AREA
RAILWAY
N 6,523,000
SB5
SB4
SD4
MAIN SITE ACCESS
VWD3
VWD4
SB3
SB2
EPA10
VWD1
SD5
E 274,000
E 275,000
E 276,000
N 6,522,000

LEGEND

- LEASE BOUNDARY - COMBINED
- MINING DISTURBANCE BOUNDARY
- CURRENT EXTRACTION LIMIT
- MINING OPERATIONAL BOUNDARY
- BIO-DIVERSITY OFFSET AREA
- WATER STORAGE
- TOPSOIL STOCKPILE
- REHABILITATED AREA
- INFRASTRUCTURE AREA
- PROPOSED REHABILITATION
- EXISTING MINING AREA
- EXISTING WASTE AREA

PLAN 5
PROPOSED REHABILITATION
WERRIS CREEK MINE

File Ref:
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Date: *June 25, 2015* *Approved by:*

0 Meters 50 100 150 200 250 300 350

SCALE 1:4000

Project Approval

Section 75J of the *Environmental Planning & Assessment Act 1979*

Under the Minister for Planning and Infrastructure's delegation of 14 September 2011, I approve the project application referred to in Schedule 1, subject to the conditions in Schedules 2 to 5.

These conditions are required to:

- prevent, minimise, and/or offset adverse environmental impacts;
- set standards and performance measures for acceptable environmental performance;
- require regular monitoring and reporting; and
- provide for the ongoing environmental management of the project.

Chris Wilson
A/Deputy Director-General
Development Assessment and Systems Performance

SIGNED 25 OCTOBER 2011
Sydney 2011

SCHEDULE 1

Application Number:	10_0059
Proponent:	Werris Creek Coal Pty Limited
Approval Authority:	Minister for Planning and Infrastructure
Land:	See Appendix 1
Project:	Werris Creek Mine Extension Project

MOD 1 (August 2012) in red type

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DEFINITIONS

Annual Review	The review required by condition 3 of schedule 5
ARTC	Australian Rail Track Corporation
BCA	Building Code of Australia
Biodiversity offset strategy	The conservation and enhancement strategy described in EA, and shown conceptually in the figure in Appendix 4
CCC	Community Consultative Committee
CEEC	Critically endangered ecological community
Conditions of this approval	Conditions contained in schedules 2 to 5 inclusive
Council	Liverpool Plains Shire Council
Day	The period from 7 am to 6 pm on Monday to Saturday, and 8 am to 6 pm on Sundays and Public Holidays
Department	Department of Planning and Infrastructure
Director-General	Director-General of the Department, or delegate
DNG	Derived native grassland
DRE	Division of Resources and Energy (within the Department of Trade and Investment, Regional Infrastructure and Services)
EA	Environmental assessment titled *Werris Creek Coal Mine Life of Mine Project*, dated December 2010, as modified by the response to submissions, dated March 2011; and the letter from Whitehaven Coal Limited to the Department, dated 25 July 2011
EA (MOD 1)	The Environmental Assessment for 10_0059 MOD 1, comprising the letters from Whitehaven Coal Limited to the Department dated 3 August 2012 and 27 August 2012
EEC	Endangered Ecological Community
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPA	Environment Protection Authority
EPL	Environment Protection Licence issued under the POEO Act
Evening	The period from 6 pm to 10 pm
Feasible	Feasible relates to engineering considerations and what is practical to build or carry out
Incident	A set of circumstances that: • causes or threatens to cause material harm to the environment; and/or • breaches or exceeds the limits or performance measures/criteria in this approval
Land	As defined in the EP&A Act, except for where the term is used in the noise and air quality conditions in schedules 3 and 4 of this approval where it is defined to mean the whole of a lot, or contiguous lots owned by the same landowner, in a current plan registered at the Land Titles Office at the date of this approval
Material harm to the environment	Actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial
Mining operations	Includes the removal of overburden and extraction, processing, handling, storage and transportation of coal
Minister	Minister for Planning and Infrastructure, or delegate
Mitigation	Activities associated with reducing the impacts of the project
Negligible	Small and unimportant, such as to be not worth considering
Night	The period from 10 pm to 7 am on Monday to Saturday, and 10 pm to 8 am on Sundays and Public Holidays
NOW	NSW Office of Water (within the Department of Primary Industries)
OEH	Office of Environment and Heritage (within the Department of Premier and Cabinet)
POEO Act	*Protection of the Environment Operations Act 1997*
Privately-owned land	Land that is not owned by a public agency or a mining company (or its subsidiary)
Project	The development described in the EA
Proponent	Werris Creek Coal Pty Limited, or its successors
Reasonable	Reasonable relates to the application of judgement in arriving at a decision, taking into account: mitigation benefits, cost of mitigation versus benefits provided, community views and the nature and extent of potential improvements
Rehabilitation	The return land disturbed by the project to a good condition, and ensure it is safe, stable and non-polluting
ROM	Run-of-mine
RMS	Roads and Maritime Services
Site	The land listed in Appendix 1
Statement of commitments	The Proponent's commitments in Appendix 6

SCHEDULE 2
ADMINISTRATIVE CONDITIONS

OBLIGATION TO MINIMISE HARM TO THE ENVIRONMENT

1. The Proponent shall implement all reasonable and feasible measures to prevent and/or minimise any material harm to the environment that may result from the construction, operation or rehabilitation of the project.

TERMS OF APPROVAL

2. The Proponent shall carry out the project generally in accordance with the:
   (a) EA;
   (b) statement of commitments;
   (c) EA MOD 1; and
   (d) the conditions of this approval.

   Notes:
   - *The general layout of the project is shown in Appendix 2; and*
   - *The statement of commitments is reproduced in Appendix 6.*

3. If there is any inconsistency between the above documents, the most recent document shall prevail to the extent of the inconsistency. However, the conditions of this approval shall prevail to the extent of any inconsistency.

4. The Proponent shall comply with any reasonable requirement/s of the Director-General arising from the Department's assessment of:
   (a) any reports, strategies, plans, programs, reviews, audits or correspondence that are submitted in accordance with this approval; and
   (b) the implementation of any actions or measures contained in these documents.

LIMITS ON APPROVAL

Mining Operations

5. The Proponent may carry out mining operations on site until the end of December 2032.

   Note: Under this approval, the Proponent is required to rehabilitate the site and carry out additional undertakings to the satisfaction of both the Director-General and the Executive Director, Mineral Resources in DRE. Consequently, this approval will continue to apply in all other respects other than the right to conduct mining operations until the rehabilitation of the site and those additional undertakings have been carried out satisfactorily.

Coal Extraction

6. The Proponent shall not extract more than 2.5 million tonnes of ROM coal from the site in a calendar year.

Coal Stockpiling

7. The Proponent shall not stockpile more than 250,000 tonnes of product coal on the site.

Coal Transport

8. The Proponent shall not transport:
   (a) more than 50,000 tonnes of product coal from the site by public road in any calendar year; and
   (b) any product coal from the site by public road to the Muswellbrook, Singleton, Mid-Western regional, Cessnock or Newcastle local government areas without the written approval of the Director-General.

SURRENDER OF EXISTING DEVELOPMENT CONSENT

9. By the end of October 2012, or as otherwise agreed by the Director-General, the Proponent shall surrender the existing development consent (DA 172-7-2004) for the Werris Creek mine in accordance with section 104A of the EP&A Act.

   Prior to the surrender of this development consent, the conditions of this approval shall prevail to the extent of any inconsistency with the conditions of the development consent.

STRUCTURAL ADEQUACY

10. The Proponent shall ensure that all new buildings and structures, and any alterations or additions to existing buildings and structures, are constructed in accordance with the relevant requirements of the BCA.

Notes:

- *Under Part 4A of the EP&A Act, the Proponent is required to obtain construction and occupation certificates (where necessary) for the proposed building works; and*
- *Part 8 of the EP&A Regulation sets out the requirements for the certification of the project.*

DEMOLITION

11. The Proponent shall ensure that all demolition work on site is carried out in accordance with *Australian Standard AS 2601-2001: The Demolition of Structures,* or its latest version.

OPERATION OF PLANT AND EQUIPMENT

12. The Proponent shall ensure that all the plant and equipment used on site, or to transport coal from the site, is:
    (a) maintained in a proper and efficient condition; and
    (b) operated in a proper and efficient manner.

STAGED SUBMISSION OF ANY STRATEGY, PLAN OR PROGRAM

13. With the approval of the Director-General, the Proponent may submit any strategy, plan or program required by this approval on a progressive basis.

Notes:

- *While any strategy, plan or program may be submitted on a progressive basis, the Proponent will need to ensure that the existing operations on site are covered by suitable strategies, plans or programs at all times; and*
- *If the submission of any strategy, plan or program is to be staged, then the relevant strategy, plan or program must clearly describe the specific stage to which the strategy, plan or program applies, the relationship of this stage to any future stages, and the trigger for updating the strategy, plan or program..*

14. Until they are replaced by an equivalent strategy, plan or program approved under this approval, the Proponent shall implement the existing strategies, plans or programs that apply under DA 172-7-2004.

COMMUNITY ENHANCEMENT

15. The Proponent shall establish and operate a Community Enhancement Fund for the project to the satisfaction of the Director-General. This fund must:
    (a) be established and operated in consultation with Council and the CCC;
    (b) be directed towards providing benefits to the local communities affected by the project;
    (c) provide for the expenditure of at least $300,000 (indexed to CPI) over 6 calendar years (2012 to 2017), and include at least $200,000 of expenditure within the town of Werris Creek; and
    (d) be operating from the end of April 2012, unless the Director-General agrees otherwise.

SCHEDULE 3
ENVIRONMENTAL PERFORMANCE CONDITIONS

NOISE

Noise Criteria

1. The Proponent shall ensure that the noise generated by the project (including noise generated on the Werris Creek Rail Spur) does not exceed the criteria in Table 1 at any residence on privately-owned land or on more than 25 percent of any privately-owned land.

Table 1: Noise criteria

Location	***Day*** ***dB(A) $L_{Aeq(15\ min)}$***	***Evening & Night*** ***dB(A) $L_{Aeq(15\ min)}$***	***Night*** ***dB(A) $L_{A1\ (1\ min)}$***
R18	40	37	45
R10, R11, R14	39	39	45
R20, R21	39	37	45
R12	38	38	45
R96	38	37	45
R7, R8, R9, R24	37	37	45
R22, R98	36	36	45
All other privately-owned land	35	35	45

Notes:

- *To interpret the locations referred to in Table 1, see the applicable figure in Appendix 3; and*
- *Noise generated by the project is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.*

However, these criteria do not apply if the Proponent has an agreement with the relevant owner/s of these residences/land to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Noise Acquisition Criteria

2. If the noise generated by the project causes sustained exceedances of the criteria in Table 2 at any residence on privately-owned land or on more than 25 percent of any privately-owned land, then upon receiving a written request for acquisition from the landowner, the Proponent shall acquire the land in accordance with the procedures in conditions 5 - 6 of schedule 4.

Table 2: Noise acquisition criteria

Location	***Day/Evening/Night*** ***dB(A) $L_{Aeq\ (15min)}$***
All privately-owned land	40

Note: Noise generated by the project is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.

Additional Noise Mitigation Measures

3. Upon receiving a written request from the owner of the land listed in Table 3, the Proponent shall implement additional noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at any residence on the land in consultation with the owner. These measures must be reasonable and feasible.

If within 3 months of receiving this request from the owner, the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

Table 3: Land subject to additional noise mitigation measures

R10	R18
R11	R20
R12	R21
R14	R96

Note: To interpret the locations referred to in Table 3, see the applicable figure in Appendix 3.

Operating Conditions

4. The Proponent shall:
   (a) implement best practice noise management to minimise the operational, low frequency, rail and road traffic noise of the project;
   (b) regularly assess the real-time noise monitoring and meteorological forecasting data and relocate, modify, and/or stop operations on site to ensure compliance with the relevant conditions of this approval;
   (c) minimise the noise impacts of the project during temperature inversions; and
   (d) use its best endeavours to achieve the long-term noise goals in Table 4, where this is reasonable and feasible, and report on the progress towards achieving these goals in the annual review;
   (e) carry out a comprehensive noise audit of the project in conjunction with each independent environmental audit,

   to the satisfaction of the Director-General.

Table 4: Long-term noise goal

Location	***Day/Evening/Night*** ***dB(A) $L_{Aeq\ (15min)}$***
All privately-owned land	35

Note: Noise generated by the project is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.

Noise Management Plan

5. The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
   (a) be prepared in consultation with EPA by a suitably qualified expert whose appointment has been approved by the Director-General;
   (b) be submitted to the Director-General for approval by the end of April 2012;
   (c) describe the measures that would be implemented to ensure compliance with the relevant conditions of this approval, including:
      - a real-time noise management system that employs both reactive and proactive mitigation measures; and
      - rail spur management plan, that has been prepared in consultation with ARTC and the rail freight company; and
   (d) include a Noise Monitoring Program that:
      - uses a combination of real-time and supplementary attended noise monitoring measures to evaluate the performance of the project;
      - is capable of monitoring temperature inversion strengths at an appropriate sampling rate;
      - evaluates and reports on the effectiveness of the real-time noise management system;
      - includes a protocol for determining exceedances of the relevant conditions of this approval.

BLASTING

Blasting Criteria

6. The Proponent shall ensure that blasting on site does not cause exceedances of the criteria in Table 5.

Table 5: Blasting Criteria

Location	***Airblast Overpressure (dB(Lin Peak))***	***Ground Vibration (ppv(mm/s))***	***Allowable Exceedance***
Any residence on privately-owned land	115	5	5% of the total number of blasts over a period of 12 months
	120	10	0%
All public infrastructure	-	50	0%

However, these criteria do not apply if the Proponent has a written agreement with the relevant owner, and has advised the Department in writing of the terms of this agreement.

Blasting Hours

7. The Proponent shall only carry out blasting on site between 9 am and 5 pm Monday to Saturday inclusive. No blasting is allowed on Sundays, public holidays, or at any other time without the written approval of the Director-General.

Blasting Frequency

8. The Proponent shall not carry out more than:
   (a) 1 blast a day on site, unless an additional blast is required following a blast misfire; and
   (b) 15 blasts a month on site.

   This condition does not apply to blasts that generate ground vibration of 0.5 mm/s or less at any residence on privately-owned land, or blasts required to ensure the safety of the mine or its workers.

   Note: For the purposes of this condition, a blast refers to a single blast event, which may involve a number of individual blasts fired in quick succession in a discrete area of the mine.

Property Inspections

9. If the Proponent receives a written request from the owner of any privately-owned land within 2 kilometres of the approved open cut pit on site for a property inspection to establish the baseline condition of any buildings and/or structures on their land, or to have a previous property inspection report updated, then within 2 months of receiving this request the Proponent shall:
   (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Director-General to:
      - establish the baseline condition of the buildings and/or structures on the land or update the previous property inspection report; and
      - identify any measures that should be implemented to minimise the potential blasting impacts of the projects on these buildings and/or structures; and
   (b) give the landowner a copy of the new or updated property inspection report.

Property Investigations

10. If the owner of any privately-owned land claims that the buildings and/or structures on their land have been damaged as a result of blasting on site, then within 2 months of receiving this claim the Proponent shall:
   (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Director-General, to investigate the claim; and
   (b) give the landowner a copy of the property investigation report.

   If this independent property investigation confirms the landowner's claim, and both parties agree with these findings, then the Proponent shall repair the damage to the satisfaction of the Director-General.

   If the Proponent or landowner disagrees with the findings of the independent property investigation, then either party may refer the matter to the Director-General for resolution.

Operating Conditions

11. The Proponent shall:
   (a) implement best practice blasting management on site to:
      - protect the safety of people and livestock in the surrounding area;
      - protect private or public property in the surrounding area;
      - minimise the dust and fume emissions of the blasting; and
   (b) minimise the duration and frequency of any road closures for blasting;
   (c) operate a suitable system to enable the public to get up-to-date information on the proposed blasting schedule on site,
   to the satisfaction of the Director-General.

12. The Proponent shall not carry out blasting on site that is within 500 metres of:
   (a) Werris Creek Road without the approval of RMS;
   (b) the Main Northern Railway without the approval of ARTC; and
   (c) any land outside the site that is not owned by the Proponent unless:
      - the Proponent has a written agreement with the relevant landowner to allow blasting to be carried out closer to the land, and the Proponent has advised the Director-General in writing of the terms of this agreement; or
      - the Proponent has:
         - demonstrated to the satisfaction of the Director-General that the blasting can be carried out closer to the land without compromising the safety of people or livestock on the land, or damaging the buildings and/or structures on the land; and

- updated the Blast Management Plan to include the specific measures that would be implemented while blasting is being carried out within 500 metres of the land.

Blast Management Plan

13. The Proponent shall prepare and implement a Blast Management Plan for the project to the satisfaction of the Director-General. This plan must:
    (a) be prepared in consultation with EPA, RMS and ARTC;
    (b) be submitted to the Director-General for approval by the end of April 2012;
    (c) describe the mitigation measures that would be implemented to ensure compliance with the relevant conditions of this approval;
    (d) describe the measures that would be implemented to ensure that the public can get up-to-date information on the proposed blasting schedule on site; and
    (e) include a blast monitoring program for evaluating the performance of the project, including:
    - compliance with the applicable criteria; and
    - minimising the fume emissions from the site.

AIR QUALITY & GREENHOUSE GAS

Odour

14. The Proponent shall ensure that no offensive odours, as defined under the POEO Act, are emitted from the site.

Greenhouse Gas Emissions

15. The Proponent shall implement all reasonable and feasible measures to minimise the release of greenhouse gas emissions from the site to the satisfaction of the Director-General.

Air Quality Criteria

16. The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the project do not exceed the criteria listed in Tables 6, 7 and 8 at any residence on privately-owned land or on more than 25 percent of any privately-owned land.

Table 6: Long-term criteria for particulate matter

Pollutant	***Averaging Period***	[d] ***Criterion***
Total suspended particulate (TSP) matter	Annual	[a] 90 µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	[a] 30 µg/m^3

Table 7: Short-term criterion for particulate matter

Pollutant	***Averaging Period***	[d] ***Criterion***
Particulate matter < 10 µm (PM_{10})	24 hour	[a] 50 µg/m^3

Table 8: Long-term criteria for deposited dust

Pollutant	***Averaging Period***	***Maximum increase in deposited dust level***	***Maximum total deposited dust level***
[c] Deposited dust	Annual	[b] 2 g/m^2/month	[a] 4 g/m^2/month

Notes to Tables 6-8:

- [a] *Total impact (ie incremental increase in concentrations due to the project plus background concentrations due to all other sources);*
- [b] *Incremental impact (ie incremental increase in concentrations due to the project on its own);*
- [c] *Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method.*
- [d] *Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents, illegal activities or any other activity agreed by the Director-General in consultation with EPA.*

Air Quality Acquisition Criteria

17. If particulate matter emissions generated by the project exceed the criteria in Tables 9, 10, and 11 at any residence on privately-owned land, or on more than 25 percent of any privately owned land, then upon written request for acquisition from the landowner, the Proponent shall acquire the land in accordance with the procedures in conditions 5-6 of schedule 4.

Table 9: Long term land acquisition criteria for particulate matter

Pollutant	***Averaging period***	***[d] Criterion***
Total suspended particulate (TSP) matter	Annual	[a] 90 µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	[a] 30 µg/m^3

Table 10: Short term land acquisition criteria for particulate matter

Pollutant	***Averaging period***	***[da] Criterion***
Particulate matter < 10 µm (PM_{10})	24 hour	[a] 150 µg/m^3
Particulate matter < 10 µm (PM_{10})	24 hour	[b] 50 µg/m^3

Table 11: Long term land acquisition criteria for deposited dust

Pollutant	***Averaging period***	***Maximum increase[2] in deposited dust level***	***Maximum total[1] deposited dust level***
[c] Deposited dust	Annual	[b] 2 g/m^2/month	[a] 4 g/m^2/month

Notes to Tables 9-11:

- [a] *Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources);*
- [b] *Incremental impact (i.e. incremental increase in concentrations due to the development on its own);*
- [c] *Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method; and*
- [d] *Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by the Director-General.*

Operating Conditions

18. The Proponent shall:
    (a) implement best practice air quality management on site to minimise the off-site odour, fume and particulate matter emissions of the project, including the dust emissions associated with the transport coal produced on site by road or rail;
    (b) minimise any visible air pollution generated by the project;
    (c) minimise any surface disturbance on site; and
    (d) regularly assess the real-time air quality monitoring and meteorological forecasting data and relocate, modify and/or stop operations on site to ensure compliance with the relevant conditions of this approval,

    to the satisfaction of the Director-General.

Air Quality and Greenhouse Gas Management Plan

19. The Proponent shall prepare and implement an Air Quality and Greenhouse Gas Management Plan for the project to the satisfaction of the Director-General. This plan must:
    (a) be prepared in consultation with EPA, and submitted to the Director-General by the end of April 2012;
    (b) describe the measures that would be implemented to ensure compliance with the relevant conditions of this approval, including a real-time air quality management system that employs both reactive and proactive mitigation measures;
    (c) describe the measures that would be implemented to minimise the release of greenhouse gas emissions from the site; and
    (d) include an air quality monitoring program, that:
        - uses a combination of real-time monitors and supplementary monitors, to evaluate the performance of the project;
        - evaluates and reports on the effectiveness of the real-time air quality management system; and
        - includes a protocol for determining any exceedances of the relevant conditions of this approval.

METEOROLOGICAL MONITORING

20. For the life of the project, the Proponent shall ensure that there is a suitable meteorological station operating in the vicinity of the site that:
    (a) complies with the requirements in the *Approved Methods for Sampling of Air Pollutants in New South Wales* guideline; and
    (b) is capable of continuous real-time measurement of temperature lapse rate, in accordance with the *NSW Industrial Noise Policy*, or as otherwise approved by EPA.

SOIL AND WATER

Note: Under the Water Act 1912 and/or the Water Management Act 2000, the Proponent is required to obtain the necessary water licences for the project.

Water Supply

21. The Proponent shall ensure that it has sufficient water for all stages of the project, and if necessary, adjust the scale of mining operations to match its available water supply, to the satisfaction of the Director-General.

Surface Water Discharges

22. The Proponent shall ensure that all surface water discharges from the site comply with the discharge limits (both volume and quality) set for the project in any EPL.

Water Management Plan

23. The Proponent shall prepare and implement a Water Management Plan for the project to the satisfaction of the Director-General. This plan must be prepared in consultation with NOW and EPA by suitably qualified and experienced persons whose appointment has been approved by the Director-General, and submitted to the Director-General by the end of April 2012.

    In addition to the standard requirements for management plans (see condition 2 of schedule 5), this plan must include:
    (a) a Site Water Balance that:
        - includes details of:
            - sources of water supply;
            - water use on site;
            - water management on site;
            - reporting procedures, which provide for the update of the site water balance in each annual review; and
        - describes what measures would be implemented to minimise potable water use on site;
    (b) a Surface Water Management Plan, that includes:
        - detailed baseline data of the surface water flows and quality in the waterbodies that could be affected by the project;
        - a detailed description of the water management system on site, including the:
            - clean water diversion systems;
            - erosion and sediment controls; and
            - water storages;
        - a plan for identifying, extracting, handling, and the long-term storage of potentially acid forming material on site;
        - detailed plans, including design objectives and performance criteria, for:
            - design and management of the final void;
            - reinstatement of drainage lines on the rehabilitated areas of the site; and
            - control of any potential water pollution from the rehabilitated areas of the site;
            - a program to monitor the effectiveness of the water management system;
        - a plan to respond to any exceedances of the performance criteria, and mitigate and/or offset any adverse surface water impacts of the project; and
    (c) a Groundwater Management Plan, which includes:
        - detailed baseline data of groundwater levels and quality surrounding the site;
        - groundwater assessment criteria, including trigger levels for investigating any potentially adverse groundwater impacts;
        - a program to monitor ***:***
            - groundwater inflows to the open cut mining operations;
            - the impacts of the project on any groundwater bores on privately-owned land;
            - the seepage/leachate from water storages or backfilled voids on site; and
        - a program to validate the groundwater model for the project, and calibrate it to site specific conditions; and
        - a plan to respond to any exceedances of the performance criteria, and mitigate and/or offset any adverse groundwater impacts of the project.

Void Water Dam 1

23a Within 2 months of the completion of construction works for the expanded Void Water Dam 1, the Proponent shall submit a "works as-executed" report to the Director-General and EPA, certified by a practising engineer, confirming that the expanded dam has been constructed to its design specifications.

BIODIVERSITY

Biodiversity Offset Strategy

24. The Proponent shall implement the biodiversity offset strategy for the project described in the EA, summarised in Table 12, and shown conceptually on the figure in Appendix 4 to the satisfaction of the Director-General.

Table 12: Summary of the Biodiversity Offset Strategy

Offset Areas	***Minimum Size (hectares)***
Eurunderee	363.93
Hillview	57.32
Marengo	284.12
Railway View	243.69
Mine Site	215.86
Greenslopes/Banool	123
TOTAL	**1,287.92**

Notes:
- *To identify the areas referred to in Table 12, see the applicable figure in Appendix 4;*
- *The strategy includes the enhancement of existing fauna habitat within these areas, and where necessary the targeted establishment of naturally scarce fauna habitat; and*
- *Greenslopes/Banool must have at least 74 hectares of Box Gum Woodland EEC.*

25. By the end of June 2012, unless the Director-General agrees otherwise, the Proponent shall update the biodiversity offset strategy for the project, in consultation with OEH, and to the satisfaction of the Director-General. The updated strategy must include the specific details of the Additional Offset Area (see Table 12).

26. The Proponent shall ensure that the biodiversity offset strategy and/or rehabilitation strategy is focused on the re-establishment and/or enhancement of:
(a) the following endangered ecological communities:
- White Box-Yellow Box-Blakely's Red Gum Woodland EEC; and
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC; and

(b) habitat for threatened fauna species, including the:
- Regent Honeyeater, Swift Parrot, Brown Treecreeper, Hooded Robin, Little Lorikeet, and Barking Owl; and
- Eastern Bent-wing Bat, Eastern False pipistrelle, Yellow-bellied Bent-wing Bat and Greater Broad-nosed Bat.

Long Term Security of Offsets

27. The Proponent shall make suitable arrangements to provide appropriate long-term security for the offset areas (excluding the rehabilitation areas) by December 2012, or other date agreed by the Director-General, to the satisfaction of the Director-General.

Biodiversity Offset Management Plan

28. The Proponent shall prepare and implement a Biodiversity Management Plan for the project to the satisfaction of the Director-General. This plan must:
(a) be prepared in consultation with OEH, and submitted to the Director-General for approval by the end of December 2012;
(b) describe how the implementation of the biodiversity offset strategy would be integrated with the overall rehabilitation of the site;
(c) describe the short, medium, and long term measures that would be implemented to:
- manage the remnant vegetation and habitat on the site and in the offset area/s (if and when applicable); and

- implement the biodiversity offset strategy (if and when applicable), including detailed performance and completion criteria;

(d) include detailed performance and completion criteria for evaluating the performance of the biodiversity offset strategy, and triggering remedial action (if necessary);

(e) include a detailed description of the measures that would be implemented over the next 3 years, including the procedures to be implemented for:
- enhancing the quality of existing vegetation and fauna habitat;
- restoring native vegetation and fauna habitat on the biodiversity areas and rehabilitation area through focusing on assisted natural regeneration, targeted vegetation establishment and the introduction of naturally scarce fauna habitat features (where necessary);
- landscaping the land on site that faces public roads to minimise the visual and lighting impacts of the project;
- maximising the salvage of resources within the approved disturbance area - including vegetative, soil and cultural heritage resources – for beneficial reuse in the enhancement of the biodiversity areas or rehabilitation area;
- collecting and propagating seed;
- minimising the impacts on fauna on site, including undertaking pre-clearance surveys;
- managing any potential conflicts between the proposed restoration works in the biodiversity areas and any Aboriginal heritage values (both cultural and archaeological);
- managing salinity;
- controlling weeds and feral pests;
- controlling erosion;
- managing grazing and agriculture on site;
- controlling access; and
- bushfire management;

(f) include a seasonally-based program to monitor and report on the effectiveness of these measures, and progress against the detailed performance and completion criteria;

(g) identify the potential risks to the successful implementation of the biodiversity offset strategy, and include a description of the contingency measures that would be implemented to mitigate against these risks; and

(h) include details of who would be responsible for monitoring, reviewing, and implementing the plan.

Conservation Bond

29. Within 6 months of the approval of the biodiversity offset strategy, the Proponent shall lodge a conservation bond with the Department to ensure that the biodiversity offset strategy is implemented in accordance with the performance and completion criteria of the Biodiversity Management Plan.

The sum of the bond shall be determined by:

(a) calculating the full cost of implementing the offset strategy (other than land acquisition costs); and

(b) employing a suitably qualified quantity surveyor to verify the calculated costs,

to the satisfaction of the Director-General.

If the offset strategy is completed generally in accordance with the completion criteria in the Biodiversity Management Plan to the satisfaction of the Director-General, the Director-General will release the bond.

If the offset strategy is not completed generally in accordance with the completion criteria in the Biodiversity Management Plan, the Director-General will call in all or part of the conservation bond, and arrange for the satisfactory completion of the relevant works.

With the agreement of the Director-General, this bond may be combined with rehabilitation security deposit administered by DRE.

HERITAGE

Historic Heritage

30. By the end of April 2012, the Proponent shall:

(a) undertake primary historical investigations and provide a report prepared by an experienced heritage consultant approved by the Director-General on the archaeological potential of the former Werris Creek Colliery site, remaining buildings and surrounds;

(b) provide recommendations for the management, salvage or recording of any archaeological features on the site and a timetable for the implementation of these recommendations;

(c) include in this report detailed archival recording, including photographic recording and location plans of any structures relating to the former Werris Creek Colliery; and

(d) provide a copy of this report to the Department, Heritage Council of NSW and Council,

to the satisfaction of the Director-General.

Human Remains

31. This approval does not allow the Proponent to disturb any human remains found on the site.

Heritage Management Plan

32. The Proponent shall prepare and implement a Heritage Management Plan for the project to the satisfaction of the Director-General. This plan must:
    (a) be prepared by suitably qualified and experienced persons whose appointment has been endorsed by the Director-General;
    (b) be prepared in consultation with OEH and the Aboriginal stakeholders (in relation to the management of Aboriginal heritage values);
    (c) be submitted to the Director-General for approval by the end of June 2012, unless the Director-General agrees otherwise;
    (d) include the following for the management of Aboriginal Heritage:
        - a description of the measures that would be implemented for:
            - protecting, relocating, monitoring and/or managing the axe-grinding grooves known as the "Narrawolga site";
            - managing the discovery of any human remains or previously unidentified Aboriginal objects on site;
            - maintaining and managing reasonable access for Aboriginal stakeholders to heritage items on site and within any Aboriginal heritage conservation areas;
            - ongoing consultation with the Aboriginal stakeholders in the conservation and management of Aboriginal cultural heritage both on site and within any Aboriginal heritage conservation areas; and
            - ensuring any workers on site receive suitable heritage inductions and that suitable records are kept of these inductions;
        - a strategy for the storage of any heritage items salvaged on site, both during the project and in the long-term;
    (e) include the following for the management of historic heritage:
        - a detailed plan for the implementation of any measures resulting from the further investigations into the former Werris Creek Colliery site and buildings;
        - a description of the measures that would be implemented for:
            - managing the discovery of human remains or previously unidentified heritage items on site; and
            - ensuring any workers on site receive suitable heritage inductions and that suitable records are kept of these inductions.

Note: It is accepted that the detailed plan for the implementation of any measures resulting from further investigations into the former Werris Creek Colliery site will not be submitted with the initial Heritage Management Plan. They should be progressively added to the plan once they are completed.

TRANSPORT

Roadworks

33. Prior to the use of the Northern Site Access Road, the Proponent shall:
    (a) construct the intersection of the Northern Site Access Road (see the figure in Appendix 2) to the satisfaction of Council;
    (b) tar seal Escott Road from Werris Creek Road to the coal haul road to the satisfaction of Council;
    (c) upgrade the intersection of Escott Road and Werris Creek Road to a CHR type intersection to the satisfaction of RMS and Council;
    (d) install appropriate rail crossings at the rail loop on Escott Road; and
    (e) install appropriate advance warning signs and lighting on Escott Road and at the intersection of the Northern Site Access Road to the satisfaction of Council.

34. Within 3 months of the commencement of coal transport from the Northern Site Access Road, the Proponent shall close the existing mine entrance on Werris Creek Road (see Figure 1 of Appendix 2) to coal transport (unless required in an emergency).

Road Maintenance

35. For the life of the project, the Proponent shall continue to provide funding towards the maintenance of Taylors Lane, in accordance with the existing road maintenance contributions agreement with Council.

Monitoring of Coal Transport

36. The Proponent shall:
    (a) keep accurate records of the amount of coal transported from the site (on a monthly basis); and
    (b) make these records available on its website at the end of each calendar year.

VISUAL

Visual Amenity

37. The Proponent shall:
    (a) implement all reasonable and feasible measures to minimise the visual and off-site lighting impacts of the project, including:
        - progressively rehabilitating overburden emplacement areas (particularly the outer batters), including partial rehabilitation of temporarily inactive areas and proposed topsoil storage stockpiles;
        - constructing a 15 metre high visual/amenity bund along the northeastern perimeter of the northern extent of the open-cut pit, and
        - planting trees at the foot of the overburden emplacement area along the eastern boundary of the site, in front of the visual/amenity bund, and to the north and east of the product coal stockpile and rail load-out facility;
    (b) establish and maintain an effective vegetative screen along the boundary of the site adjoining public roads;
    (c) ensure no outdoor lights shine above the horizontal; and
    (d) ensure that all external lighting associated with the development complies with *Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting*,

    to the satisfaction of the Director-General.

Additional Visual Impact Mitigation

38. Upon receiving a written request from the owner of any residence on privately-owned land which has, or would have, significant direct views of the mining operations on site during the project, the Proponent shall implement additional visual impact mitigation measures (such as landscaping treatments or vegetation screens) to reduce the visibility of these mining operations from the residences on their properties.

    These mitigation measures must be reasonable and feasible, and must be implemented within a reasonable timeframe.

    If the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

    Notes:
    - *The additional visual impact mitigation measures must be aimed at reducing the visibility of the mining operations on site from significantly affected residences, and do not require measures to reduce the visibility of the mining operations from other locations on the affected properties;*
    - *The additional visual impact mitigation measures do not necessarily have to include the implementation of measures on the affected property itself (i.e. the additional measures could involve the implementation of measures outside the affected property boundary that provide an effective reduction in visual impacts).*

WASTE

39. The Proponent shall:
    (a) implement all reasonable and feasible measures to minimise the waste generated by the project;
    (b) ensure that the waste generated by the project is appropriately stored, handled and disposed of; and
    (c) monitor and report on effectiveness of the waste minimisation and management measures in the annual review.

BUSHFIRE MANAGEMENT

40. The Proponent shall:
    (a) ensure that the project is suitably equipped to respond to any fires on site; and
    (b) assist the Rural Fire Service and emergency services as much as possible if there is a fire in the surrounding area.

REHABILITATION

Rehabilitation Objectives

41. The Proponent shall rehabilitate the site to the satisfaction of the Executive Director, Mineral resources in DRE. This rehabilitation must be generally consistent with the proposed rehabilitation strategy described in the EA (and shown conceptually in the figure in Appendix 5), and comply with the objectives in Table 13.

Table 13: Rehabilitation objectives

Feature	***Objective***
Mine site (as a whole)	• Safe, stable & non-polluting; • A landform consistent with the surrounding environment, and final land uses compatible with surrounding land uses; • Establishment of 280 hectares of the White Box-Yellow Box-Blakely's Red Gum Woodland EEC; and • Restoration of ecosystem function, including maintaining or establishing self-sustaining native ecosystems, comprised of: - local native plant species; - at least 180 hectares of shrubby woodland.
Amenity Bunds and Overburden Emplacements	• Early revegetation and planting with local native woodland species; and • Free draining.
Final Void	• Minimise the size and depth of the final void as far as is reasonable and feasible, with its floor a minimum of 5 metres above the predicted long-term groundwater level.
Project infrastructure	• To be decommissioned and removed, unless the Executive Director, DRE agrees otherwise.
Community	• Minimise the adverse socio-economic effects associated with mine closure.

Progressive Rehabilitation

42. The Proponent shall rehabilitate the site progressively, that is, as soon as reasonably practicable following disturbance.

Rehabilitation Management Plan

43. The Proponent shall prepare and implement a Rehabilitation Management Plan for the project to the satisfaction of the Executive Director, Mineral Resources in DRE. This plan must:
    (a) be prepared in consultation with the Department, NOW, OEH, Council and the CCC;
    (b) be submitted to the Executive Director, Mineral Resources in DRE by the end of April 2012
    (c) be prepared in accordance with any relevant DRE guideline;
    (d) describe how the rehabilitation of the site would be integrated with the implementation of the biodiversity offset strategy;
    (e) include detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, and triggering remedial action (if necessary);
    (f) describe the measures that would be implemented to ensure compliance with the conditions of this approval, and address all aspect of rehabilitation including mine closure, final landform, and final land use;
    (g) include a program to monitor and report on the effectiveness of the measures, and progress against the detailed performance and completion criteria; and
    (h) build to the maximum extent practicable on the other management plans required under this approval.

SCHEDULE 4
ADDITIONAL PROCEDURES

NOTIFICATION OF LANDOWNERS

1. By the end of December 2011, the Proponent shall:
   (a) notify in writing the owners of:
      - any residence on the land listed in Table 3 of schedule 3 that they are entitled to ask the Proponent to install additional noise mitigation measures at their residence at any stage during the project; and
      - any privately-owned land within 2 kilometres of the approved open cut mining pit that they are entitled to ask the proponent for a property inspection to establish the baseline condition of any buildings or structures on their land, or to have a previous property inspection report updated; and
   (b) send a copy of the NSW Health fact sheet entitled "Mine Dust and You" (as may be updated from time to time) to the owners of any land (including mine-owned land) where the predictions in the EA identify that dust emissions generated by the project are likely to be greater than the relevant air quality criteria in schedule 3 at any time during the life of the project.

2. As soon as practicable after obtaining monitoring results showing:
   (a) an exceedance of the relevant criteria in schedule 3, the Proponent shall notify the affected landowner in writing of the exceedance, and provide regular monitoring results to each of these parties until the project is complying with the relevant criteria again; and
   (b) an exceedance of the relevant air quality criteria schedule 3, the Proponent shall send a copy of the NSW Health fact sheet entitled "Mine Dust and You" (as may be updated from time to time) to the affected landowners.

INDEPENDENT REVIEW

3. If an owner of privately-owned land considers the project to be exceeding the relevant criteria in schedule 3, then he/she may ask the Director-General in writing for an independent review of the impacts of the project on his/her land.

   If the Director-General is satisfied that an independent review is warranted, then within 2 months of the Director-General's decision the Proponent shall:
   (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Director-General, to:
      - consult with the landowner to determine his/her concerns;
      - conduct monitoring to determine whether the project is complying with the relevant criteria in schedule 3; and
      - if the project is not complying with these criteria, then identify the measures that could be implemented to ensure compliance with the relevant criteria; and
   (b) give the Director-General and landowner a copy of the independent review.

4. If the independent review determines that the project is complying with the relevant criteria in schedule 3, then the Proponent may discontinue the independent review with the approval of the Director-General.

   If the independent review determines that the project is not complying with the relevant criteria in schedule 3, then the Proponent shall:
   (a) implement all reasonable and feasible mitigation measures, in consultation with the landowner and appointed independent person, and conduct further monitoring until the project complies with the relevant criteria; and
   (b) secure a written agreement with the landowner to allow exceedances of the relevant criteria;

   to the satisfaction of the Director-General.

   If the independent review determines that the project is not complying with the relevant acquisition criteria, and that the project is primarily responsible for this non-compliance, then upon receiving a written request from the landowner, the Proponent shall acquire all or part of the landowner's land in accordance with the procedures in condition 5-6 below.

LAND ACQUISITION

5. Within 3 months of receiving a written request from a landowner with acquisition rights, the Proponent shall make a binding written offer to the landowner based on:
   (a) the current market value of the landowner's interest in the land at the date of this written request, as if the land was unaffected by the project, having regard to the:
      - existing and permissible use of the land, in accordance with the applicable planning instruments at the date of the written request; and
      - presence of improvements on the land and/or any approved building or structure which has been physically commenced at the date of the landowner's written request, and is due to be

completed subsequent to that date, but excluding any improvements that have resulted from the implementation of 'additional noise mitigation measures' in condition 4 of schedule 3;

(b) the reasonable costs associated with:
- relocating within the Liverpool Plains Shire local government area, or to any other local government area agreed to by the Director-General;
- obtaining legal advice and expert advice for determining the acquisition price of the land, and the terms upon which it is to be acquired; and

(c) reasonable compensation for any disturbance caused by the land acquisition process.

However, if at the end of this period, the Proponent and landowner cannot agree on the acquisition price of the land and/or the terms upon which the land is to be acquired, then either party may refer the matter to the Director-General for resolution.

Upon receiving such a request, the Director-General will request the President of the NSW Division of the Australian Property Institute to appoint a qualified independent valuer to:
- consider submissions from both parties;
- determine a fair and reasonable acquisition price for the land and/or the terms upon which the land is to be acquired, having regard to the matters referred to in paragraphs (a)-(c) above;
- prepare a detailed report setting out the reasons for any determination; and
- provide a copy of the report to both parties.

Within 14 days of receiving the independent valuer's report, the Proponent shall make a binding written offer to the landowner to purchase the land at a price not less than the independent valuer's determination.

However, if either party disputes the independent valuer's determination, then within 14 days of receiving the independent valuer's report, they may refer the matter to the Director-General for review. Any request for a review must be accompanied by a detailed report setting out the reasons why the party disputes the independent valuer's determination. Following consultation with the independent valuer and both parties, the Director-General will determine a fair and reasonable acquisition price for the land, having regard to the matters referred to in paragraphs (a)-(c) above, the independent valuer's report and any other relevant submissions. Within 14 days of this determination, the Proponent shall make a binding written offer to the landowner to purchase the land at a price not less than the Director-General's determination.

If the landowner refuses to accept the Proponent's binding written offer under this condition within 6 months of the offer being made, then the Proponent's obligations to acquire the land shall cease, unless the Director-General determines otherwise.

6. The Proponent shall pay all reasonable costs associated with the land acquisition process described in condition 4 above, including the costs associated with obtaining Council approval for any plan of subdivision (where permissible), and registration of the plan at the Office of the Registrar-General.

SCHEDULE 5
ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING

ENVIRONMENTAL MANAGEMENT

Environmental Management Strategy

1. The Proponent shall prepare and implement an Environmental Management Strategy for the project to the satisfaction of the Director-General. This strategy must:
   (a) be submitted to the Director-General for approval by the end of April 2012;
   (b) provide the strategic framework for the environmental management of the project;
   (c) identify the statutory approvals that apply to the project;
   (d) describe the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the project;
   (e) describe the procedures that would be implemented to:
      - keep the local community and relevant agencies informed about the operation and environmental performance of the project;
      - receive, handle, respond to, and record complaints;
      - resolve any disputes that may arise during the course of the project;
      - respond to any non-compliance;
      - respond to emergencies; and
   (f) include:
      - copies of any strategies, plans and programs approved under the conditions of this approval; and
      - a clear plan depicting all the monitoring required to be carried out under the conditions of this approval.

Management Plan Requirements

2. The Proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:
   (a) detailed baseline data;
   (b) a description of:
      - the relevant statutory requirements (including any relevant approval, licence or lease conditions);
      - any relevant limits or performance measures/criteria;
      - the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;
   (c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;
   (d) a program to monitor and report on the:
      - impacts and environmental performance of the project;
      - effectiveness of any management measures (see (c) above);
   (e) a contingency plan to manage any unpredicted impacts and their consequences;
   (f) a protocol for managing and reporting any:
      - incidents;
      - complaints;
      - non-compliances with statutory requirements; and
      - exceedances of the impact assessment criteria and/or performance criteria; and
   (g) a protocol for periodic review of the plan.

Annual Review

3. By the end of March each year, the Proponent shall review the environmental performance of the project to the satisfaction of the Director-General. This review must:
   (a) describe the development (including any rehabilitation) that was carried out in the past year, and the development that is proposed to be carried out over the next year;
   (b) include a comprehensive review of the monitoring results and complaints records of the project over the past year, which includes a comparison of these results against the:
      - relevant statutory requirements, limits or performance measures/criteria;
      - monitoring results of previous years; and
      - relevant predictions in the EA;
   (c) identify any non-compliance over the past year, and describe what actions were (or are being) taken to ensure compliance;
   (d) identify any trends in the monitoring data over the life of the project;
   (e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and
   (f) describe what measures will be implemented over the next year to improve the environmental performance of the project.

Revision of Strategies, Plans and Programs

4. Within 3 months of:
   (a) the submission of an annual review under condition 3 above;
   (b) the submission of an incident report under condition 6 below;
   (c) the submission of an audit under condition 8 below; or
   (d) any modification to the conditions of this approval (unless the conditions require otherwise),

   the Proponent shall review, and if necessary revise, the strategies, plans, and programs required under this approval to the satisfaction of the Director-General.

   Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the project.

Community Consultative Committee

5. The Proponent shall operate a Community Consultative Committee (CCC) for the Werris Creek Coal Mine for the life of the project, in general accordance with the *Guidelines for Establishing and Operating Community Consultative Committees for Mining Projects* (Department of Planning, 2007, or its latest version), and to the satisfaction of the Director-General.

   Notes:
   - *The CCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Proponent complies with this approval; and*
   - *In accordance with the guideline, the Committee should be comprised of an independent chair and appropriate representation from the Proponent, Council, recognised environmental groups and the local community.*

REPORTING

Incident Reporting

6. The Proponent shall notify, at the earliest opportunity, the Director-General and any other relevant agencies of any incident that has caused, or threatens to cause, material harm to the environment. For any other incident associated with the project, the Proponent shall notify the Director-General and any other relevant agencies as soon as practicable after the Proponent becomes aware of the incident. Within 7 days of the date of the incident, the Proponent shall provide the Director-General and any relevant agencies with a detailed report on the incident, and such further reports as may be requested.

Regular Reporting

7. The Proponent shall provide regular reporting on the environmental performance of the project on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of this approval.

INDEPENDENT ENVIRONMENTAL AUDIT

8. By the end of June 2014, and every 3 years thereafter, unless the Director-General directs otherwise, the Proponent shall commission and pay the full cost of an Independent Environmental Audit of the project. This audit must:
   (a) be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Director-General;
   (b) include consultation with the relevant agencies;
   (c) assess the:
      - environmental performance of the project; and
      - whether it is complying with the requirements in this approval, any relevant EPL or Mining Lease (including any assessment, plan or program required under these approvals); and
   (d) recommend appropriate measures or actions to improve the environmental performance and rehabilitation of the project.

   Note: This audit team must be led by a suitably qualified auditor and include experts in any fields specified by the Director-General.

9. Within 6 weeks of the completion of this audit, or as otherwise agreed by the Director-General, the Proponent shall submit a copy of the audit report to the Director-General, together with its response to any recommendations contained in the audit report.

ACCESS TO INFORMATION

10. The Proponent shall:
   (a) make copies of the following publicly available on its website:
      - the EA;
      - current statutory approvals for the project;
      - approved strategies, plans and programs required under the conditions of this approval;

- a comprehensive summary of the monitoring results of the project, which have been reported in accordance with the conditions of this approval or any approved plans or programs;
- a complaints register, which is to be updated on a monthly basis;
- minutes of any CCC meetings;
- the last five annual reviews;
- any independent environmental audit of the project, and the Proponent's response to the recommendations in any audit;
- any other matter required by the Director-General; and

(b) keep this information up-to-date,

to the satisfaction of the Director-General.

APPENDIX 1
SCHEDULE OF LAND

Lot(s)	*DP Number*
19, 20, 65, 73-75, 83, 90, 92, 109, 110, 112, 120, 121, 123, 126-130, 131-135, 217, 225	751017
1-4	1022826
1-4	1037145
2	431951
1	186633
270	257307
2	1095262
1	344178
1	1114226
1	328762
1	328763
11-12	1160636
2	1085891
All Crown and public roads within the project boundary, as shown in Figure 1.	

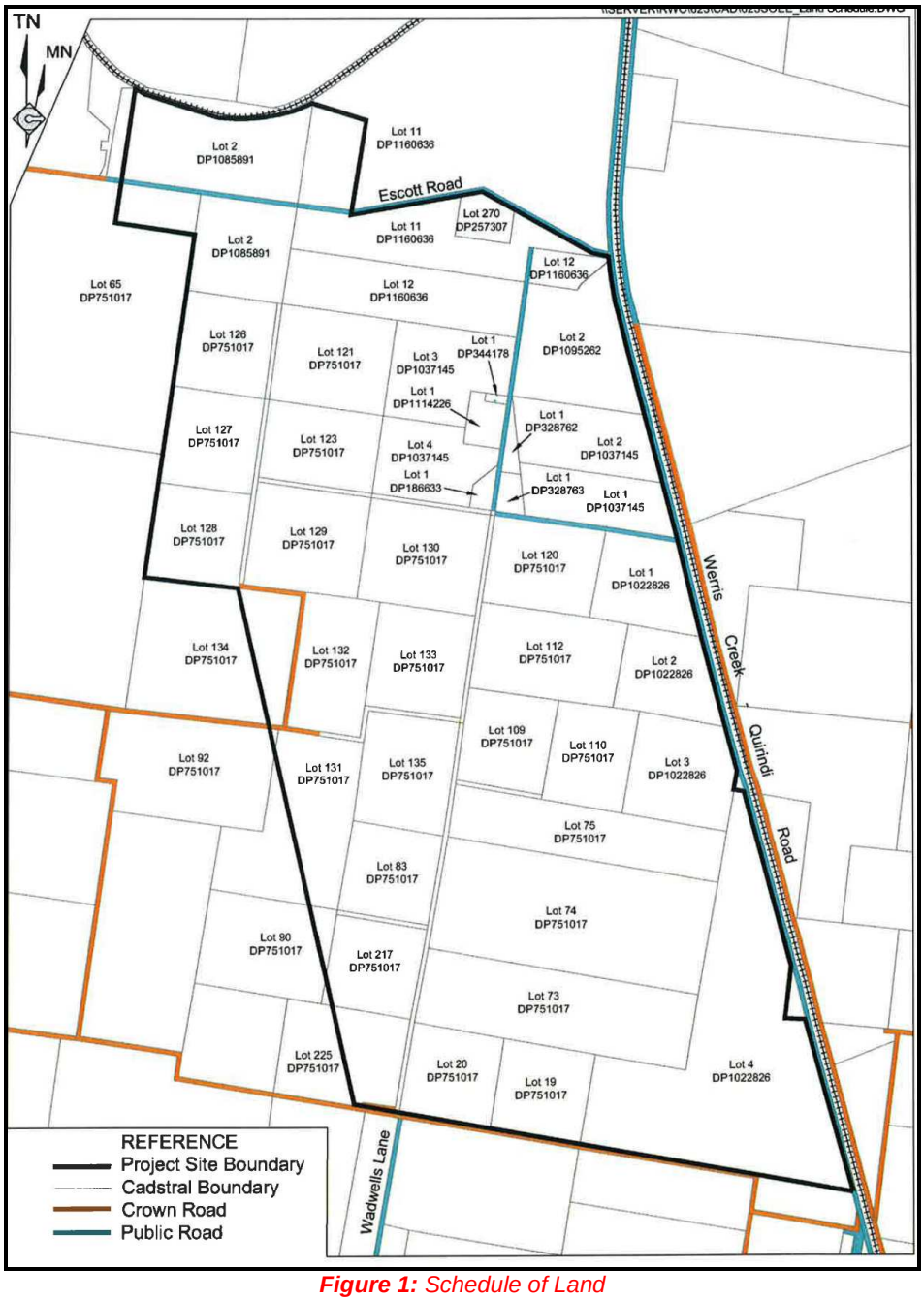

Figure 1: *Schedule of Land*

APPENDIX 2
PROJECT LAYOUT PLAN

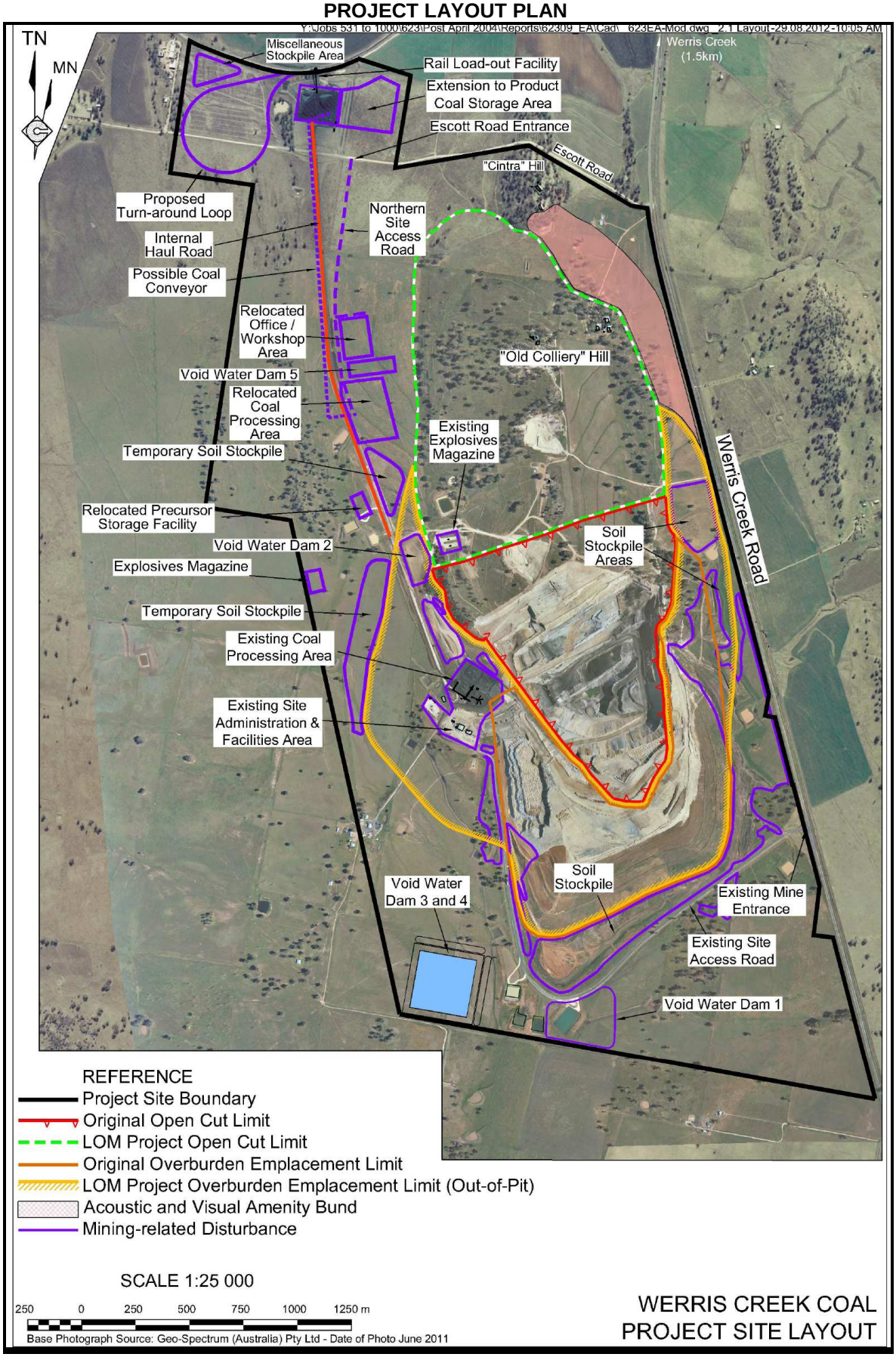

Figure 1: *Project General Arrangement*

APPENDIX 3
NOISE RECEIVER LOCATIONS

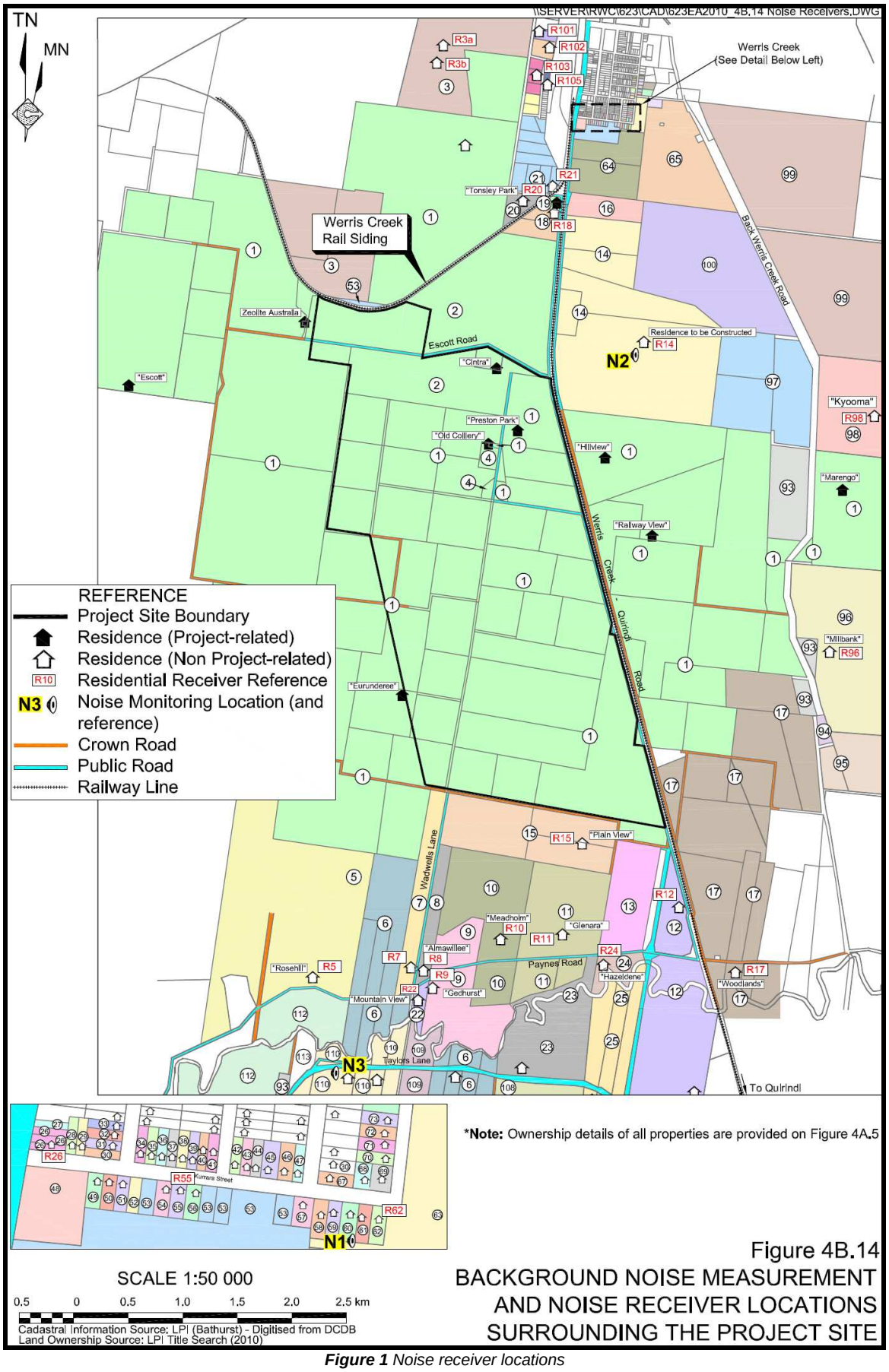

Figure 1 *Noise receiver locations*

APPENDIX 4
BIODIVERSITY OFFSET STRATEGY

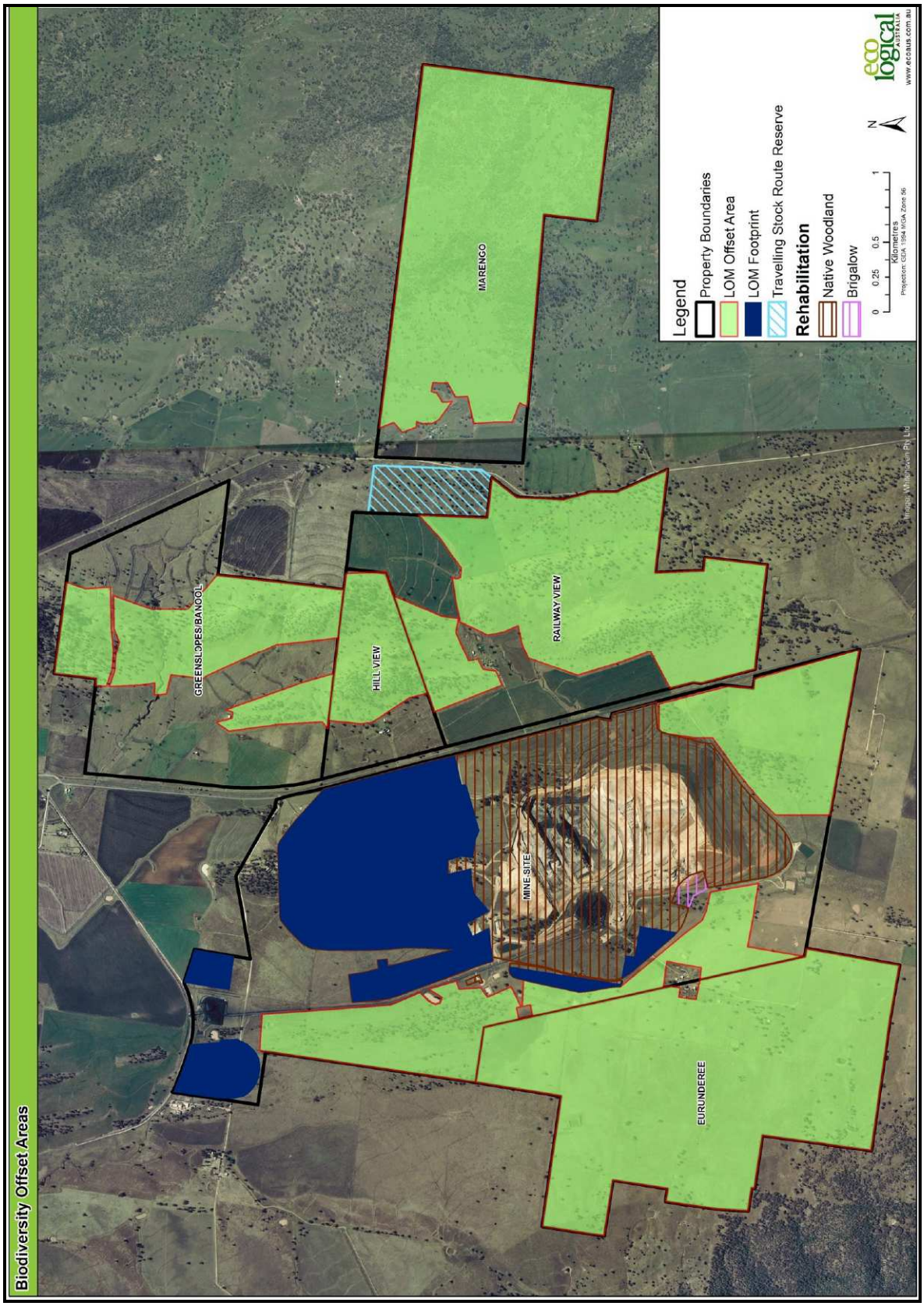

Figure 1: *Modified Biodiversity Offset Strategy*

APPENDIX 5
CONCEPTUAL FINAL LANDFORM PLAN

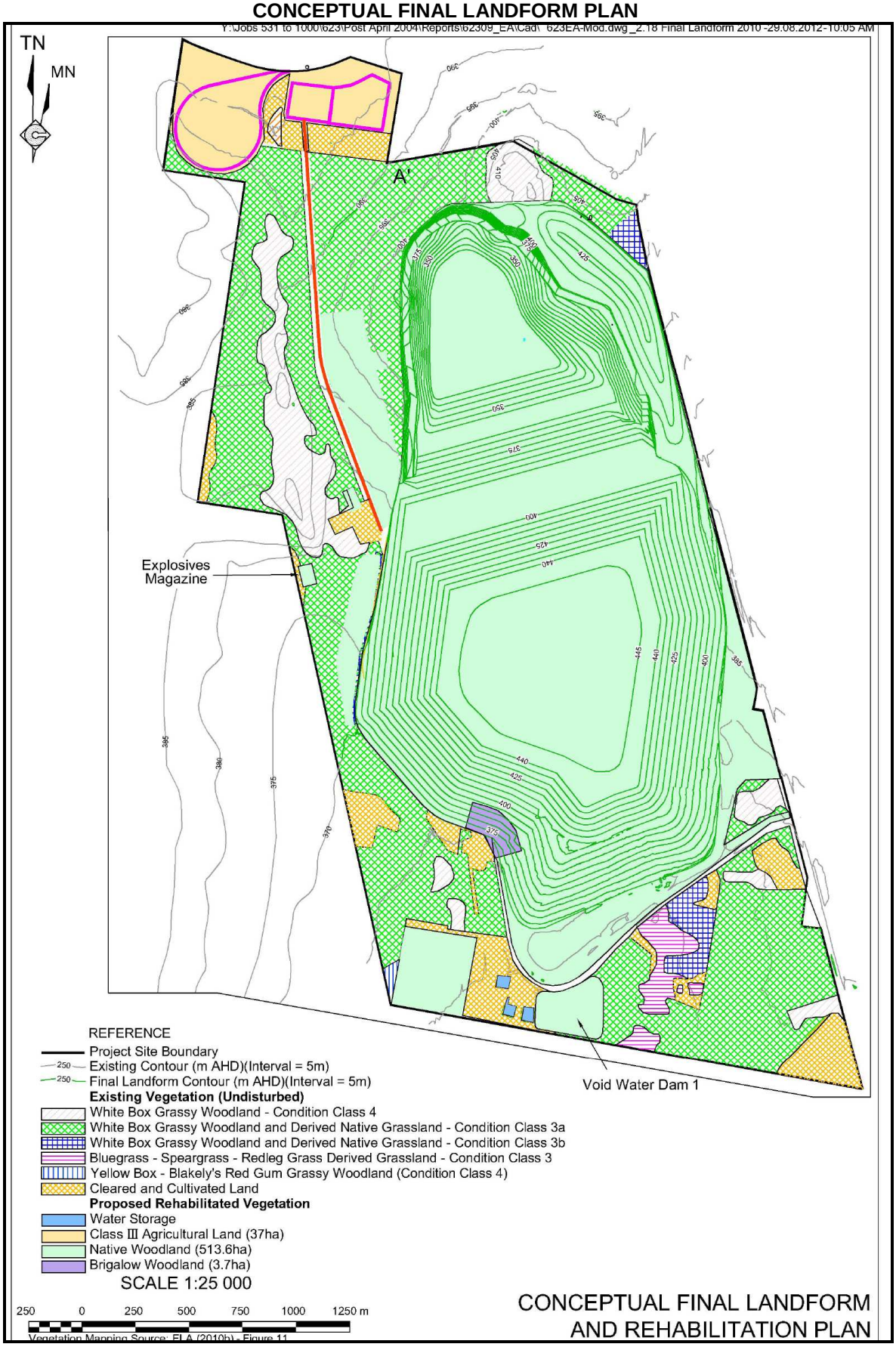

Figure 1: *Conceptual Final Landform*

APPENDIX 6
STATEMENT OF COMMITMENTS

Desired Outcome	Action		Timing
1. Groundwater			
Effective management of water dewatered from the former Werris Creek Colliery underground workings.	1.1	Dewater water from the underground workings to the already approved groundwater storage cells and use it preferentially for dust suppression activities.	Ongoing
Effective management of the potential contamination of groundwater resources.	1.2	Implement mitigation measures associated with the contamination of groundwater due to a hydrocarbon spill in accordance with the existing *Groundwater Contingency Plan.*	If contamination of groundwater due to a hydrocarbon spill occurs
	1.3	Fill the final void above the equilibrium water level following the cessation of mining in order to avoid leaving a potentially saline water body, which may have the potential to contaminate the surrounding aquifers.	Following the cessation of mining
	1.4	Increase the groundwater monitoring regime analytes monitored and/or frequency of sampling to confirm the magnitude and extent of any change in water chemistry and verify the change is a consequence of operations associated with the LOM Project.	If pH or EC trigger level exceeded
	1.5	Install one or more piezometers into the back filled void and monitor water chemistry to confirm back filled overburden and interburden is not adversely affecting the local groundwater.	Within 2 years of project approval
	1.6	Ongoing analysis of overburden / interburden samples to confirm the low potential for acid and soluble salt generation, or other potential contamination.	Ongoing
Ensure the availability of groundwater to surrounding users is maintained.	1.7	Review, update and incorporate the Groundwater Contingency Plan into a Water Management Plan for the Werris Creek Coal Mine.	Within 6 months of project approval
	1.8	In the event that routine monitoring indicates that a groundwater trigger has been reached, commence contingency procedures which will require an increased monitoring frequency to confirm a breach of the trigger. If the breach confirmed, commission a hydrogeologist to review the data, and provide independent advice as to the cause of the trigger. The outcomes of that review, including any recommendations, will be subject to discussion and agreement with hydrogeologists from NOW.	In the event that routine monitoring indicates that a groundwater trigger has been reached
Ensure the availability of groundwater to surrounding users is maintained. (cont'd)	1.9	If the saturated thickness in any bore is reduced below trigger level, notify the affected landowner(s).	If the saturated thickness trigger level is achieved in any bore

Desired Outcome	Action		Timing
	1.10	If a reduction in the saturated thickness within any bore is in excess of the trigger level, and is determined to be as a consequence of operations associated with the LOM Project, negotiate with the affected landowner(s) with the intent of formulating an agreement in accordance with the *Groundwater Contingency Plan.*	In the event that monitoring identifies a reduction in the saturated thickness and is determined to be a consequence of operations associated with the LOM Project
2. Surface Water			
Separate clean water from dirty water.	2.1	Construct temporary diversion banks on the upslope boundary of all areas to be stripped of groundcover and soil.	Prior to clearing and stripping operations
	2.2	Construct catch drains or banks and/or install a sediment fence on the downslope boundary of an area to be stripped of groundcover and soil.	Prior to clearing and stripping operations
	2.3	Direct sediment-laden runoff into sediment basins for treatment prior to discharge (if required).	Ongoing
	2.4	Construct all water management infrastructure in accordance with Volume 2E of the guideline document "*Soils and Construction: Managing Urban Stormwater*" (DECC, 2008).	Construction of water management infrastructure
Prevent the discharge of contaminated water from the Project Site	2.5	Install a sediment trap in the coal crushing/ stockpiling and maintenance area to remove coal fines from surface flows.	Ongoing
	2.6	Install an oil/water separating unit to receive and treat potentially contaminated water from the maintenance and wash-down bay prior to further treatment within the dirty water management system.	Ongoing
Implementation of a comprehensive and ongoing surface water monitoring program.	2.7	Monitor surface water quality for pH, electrical conductivity, total suspended solid concentration, Oil & Grease levels, within: • licensed discharge points; • receiving waters (Werris and Quipolly Creeks); and • Clean, Dirty and Void Water Dams	 Quarterly and during discharge Quarterly and within 12 hours after discharge Quarterly
Prevention of saline water discharge off site.	2.8	Retain all void water within the Void Water Dams or sumps within the open cut.	Ongoing

Desired Outcome	Action		Timing
2. Surface Water (cont'd)			
Prevention of dirty water flowing into Werris and Quipolly Creeks.	2.9	Where practically possible, ensure the licensed discharge points / sediment basins are maintained in a dry condition to provide full storage capacity in the event of rainfall events exceeding 39.2 mm of rain over a 5-day period.	Ongoing
3. Biodiversity			
Avoid and minimise impacts on native vegetation (including the two identified EECs) where possible.	3.1	Ensure disturbance associated with the relocation of site infrastructure occurs in the locations specified on **Figure 2.1**, i.e. on cleared and cultivated land (Condition Class 1), or derived native grassland without native tree overstorey (Condition Class 3).	Prior to and during relocation of infrastructure
	3.2	Limit vegetation clearing each year to an area required for the following 12 months mine development.	Annual
	3.3	Clearly mark / peg areas required for surface infrastructure establishment and mining.	Ongoing
	3.4	Retain felled trees on the Project Site for subsequent use during rehabilitation activities.	Site establishment and rehabilitation phases
Mitigate unavoidable disturbance to native vegetation and fauna habitat.	3.5	Identify, as part of the Pre-start Clearing Inspection, biological resources within the disturbance area including habitat resources such as hollows, stag trees and coarse woody debris, and the availability of endemic seed.	During annual clearing campaigns
	3.6	Implement a seed collection strategy and program to harvest endemic seed from local vegetation to either directly sow or propagate for tube stock planting in either biodiversity offset or rehabilitation areas.	Ongoing
	3.7	Complete monitoring and inspection programs to review the progress of rehabilitation against criteria based on vegetation community benchmark data.	Annual
Rehabilitate disturbed areas to create a final landform that maintains or improves biodiversity values of the Project Site.	3.8	Create a final landform generally similar to that of the pre-mining landform, i.e. approximating the conceptual final landform provided by **Figure 2.18**.	Ongoing
	3.9	Revegetate the final landform as nominated by **Figure 2.18** (or subsequent Rehabilitation Management Plan), i.e. predominantly native woodland vegetation which will supplement the LOM Project BOS and improve the linkage between remnant areas of native woodland vegetation to the east and west.	Ongoing
	3.10	Designate approximately 3.7ha of the final landform as Brigalow woodland.	During rehabilitation

Desired Outcome	Action		Timing
3. Biodiversity (cont'd)			
Rehabilitate disturbed areas to create a final landform that maintains or improves biodiversity values of the Project Site.	3.11	Augment habitat through the placement of previously cleared timber (on the ground as well as upright 'stags') to provide important habitat value for arboreal and ground hollow dependant fauna and perching sites.	During rehabilitation operations
Manage the impacts of noxious weeds.	3.12	Monitor noxious weeds on a regular basis, and if required, conduct weed management campaigns to manage weed outbreaks.	Ongoing
Minimise or avoid impacts on native fauna (including threatened species).	3.13	Undertake vegetation clearing during a single campaign each year (except when there are extenuating circumstances), preferably during seasons that minimise the risk of impacting on hibernating microbats or breeding woodland birds, i.e. Autumn.	Vegetation clearing and ongoing
	3.14	Commission a Pre-start Clearing Inspection of the proposed disturbance area by an ecologist to identify the presence of native fauna (including threatened species such as the Koala and microbats).	Vegetation clearing and ongoing
	3.15	Suspend all clearing activities, in the event a koala (or other threatened fauna species) is present in the trees to be cleared, until it moves away from the subject area or is relocated by a suitably qualified person.	Prior to clearing operations within areas of remnant vegetation
Offset residual impact of the LOM Project.	3.16	Develop and implement, in consultation with the DECCW, DoP and DSEWPaC, a Biodiversity Offset Strategy for the LOM Project.	Within 18 months of Project Approval
	3.17	Prepare a Biodiversity Offset Management Plan which includes a detailed description of the procedures to be applied within the offset area including: • erosion and sediment control; • soil and water management, bushfire management; • exclusion of domestic stock; • weed management; • retention of regrowth and native vegetation; • retention of dead timber and fallen logs; • in-fill planting with locally indigenous species where required; • feral animal control; • limitation of human access; and • an annual review and reporting requirement.	Within 18 months of Project Approval

Desired Outcome	Action		Timing
3. Biodiversity (cont'd)			
Offset residual impact of the LOM Project. (cont'd)	3.18	Provide for the completion of an independent review of the BOMP at least every 5 years to report on the success of BOMP procedures (see Commitment 3.17).	Every 5 years following the establishment of the BOMP
4. Heritage			
Maintain Aboriginal heritage values on site.	4.1	Update the Aboriginal Cultural Heritage Management Plan to reflect the approval of the LOM Project.	Within 12 months of project approval
	4.2	Re-instate the Narrawolga Axe Grinding Grooves to a position as close as possible to their original location following rehabilitation of the Project Site in consultation with local Aboriginal community representatives.	Following mine closure
	4.3	Continue awareness training of staff and contractors for cultural heritage matters	Ongoing
	4.4	In the event the Project Site disturbance footprint changes, ensure that appropriate consultation and field survey is undertaken to confirm no sites or objects of Aboriginal heritage significance are impacted.	If the disturbance footprint changes
Maintain Aboriginal heritage values on site.	4.5	In the event any previously unidentified 'objects' or other Aboriginal sites (such as burials) are uncovered, ensure that work in that area is suspended and the DECCW Western Regional Archaeologist (Dubbo Office) and local Aboriginal community are contacted to discuss how to proceed.	If a previously unidentified object or Aboriginal site is uncovered
Develop an historic context for the Project Site particularly in reference to the operation of the former Werris Creek Colliery.	4.6	Salvage the concrete marked with the hand and footprints of the former Deputy Mine Manager's daughter at the residence and provide to Ms Dora Koops (one of the daughters) for posterity.	Prior to the demolition of the residence
	4.7	Provide the photo record held by the Proponent and its consultants to the Werris Creek Historical Society (or other similar community group) as a record of the remnant features at the time of removal.	Once available
	4.8	Provide a copy of the Cultural Heritage Assessment (Landskape, 2010) to the Werris Creek Historical Society (or other similar community group) as a record of the remnant features at the time of removal.	Once available
5. Transport Aspects			
Product haulage by public road is conducted in an appropriate and safe manner.	5.1	Limit the road transportation of coal to 50 000tpa.	Ongoing
	5.2	Provide final detailed design for the proposed road upgrades to accommodate B-Double use and in accordance with Austroads Pt. 4 – Road Design Guide.	In designing road and intersection upgrades

Desired Outcome	Action		Timing
5. Transport Aspects (cont'd)			
Product haulage by public road is conducted in an appropriate and safe manner. (cont'd)	5.3	Complete all intersections to a standard providing appropriate dimensional capacity and signage and to the satisfaction of the relevant road authority.	During road and intersection construction
	5.4	Prevent spillage from the trucks through the continuation of a 'covered load' policy.	Ongoing
	5.5	Obtain school bus timetable at the beginning of each year and manage road haulage despatch to avoid potential conflict.	Ongoing
Accommodate the increased volume of traffic using Escott Road.	5.6	Upgrade the intersection between Escott Road and Werris Creek Road generally in accordance with the designs provided by Constructive Solutions (2010) and in accordance with Austroads Pt. 4 – Road Design Guide 2009.	During the construction phase of the Project
	5.7	Upgrade Escott Road as recommended by Constructive Solutions (2010) and in accordance with AUSTROADS Pt. 4 – Road Design Guide 2009.	During the construction phase of the Project
	5.8	Provide for a seal of at least 50m of the Northern Site Access Road from the Escott Road Entrance	During the construction phase of the Project
Accommodate the increased volume of traffic using the Rail Load-out Road	5.9	Construct the Escott Road – Rail Load-out Road cross-junction as an RTA Modified BAR type intersection.	During the construction phase of the Project
Maintain access across the rail turn-around loop.	5.10	Construct two level crossings across the rail turn-around loop.	During construction of the rail turn-around loop
	5.11	Construct an all-weather side track around the rail loop to allow emergency access should the road be blocked by a train.	During construction of the rail turn-around loop
Contribute to the maintenance of Taylors Lane.	5.12	Provide ongoing funding for maintenance of Taylors Lane on a per tonne basis (in the form of section 94 contributions) as per the current agreement that exists with Liverpool Plains Shire Council.	Ongoing
Provide traffic management for road closures required for blasting	5.13	Review and update (as required) the traffic management procedure "*Whitehaven Coal Procedure – Road Closure*".	During the construction phase of the Project

Desired Outcome	Action	Timing
6. Noise		
Attenuate mining noise sources to ensure compliance with Project Specific Noise Criteria.	6.1 Construct an Acoustic and Visual Amenity Bund at the northern extent of mining operations.	Once mining operations reach the base of "Old Colliery" Hill
	6.2 Locate all mining-related infrastructure, eg. the Coal Processing Area and Site Administration and Facilities Area, in such a way that local topography (of "Old Colliery" and "Cintra" Hills) provides a natural acoustic barrier to the town of Werris Creek and the residential receivers located to the south of the town.	During the construction phase of the Project
	6.3 Use temporary ROM coal stockpiles from time to time within the open cut mine area to minimise the transmission of noise during night-time operations.	Ongoing during night-time period
	6.4 Continue to enclose the conveyor belt of the rail load out facility.	Ongoing
	6.5 Ensure that all noise mitigation measures are implemented to ensure that all noise emissions from the Project Site meet predicted noise levels. This may include the following. • Apply the manufacturer specified attenuator kits to each truck to achieve a noise reduction of 8dB. • Apply a 1 600rpm reverse gear limiter on bulldozers operating on exposed areas of the Project Site such as the Product Coal Storage Area and ROM Pad.	 Ongoing Ongoing
	• Construct a 5m high barrier around the northeastern perimeter of the relocated coal processing infrastructure. • Ensure that all equipment exhibits sound power levels consistent with the schedules in *Appendix D* of Spectrum Acoustics (2010). • Limit the number of operating drills (non exploration) on the Project Site to two at any one time. • Stand down all mobile equipment operating to the north of the advancing open cut under noise enhancing conditions during the evening and night-time, i.e. temperature inversion and winds from the south-southeast or northwest. • Whilst the Coal Processing Area remains in its current location, limit the number of trucks and excavators operating during inversion conditions to 10 and 3 respectively. • Ensure that during periods of noise enhancing winds, overburden emplacement activities are preferentially undertaken 'in-pit'.	Within 6 months of Project Approval Ongoing Ongoing During adverse meteorological conditions during the night-time period Ongoing until the coal crushing and screening infrastructure are relocated Ongoing

Desired Outcome	Action		Timing
6. Noise (cont'd)			
Monitor and manage noise generated by the LOM Project	6.6	Update the Noise Management Plan (NMP) for the LOM Project.	Within 12 months of project approval
	6.7	Continue the existing monthly Noise Monitoring Program at the existing site to include five new locations to be affected by the Project.	Ongoing
	6.8	Implement a real-time noise monitoring program at selected residential locations that would be most affected by the LOM Project.	Within 12 months of project approval
	6.9	Implement a real-time meteorological monitoring program at the Project Site to gather data on wind speed and direction, and deduce inversion conditions.	Within 12 months of project approval
	6.10	Use the real time meteorological data in the management of mining operations to minimise impact of noise on the environment.	Ongoing
7. Blasting			
Minimise impacts from blasting on surrounding receptors and infrastructure.	7.1	Maintain the Deed of Agreement that has been established with ARTC.	Ongoing
	7.2	Continue to implement the road closure management procedure when blasting occurs within the 500m of Werris Creek Road.	Ongoing
	7.3	Minimise the number of blasts by maximising blast size without compromising compliance with the environmental criteria.	Ongoing
Minimise impacts from blasting on surrounding receptors and infrastructure. (cnt'd)	7.4	Implement refinements to blast design components on the basis of monitoring results and the achievement of specific blasting objectives.	Ongoing
	7.5	Blast design and implementation is undertaken by a suitably qualified blasting engineer and/or experienced and appropriately certified shot-firer.	All blasts
	7.6	Ensure that the minimum practicable weight of explosive detonates at an instant for each blast.	All blasts
	7.7	Maintain a blast exclusion zone of 500m around each blast.	All blasts
	7.8	Continue to monitor blasting impacts at the current monitoring locations.	All blasts
8. Air Quality			
Minimise impacts to air quality relating to the Project.	8.1	Maintain the enclosed conveyor belt on the rail load out facility.	Ongoing
	8.2	Cleared vegetation would not be burnt.	Ongoing
	8.3	Limit groundcover removal in advance of mining to be consistent with operational requirements.	Ongoing

Desired Outcome	Action		Timing
8. Air Quality (cont'd)			
Minimise impacts to air quality relating to the Project.	8.4	Where practicable, soil stripping operations would be undertaken at a time when there is sufficient soil moisture to prevent significant lift-off of dust.	During soil stripping operations
	8.5	Overburden emplacement would be limited on the top lift of the overburden emplacement area when winds are from a northerly direction and greater than 3m/s over more than four consecutive 15 minute periods during operations similar to those operations modelled in Scenario 1.	Ongoing until Coal Processing Area relocated to the north
	8.6	Apply water at the feed hopper, crusher and at all conveyor transfer and discharge points.	Ongoing
	8.7	Fit all conveyors with appropriate cleaning and collection devices to minimise the amount of material falling from the return conveyor belts.	Ongoing in the current CHPP and prior to the operation of the relocated CHPP
	8.8	Cease coal processing activities during periods of concurrent high winds and temperatures which cause coal dust dispersal, independent of water applications.	During high winds and temperatures which cause coal dispersal independent of water applications
	8.9	Apply water to exposed surfaces with emphasis on those areas subject to frequent vehicle / equipment movements which may cause dust generation and dispersal.	Ongoing
	8.10	Water all internal haul roads regularly.	Ongoing
	8.11	Ensure operators use appropriate speeds to limit trafficable dust emissions on all vehicles and equipment.	Ongoing
	8.12	Progressively rehabilitate areas of disturbance once they are no longer required for mining purposes.	Ongoing
	8.13	Use water injection on all drill rigs.	Ongoing during drilling operations
	8.14	Cover all product coal trucks prior to leaving the Project Site	Ongoing
Monitor and manage dust emissions generated by the LOM Project	8.15	Update the Air Quality Monitoring Program (AQMP) for the LOM Project.	Within 12 months of project approval
	8.16	Continue the existing deposited dust, PM_{10} and TSP monitoring at the existing site locations.	Ongoing
	8.17	Implement a real-time particulate matter monitoring program at locations to be determined within 12 months of approval.	Within 12 months of project approval

Desired Outcome	Action		Timing
8. Air Quality (cont'd)			
Monitor and manage dust emissions generated by the LOM Project (cont'd)	8.18	Use the real time monitoring data in the management of mining operations to minimise the impact of PM_{10} and $PM_{2.5}$ on the environment.	Ongoing
	8.19	Review the existing Energy Savings Action Plan.	In accordance with approval conditions
9. Visibility			
Screen the operation visually from the surrounding local area.	9.1	Construct an Acoustic and Visual Amenity Bund at the northern extent of mining operations.	Once mining operations reach the base of "Old Colliery" Hill
	9.2	Locate all mining-related infrastructure, e.g. the Coal Processing Area and Site Administration and Facilities Area, in such a way that local topography (of "Old Colliery" and "Cintra" Hills) provides a visual barrier to the town of Werris Creek and the residential receivers located to the south of the town.	As infrastructure is constructed
	9.3	Plant a screen of native trees and shrubs in front of the Acoustic and Visual Amenity Bund prior to its construction.	Commencement of the Project
	9.4	Plant trees around the perimeter of the extended product coal storage area.	On completion of construction of the extended product coal storage area
	9.5	Continue to construct the existing overburden emplacement area to create a visual barrier to the east of the Project Site including Werris Creek Road.	Ongoing
	9.6	Progressively rehabilitate areas of disturbance once they are no longer required for mining purposes.	Ongoing
	9.7	Continue to position and direct floodlights to minimise emissions.	During night-time operations
	9.8	Maintain the LOM Project area and associated areas of disturbance in a clean and tidy condition at all times.	Ongoing
10. Soils, Land Capability and Agricultural Suitability			
Create a final landform that is safe, stable and is amenable to a combination of agricultural and native flora/fauna conservation activities.	10.1	(Where practicable), immediately transfer stripped soil from source to active rehabilitation.	During soil stockpiling activities
	10.2	Stockpile the soils of each soil unit separately. This will allow the Dark Brown Vertosol soils to be preferentially used for areas of the final landform designated for the re-establishment of higher quality agricultural land.	During soil stockpiling activities

Desired Outcome	Action	Timing
10. Soils, Land Capability and Agricultural Suitability (cont'd)		
Create a final landform that is safe, stable and is amenable to a combination of agricultural and native flora/fauna conservation activities.	10.3 Maintain a soil inventory: • to ensure appropriate volumes of different soil units are stripped consistently with the soil requirements of the final landform. • to identify the age of various soil stockpiles on the Project Site and therefore assist in minimising the length of time soils remained stockpiled. • to assist the Proponent in using the most appropriate soils for the different elements of the final landform.	Ongoing
	10.4 Construct the eastern, southern and western surfaces of the overburden emplacement at 10^{o} or less.	During regrading of the final slopes
	10.5 Construct the northern surface of the overburden emplacement, which runs into the open cut void with steeper slopes which would ultimately be reduced to 18º (1V:3H) or less in the final landform.	During regrading of the final slopes
	10.6 Create a series of contour banks, similar to those on the existing landform, on the outer slopes of the regraded emplacement to manage surface water runoff and assist in minimising erosion of these slopes.	During rehabilitation activities
	10.7 Conduct monitoring of rehabilitation performance against the proposed sustainable land use outcome and carry out amelioration works where necessary.	During rehabilitation activities
	10.8 Reinstate at least 37a of Class III land on the rehabilitated landform.	By the end of mine life
	10.9 Backfill the final void to above the modelled final water table level.	During construction of the final void
Minimise the degradation to soil resources.	10.10 Undertake vegetation clearing activities so as to minimise soil disturbance.	During clearing of larger vegetation
	10.11 Retain smaller vegetation and leaf litter in the soil to be stripped.	During soil stripping activities
	10.12 Stripping of soil during periods of excessive soil moisture content will be avoided to reduce the likelihood of damage to soil structure.	During soil stripping activities
	10.13 Soil to be preferentially respread on areas of the final landform immediately following stripping rather than being stockpiled.	During soil stripping activities
	10.14 Where stockpiling is necessary, soil stockpiles would not exceed 3m in height.	During soil stockpiling activities
Maximise the retention of soil resources.	10.15 Soil is to be generally stripped in accordance with **Table 2.7.**	During soil stripping activities

Desired Outcome	Action	Timing
11. Waste		
Manage waste appropriately on site.	11.1 Maintain a register of the types and quantities of wastes produced on the Project Site.	Ongoing
	11.2 Design and maintain storage areas to contain spillages.	Ongoing
	11.3 Segregate and retain recyclable and non-recyclable waste in designated storage areas prior to removal from the Project Site.	Ongoing
	11.4 Keep the Project Site in a clean and tidy condition.	Ongoing
	11.5 Ensure waste is regularly removed from the Project Site by a licensed contractor.	Ongoing
12. Hazards		
Manage bushfire hazards appropriately.	12.1 Maintain an immediate method of egress from the Project Site to Project personnel in the event of bushfire attack on the Project Site.	Ongoing.
	12.2 Follow all instructions provided by the NSW Rural Fire Service (RFS) or police in the event of a local bushfire event threatening the Project Site.	In the event of a local bushfire event threatening the Project Site.
Manage bushfire hazards appropriately. (cont'd)	12.3 Provide access to all Project Site water storages to the RFS and any reasonable assistance offered to RFS or police personnel.	In the event of a local bushfire event threatening the Project Site.
	12.4 Refuelling to be undertaken within designated fuel bays or within cleared area of the Project Site.	Ongoing.
	12.5 Turn off vehicles during refuelling.	During refuelling.
	12.6 Enforce a no smoking policy in designated areas of the Project Site.	Ongoing.
	12.7 Maintain fire extinguishers within site vehicles and refuelling areas.	Ongoing.
	12.8 Ensure a water cart is available to assist in extinguishing any fire ignited.	In the event of a fire.
	12.9 Equip all equipment on site with adequate and fully operational fire suppression equipment in accordance with AS 1841 and AS 1851.	Ongoing.
	12.10 Train all employees in the proper use of fire fighting equipment held on site.	Ongoing.
	12.11 Set aside water especially for fire fighting on site.	Ongoing.
	12.12 Ensure that fire fighting equipment is made available to the local Rural Fire Service if required in the event of a bushfire in the land surrounding the Project Site.	In the event of a bushfire in the land surrounding the Project Site
	12.13 Develop and maintain firebreaks at the edge of the Project Site.	Ongoing.

Desired Outcome	Action		Timing
12. Hazards (cont'd)			
Minimise the potential for a traffic incident on a public road involving a Project related vehicle.	12.14	Locate the Escott Road Entrance to the Project Site to the east of the Rail Load-out Road with light vehicle traffic to the Project Site offices not required to cross the Rail Load-out Road.	During the construction phase of the Project
	12.15	Install level crossings at the two points where Escott Road crosses the turn-around rail loop.	During construction of the rail loop
	12.16	Construct an all-weather access road around the perimeter of the turn-around rail loop.	During construction of the rail loop
The storage and handling of hazardous materials is appropriately managed.	12.17	Direct all water from wash-down areas and workshops to oil separators and containment systems.	Ongoing
	12.18	Ensure that all storage tanks are either self bunded tanks or bunded with an impermeable surface and a capacity to contain a minimum 110% of the largest storage tank capacity.	Ongoing
	12.19	Securely store all hydrocarbon products.	Ongoing
	12.20	Designate areas for refuelling and minor maintenance work (with the exception of less mobile mining equipment, e.g. excavators which would be refuelled within the open cut area) and enforce the use of these areas.	Ongoing
13. Community Contributions			
Provide for ongoing support to the Werris Creek local community and Liverpool Plains Shire Council.	13.1	Maintain the Community Consultative Committee and include local community representative as stipulated by project approval conditions.	Ongoing
	13.2	Complete and distribute regular newsletters regarding project progress and operations.	At least 6 monthly
	13.3	Continue to provide funding towards maintenance of Taylors Lane through S94 contributions as per the current contributions agreement with LPSC.	Ongoing
	13.4	Establish a Community Enhancement Fund through Liverpool Plains Shire Council as agreed by Council in their 5 July 2010.	Ongoing
14. Environmental Monitoring			
Implement a comprehensive and ongoing surface water monitoring program.	14.1	Monitor surface water quality for: pH, electrical conductivity, total suspended solid concentration, Oil & Grease levels at licensed discharge points, receiving waters (Werris and Quipolly Creeks) and clean, dirty and void water dams. (See also Commitment 2.7).	Quarterly and during surface overflow events from licensed discharge points Quarterly and within 12 hours after an overflow event to the receiving waters

Desired Outcome	Action		Timing
14. Environmental Monitoring (cont'd)			
Implement a comprehensive and ongoing groundwater monitoring program.	14.2	Continue monitoring of piezometers and groundwater bores on and surrounding the Project Site in accordance with the current Groundwater Monitoring Program.	Both monthly and continuous (dependent on particular piezometer or groundwater bore)
Implement a comprehensive and ongoing groundwater monitoring program.	14.3	Update the Groundwater Monitoring Program.	Within 12 months of receiving project approval
	14.4	Commission an experienced hydrogeologist to collate and review the monitoring data collected annually in order to assess the impacts of the project on the groundwater environment, and to compare any observed impacts with those predicted from groundwater modelling.	Annual
	14.5	Implement the Groundwater Contingency Plan as required.	In the event that routine monitoring indicates that a trigger has been reached
Implementation of an appropriate noise monitoring program to ensure continuing compliance with DECCW guideline levels.	14.6	Undertake attended noise monitoring at the residences most likely to be affected by the LOM Project. • R20: "Tonsley Park" • R9: "Almawillee" • R11: "Glenara" • R12: Fletcher • Werris Creek Town (R55 or R62) • R14: "Greenslopes & Banool"	Monthly
	14.7	Implement a real-time noise monitoring program with monitoring to be conducted at the most affected receiver based on the prevailing conditions at the time	Within 12 months of project approval
Implementation of an appropriate noise monitoring program to ensure continuing compliance with DECCW guideline levels.	14.8	Update the Noise Monitoring Program to reflect additional attended and real time monitoring sites.	Within 12 months of receiving project approval
Implementation of an appropriate air quality monitoring program to ensure continuing compliance with DECCW guideline levels.	14.9	Maintain the existing dust (WC1 to WC10), PM_{10} (WCHV1 to WCHV4) and TSP (WCTSP) monitoring network as identified in the Werris Creek Coal Mine Air Quality Monitoring Program.	Ongoing
	14.10	Install a new High Volume Air Sampler, monitoring for $PM_{2.5}$,	Within 12 months of project approval
	14.11	Implement a real-time particulate matter monitoring program at locations to be determined within 12 months of approval.	Within 12 months of project approval

Desired Outcome	Action	Timing
15. Environmental Management System		
A systematic set of documents are in place to guide the planning and implementation of all environmental management strategies.	15.1 Incorporate the environmental procedures in an on-site management system.	Prior to relevant activity
	15.2 Prepare or update the following management and monitoring plans; • Mining Operations Plan • Aboriginal Cultural Heritage Management Plan • Energy Savings Action Plan • Water Management Plan • Erosion & Sediment Control Plan • Noise Management Plan • Noise Monitoring Program • Air Quality Monitoring Program • Rehabilitation and Landscape Management Plan • Biodiversity Offset Management Plan	Various and as nominated by project approval
	15.3 Incorporate relevant environmental data / information in Annual Environmental Management Reports.	Annually

Environment Protection Licence

Licence - 12290

Licence Details	
Number:	12290
Anniversary Date:	01-April

Licensee
WERRIS CREEK COAL PTY LIMITED
PO BOX 125
WERRIS CREEK NSW 2341

Premises
WERRIS CREEK COAL
1435 WERRIS CREEK ROAD
WERRIS CREEK NSW 2341

Scheduled Activity
Coal Works
Mining for Coal

Fee Based Activity	Scale
Coal works	> 2000000-5000000 T handled
Mining for coal	> 2000000-3500000 T produced

Region
North - Armidale
Ground Floor, NSW Govt Offices, 85 Faulkner Street ARMIDALE NSW 2350
Phone: (02) 6773 7000
Fax: (02) 6772 2336
PO Box 494 ARMIDALE
NSW 2350

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Information about this licence

Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act); and
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

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The EPA publication “A Guide to Licensing” contains information about how to calculate your licence fees. The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

Transfer of licence

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

Public register and access to monitoring data

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

This licence is issued to:

WERRIS CREEK COAL PTY LIMITED
PO BOX 125
WERRIS CREEK NSW 2341

subject to the conditions which follow.

Environment Protection Licence

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1 Administrative Conditions

A1 What the licence authorises and regulates

A1.1 This licence authorises the carrying out of the scheduled development work listed below at the premises listed in A2:
Construct mine entrance/ access/ rail load out roads; site preparation; (clearing/ soil removal) including mining activities, earthworks for processing plant, coal loading & office facility installation; install water management controls.

A1.2 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

Scheduled Activity	Fee Based Activity	Scale
Coal Works	Coal works	> 2000000 - 5000000 T handled
Mining for Coal	Mining for coal	> 2000000 - 3500000 T produced

A1.3 The licensee must not carry on any scheduled activities until the scheduled development works are completed, except as elsewhere provided in this licence.

A2 Premises or plant to which this licence applies

A2.1 The licence applies to the following premises:

Premises Details
WERRIS CREEK COAL
1435 WERRIS CREEK ROAD
WERRIS CREEK
NSW 2341
THE LAND BOUND WITHIN THE "PROJECT SITE BOUNDARY" IDENTIFIED IN THE MAP TITLED "FIGURE 1: SCHEDULE OF LAND" OF APPENDIX 1 SCHEDULE OF LAND OF PROJECT APPROVAL 10_0059, DATED 25 OCTOBER 2011 (DOC13/87398).

A3 Information supplied to the EPA

A3.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:
a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and
b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

2 Discharges to Air and Water and Applications to Land

P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.

Air

EPA identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
9	Ambient Weather Monitoring.		Weather station located on the top level of the overburden emplacement at RL 445m
28	Ambient Air Monitoring/Air Discharge Quality	Ambient Air Monitoring/Air Discharge Quality	Within 100m of the residence "Kyooma" identified as "R98" in Appendix 3 of Project Approval 10_0059.
29	Ambient Air Monitoring / Air Discharge Quality	Ambient Air Monitoring / Air Discharge Quality	Within 100 metres of the residence "Glenara" identified as "R11" in Appendix 3 of Project Approval 10_0059.
30	Ambient Air Monitoring / Air Discharge Monitoring	Ambient Air Monitoring / Air Discharge Monitoring	Within 100m of the location idenitifed as property number "92" in Figure 4A.5 of Environmental Assessment for Werris Creek Coal Mine, Life of Mine Project Dated Decmber 2010 prepared by R.W. Corkery & Co. Pty Limited.
31	Ambient Weather Monitoring		Lower level temperature sensor located at the toe of the south eastern rehabilitation area at RL 373.5m AHD.

P1.2 The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.

P1.3 The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area.

Water and land

EPA Identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description

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10	Wet Weather Discharge / Discharge Water Quality Monitoring.	Wet Weather Discharge / Discharge Water Quality Monitoring.	Point idenitifed as "SB2" marked on Figure 4B.10 of the Environmental Assessment for Werris Creek Coal Mine, Life of Mine Project referenced in Project Approval 10_0059.
12	Wet Weather Discharge / Discharge Water Quality Monitoring	Wet Weather Discharge / Discharge Water Quality Monitoring	Point idenitifed as "SB9" in Figure 4B.10 of the Environmental Assessment for Werris Creek Coal Mine, Life of Mine Project referenced in Project Approval 10_0059.
14	Wet Weather Discharge / Discharge Water Quality Monitoring	Wet Weather Discharge / Discharge Water Quality Monitoring	Point identified as "SB10" marked on Figure 4B.10 of the Environmental Assessment for Werris Creek Coal mine, Life of Mine Project referenced in Project Approval 10_0059.
16	Water Quality Monitoring		Point idenitifed as "VWD1" marked on Figure 4B.10 in the Environmental Assessment for Werris Creek Coal mine, Life of Mine Project referenced in Project Approval 10_0059.
17	Groundwater Quality Monitoring		Point identified as "GW966036/MW1" marked on Figure 4B.2 in the Environmental Assessment for Werris Creek Coal Mine, Life of Mine Project referenced in Project Approval 10_0059.
18	Groundwater Quality Monitoring		Point identified as "GW966127/MW2" marked on Figure 4B.2 in the Environmental Assessment for Werris Creek Coal Mine, Life of Mine Project referenced in Project Approval 10_0059.
19	Groundwater Quality Monitoring		Point identified as "GW965729/MW3" on Figure 4B.2 in the Environmental Assessment for Werris Creek Coal Mine, Life of Mine Project referenced in Project Approval 10_0059.
20	Groundwater Quality Monitoring		Point identified as "MW4b" on Figure 4B.2 in the Environmental Assessment for Werris Creek Coal Mine, Life of Mine Project referenced in Project Approval 10_0059.

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21	Groundwater Quality Monitoring	Point identified as "GW968728/MW5" on Figure 4B.2 in the Environmental Assessment for Werris Creek Coal Mine, Life of Mine Project referenced in Project Approval 10_0059.
22	Groundwater Quality Monitoring	Point identified as "MW6" on Figure 4B.2 in the Environmental Assessment for Werris Creek Coal Mine, Life of Mine Project referenced in Project Approval 10_0059.
23	Ambient/Discharge Water Quality Monitoring	Point WC-U on Werris Creek marked on Figure 4 in the Site Water Management Plan for Werris Creek Coal Mine dated March 2009 that was submitted to EPA on 22-9-09 and which is kept on file LIC07/2029.09.
24	Ambient/Discharge Water Quality Monitoring	Point WC-D on Werris Creek marked on Figure 4 in the Site Water Management Plan for Werris Creek Coal Mine dated March 2009 that was submitted to EPA on 22-9-09 and which is kept on file LIC07/2029-09.
25	Ambient/Discharge Water Quality Monitoring	Point QC-U on Quipolly Creek marked on Figure 4 in the Site Water Management Plan for Werris Creek Coal Mine dated March 2009 that was submitted to EPA on 22-9-09 and which is kept on file LIC07/2029-09.
26	Ambient/Discharge Water Quality Monitoring	Point QC-D on Quipolly Creek marked on Figure 4 in the Site Water Management Plan for Werris Creek Coal Mine dated March 2009 that was submitted to EPA on 22-9-09 and which is kept on file LIC07/2029-09.
27	Water Quality Montioring	Point identified as "VWD2" on Figure 4B.10 in the Environmental Assessment for Werris Creek Coal Mine, Life of Mine Project referenced in Project Approval 10_0059.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with

section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.

L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.

L2.4 Water and/or Land Concentration Limits

POINT 10,12,14

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Oil and Grease	milligrams per litre	-	-	-	10
pH	pH	-	-	-	6.5- 8.5
Total suspended solids	milligrams per litre	20	35	-	50

L2.5 The Total Suspended Solids concentration limits specified for Points 10, 12 and 14 may be exceeded for water discharged from the sediment basins provided that:

(a) the discharge occurs solely as a result of rainfall measured at the premises that exceeds 39.2 millimetres over any consecutive 5 day period immediately prior to the discharge occurring; and

(b) all practical measures have been implemented to dewater all sediment dams within 5 days of rainfall such that they have sufficient capacity to store run off from a 39.2 millimetre, 5 day rainfall event.

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal or any waste generated at the premises to be disposed of at the premises, except as expressly permitted by the licence.

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L3.2 This condition only applies to the storage, treatment, processing, reprocessing or disposal of waste at the premises if those activities require an environment protection licence.

L4 Noise limits

L4.1 Noise generated from the premises must not exceed the noise limits in the table below. The locations referred to in the table below are defined within Appendix 3 of Werris Creek Coal Mine, Extension Project Approval 10_0059:

Locality and Location	Day LAeq (15 minute)	Evening LAeq (15 minute)	Night LAeq (15 minute)	Night LA1 (1 minute)
The residence on the property "Talavera" marked as location "R96" in Appendix 3 of Project Approval 10_0059	38	37	37	45
The residence known as "Quipolly Railway Cottage" marked as location "R12" in Appendix 3 of Project Approval 10_0059	38	38	38	45
The residence located at 83 Wadwells Lane marked as location "R7" in Appendix 3 of Project Approval 10_0059	37	37	37	45
The residence on the property "Gedhurst" marked as location "R9" in Appendix 3 of Project Approval 10_0059	37	37	37	45
The residence on the property "Hazeldene" marked as location "R24" in Appendix 3 of Project Approval 10_0059	37	37	37	45

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The residence on the property "Mountain View" marked as location "R22" in Appendix 3 of Project Approval 10_0059	36	36	36	45
Any other affected residence not owned by the licensee or its related companies	35	35	35	45

L4.2 For the purpose of the condition above;
a) Day is defined as the period from 7am to 6pm on any day.
b) Evening is defined as the period 6pm to 10pm on any day.
c) Night is defined as the period from 10pm to 7am on any day.

Note: For the purpose of the noise criteria for this condition, 5dBA must be added to the measurement level if the noise is substantially tonal or impulsive in character.

L4.3 The noise limits set out in the Noise Limits table apply under all meteorological conditions except for the following:
a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
b) Temperature inversion conditions up to 12ºC/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
c) Temperature inversion conditions greater than 12ºC/100m.

Note: For the purpoess of this condition, data recorded by the meteorological station identified as EPA Indentification Point no. 9 and the lower level temperature sensor identified as EPA Identification Point No. 31 must be used to determine meteorological conditions.

Note: Temperature inversion conditions (vertical temperature gradient in degrees C/100m) are to be determined as [(TM2 – TM3 – 0.7) * 1.25], where TM2 is the temperature from sensor M2 (10m weather station at top of rehabilitated overburden emplacement) and TM3 is the temperature from sensor M3 (lower weather station at base of rehabilitated overburden emplacement). Reference: Spectrum Acoustics letter report Ref: 04035/4580 of 7 November 2012 to Werris Creek Coal.

L4.4 Noise impacts where wind speed exceeds 3 metres per second at 10 metres above the ground must be addressed by:

a) documenting noise complaints received to identify any higher level of impacts or wind patterns;
b) where levels of noise complaints indicate a higher level of impact then actions to quantify and ameliorate any enhanced impacts where wind speed exceeds 3 metres per second at 10 metres above the ground must be developed and implemented.

L4.5 The noise limits set by condition L4.1 of the licence do not apply where a current legally binding agreement exists between the proponent and the occupant of a residential property that:

a) agrees to an alternative noise limit for that property; or
b) provides an alternative means of compensation to address noise impacts from the premises.

A copy of any agreement must be provided to the EPA before the proponent can take advantage of the agreement.

L4.6 **Determining Compliance**

To determine compliance:
a) with the Leq(15 minute) noise limits in the Noise Limits table, the noise measurement equipment must be located:
i) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
ii) within 30 metres of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable
iii) within approximately 50 metres of the boundary of a National Park or a Nature Reserve.
b) with the LA1(1 minute) noise limits in the Noise Limits table, the noise measurement equipment must be located within 1 metre of a dwelling façade.
c) with the noise limits in the Noise Limits table, the noise measurement equipment must be located:
i) at the most affected point at a location where there is no dwelling at the location; or
ii) at the most affected point within an area at a location prescribed by part (a) or part (b) of this condition.

Note: A non-compliance of the Noise Limits table will still occur where noise generated from the premises in excess of the appropriate limit is measured:
i) at a location other than an area prescribed in part (a) and part (b); and/or
ii) at a point other than the most affected point at a location.

L5 Blasting

L5.1 The overpressure level from blasting operations at the premises must not exceed 120dB (Lin Peak) at any time. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.

L5.2 The airblast overpressure level from blasting operations at the premises must not exceed 115dB (Lin Peak) at any noise sensitive locations for more than five per cent of the total number of blasts over each reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.

L5.3 Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 10mm/sec at any time at any noise sensitive locations. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.

L5.4 Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 5mm/sec at any noise sensitive locations for more than five per cent of the total number of blasts over each reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.

L5.5 Blasting operations at the premises may only take place between 9:00am-5:00pm Monday to Saturday. Blasting is not permitted on public holidays.

Blasting outside the hours specified above can only take place with the written approval of the EPA.

L5.6 The hours of operation for blasting operations specified in this licence may be varied by the EPA, having regard to the effect that the proposed variation would have on the amenity of the residents in the locality, gives written consent to the variation.

L5.7 Blasting at the premises is limited to 1 blast on each day on which blasting is permitted.

Note: Additional blasts are permitted where the EPA and neighbours have been notified of the intended blast prior to the additional blast being fired; and
- it is demonstrated to be necessary for safety reasons; or
- the previous blast generated ground vibration levels of less than 0.5 mm per second at all non-project related residences.

L5.8 To determine compliance with condition(s) L5.1, L5.2, L5.3 and L5.4
a) Airblast overpressure and ground vibration levels must be measured and electronically recorded at any point within 30 metres of any non-project related residential building or other sensitive locations such as schools or hospitals for all blasts carried out in or on the premises; and
b) Instrumentation used to measure the airblast overpressure and ground vibration must meet the requirements of Australian Standard AS 2187.2-2006.

Note: A breach of the licence will still occur where airblast overpressure or ground vibration levels from the blasting operations at the premises exceeds the limit specified in this licence at any “noise sensitive locations” other than the locations identified in the above condition.

L6 Hours of operation

L6.1 Activities at the premises, other than blasting (which is subject to the limits applied by condition L5.5), may be carried out 24 hours a day, 7 days per week.

L7 Potentially offensive odour

L7.1 No condition in this licence identifies a potentially offensive odour for the purposes of section 129 of the Protection of the Environment Operations Act 1997.

Note: Section 129 of the Protection of the Environment Operations Act 1997 provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the

activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

O3 Dust

O3.1 All operations and activities occurring at the premises must be carried out in a manner that will minimise the emission of dust from the premises.

O3.2 Trucks transporting coal from the premises must be covered immediately after loading to prevent wind blown emissions and spillage. The covering must be maintained until immediately before unloading the trucks.

O4 Other operating conditions

O4.1 All reversing beepers fitted to vehicles on the premises must be a mid-high frequency broadband type as described in the EIS.

5 Monitoring and Recording Conditions

M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.

M1.2 All records required to be kept by this licence must be:
a) in a legible form, or in a form that can readily be reduced to a legible form;
b) kept for at least 4 years after the monitoring or event to which they relate took place; and
c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:
a) the date(s) on which the sample was taken;
b) the time(s) at which the sample was collected;
c) the point at which the sample was taken; and
d) the name of the person who collected the sample.

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M2 Requirement to monitor concentration of pollutants discharged

M2.1 For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:

M2.2 Air Monitoring Requirements

POINT 28,29,30

Pollutant	Units of measure	Frequency	Sampling Method
PM10	micrograms per cubic metre	Every 6 days	AM-18
Solid Particles	grams per square metre per month	Continuous	AM-19

M2.3 Water and/ or Land Monitoring Requirements

POINT 10,12,14

Pollutant	Units of measure	Frequency	Sampling Method
Conductivity	microsiemens per centimetre	Special Frequency 1	Grab sample
Nitrate	milligrams per litre	Special Frequency 1	Grab sample
Nitrogen (total)	milligrams per litre	Special Frequency 1	Grab sample
Oil and Grease	milligrams per litre	Special Frequency 1	Grab sample
pH	pH	Special Frequency 1	Grab sample
Phosphorus (total)	milligrams per litre	Special Frequency 1	Grab sample
Reactive Phosphorus	milligrams per litre	Special Frequency 1	Grab sample
Total suspended solids	milligrams per litre	Special Frequency 1	Grab sample

POINT 16,27

Pollutant	Units of measure	Frequency	Sampling Method
Conductivity	microsiemens per centimetre	Every 3 months	Grab sample
Nitrate	milligrams per litre	Every 3 months	Grab sample
Nitrogen (total)	milligrams per litre	Every 3 months	Grab sample
Oil and Grease	milligrams per litre	Every 3 months	Grab sample
pH	pH	Every 3 months	Grab sample
Phosphorus (total)	milligrams per litre	Every 3 months	Grab sample
Reactive Phosphorus	milligrams per litre	Every 3 months	Grab sample

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Total suspended solids	milligrams per litre	Every 3 months	Grab sample

POINT 17,18,19,20,22,21

Pollutant	Units of measure	Frequency	Sampling Method
Conductivity	microsiemens per centimetre	Every 6 months	Representative sample
Nitrate	milligrams per litre	Every 6 months	Representative sample
Nitrogen (total)	milligrams per litre	Every 6 months	Representative sample
pH	pH	Every 6 months	Representative sample
Phosphorus (total)	milligrams per litre	Every 6 months	Representative sample
Reactive Phosphorus	milligrams per litre	Every 6 months	Representative sample
Standing Water Level	metres	Every 6 months	In situ

POINT 23,24,25,26

Pollutant	Units of measure	Frequency	Sampling Method
Conductivity	microsiemens per centimetre	Special Frequency 2	Special Method 1
Nitrate	milligrams per litre	Special Frequency 2	Special Method 1
Nitrogen (total)	milligrams per litre	Special Frequency 2	Special Method 1
Oil and Grease	milligrams per litre	Special Frequency 2	Special Method 1
pH	pH	Special Frequency 2	Special Method 1
Phosphorus (total)	milligrams per litre	Special Frequency 2	Special Method 1
Reactive Phosphorus	milligrams per litre	Special Frequency 2	Special Method 1
Total suspended solids	milligrams per litre	Special Frequency 2	Special Method 1

Note: For the purposes of this condition, Special Frequency 1 means as soon as practicable after overflow commences and in any case not more than 12 hours after any overflow commencing.

For the purposes of this condition, Special Frequency 2 means within 12 hours after any overflow from a storage dam(s) on the premises occurring.

For the purposes of this condition, Special Method 1 means that grab samples must be taken from those ambient/discharge water quality monitoring points (i.e. points 23-26) located in same drainage catchment (Werris Creek and/or Quipolly Creek) as those wet weather discharge points (i.e. points 10, 12 and/or 14) overflowing in any individual discharge event.

Note: The frequency of monitoring and the pollutant/s to be monitored may be varied by the EPA once the variability of the water quality and ground water quality is established.

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M3 Testing methods - concentration limits

M3.1 Monitoring for the concentration of a pollutant emitted to the air required to be conducted by this licence must be done in accordance with:
a) any methodology which is required by or under the Act to be used for the testing of the concentration of the pollutant; or
b) if no such requirement is imposed by or under the Act, any methodology which a condition of this licence requires to be used for that testing; or
c) if no such requirement is imposed by or under the Act or by a condition of this licence, any methodology approved in writing by the EPA for the purposes of that testing prior to the testing taking place.

Note: The *Protection of the Environment Operations (Clean Air) Regulation 2010* requires testing for certain purposes to be conducted in accordance with test methods contained in the publication "Approved Methods for the Sampling and Analysis of Air Pollutants in NSW".

M3.2 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

M4 Weather monitoring

M4.1 Weather Monitoring Requirements

POINT 9

Parameter	Units of Measure	Frequency	Averaging Period	Sampling Method
Rainfall	millimetres per hour	continuous	1 hour	AM-4
Wind speed @10 metres	metres per second	continuous	15 minute	AM-2 & AM-4
Wind direction @10 metres	degrees clockwise from true north	continuous	15 minute	AM-2 & AM-4
Temperature @2 metres	degrees celsius	continuous	15 minute	AM-4
Temperature @10 metres	degrees celsius	continuous	15 minute	AM-4
Sigma theta @10 metres	degrees clockwise from true north	continuous	15 minute	AM-2 & AM-4
Solar radiation	watts per square metre	continuous	15 minute	AM-4
Additional requirements - siting	-	-	-	AM-1, AM-4 & special method 2
Additional requirements - measurement	-	-	-	AM-1, AM-4 & special method 2

M4.2 POINT 31

Parameter	Units of Measure	Frequency	Averaging Period	Sampling Method
Temperature @ 2 metres	degrees celsius	continuous	15 minute	AM-4 & special method 2

Note: For the purposes of conditions M4.1 & M4.2, Special Method 2 means that the location of the meteorological monitoring equipment and details of that equipment, the equipment operation and maintenance/service procedures and schedules must be submitted in writing and approved in writing by the EPA before any sampling or analysis is carried out. The meteorological monitoring equipment must be calibrated at least once every 12 months. Any proposed changes to the meteorological monitoring equipment location, operating and maintenance/service procedures and schedules, or to the monitoring hardware itself must also be submitted in writing and approved in writing by the EPA. The EPA is to be provided with the monitoring data on request in a Microsoft ® Office software compatible format.

M5 Recording of pollution complaints

M5.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.

M5.2 The record must include details of the following:
a) the date and time of the complaint;
b) the method by which the complaint was made;
c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
d) the nature of the complaint;
e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
f) if no action was taken by the licensee, the reasons why no action was taken.

M5.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M5.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M6 Telephone complaints line

M6.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M6.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

M6.3 The preceding two conditions do not apply until 3 months after:
a) the date of the issue of this licence or
b) if this licence is a replacement licence within the meaning of the Protection of the Environment Operations (Savings and Transitional) Regulation 1998, the date on which a copy of the licence was

served on the licensee under clause 10 of that regulation.

M7 Blasting

M7.1 POINTS: Within 30 metres of the residences at the locations marked as "R98" ("Kyooma"), "R11" ("Glenara") and "R62" (43 Kurrara Street, Werris Creek) on Appendix 3 of Project Approval 10_0059 and within 30 metres of the location marked as "R92" in Figure 4A.5 of Environmental Assessment for Werris Creek Coal Mine, Life of Mine Project, dated December 2010 and prepared by R.W. Corkery and Co. Pty Limited.

Parameter	Units of Measure	Frequency	Sampling Method
Blast Noise	dB (Lin Peak)	Every Blast	Type 1 Noise/Blast Logger
Blast Vibration	mm/s	Every Blast	Geophone Logger or similar

M8 Other monitoring and recording conditions

M8.1 NOISE MONITORING

M8.2 To assess compliance with the noise limits presented in the Noise Limits table, attended noise monitoring must be undertaken in accordance with the condition titled Determining Compliance, outlined above, and:
a) at the locations marked as "R7" (83 Wadwells Lane), "R9" ("Gedhurst"), "R22" ("Mountain View"), "R24" (Hazeldene"), "R12" ("Quipolly railway Cottage"), "R96" ("Talvera" listed as "Millbank") and non project related residence number "57" (33 Kurrara Street) on Appendix 3 of Project Approval 10_0059;
b) occur monthly in a reporting period;
c) occur during each day, evening and night period as defined in the NSW Industrial Noise Policy for a minimum of:
i) 1 hour during the day; and
ii) 1 hour during the evening or night.

Note: The frequency of monitoring may be varied by the EPA once the variability of the noise impact is established.

6 Reporting Conditions

R1 Annual return documents

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:
a) a Statement of Compliance; and
b) a Monitoring and Complaints Summary.
At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.

R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

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Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

R1.3 Where this licence is transferred from the licensee to a new licensee:
a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

R1.5 The Annual Return for the reporting period must be supplied to the EPA by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.

R1.7 Within the Annual Return, the Statement of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:
a) the licence holder; or
b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

R1.8 A person who has been given written approval to certify a certificate of compliance under a licence issued under the Pollution Control Act 1970 is taken to be approved for the purpose of this condition until the date of first review of this licence.

R2 Notification of environmental harm

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.

R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

R3 Written report

R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
a) where this licence applies to premises, an event has occurred at the premises; or
b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,
and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.

R3.3 The request may require a report which includes any or all of the following information:
a) the cause, time and duration of the event;
b) the type, volume and concentration of every pollutant discharged as a result of the event;
c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
g) any other relevant matters.

R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

R4 Other reporting conditions

R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the monthly monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:
a) an assessment of compliance with noise limits presented in the Noise Limits table; and
b) an outline of any management actions taken within the monitoring period to address any exceedences of the limits contained in the Noise Limits table.

7 General Conditions

G1 Copy of licence kept at the premises or plant

G1.1 A copy of this licence must be kept at the premises to which the licence applies.

G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.

G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

G2 Other general conditions

G2.1 **Completed Pollution Studies and Reduction Programs (PRPs)**

PRP	Description	Completed Date
PRP 1: Noise Monitoring and Assessment Program	This PRP requires the licensee to undertake a noise monitoring and assessment of the impacts of typical construction and mining activities on the premises.	15-May-2008
PRP 2: Coal Mine Particulate Matter Control Best Practice	Requires licensee to conduct a site specific best management practice (BMP) determination to identify ways to reduce particulate emissions.	27-June-2012

8 Pollution Studies and Reduction Programs

U1 Particulate Matter Control Best Practice Implementation – Wheel Generated Dust

U1.1 The Licensee must achieve and maintain a dust control efficiency of 80% or more on all active haul roads by 22 March 2013.

Control efficiency is calculated as:

$$CE = \frac{E\ (uncontrolled) - E\ (controlled)}{E\ (uncontrolled)} \times 100$$

Where E = the emission rate of the activity

U1.2 To assess compliance with Condition U1.1, the Licensee must:

- measure uncontrolled and controlled haul road emissions on at least 2 occasions using a mobile dust monitor;
- continuously measure and record 'additional site data' including:

· vehicle kilometres travelled (VKT),
· meteorological conditions,
· water use for dust suppression.

- undertake silt content and soil moisture sampling during sampling events; and
- determine if a site specific relationship can be derived between the measured control efficiency, additional site data, water use, meteorological data; and silt content and soil moisture levels.

The measurement of uncontrolled and controlled haul road PM10 emissions must be undertaken under varying meteorological conditions, including at those times when analysis of meteorological data indicates that elevated levels of dust are most likely at the Premises.

Note: The EPA acknowledges that in order to determine uncontrolled PM10 emissions, the section of haul road to be sampled will need to be left untreated for a period of up to 12 hours prior to the sampling taking place.

U1.3 The Licensee must submit a report to the EPA which documents the results of the assessment undertaken in accordance with Condition U1.1. The report must include an assessment of:

- the dust control effectiveness,
- the dust levels recorded, and
- any relationship established between control effectiveness and the additional site data.

The report must be submitted by the Licensee to the Environment Protection Authority Regional Manager Armidale, at PO Box 494, ARMIDALE by 15 August 2014.

U1.4 The report required by condition U1.3 must be made publicly available by the Licensee on the Licensee's website by (two weeks from submission date nominated in U1.3).

U2 Particulate Matter Control Best Practice Implementation – Disturbing and Handling Overburden under Adverse Weather Conditions

U2.1 The licensee must alter or cease the use of equipment on overburden and the loading and dumping of overburden during adverse weather conditions to minimise the generation of particulate matter from 22 March 2013.

U2.2 To assess compliance with Condition U2.1, the Licensee must:
- undertake daily visual dust level assessments, continuously record real-time PM10 levels and continuously measure and record real-time meteorological conditions; and
- record changes to mining activities due to adverse weather conditions.

U2.3 The Licensee must submit a report to the EPA which documents the results of the actions taken in accordance with Condition U2.1. The report must include an assessment of the effectiveness of changes made to mining activities due to adverse weather and document meteorological conditions and the resultant dust levels. The report must be submitted by the Licensee to the Environment Protection Authority Regional Manager Armidale, at PO Box 494, ARMIDALE by 15 August 2014.

U2.4 The report required by Condition U2.3 must be made publicly available by the Licensee on the Licensee's website by (two weeks from submission date in 2.3 above).

U3 Particulate Matter Control Best Practice Implementation – Trial of Best Practice Measures for Disturbing and Handling Overburden

U3.1 The Licensee must submit a report documenting an investigation and trial of best practice measures for the control of particulate matter from the use of equipment on overburden and the loading and dumping of

overburden. Best practice measures may include, but should not be limited to, the following:

- the use of foggers;
- the use of water sprays; and
- reduction of drop heights.

The report must document the investigation and trial of each best practice measure. It must quantify the particulate matter control effectiveness and discuss the practicability of each best practice measure.

The report must be submitted by the Licensee to the Environment Protection Authority Regional Manager Armidale, at PO Box 494, ARMIDALE by 14 April 2014.

9 Special Conditions

E1 Three Yearly Independent Noise Audit

E1.1 The licensee must provide the EPA with a copy of any Noise Audit and Independent Environmental Audit Report required by condition 4 of Schedule 3 and conditions 8 and 9 of Schedule 5 of the Werris Creek Mine Extension Project Approval (No. 10_0059). If the Noise Audit and Independent Environmental Audit Report do not incorporate the following information or assessments, then the licensee must also provide a separate report to the EPA that incorporates the following:

(a) An assessment of noise emissions from the premises against the noise limits established by the Project Approval (No. 10_0059), as well as against the long term noise goal and noise acquisition criteria established within Project Approval No. 10_0059 that has been completed in accordance with the procedures defined in the *NSW Industrial Noise Policy* and any relevant Application Notes published by the EPA;
(b) An evaluation of current mine noise impacts at all non-project related receptors and the noise mitigation practices that have been implemented at the premises against the best available economically achievable technology and current best practice principles for minimising noise emissions; and
(c) Where noise impacts at any affected non-project related receptor exceeds the long term noise goal established by condition 4 of Schedule 3 of Project Approval 10_0059, the licensee must provide documented evidence that demonstrates that reasonable attempts have been made to reach a negotiated agreement with all relevant affected receptors within the last 3 years.

The reports required by this condition must be submitted to the EPA's Armidale office within 6 weeks of the 30 June 2014, and every three years thereafter.

Note: For the purposes of this condition, a privately owned property that is subject to a current and legally biding negotiated agreement between the licensee and the relevant property owner, is considered project related, as is any property or residence held in the ownership of the licensee or its associated companies.

E1.2 If the reports required by E1.1 above indicate that non-project related receptors continue to receive impacts that exceed the long term noise goal established by condition 4 of Schedule 3 of Project Approval 10_0059, then the licensee must provide the EPA with a report detailing the actions it will take during the next three year period, to further reduce noise impacts from the mine. The report must:

(a) Provide details of any trials, tests or research that it will commission in an attempt to develop new or

innovative noise mitigation technologies or management practices;
(b) Detail the nature of any works that will be carried out at the premises or at the relevant receptor locations to further reduce noise impacts;
(c) Provide timelines and provisional costings for the proposed actions or works;
(d) Provide an analysis where possible of the potential noise reductions that the proposed actions are likely to achieve; and
(e) Define any additional noise monitoring programs that might be required to measure/validate the performance of the proposed mitigation actions.

The report required by this condition must be submitted to the EPA by **31 August 2014 and every three years thereafter** until noise emissions from the premises meet the long term noise goal established by condition 4 of Schedule 3 of Project Approval 10_0059.

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Dictionary

General Dictionary

3DGM [in relation to a concentration limit]	Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples
Act	Means the Protection of the Environment Operations Act 1997
activity	Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997
actual load	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
AM	Together with a number, means an ambient air monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
AMG	Australian Map Grid
anniversary date	The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
annual return	Is defined in R1.1
Approved Methods Publication	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
assessable pollutants	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
BOD	Means biochemical oxygen demand
CEM	Together with a number, means a continuous emission monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
COD	Means chemical oxygen demand
composite sample	Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume.
cond.	Means conductivity
environment	Has the same meaning as in the Protection of the Environment Operations Act 1997
environment protection legislation	Has the same meaning as in the Protection of the Environment Administration Act 1991
EPA	Means Environment Protection Authority of New South Wales.
fee-based activity classification	Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009.
general solid waste (non-putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997

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flow weighted composite sample	Means a sample whose composites are sized in proportion to the flow at each composites time of collection.
general solid waste (putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environmen t Operations Act 1997
grab sample	Means a single sample taken at a point at a single time
hazardous waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
licensee	Means the licence holder describe d at the front of this licence
load calculation protocol	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
local authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
material harm	Has the same meaning as in section 147 Protection of the Environment Operations Act 1997
MBAS	Means methylene blue active substances
Minister	Means the Minister administering the Protection of the Environment Operations Act 1997
mobile plant	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
motor vehicle	Has the same meaning as in the Protection of the Environment Operations Act 1997
O&G	Means oil and grease
percentile [in relation to a concentration limit of a sample]	Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence.
plant	Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles.
pollution of waters [or water pollution]	Has the same meaning as in the Protection of the Environment Operations Act 1997
premises	Means the premises described in condition A2.1
public authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
regional office	Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence
reporting period	For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 mo nths. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
restricted solid waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
scheduled activity	Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997
special waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
TM	Together with a number, means a test method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.

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TSP	Means total suspended particles
TSS	Means total suspended solids
Type 1 substance	Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements
Type 2 substance	Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements
utilisation area	Means any area shown as a utilisation area on a map submitted with the application for this licence
waste	Has the same meaning as in the Protection of the Environment Operations Act 1997
waste type	Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non-putrescible), special waste or hazardous waste

Mr Stephen O'Donoghue

Environment Protection Authority

(By Delegation)

Date of this edition: 18-April-2005

Environment Protection Licence

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End Notes

1	Licence varied by notice 1059992, issued on 23-May-2006, which came into effect on 23-May-2006.
2	Licence varied by notice 1064880, issued on 14-Sep-2006, which came into effect on 14-Sep-2006.
3	Licence varied by notice 1067351, issued on 04-Jan-2007, which came into effect on 04-Jan-2007.
4	Licence fee period changed by notice 1079180 approved on .
5	Licence varied by notice 1087334, issued on 07-Oct-2009, which came into effect on 07-Oct-2009.
6	Licence varied by notice 1115057, issued on 16-Jun-2010, which came into effect on 16-Jun-2010.
7	Licence varied by notice 1122371, issued on 23-Dec-2010, which came into effect on 23-Dec-2010.
8	Licence varied by notice 1126948, issued on 13-Jul-2011, which came into effect on 13-Jul-2011.
9	Licence varied by notice 1503171 issued on 20-Dec-2011
10	Licence varied by notice 1503674 issued on 04-Apr-2012
11	Licence varied by notice 1510431 issued on 21-Mar-2013
12	Licence varied by notice 1513290 issued on 01-May-2013
13	Licence varied by notice 1516119 issued on 06-Sep-2013
14	Licence varied by notice 1518349 issued on 08-Jan-2014

N.S.W. STAMP DUTY
CL No. 1846988 COAL MINING LEASE
2003•••2004•••2005

MINING LEASE

MINING ACT 1992

NO. **1563**

DATED **23rd March 2005**

THE MINISTER FOR MINERAL RESOURCES

OF THE STATE

OF NEW SOUTH WALES

TO

Creek Resources Pty Limited
(A. C. N. 100 228 886)

AND

Betalpha Pty Limited
(A. C. N. 105 663 518)

RECORDED in the Department of Primary Industries, Mineral Resources

this **fifth** day of **April 2005** A.D.

at the hour of **10:00**

o'clock in the fore noon.

Director-General

MINING ACT 1992

MINING LEASE

THIS DEED made the **twenty third**——————————day of **March**——— Two thousand and **five**——————————in pursuance of the provisions of the Mining Act 1992 (hereinafter called "the Act") BETWEEN **THE HONOURABLE KERRY ARTHUR HICKEY MINISTER FOR MINERAL RESOURCES** of the State of New South Wales (hereinafter called "the Minister" which expression shall where the context admits or requires include the successors in office of the Minister and the person acting as such Minister for the time being) AND **Creek Resources Pty Limited (A. C. N. 100 228 886) and Betalpha Pty Limited (A. C. N. 105 663 518)** (which with its successors and transferees is hereinafter called "the lease holder")

WHEREAS

(a) in conformity with the Act application was made for a mining lease over the lands hereinafter described; and

(b) all conditions and things required to be done and performed before granting a mining lease under the Act have been done and performed NOW THIS DEED WITNESSETH that in consideration of the observance and performance of the covenants contained in this Deed and the payment of royalty by the lease holder, the Minister in pursuance of the provisions of the Act DOES HEREBY demise and lease to the lease holder ALL THAT piece or parcel of land containing by admeasurement of **678.5 hectares** and more particularly described and delineated in the plan catalogue No. **M27037** attached for the purpose of prospecting and mining for **coal.**

TO HOLD the said land together with any appurtenances thereon subject to:

(a) such rights and interests as may be lawfully subsisting therein or which may be reserved by the Act at the date of this Deed; and

(b) such conditions, provisos and stipulations as are contained in this Deed UNTO the lease holder from and including the date of this Deed for the period of **twenty one (21) years** for the purpose as stated and for no other purpose.

1. THAT in this lease except insofar as the context otherwise indicates or requires:

   (a) any reference to an Act includes that Act and any Act amending or in substitution for the same; "Director-General" means the person for the time being holding office or acting as Director-General, Department of Mineral Resources, Sydney; the word "mine" has the meaning assigned to it by the Act; words importing the singular number shall include the plural, the masculine gender the feminine or neuter gender and vice versa; and

(b) any covenant on the part of two or more persons shall be deemed to bind them jointly and severally.

2. THAT the lease holder shall during the said term pay to the Minister in Sydney in respect of all such minerals as stated, recovered from the land hereby demised, royalty at the rate or rates prescribed by the Act and the Regulations thereunder at the time the minerals are recovered, or at the rate or rates fixed by the Minister from time to time during the term of this demise in exercise of the power in that behalf conferred upon him by the Act.

3. THAT the lease holder shall at all times during the term of this lease keep and preserve the said mine from all avoidable injury or damage and also the levels, drifts, shafts, watercourses, roadways, works, erections and fixtures therein and thereon in good repair and condition and in such state and condition shall on the expiration or sooner determination of the said term or any renewal thereof deliver possession of the land and the premises hereby demised to the Minister or other persons authorised to receive possession thereof.

4. THAT the conditions and provisions set forth in the Schedule of Mining Lease Conditions 2004 herein and numbered:- **1 to 21 (inclusive), 23, 24, 25, 29, 30 and 31** are embodied and incorporated within this Deed as conditions and provisions of the lease hereby granted.

PROVIDED always and it is hereby declared as follows:

(a) THAT this lease is granted subject to amendment as provided under Section 79 of the Act.

(b) THAT if the lease holder at any time during the term of this demise -

(i) fails to fulfil or contravenes the covenants and conditions herein contained; or

(ii) fails to comply with any provision of the Act or the Regulations with which the lease holder is required to comply; or

(iii) fails to comply with the requirements of any agreement or assessment in relation to the payment of compensation,

this lease may be cancelled by the Minister by instrument in writing and the cancellation shall have effect from and including the date on which notice of the cancellation is served on the lease holder or on such later date as is specified in the notice; and any liability incurred by the lease holder before the cancellation took effect shall not be affected.

(c) THAT no implied covenant for title or for quiet enjoyment shall be contained herein.

(d) THAT all the conditions and provisions contained in the Mining Act 1992 and the Regulations thereunder, the Mines Inspection Act 1901 and the Coal Mines Regulation Act 1982 or any other law hereafter to be passed or prescribed shall be incorporated within this Deed as conditions and provisions of the lease granted. The lease holder hereby covenants to observe, fulfil and perform the same.

(e) THAT such of the provisions and conditions declared and contained in this Deed as requiring anything to be done or not to be done by the lease holder, shall be read and construed as covenants by the lease holder with the Minister which are to be observed and performed.

IN WITNESS WHEREOF the parties hereto have executed this Deed the day and year first abovewritten.

SIGNED SEALED AND DELIVERED
BY

The Honourable Kerry Arthur Hickey
as such Minister as aforesaid

.....
Minister

in the presence of

.....
Witness

SIGNED SEALED AND DELIVERED
by the said

Creek Resources Pty Limited
(A. C. N. 100 228 886)

in the presence of

.....
Witness

SIGNED IN ACCORDANCE WITH THE CONSTITUTION '81:

Betalpha Pty Limited
(A. C. N. 105 663 518)

.....
K ROSS - DIRECTOR.

in the presence of

.....
Witness
HAMILTON - SECRETARY.

MINING LEASE CONDITIONS 2004

Notice to Landholders

1. Within a period of three months from the date of grant of this lease or within such further time as the Minister may allow, the lease holder must serve on each landholder of the land a notice in writing indicating that this lease has been granted and whether the lease includes the surface. An adequate plan and description of the lease area must accompany the notice.

   If there are ten or more landholders affected, the lease holder may serve the notice by publication in a newspaper circulating in the region where the lease area is situated. The notice must indicate that this lease has been granted; state whether the lease includes the surface and must contain an adequate plan and description of the lease area.

Mining, Rehabilitation, Environmental Management Process (MREMP)

Mining Operations Plan (MOP)

2. (1) Mining operations, including mining purposes, must be conducted in accordance with a Mining Operations Plan (the Plan) satisfactory to the Director-General. The Plan together with environmental conditions of development consent and other approvals will form the basis for:-

   (a) ongoing mining operations and environmental management; and

   (b) ongoing monitoring of the project.

   (2) The Plan must be prepared in accordance with the Director-General's guidelines current at the time of lodgement.

   (3) A Plan must be lodged with the Director-General:-

   (a) prior to the commencement of mining operations (including mining purposes);

   (b) subsequently as appropriate prior to the expiry of any current Plan; and

   (c) in accordance with any direction issued by the Director-General.

   (4) The Plan must present a schedule of proposed mine development for a period of up to seven (7) years and contain diagrams and documentation which identify:-

   (a) area(s) proposed to be disturbed under the Plan;

   (b) mining and rehabilitation method(s) to be used and their sequence;

   (c) areas to be used for disposal of tailings/waste;

(d) existing and proposed surface infrastructure;

(e) existing flora and fauna on the site;

(f) progressive rehabilitation schedules;

(g) areas of particular environmental, ecological and cultural sensitivity and measures to protect these areas;

(h) water management systems (including erosion and sediment controls);

(i) proposed resource recovery; and

(j) where the mine will cease extraction during the term of the Plan, a closure plan including final rehabilitation objectives/methods and post mining landuse/vegetation.

(5) The Plan when lodged will be reviewed by the Department.

(6) The Director-General may within two (2) months of the lodgement of a Plan, require modification and re-lodgement.

(7) If a requirement in accordance with clause (6) is not issued within two (2) months of the lodgement of a Plan, the lease holder may proceed with implementation of the Plan.

(8) During the life of the Mining Operations Plan, proposed modifications to the Plan must be lodged with the Director-General and will be subject to the review process outlined in clauses (5) - (7) above.

Annual Environmental Management Report (AEMR)

3. (1) Within 12 months of the commencement of mining operations and thereafter annually or, at such other times as may be allowed by the Director-General, the lease holder must lodge an Annual Environmental Management Report (AEMR) with the Director-General.

(2) The AEMR must be prepared in accordance with the Director-General's guidelines current at the time of reporting and contain a review and forecast of performance for the preceding and ensuing twelve months in terms of:

(a) the accepted Mining Operations Plan;

(b) development consent requirements and conditions;

(c) Department of Environment and Conservation and Department of Infrastructure, Planning and Natural Resources licences and approvals;

(d) any other statutory environmental requirements;

(e) details of any variations to environmental approvals applicable to the lease area; and

(f) where relevant, progress towards final rehabilitation objectives.

(3) After considering an AEMR the Director-General may, by notice in writing, direct the lease holder to undertake operations, remedial actions or supplementary studies in the manner and within the period specified in the notice to ensure that operations on the lease area are conducted in accordance with sound mining and environmental practice.

(4) The lease holder shall, as and when directed by the Minister, co-operate with the Director-General to conduct and facilitate review of the AEMR involving other government agencies and the local council.

Subsidence Management

4. (a) The lease holder shall prepare a Subsidence Management Plan prior to commencing any underground mining operations which will potentially lead to subsidence of the land surface.

(b) Underground mining operations which will potentially lead to subsidence include secondary extraction panels such as longwalls or miniwalls, associated first workings (gateroads, installation roads and associated main headings, etc), and pillar extractions, and are otherwise defined by the *Guideline for Applications for Subsidence Management Approvals.*

(c) The lease holder must not commence or undertake underground mining operations that will potentially lead to subsidence other than in accordance with a Subsidence Management Plan approved by the Director-General, an approval under the *Coal Mines Regulation Act 1982*, or the document *New Subsidence Management Plan Approval Process – Transitional Provisions.*

(d) Subsidence Management Plans are to be prepared in accordance with the *Guideline for Applications for Subsidence Management Approvals.*

(e) Subsidence Management Plans as approved shall form part of the Mining Operations Plan required under Condition 2 and will be subject to the Annual Environmental Management Report process as set out under Condition 3. The SMP is also subject to the requirements for subsidence monitoring and reporting set out in the document *New Approval Process for Management of Coal Mining Subsidence - Policy.*

Working Requirement

5. The lease holder must:

(a) ensure that at least **28** competent people are efficiently employed on the lease area on each week day except Saturday or any week day that is a public holiday,

OR

(b) expend on operations carried out in the course of prospecting or mining the lease area, an amount of not less than **$490,000.00** per annum whilst the lease is in force.

The Minister may at any time or times, by instrument in writing served on the lease holder, increase or decrease the expenditure required or the number of people to be employed.

Control of Operations

6. (a) If an Environmental Officer of the Department believes that the lease holder is not complying with any provision of the Act or any condition of this lease relating to the working of the lease, he may direct the lease holder to:-

(i) cease working the lease; or

(ii) cease that part of the operation not complying with the Act or conditions;

until in the opinion of the Environmental Officer the situation is rectified.

(b) The lease holder must comply with any direction given. The Director-General may confirm, vary or revoke any such direction.

(c) A direction referred to in this condition may be served on the Mine Manager.

Reports

7. The lease holder must provide an exploration report, within a period of twenty-eight days after each anniversary of the date this lease has effect or at such other date as the Director-General may stipulate, of each year. The report must be to the satisfaction of the Director-General and contain the following:

(a) Full particulars, including results, interpretation and conclusions, of all exploration conducted during the twelve months period;

(b) Details of expenditure incurred in conducting that exploration;

(c) A summary of all geological findings acquired through mining or development evaluation activities;

(d) Particulars of exploration proposed to be conducted in the next twelve months period;

(e) All plans, maps, sections and other data necessary to satisfactorily interpret the report.

Licence to Use Reports

8. (a) The lease holder grants to the Minister, by way of a non-exclusive licence, the right in copyright to publish, print, adapt and reproduce all exploration reports lodged in any form and for the full duration of copyright.

(b) The non-exclusive licence will operate as a consent for the purposes of section 365 of the Mining Act 1992.

Confidentiality

9. (a) All exploration reports submitted in accordance with the conditions of this lease will be kept confidential while the lease is in force, except in cases where:

(i) the lease holder has agreed that specified reports may be made non-confidential.

(ii) reports deal with exploration conducted exclusively on areas that have ceased to be part of the lease.

(b) Confidentiality will be continued beyond the termination of a lease where an application for a flow-on title was lodged during the currency of the lease. The confidentiality will last until that flow-on title or any subsequent flow-on title, has terminated.

(c) The Director-General may extend the period of confidentiality.

Terms of the non-exclusive licence

10. The terms of the non-exclusive copyright licence granted under condition 8 (a) are:

(a) the Minister may sub-licence others to publish, print, adapt and reproduce but not on-licence reports.

(b) the Minister and any sub-licensee will acknowledge the lease holder's and any identifiable consultant's ownership of copyright in any reproduction of the reports, including storage of reports onto an electronic database.

(c) the lease holder does not warrant ownership of all copyright works in any report and, the lease holder will use best endeavours to identify those parts of the report for which the lease holder owns the copyright.

(d) there is no royalty payable by the Minister for the licence.

(e) if the lease holder has reasonable grounds to believe that the Minister has exercised his rights under the non-exclusive copyright licence in a manner which adversely affects the operations of the lease holder, that licence is revocable on the giving of a period of not less than three months notice.

Blasting

11. (a) Ground Vibration

The lease holder must ensure that the ground vibration peak particle velocity generated by any blasting within the lease area does not exceed 10 mm/second and does not exceed 5 mm/second in more than 5% of the total number of blasts over a period of 12 months at any dwelling or occupied premises as the case may be, unless determined otherwise by the Department of Environment and Conservation.

(b) Blast Overpressure

The lease holder must ensure that the blast overpressure noise level generated by any blasting within the lease area does not exceed 120 dB (linear) and does not exceed 115 dB (linear) in more than 5% of the total number of blasts over a period of 12 months, at any dwelling or occupied premises, as the case may be, unless determined otherwise by the Department of Environment and Conservation.

Safety

12. Operations must be carried out in a manner that ensures the safety of persons or stock in the vicinity of the operations. All drill holes shafts and excavations must be appropriately protected, to the satisfaction of the Director-General, to ensure that access to them by persons and stock is restricted. Abandoned shafts and excavations opened up or used by the lease holder must be filled in or otherwise rendered safe to a standard acceptable to the Director-General.

Rehabilitation

13. (a) Land disturbed must be rehabilitated to a stable and permanent form suitable for a subsequent land use acceptable to the Director-General and in accordance with the Mining Operations Plan so that:-

- there is no adverse environmental effect outside the disturbed area and that the land is properly drained and protected from soil erosion.
- the state of the land is compatible with the surrounding land and land use requirements.
- the landforms, soils, hydrology and flora require no greater maintenance than that in the surrounding land.
- in cases where revegetation is required and native vegetation has been removed or damaged, the original species must be re-established with close reference to the flora survey included in the Mining Operations Plan. If the original vegetation was not native, any re-established vegetation must be appropriate to the area and at an acceptable density.

- the land does not pose a threat to public safety.

(b) Any topsoil that is removed must be stored and maintained in a manner acceptable to the Director-General.

14. The lease holder must comply with any direction given by the Director-General regarding the stabilisation and revegetation of any mine residues, tailings or overburden dumps situated on the lease area.

Exploratory Drilling

15. (1) At least twenty eight days prior to commencement of drilling operations the lease holder must notify the relevant Department of Infrastructure, Planning and Natural Resources regional hydrogeologist of the intention to drill exploratory drill holes together with information on the location of the proposed holes.

(2) If the lease holder drills exploratory drill holes he must satisfy the Director-General that:-

(a) all cored holes are accurately surveyed and permanently marked in accordance with Departmental guidelines so that their location can be easily established;

(b) all holes cored or otherwise are sealed to prevent the collapse of the surrounding surface;

(c) all drill holes are permanently sealed with cement plugs to prevent surface discharge of groundwaters;

(d) if any drill hole meets natural or noxious gases it is plugged or sealed to prevent their escape;

(e) if any drill hole meets an artesian or sub-artesian flow it is effectively sealed to prevent contamination of aquifers.

(f) once any drill hole ceases to be used the hole must be sealed in accordance with Departmental guidelines. Alternatively, the hole must be sealed as instructed by the Director-General.

(g) once any drill hole ceases to be used the land and its immediate vicinity is left in a clean, tidy and stable condition.

Prevention of Soil Erosion and Pollution

16. Operations must be carried out in a manner that does not cause or aggravate air pollution, water pollution (including sedimentation) or soil contamination or erosion, unless otherwise authorised by a relevant approval, and in accordance with an accepted Mining Operations Plan. For the purpose of this condition, water shall be taken to include any watercourse, waterbody or groundwaters. The lease holder must observe and perform any instructions given by the Director-General in this regard.

Transmission lines, Communication lines and Pipelines

17. Operations must not interfere with or impair the stability or efficiency of any transmission line, communication line, pipeline or any other utility on the lease area without the prior written approval of the Director-General and subject to any conditions he may stipulate.

Fences, Gates

18. (a) Activities on the lease must not interfere with or damage fences without the prior written approval of the owner thereof or the Minister and subject to any conditions the Minister may stipulate.

(b) Gates within the lease area must be closed or left open in accordance with the requirements of the landholder.

Roads and Tracks

19. (a) Operations must not affect any road unless in accordance with an accepted Mining Operations Plan or with the prior written approval of the Director-General and subject to any conditions he may stipulate.

(b) The lease holder must pay to the designated authority in control of the road (generally the local council or the Roads and Traffic Authority) the cost incurred in fixing any damage to roads caused by operations carried out under the lease, less any amount paid or payable from the Mine Subsidence Compensation Fund.

20. Access tracks must be kept to a minimum and be positioned so that they do not cause any unnecessary damage to the land. Temporary access tracks must be ripped, topsoiled and revegetated as soon as possible after they are no longer required for mining operations. The design and construction of access tracks must be in accordance with specifications fixed by the Department of Infrastructure, Planning and Natural Resources.

Trees and Timber

21. (a) The lease holder must not fell trees, strip bark or cut timber on the lease without the consent of the landholder who is entitled to the use of the timber, or if such a landholder refuses consent or attaches unreasonable conditions to the consent, without the approval of a warden.

(b) The lease holder must not cut, destroy, ringbark or remove any timber or other vegetative cover on the lease area except such as directly obstructs or prevents the carrying on of operations. Any clearing not authorised under the Mining Act 1992 must comply with the provisions of the Native Vegetation Conservation Act 1997.

(c) The lease holder must obtain all necessary approvals or licences before using timber from any Crown land within the lease area.

Resource Recovery

23. (a) Notwithstanding any description of mining methods and their sequence or of proposed resource recovery contained within the Mining Operations Plan, if at any time the Director-General is of the opinion that minerals which the lease entitles the lease holder to mine and which are economically recoverable at the time are not being recovered from the lease area, or that any such minerals which are being recovered are not being recovered to the extent which should be economically possible or which for environmental reasons are necessary to be recovered, he may give notice in writing to the lease holder requiring the holder to recover such minerals.

(b) The notice shall specify the minerals to be recovered and the extent to which they are to be recovered, or the objectives in regard to resource recovery, but shall not specify the processes the lease holder shall use to achieve the specified recovery.

(c) The lease holder must, when requested by the Director-General, provide such information as the Director-General may specify about the recovery of the mineral resources of the lease area.

(d) The Director-General shall issue no such notice unless the matter has firstly been thoroughly discussed with and a report to the Director-General has incorporated the views of the lease holder.

(e) The lease holder may object to the requirements of any notice issued under this condition and on receipt of such an objection the Minister shall refer it to a Warden for inquiry and report under Section 334 of the Mining Act, 1992.

(f) After considering the Warden's report the Minister shall decide whether to withdraw, modify or maintain the requirements specified in the original notice and shall give the lease holder written notice of the decision. The lease holder must comply with the requirements of this notice.

Indemnity

24. The lease holder must indemnify and keep indemnified the Crown from and against all actions, suits, claims and demands of whatsoever nature and all costs, charges and expenses which may be brought against the lease holder or which the lease holder may incur in respect of any accident or injury to any person or property which may arise out of the construction, maintenance or working of any workings now existing or to be made by the lease holder within the lease area or in connection with any of the operations notwithstanding that all other conditions of this lease shall in all respects have been observed by the lease holder or that any such accident or injury shall arise from any act or thing which the lease holder may be licensed or compelled to do.

Security

25. (a) A security in the sum of **$50,000.00** must be given and maintained with the Minister by the lease holder for the purpose of ensuring the fulfilment by the lease holder of obligations under this lease. If the lease holder fails to fulfil any one or more of such obligations the said sum may be applied at the discretion of the Minister towards the cost of fulfilling such obligations. For the purpose of this clause the lease holder shall be deemed to have failed to fulfil the obligations of this lease if the lease holder fails to comply with any condition or provision hereof, any provision of the Act or regulations made thereunder or any condition or direction imposed or given pursuant to a condition or provision hereof or of any provision of the Act or regulations made thereunder.

(b) The lease holder must provide the security required by sub-clause (a) in one of the following forms:

(i) cash,

(ii) a security certificate in a form approved by the Minister and issued by an authorised deposit-taking institution.

Barriers

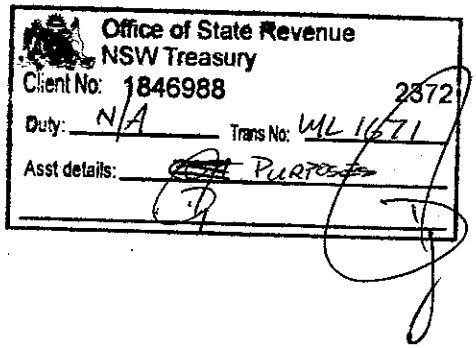
29. (a) Unless with the consent of the Minister first had and obtained and subject to such further conditions as he may impose, the lease holder shall not mine within a barrier of 50 metres in width against the underground workings of the former Werris Creek Colliery as referred to in the Environmental Impact Statement entitled "Werris Creek Coal Pty Limited – ABN 69 107 169 103 - Environmental Impact Statement for the Proposed Werris Creek Coal Mine" dated August 2004.

(b) The lease holder must, prior to seeking the Ministers consent under this condition, complete a risk assessment to determine hazards and develop management controls. This risk assessment is to be subject to any amendments as may be required by the Director General.

Special Conditions

30. The lease holder shall ensure that operations on the lease area are conducted in a manner consistent with the Environmental Impact Statement, except were no longer applicable due to subsequent approval, conditioning or exemption.

31. The lease holder shall ensure that 53 hectares of the rehabilitated landform is revegetated with species from the White Box Yellow Box Blakley's Red Gum Endangered Ecological Community, and stock are excluded from the 200 hectares as shown in Figure 4.15 of the Environmental Impact Statement.



MINING LEASE (PURPOSES)

MINING ACT 1992

NO 1671

DATED 9 MARCH 2012

THE MINISTER FOR RESOURCES AND ENERGY

OF THE STATE

OF NEW SOUTH WALES

TO

WERRIS CREEK COAL PTY LIMITED

(ACN 107169 102)

Mining Lease Application No 407

MINING ACT 1992

MINING LEASE
(PURPOSES)

THIS DEED made the Ninth day of March Two Thousand and Twelve in pursuance of the provisions of the *Mining Act 1992* (hereinafter called "the Act") BETWEEN, **CHRIS HARTCHER MP, MINISTER FOR RESOURCES AND ENERGY** of the State of New South Wales (hereinafter called "the Minister" which expression shall where the context admits or requires include the successors in office of the Minister and the person acting as such Minister for the time being) AND **WERRIS CREEK COAL PTY LIMITED (ACN 107 169 102)** (which with its successors and transferees is hereinafter called "the lease holder") of **Level 28, 259 George Street, SYDNEY NSW 2000.**

WHEREAS

(a) in conformity with the Act application was made for a mining lease over the lands hereinafter described; and

(b) all conditions and things required to be done and performed before granting a mining lease under the Act have been done and performed NOW THIS DEED WITNESSETH that in consideration of the observance and performance of the covenants contained in this Deed, the Minister in pursuance of the provisions of the Act DOES HEREBY demise and lease to the lease holder ALL THAT piece or parcel of land containing by admeasurement **96.15 hectares** as shown on Plan No **M27210** more particularly described and delineated in the plan attached for mining purposes of:

(a) The construction, maintenance or use (in or in connection with mining operations) of any one or more of the following:
   i. Any building or mining plant,
   ii. Any road, railway, tramway, bridge or jetty,
   iii. Any reservoir, dam, drain or water race,
   iv. Any cable, conveyor, pipeline, telephone line or signalling system.

(c) The removal, stockpiling, management or depositing of overburden, ore or tailings to the extent that it is associated with mineral extraction or mineral beneficiation.

(d) The storage of fuel, machinery, timber or equipment for use in or in connection with mining operations.

(e) the generation and transmission of electricity for use in or in connection with mining operations.

(f) the construction, maintenance and use (in or in connection with mining operations) of any drillhole or shaft for:

ii. drainage or conveyance of water, or

iv. conveyance of electricity, or

v. conveyance of materials.

TO HOLD the said land together with any appurtenances thereon subject to:

(a) such rights and interests as may be lawfully subsisting therein or which may be reserved by the Act at the date of this Deed; and

(b) such conditions, provisos and stipulations as are contained in this Deed UNTO the lease holder from and including the date of this Deed for the period of **twenty one (21) years,** for the purpose as stated and for no other purpose.

1. THAT in this lease except insofar as the context otherwise indicates or requires:

(a) any reference to an Act includes that Act and any Act amending or in substitution for the same; "Director-General" means the person for the time being holding office or acting as Director-General, Department of Trade and Investment; Regional Infrastructure and Services; the word "mine" has the meaning assigned to it by the Act; words importing the singular number shall include the plural, the masculine gender the feminine or neuter gender and vice versa; and

(b) any covenant on the part of two or more persons shall be deemed to bind them jointly and severally.

2. THAT the lease holder shall at all times during the term of this lease keep and preserve the said mine from all avoidable injury or damage and also the levels, drifts, shafts, watercourses, roadways, works, erections and fixtures therein and thereon in good repair and condition and in such state and condition shall on the expiration or sooner determination of the said term or any renewal thereof deliver possession of the land and

the premises hereby demised to the Minister or other persons authorised to receive possession thereof.

3. THAT the conditions and provisions set forth in the Schedule of Mining Lease Conditions 2010 herein and numbered: **1-7 (inclusive), 10-15 (inclusive), 18, 20 and 24** are embodied and incorporated within this Deed as conditions and provisions of the lease hereby granted AND that the lease holder shall observe fulfil and perform the same. Conditions 2 to 7 and 12 to 16 (if included in the mining lease) are identified as conditions relating to environmental management for the purposes of Section 374A(1) of the *Mining Act 1992.*

Note: Conditions 2 to 7 and 12 to 15 of this mining lease are imposed pursuant to sections 238 and 239 of the Mining Act 1992. Clause 7 of Schedule 12 of the Mining Regulation 2010 saves higher penalties for a breach of condition imposed by or under sections 238 or 239 of the Act.

PROVIDED always and it is hereby declared as follows:

(a) THAT this lease is granted subject to amendment as provided under Sections 79 and 168A of the Act.

(b) THAT if the lease holder at any time during the term of this demise -

(i) fails to fulfil or contravenes the covenants and conditions herein contained; or

(ii) fails to comply with any provision of the Act or the Regulations with which the lease holder is required to comply; or

(iii) fails to comply with the requirements of any agreement or assessment in relation to the payment of compensation,

this lease may be cancelled by the Minister by instrument in writing and the cancellation shall have effect from and including the date on which notice of the cancellation is served on the lease holder or on such later date as is specified in the notice; and any liability incurred by the lease holder before the cancellation took effect shall not be affected.

(c) THAT no implied covenant for title or for quiet enjoyment shall be contained herein.

(d) THAT all the conditions and provisions contained in the *Mining Act 1992* and the Regulations thereunder, the *Mine Health & Safety Act 2004, Mine Health & Safety Regulation 2007 or Coal Mine Health & Safety Regulation 2006,* or any other law hereafter to be passed or prescribed shall be incorporated within this Deed as conditions and provisions of the lease granted. The lease holder hereby covenants to observe, fulfil and perform the same.

(e) THAT such of the provisions and conditions declared and contained in this Deed as requiring anything to be done or not to be done by the lease holder, shall be read and construed as covenants by the lease holder with the Minister which are to be observed and performed.

IN WITNESS WHEREOF the parties hereto have executed this Deed the day and year first abovewritten.

SIGNED AND DELIVERED
BY

WERRIS CREEK COAL PTY LIMITED
(ACN 107 169 102)

.....

in the presence of

.....
Witness

SIGNED AND DELIVERED
BY

.....

in the presence of

.....
Witness

MINING LEASE CONDITIONS 2010

Content

Definition

1. Notice to Landholders
2. Environmental Harm
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4. Environment Management Report
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14. Roads and Tracks
15. Trees and Vegetation
18. Indemnity
20. Single Security
24. Cooperation Agreement

Note: Exploration Reports (Geological and Geophysical)

Definition:

"Director-General" means the Director-General of the Department of Trade and Investment; Regional Infrastructure and Services

1. Notice to Landholders

(a) Within a period of three months from the date of grant/renewal of this lease or within such further time as the Minister may allow, the lease holder must serve on each landholder of the land a notice in writing indicating that this lease has been granted/renewed and whether the lease includes the surface. An adequate plan and description of the lease area must accompany the notice.

(b) If there are ten or more landholders affected, the lease holder may serve the notice by publication in a newspaper circulating in the region where the lease area is situated. The notice must indicate that this lease has been granted/renewed; state whether the lease includes the surface and must contain an adequate plan and description of the lease area.

2. Environmental Harm

(a) The lease holder must implement all practicable measures to prevent and/or minimise any harm to the environment that may result from the construction, operation or rehabilitation of any activities under this lease.

(b) For the purposes of this condition:

(i) environment means components of the earth, including:

(A) land, air and water, and

(B) any layer of the atmosphere, and

(C) any organic or inorganic matter and any living organism, and

(D) human-made or modified structures and areas,

and includes interacting natural ecosystems that include components referred to in paragraphs (A)–(C).

(ii) harm to the environment includes any direct or indirect alteration of the environment that has the effect of degrading the environment and, without limiting the generality of the above, includes any act or omission that results in pollution, contributes to the extinction or degradation of any threatened species, populations or ecological communities and their habitats and causes impacts to places, objects and features of significance to Aboriginal people.

3. Mining Operations Plan

(a) Mining operations must not be carried out otherwise than in accordance with a Mining Operations Plan (MOP) which has been approved by the Director-General.

(b) The MOP must:

(i) identify areas that will be disturbed by mining operations;

(ii) detail the staging of specific mining operations;

(iii) identify how the mine will be managed to allow mine closure;

(iv) identify how mining operations will be carried out in order to prevent and or minimise harm to the environment;

(v) reflect the conditions of approval under:

- the *Environmental Planning and Assessment Act 1979*
- the *Protection of the Environment Operations Act 1997*
- and any other approvals relevant to the development including the conditions of this lease; and
- have regard to any relevant guidelines adopted by the Director-General.

(c) The leaseholder may apply to the Director-General to amend an approved MOP at any time.

(d) It is not a breach of this condition if:

(i) the operations constituting the breach were necessary to comply with a lawful order or direction given under the *Mining Act 1992*, the *Environmental Planning and Assessment Act 1979*, *Protection of the Environment Operations Act 1997*, *Mine Health and Safety Act 2004 / Coal Mine Health and Safety Act 2002* and *Mine Health and Safety Regulation 2007 / Coal Mine Health and Safety Regulation 2006* or the *Occupational Health and Safety Act 2000*; and

(ii) the Director-General had been notified in writing of the terms of the order or direction prior to the operations constituting the breach being carried out.

(e) A MOP ceases to have effect 7 years after date of approval or other such period as identified by the Director-General.

4. Environment Management Report

(a) The lease holder must lodge Environmental Management Reports (EMR) with the Director-General annually or at dates otherwise directed by the Director-General.

(b) The EMR must:

(i) report against compliance with the MOP;

(ii) report on progress in respect of rehabilitation completion criteria;

(iii) report on the extent of compliance with regulatory requirements; and

(iv) have regard to any relevant guidelines adopted by the Director-General;

5. Environmental Incident Report

(a) The lease holder must report any environmental incidents. The report must:

(i) be prepared according to any relevant Departmental guidelines;

(ii) be submitted within 24 hours of the environmental incident occurring:

(b) For the purposes of this condition, environmental incident includes:

(i) any incident causing or threatening material harm to the environment

(ii) any breach of Conditions 1 to 9 and 11 to 24;

(iii) any breach of environment protection legislation; or,

(iv) a serious complaint from landholders or the public.

(c) For the purposes of this condition, harm to the environment is material if:

(i) it involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial, or

(ii) it results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000, where loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment.

6. Additional Environmental Reports

Additional environmental reports may be required from time to time as directed in writing by the Director-General and must be lodged as instructed.

7. Rehabilitation

Any disturbance as a result of activities under this lease must be rehabilitated to the satisfaction of the Director-General.

10. Blasting

(a) Ground Vibration

The lease holder must ensure that the ground vibration peak particle velocity generated by any blasting within the lease area does not exceed 10 mm/second and does not exceed 5 mm/second in more than 5% of the total number of blasts over a period of 12 months at any dwelling or occupied premises as the case may be, unless determined otherwise by the Department of Environment, Climate Change and Water.

(b) Blast Overpressure

The lease holder must ensure that the blast overpressure noise level generated by any blasting within the lease area does not exceed 120 dB (linear) and does not exceed 115 dB (linear) in more than 5% of the total number of blasts over a period of 12 months, at any dwelling or occupied premises, as the case may be, unless determined otherwise by the Department of Environment, Climate Change and Water.

11. Safety

Operations must be carried out in a manner that ensures the safety of persons or stock in the vicinity of the operations. All drill holes shafts and excavations must be appropriately protected, to the satisfaction of the Director-General, to ensure that access to them by persons and stock is restricted. Abandoned shafts and excavations opened up or used by the lease holder must be notified in writing to the Department and filled in or otherwise rendered safe to a standard acceptable to the Director-General.

12. Prevention of soil erosion and pollution

Prospecting operations must be carried out in a manner that does not cause or aggravate air pollution, water (including groundwater) pollution, soil contamination or erosion, unless otherwise authorised by a relevant approval, and in accordance with an accepted Mining Operations Plan.

13. Transmission lines, Communication lines and Pipelines

Operations must not interfere with or impair the stability or efficiency of any transmission line, communication line, pipeline or any other utility on the lease area without the prior written approval of the Director-General and subject to any conditions stipulated.

14. Roads and Tracks

(a) The lease holder must pay to the relevant roads authority in control of the road or track the reasonable costs incurred by the roads authority in making good any damage to roads or tracks caused by operations carried out under this lease less any amount paid or payable from the Mine Subsidence Compensation Fund.

(b) During wet weather the use of any road or track must be restricted so as to prevent damage to the road or track.

(c) Existing access tracks should be used for all operations where reasonably practicable. New access tracks must be kept to a minimum and be positioned in order to minimise damage to the land, watercourses or vegetation.

(d) Temporary access tracks must be rehabilitated and revegetated to the satisfaction of the Director-General as soon as reasonably practicable after they are no longer required under this lease.

15. Trees and Vegetation

(a) The lease holder must not fell trees, strip bark or cut timber on any land subject of this lease without the consent of the landholder who is entitled to the use of the timber.

(b) The lease holder must contact Forests NSW and obtain any required permit, licence or approval before taking timber from any Crown land within the lease area.

Note: Any clearing not authorised under the Act must comply with the requirements of the Native Vegetation Act 2003. Any clearing or taking of timber on Crown land is subject to the requirements of the Forestry Act 1916.

18. Indemnity

The lease holder must indemnify and keep indemnified the Crown from and against all actions, suits, claims and demands of whatsoever nature and all costs, charges and expenses which may be brought against the lease holder or which the lease holder may incur in respect of any accident or injury to any person or property which may arise out of the construction, maintenance or working of any workings now existing or to be made by the lease holder within the lease area or in connection with any of the operations notwithstanding that all other conditions of this lease shall in all respects have been observed by the lease holder or that any such accident or injury shall arise from any act or thing which the lease holder may be licensed or compelled to do.

20 Single Security

A single security in the sum of **$4,062,000** must be given and maintained with the Minister by the lease holder for the purpose of ensuring the fulfilment by the lease holder of obligations under each Mining Lease 1563 (Act 1992) and any lease granted in satisfaction of Mining Lease Applications 407, 408 and 409 (Act 1992).

24. Cooperation Agreement

The lease holder must make every reasonable attempt, and be able to demonstrate their attempts, to enter into a cooperation agreement with the holder(s) of any overlapping title(s). The cooperation agreement should address but not be limited to issues such as:

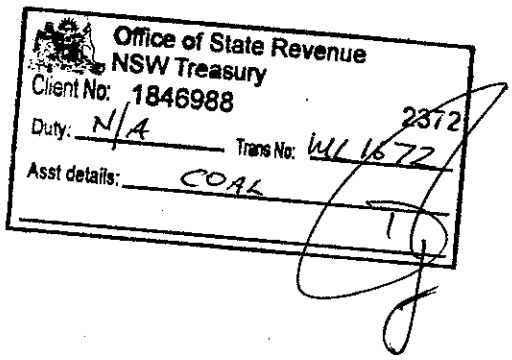
- access arrangements
- operational interaction procedures
- dispute resolution
- information exchange
- well location
- timing of drilling
- potential resource extraction conflicts and

- rehabilitation issues.

Note: *Exploration Reports (Geological and Geophysical)*

The lease holder must lodge reports to the satisfaction of the Director-General in accordance with section 163C of the Mining Act 1992 and in accordance with clause 57 of the Mining Regulation 2010.

Reports must be prepared in accordance with Exploration Reporting: A guide for reporting on exploration and prospecting in New South Wales (Department of Trade and Investment; Regional Infrastructure and Services 2010).



MINING LEASE

MINING ACT 1992

NO 1672

DATED 9 MARCH 2012

THE MINISTER FOR RESOURCES AND ENERGY

OF THE STATE

OF NEW SOUTH WALES

TO

WERRIS CREEK COAL PTY LIMITED
(ACN 107 169 102)

Mining Lease Application Nos 408 and 409

MINING ACT 1992

MINING LEASE

THIS DEED made the Ninth day of March Two Thousand and Twelve in pursuance of the provisions of the *Mining Act 1992* (hereinafter called "the Act") BETWEEN **CHRIS HARTCHER MP, MINISTER FOR RESOURCES AND ENERGY** of the State of New South Wales (hereinafter called "the Minister" which expression shall where the context admits or requires include the successors in office of the Minister and the person acting as such Minister for the time being) AND **WERRIS CREEK COAL PTY LIMITED ACN 107 169 102** (which with its successors and transferees is hereinafter called "the lease holder") of **Level 28, 259 George Street, SYDNEY NSW 2000**.

WHEREAS

(a) in conformity with the Act application was made for a mining lease over the lands hereinafter described; and

(b) all conditions and things required to be done and performed before granting a mining lease under the Act have been done and performed NOW THIS DEED WITNESSETH that in consideration of the observance and performance of the covenants contained in this Deed and the payment of royalty by the lease holder, the Minister in pursuance of the provisions of the Act DOES HEREBY demise and lease to the lease holder ALL THAT piece or parcel of land containing by admeasurement **130.5** hectares as shown on Plan No. **M27211**, more particularly described and delineated in the plan attached for the purpose of prospecting and mining for **COAL**.

TO HOLD the said land together with any appurtenances thereon subject to:

(a) such rights and interests as may be lawfully subsisting therein or which may be reserved by the Act at the date of this Deed; and

(b) such conditions, provisos and stipulations as are contained in this Deed UNTO the lease holder from and including the date of this Deed for the term of **twenty one (21) years,** for the purpose as stated and for no other purpose.

1. THAT in this lease except insofar as the context otherwise indicates or requires:

   (a) any reference to an Act includes that Act and any Act amending or in substitution for the same; "Director-General" means the person for the time being holding office or acting as Director-General, Department of Trade and Investment; Regional Infrastructure and Services; the word "mine" has the meaning assigned to it by the Act; words importing the singular number shall include the plural, the masculine gender the feminine or neuter gender and vice versa; and

   (b) any covenant on the part of two or more persons shall be deemed to bind them jointly and severally.

2. THAT the lease holder shall during the said term pay to the Minister in Sydney in respect of all such minerals as stated, recovered from the land hereby demised, royalty at the rate or rates prescribed by the Act and the Regulations thereunder at the time the minerals are recovered, or at the rate or rates fixed by the Minister from time to time during the term of this demise in exercise of the power in that behalf conferred upon him by the Act.

3. THAT the lease holder shall at all times during the term of this lease keep and preserve the said mine from all avoidable injury or damage and also the levels, drifts, shafts, watercourses, roadways, works, erections and fixtures therein and thereon in good repair and condition and in such state and condition shall on the expiration or sooner determination of the said term or any renewal thereof deliver possession of the land and the premises hereby demised to the Minister or other persons authorised to receive possession thereof.

4. THAT the conditions and provisions set forth in the Schedule of Mining Lease Conditions 2010 herein and numbered: **1-15 (inclusive), 17, 18, 20, 23 and 24** are embodied and incorporated within this Deed as conditions and provisions of the lease hereby granted AND that the lease holder shall observe fulfil and perform the same. Conditions 2 to 8 and 12 to 16 (if included in the mining lease) are identified as conditions relating to environmental management for the purposes of Section 374A(1) of the *Mining Act 1992.*

   Note: Conditions 2 to 8 and 12 to 15 of this mining lease are imposed pursuant to sections 238 and 239 of the Mining Act 1992. Clause 7 of Schedule 12 of the Mining Regulation 2010 saves higher penalties for a breach of condition imposed by or under sections 238 or 239 of the Act.

PROVIDED always and it is hereby declared as follows:

(a) THAT this lease is granted subject to amendment as provided under Section 79 and 168A of the Act.

(b) THAT if the lease holder at any time during the term of this demise -

(i) fails to fulfil or contravenes the covenants and conditions herein contained; or

(ii) fails to comply with any provision of the Act or the Regulations with which the lease holder is required to comply; or

(iii) fails to comply with the requirements of any agreement or assessment in relation to the payment of compensation,

this lease may be cancelled by the Minister by instrument in writing and the cancellation shall have effect from and including the date on which notice of the cancellation is served on the lease holder or on such later date as is specified in the notice; and any liability incurred by the lease holder before the cancellation took effect shall not be affected.

(c) THAT no implied covenant for title or for quiet enjoyment shall be contained herein.

(d) THAT all the conditions and provisions contained in the *Mining Act 1992* and the Regulations thereunder, the *Mine Health & Safety Act 2004,* the *Mine Health and Safety Regulation 2007* or the *Coal Mine Health & Safety Regulation 2006*, or any other law hereafter to be passed or prescribed shall be incorporated within this Deed as conditions and provisions of the lease granted. The lease holder hereby covenants to observe, fulfil and perform the same.

(e) THAT such of the provisions and conditions declared and contained in this Deed as requiring anything to be done or not to be done by the lease holder, shall be read and construed as covenants by the lease holder with the Minister which are to be observed and performed.

IN WITNESS WHEREOF the parties hereto have executed this Deed the day and year first abovewritten.

SIGNED AND DELIVERED
BY

WERRIS CREEK COAL PTY LIMITED
(ACN 107 169 102)

.....

in the presence of

.....
Witness

SIGNED AND DELIVERED
BY

.....

in the presence of

.....
Witness

MINING LEASE CONDITIONS 2010

Content

Definition

1. Notice to Landholders
2. Environmental Harm
3. Mining Operations Plan
4. Environment Management Report
5. Environmental Incident Report
6. Additional Environmental Reports
7. Rehabilitation
8. Subsidence Management
9. Working Requirement
10. Blasting
11. Safety
12. Prevention of Soil Erosion and Pollution
13. Transmission lines, Communication lines and Pipelines
14. Roads and Tracks
15. Trees and Vegetation
17. Resource Recovery
18. Indemnity
20. Single Security
23. Suspension of Mining Operations
24. Cooperation Agreement

Note: Exploration Reports (Geological and Geophysical)

Definition:

"Director-General" means the Director-General of the Department of Trade and Investment; Regional Infrastructure and Services

1. Notice to Landholders

(a) Within a period of three months from the date of grant/renewal of this lease or within such further time as the Minister may allow, the lease holder must serve on each landholder of the land a notice in writing indicating that this lease has been granted/renewed and whether the lease includes the surface. An adequate plan and description of the lease area must accompany the notice.

(b) If there are ten or more landholders affected, the lease holder may serve the notice by publication in a newspaper circulating in the region where the lease area is situated. The notice must indicate that this lease has been granted/renewed; state whether the lease includes the surface and must contain an adequate plan and description of the lease area.

2. Environmental Harm

(a) The lease holder must implement all practicable measures to prevent and/or minimise any harm to the environment that may result from the construction, operation or rehabilitation of any activities under this lease.

(b) For the purposes of this condition:

(i) environment means components of the earth, including:

(A) land, air and water, and

(B) any layer of the atmosphere, and

(C) any organic or inorganic matter and any living organism, and

(D) human-made or modified structures and areas,

and includes interacting natural ecosystems that include components referred to in paragraphs (A)–(C).

(ii) harm to the environment includes any direct or indirect alteration of the environment that has the effect of degrading the environment and, without limiting the generality of the above, includes any act or omission that results in pollution, contributes to the extinction or degradation of any threatened species, populations or ecological communities and their habitats and causes impacts to places, objects and features of significance to Aboriginal people.

3. Mining Operations Plan

(a) Mining operations must not be carried out otherwise than in accordance with a Mining Operations Plan (MOP) which has been approved by the Director-General.

(b) The MOP must:

(i) identify areas that will be disturbed by mining operations;

(ii) detail the staging of specific mining operations;

(iii) identify how the mine will be managed to allow mine closure;

(iv) identify how mining operations will be carried out in order to prevent and or minimise harm to the environment;

(v) reflect the conditions of approval under:

- the *Environmental Planning and Assessment Act 1979*
- the *Protection of the Environment Operations Act 1997*
- and any other approvals relevant to the development including the conditions of this lease; and
- have regard to any relevant guidelines adopted by the Director-General.

(c) The leaseholder may apply to the Director-General to amend an approved MOP at any time.

(d) It is not a breach of this condition if:

(i) the operations constituting the breach were necessary to comply with a lawful order or direction given under the *Mining Act 1992*, the *Environmental Planning and Assessment Act 1979*, *Protection of the Environment Operations Act 1997, Mine Health and Safety Act 2004 / Coal Mine Health and Safety Act 2002* and *Mine Health and Safety Regulation 2007 / Coal Mine Health and Safety Regulation 2006* or the *Occupational Health and Safety Act 2000*; and

(ii) the Director-General had been notified in writing of the terms of the order or direction prior to the operations constituting the breach being carried out.

(e) A MOP ceases to have effect 7 years after date of approval or other such period as identified by the Director-General.

4. Environment Management Report

(a) The lease holder must lodge Environmental Management Reports (EMR) with the Director-General annually or at dates otherwise directed by the Director-General.

(b) The EMR must:

(i) report against compliance with the MOP;

(ii) report on progress in respect of rehabilitation completion criteria;

(iii) report on the extent of compliance with regulatory requirements; and

(iv) have regard to any relevant guidelines adopted by the Director-General;

5. Environmental Incident Report

(a) The lease holder must report any environmental incidents. The report must:

(i) be prepared according to any relevant Departmental guidelines;

(ii) be submitted within 24 hours of the environmental incident occurring:

(b) For the purposes of this condition, environmental incident includes:

(i) any incident causing or threatening material harm to the environment

(ii) any breach of Conditions 1 to 9 and 11 to 24;

(iii) any breach of environment protection legislation; or,

(iv) a serious complaint from landholders or the public.

(c) For the purposes of this condition, harm to the environment is material if:

(i) it involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial, or

(ii) it results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000, where loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment.

6. Additional Environmental Reports

Additional environmental reports may be required from time to time as directed in writing by the Director-General and must be lodged as instructed.

7. Rehabilitation

Any disturbance as a result of activities under this lease must be rehabilitated to the satisfaction of the Director-General.

8. Subsidence Management

(a) The lease holder shall prepare a Subsidence Management Plan prior to commencing any underground mining operations which will potentially lead to subsidence of the land surface.

(b) Underground mining operations which will potentially lead to subsidence include secondary extraction panels such as longwalls or miniwalls, associated first workings (gateroads, installation roads and associated main headings, etc), and pillar extractions, and are otherwise defined by the Applications for Subsidence Management Approvals guidelines (EDG17)

(c) The lease holder must not commence or undertake underground mining operations that will potentially lead to subsidence other than in accordance with a Subsidence Management Plan approved by the Director-General, an approval under the *Coal Mine Health & Safety Act 2002*, or the document New Subsidence Management Plan Approval Process – Transitional Provisions (EDP09).

(d) Subsidence Management Plans are to be prepared in accordance with the Guideline for Applications for Subsidence Management Approvals.

(e) Subsidence Management Plans as approved shall form part of the Mining Operations Plan required under Condition 3 and will be subject to the Environmental Management Report process as set out under Condition 4. The SMP is also subject to the requirements for subsidence monitoring and reporting set out in the document New Approval Process for Management of Coal Mining Subsidence - Policy.

9. Working Requirement

The lease holder must:

(a) ensure that at least **six (6)** competent people are efficiently employed in relation to the mining process or mining operations on the lease area

OR

(b) expend on operations carried out in the course of prospecting or mining the lease area, an amount of not less than **$105,000** per annum whilst the lease is in force.

The Minister may at any time or times, by instrument in writing served on the lease holder, increase or decrease the expenditure required or the number of people to be employed.

10. Blasting

(a) Ground Vibration

The lease holder must ensure that the ground vibration peak particle velocity generated by any blasting within the lease area does not exceed 10 mm/second and does not exceed 5 mm/second in more than 5% of the total number of blasts over a period of 12 months at any dwelling or occupied premises as the case may be, unless determined otherwise by the Department of Environment, Climate Change and Water.

(b) Blast Overpressure

The lease holder must ensure that the blast overpressure noise level generated by any blasting within the lease area does not exceed 120 dB (linear) and does not exceed 115 dB (linear) in more than 5% of the total number of blasts over a period of 12 months, at any dwelling or occupied premises, as the case may be, unless determined otherwise by the Department of Environment, Climate Change and Water.

11. Safety

Operations must be carried out in a manner that ensures the safety of persons or stock in the vicinity of the operations. All drill holes shafts and excavations must be appropriately protected, to the satisfaction of the Director-General, to ensure that access to them by persons and stock is restricted. Abandoned shafts and excavations opened up or used by the lease holder must be notified in writing to the Department and filled in or otherwise rendered safe to a standard acceptable to the Director-General.

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Prospecting operations must be carried out in a manner that does not cause or aggravate air pollution, water (including groundwater) pollution, soil contamination or erosion, unless otherwise authorised by a relevant approval, and in accordance with an accepted Mining Operations Plan.

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Operations must not interfere with or impair the stability or efficiency of any transmission line, communication line, pipeline or any other utility on the lease area without the prior written approval of the Director-General and subject to any conditions stipulated.

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(a) The lease holder must pay to the relevant roads authority in control of the road or track the reasonable costs incurred by the roads authority in making good any damage to roads or tracks caused by operations carried out under this lease less any amount paid or payable from the Mine Subsidence Compensation Fund.

(b) During wet weather the use of any road or track must be restricted so as to prevent damage to the road or track.

(c) Existing access tracks should be used for all operations where reasonably practicable. New access tracks must be kept to a minimum and be positioned in order to minimise damage to the land, watercourses or vegetation.

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(a) The lease holder must not fell trees, strip bark or cut timber on any land subject of this lease without the consent of the landholder who is entitled to the use of the timber.

(b) The lease holder must contact Forests NSW and obtain any required permit, licence or approval before taking timber from any Crown land within the lease area.

Note: Any clearing not authorised under the Act must comply with the requirements of the Native Vegetation Act 2003. Any clearing or taking of timber on Crown land is subject to the requirements of the Forestry Act 1916.

17. Resource Recovery

(a) Notwithstanding any description of mining methods and their sequence or of proposed resource recovery contained within the Mining Operations Plan, if at any time the Director-General is of the opinion that minerals which the lease entitles the lease holder to mine and which are economically recoverable at the time are not being recovered from the lease area, or that any such minerals which are being recovered are not being recovered to the extent which should be economically possible or which for environmental reasons are necessary to be recovered, notice in writing to the lease holder may be given requiring the holder to recover such minerals.

(b) The notice shall specify the minerals to be recovered and the extent to which they are to be recovered, or the objectives in regard to resource recovery, but shall not specify the processes the lease holder shall use to achieve the specified recovery.

(c) The lease holder must, when requested by the Director-General, provide such information as the Director-General may specify about the recovery of the mineral resources of the lease area.

18. Indemnity

The lease holder must indemnify and keep indemnified the Crown from and against all actions, suits, claims and demands of whatsoever nature and all costs, charges and expenses which may be brought against the lease holder or which the lease holder may incur in respect of any accident or injury to any person or property which may arise out of the construction, maintenance or working of any workings now existing or to be made by the lease holder within the lease area or in connection with any of the operations notwithstanding that all other conditions of this lease shall in all respects have been observed by the lease holder or that any such accident or injury shall arise from any act or thing which the lease holder may be licensed or compelled to do.

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A single security in the sum of **$4,062,000** must be given and maintained with the Minister by the lease holder for the purpose of ensuring the fulfilment by the lease holder of obligations under each Mining Lease 1563 (Act 1992) and any lease granted in satisfaction of Mining Lease Applications 407, 408 and 409 (Act 1992).

23. Suspension of Mining Operations

The holder of a mining lease may not suspend mining operations in the mining area other than in accordance with the consent of the Minister.

24. Cooperation Agreement

The lease holder must make every reasonable attempt, and be able to demonstrate their attempts, to enter into a cooperation agreement with the holder(s) of any overlapping title(s). The cooperation agreement should address but not be limited to issues such as:

- access arrangements
- operational interaction procedures
- dispute resolution
- information exchange
- well location
- timing of drilling
- potential resource extraction conflicts and
- rehabilitation issues.

Note: *Exploration Reports (Geological and Geophysical)*

The lease holder must lodge reports to the satisfaction of the Director-General in accordance with section 163C of the Mining Act 1992 and in accordance with clause 57 of the Mining Regulation 2010.

Reports must be prepared in accordance with Exploration Reporting: A guide for reporting on exploration and prospecting in New South Wales (Department of Trade and Investment; Regional Infrastructure and Services 2010).

Deposited Dust - Werris Creek Coal Mine 2014-2015

MONTH (g/m2/month)				April 2014	May 2014	June 2014	July 2014	August 2014	September 2014	October 2014	November 2014	December 2014	January 2015	February 2015	March 2015	ANNUAL AVERAGE	AVERAGE - EXCLUDED	MINIMUM	MAXIMUM	AQGHGMP Criteria
-	DG1	Escott	Total Matter	0.3	0.5	0.5	0.2	0.1	<0.1	0.4	0.9	0.8	1.1	1.2	1.4	0.7	0.8	0.1	1.4	4.0
			Ash Content	0.1	0.4	0.3	<0.1	<0.1	<0.1	0.2	0.5	0.5	0.5	0.4	1.1					
-	DG2	Cintra	Total Matter	2.6	2.0	3.8	1.9	3.8	2.0	3.1	2.8	3.0	2.1	1.4	1.1	2.5	2.8	1.1	3.8	4.0
			Ash Content	0.6	1.0	2.5	1.1	2.5	1.1	1.8	1.5	1.3	0.7	0.6	0.3					
-	DG3	Eurunderee	Total Matter	2.4	0.7	0.5	1.5	0.5	2.6	0.8	0.3	6.6	2.1	1.3	0.8	1.7	1.5	0.3	6.6	4.0
			Ash Content	1.9	0.4	0.2	0.8	0.2	<0.1	0.4	0.1	1.6	1.3	0.8	0.3					
-	DG5	Railway View	Total Matter	0.1	0.6	0.8	0.5	3.3	5.7	1.0	2.5	3.6	0.5	1.5	1.0	1.8	1.5	0.1	5.7	4.0
			Ash Content	<0.1	0.3	0.4	0.3	1.3	2.9	0.6	1.4	1.8	0.2	0.9	0.4					
-	DG9	Marengo	Total Matter	0.5	0.1	<0.1	0.2	0.2	0.8	0.5	0.9	1.2	7.9	7.1	14.7	3.1	0.5	0.1	14.7	4.0
			Ash Content	0.1	<0.1	<0.1	0.1	<0.1	0.3	0.2	0.6	0.4	0.9	5.4	11.3					
EPL#29	DG11	Glenara	Total Matter	0.3	0.4	1.1	0.8	0.5	0.6	1.3	2.2	1.5	0.8	0.4	1.8	1.0	1.0	0.3	2.2	4.0
			Ash Content	0.2	0.2	0.7	0.5	0.5	0.6	0.6	1.2	1.0	0.5	0.1	1.2					
-	DG14	Greenslopes	Total Matter	0.4	0.8	0.5	0.3	0.4	1.9	1.7	2.7	3.4	1.1	0.5	0.4	1.2	1.8	0.3	3.4	4.0
			Ash Content	0.1	0.5	0.2	0.1	0.1	1.2	0.6	1.2	1.8	0.6	0.2	0.1					
-	DG15	Plain View	Total Matter	0.3	0.4	0.4	0.6	<0.1	0.6	0.6	1.2	0.8	21.3	0.6	0.5	2.5	0.8	0.3	21.3	4.0
			Ash Content	0.1	0.2	<0.1	0.3	<0.1	0.2	0.2	0.7	0.4	0.4	0.2	0.1					
-	DG17	Woodlands	Total Matter	0.9	0.4	<1	0.5	0.7	0.7	1.3	7.6	1.8	1.5	0.6	2.0	1.6	1.0	0.4	7.6	4.0
			Ash Content	0.4	0.2	<0.1	0.3	0.4	0.4	0.7	2.0	1.1	0.8	0.2	0.7					
-	DG20	Tonsley Park	Total Matter	3.1	3.3	3.5	1.1	1.3	4.3	5.9	6.7	7.0	10.1	0.2	4.2	4.2	2.5	0.2	10.1	4.0
			Ash Content	2.4	1.8	2.7	0.8	0.9	2.6	3.8	2.7	3.6	4.2	<0.1	2.1					
-	DG22	Mountain View	Total Matter	1.9	0.8	1.5	0.6	3.5	0.2	2.0	3.9	0.7	8.7	0.5	0.8	2.1	1.6	0.2	8.7	4.0
			Ash Content	1.0	0.5	0.9	0.3	2.4	0.1	1.3	2.6	0.4	2.5	0.2	0.5					
-	DG24	Hazeldene	Total Matter	0.6	0.9	0.3	0.8	0.2	0.5	1.2	2.8	1.7	0.6	0.6	4.8	1.3	0.9	0.2	4.8	4.0
			Ash Content	0.4	0.7	0.2	0.5	0.1	0.3	0.7	1.9	1.4	0.3	0.3	4.0					
-	DG34	8 Kurrara Street	Total Matter	0.3	<0.1	22.1	3.8	0.8	0.3	0.7	0.1	1.3	1.1	0.3	0.4	2.8	1.5	0.1	22.1	4.0
			Ash Content	0.1	<0.1	14.6	2.7	0.5	<0.1	0.1	<0.1	0.7	0.6	0.1	0.1					
-	DG62	Werris Creek South	Total Matter	0.2	0.2	0.2	0.1	0.2	1.1	7.5	1.0	1.3	0.8	4.3	0.2	1.4	0.8	0.1	7.5	4.0
			Ash Content	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	4.0	0.5	0.8	0.5	2.4	<0.1					
EPL#30	DG92	Werris Creek Centre	Total Matter	0.2	0.3	0.4	0.1	0.6	0.1	0.8	0.7	1.7	0.5	0.2	0.2	0.5	0.7	0.1	1.7	4.0
			Ash Content	<0.1	0.1	0.2	<0.1	0.1	<0.1	<0.1	0.3	1.0	0.3	<0.1	<0.1					
-	DG96	Talavera	Total Matter	0.4	0.2	0.5	0.2	1.0	1.3	0.5	2.5	1.5	1.1	0.6	0.6	0.9	1.0	0.2	2.5	4.0
			Ash Content	<0.1	<0.1	0.2	<0.1	0.5	0.5	0.2	1.2	0.7	0.5	0.1	0.1					
EPL#28	DG98	Kyooma	Total Matter	0.2	0.1	0.2	0.1	<0.1	0.1	27.3	0.9	0.9	3.4	0.2	0.6	3.1	0.4	0.1	27.3	4.0
			Ash Content	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	0.6	0.1	0.1	0.2					
-	DG101	Westfall	Total Matter	0.7	1.0	0.8	0.7	0.5	0.6	0.7	1.1	2.0	1.4	1.1	1.2	1.0	1.0	0.5	2.0	4.0
			Ash Content	0.4	0.5	0.5	0.4	0.4	0.5	0.3	0.4	1.2	0.7	0.5	0.6					
-	DG103	West Street	Total Matter	0.6	0.3	0.5	2.5	1.6	0.6	2.1	0.8	2.2	0.8	0.6	0.3	1.1	0.9	0.3	2.5	4.0
			Ash Content	0.3	0.2	0.3	1.1	1.2	0.2	1.0	0.6	1.7	0.5	0.4	0.1					
-	DG106	Villamagna	Total Matter	0.5	-	-	-	-	-	-	-	-	-	-	-	0.5	0.5	0.5	0.5	4.0
			Ash Content	0.4	-	-	-	-	-	-	-	-	-	-	-					

Note: All results are in the form of Insoluble Matter (g/m2/month); NS - Not sampled

BROWN - indicates sample is contaminated from a Non-Werris Creek Coal dust source

YELLOW - sample contaminated with excessive organic matter (>50%) from non-mining source (i.e bird droppings and insects)

RED - result above 4g/m2/month

Werris Creek Coal
HVAS TEOM Dust Monitoring
2014-2015

Site / Date	2.5TEOM92 Werris Creek	Monthly Summary	Annual Average	10TEOM92 Werris Creek	EPL#30 Monthly Summary	Annual Average	HVP20 Tonsley Park	Monthly Summary	Rolling Annual Average	HVP98 Kyooma	EPL#28 Monthly Summary	Rolling Annual Average	HVP1 Escott	Monthly Summary	Rolling Annual Average	HVP11 Glenara	EPL#29 Monthly Summary	Rolling Annual Average	HVT98 Kyooma	Monthly Summary	Rolling Annual Average	PM10 24hr Limit	PM10 Annual Average	TSP Annual Average
04-Apr-14							-	8.4	#DIV/0!	6	2.5	6.2	8	3.9	8.3	14	7.0	13.7	13	5.5	12.6	50	30	90
10-Apr-14		4.5			7.3		19	**14.4**	18.8	10.7	**7.2**	8.5	12.4	**8.8**	10.4	18	**18.2**	15.8	16.2	**12.3**	14.4	50	30	90
16-Apr-14		**9.7**	9.7		**15.1**	15.1	10	14.2	14.2	5	6.2	7.3	6	8.3	8.8	31	17.8	20.7	7	12.6	11.9	50	30	90
22-Apr-14		9.6			16.1		21	20.7	16.4	12	11.5	8.4	14	14.0	10.1	22	30.5	21.0	21	20.5	14.0	50	30	90
28-Apr-14		17.4			23.5		8		14.4	3		7.2	4		8.8	7		18.2	6		12.3	50	30	90
04-May-14		6.1			8.4		3	2.6	12.0	2	2.1	6.4	2	2.3	7.8	1	1.3	15.4	4.5	4.5	11.0	50	30	90
10-May-14		**12.2**	11.0		**16.9**	16.0	12	**13.0**	11.9	12	**8.8**	7.1	9	**6.5**	7.9	16	**15.1**	15.4	15	**14.1**	11.6	50	30	90
16-May-14		12.3			16.5		15	13.2	12.3	4	8.0	6.8	4	6.6	7.5	18	16.9	15.7	7.7	11.6	11.2	50	30	90
22-May-14		19.4			34.7		23	22.9	13.7	17	16.9	7.9	11	10.7	7.8	25	25.1	16.8	29	28.7	13.1	50	30	90
28-May-14							8		13.1	14		8.5	8		7.8	11		16.2	25		14.3	50	30	90
03-Jun-14		4.0			5.3		7	3.5	12.4	7	2.5	8.3	4	2.2	7.5	4	2.3	15.1	9	3.8	13.7	50	30	90
09-Jun-14		**9.7**	10.5		**13.1**	15.0	8	**6.6**	12.0	9	**7.3**	8.4	4	**4.1**	7.2	4	**4.9**	14.2	6	**9.9**	13.0	50	30	90
15-Jun-14		9.8			13.5		4	6.6	11.3	3	6.6	8.0	2	3.9	6.8	2	4.0	13.3	4	6.9	12.3	50	30	90
21-Jun-14		14.1			19.1		6	8.3	10.9	4	14.2	7.7	3	7.8	6.5	3	11.0	12.5	7	24.6	11.9	50	30	90
27-Jun-14							16		11.3	10		7.8	7		6.5	22		13.2	12		12.0	50	30	90
03-Jul-14		1.5			3.8		21	7.2	12.0	10	5.2	8.0	9	5.3	6.7	15	12.0	13.3	12	7.1	12.0	50	30	90
09-Jul-14		**8.3**	10.0		**11.6**	14.1	13	**13.3**	12.0	8	**8.3**	8.0	9	**7.4**	6.8	43	**26.3**	15.1	20	**13.0**	12.4	50	30	90
15-Jul-14		8.4			11.9		10	12.7	11.9	8	8.3	8.0	6	7.0	6.8	39	22.1	16.4	14	12.4	12.5	50	30	90
21-Jul-14		14.7			21.0		7	20.8	11.6	5	10.2	7.8	5	9.4	6.7	12	43.3	16.1	7	19.5	12.2	50	30	90
27-Jul-14							4		11.2	1		7.5	1		6.4	2		15.4	2		11.7	50	30	90
02-Aug-14		0.7			1.9		11	4.3	11.2	6	0.6	7.4	4	1.0	6.3	10	2.2	15.2	22	1.9	12.2	50	30	90
08-Aug-14		**6.7**	9.3		**10.2**	13.3	24	**11.0**	11.8	11	**6.0**	7.6	10	**6.0**	6.5	33	**13.2**	16.0	16	**11.4**	12.3	50	30	90
14-Aug-14		4.0			7.7		10	9.5	11.7	5	6.4	7.5	4	3.9	6.4	11	10.2	15.8	8	9.4	12.2	50	30	90
20-Aug-14		18.1			28.3		7	23.6	11.5	7	11.3	7.5	11	11.2	6.6	10	32.7	15.5	9	21.6	12.0	50	30	90
26-Aug-14							8		11.3	4		7.3	5		6.5	5		15.1	4		11.7	50	30	90
01-Sep-14							12		11.3	6		7.3	3		6.4	17		15.2	8		11.6	50	30	90
07-Sep-14		0.0			0.0		7	7.2	11.2	4	3.9	7.2	6	3.4	6.4	13	5.4	15.1	9	4.1	11.5	50	30	90
13-Sep-14		**4.5**	8.5		**9.2**	12.7	16	**13.2**	11.3	10	**5.6**	7.2	6	**5.6**	6.4	16	**17.0**	15.1	17	**11.1**	11.7	50	30	90
19-Sep-14		4.8			10.5		18	13.9	11.6	6	5.0	7.2	8	5.7	6.4	40	14.7	16.0	20	8.8	12.0	50	30	90
25-Sep-14		9.0			17.3		18	18.3	11.8	4	9.6	7.1	5	8.1	6.4	11	39.7	15.8	8	19.7	11.8	50	30	90
01-Oct-14		4.6			6.8		28	16.4	12.3	13	8.5	7.3	17	7.4	6.7	30	14.6	16.3	25	13.4	12.3	50	30	90
07-Oct-14		**7.8**			**16.6**		30	**25.4**	12.9	22	**14.4**	7.8	21	**15.3**	7.2	27	**23.2**	16.6	39	**26.4**	13.1	50	30	90
13-Oct-14		7.7	8.4		16.1	13.2	19	27.6	13.1	10	13.4	7.8	11	16.5	7.3	19	26.0	16.7	23	24.5	13.4	50	30	90
19-Oct-14		13.1			33.0		16	33.8	13.2	9	22.4	7.9	7	21.3	7.3	15	29.6	16.6	13	38.9	13.4	50	30	90
25-Oct-14							34		13.8	18		8.1	20		7.7	26		16.9	32		13.9	50	30	90
31-Oct-14							42		14.6	23		8.6	30		8.3	62		18.1	46		14.8	50	30	90
06-Nov-14		3.0			3.3		15	15.1	14.6	10	9.8	8.6	11	11.0	8.3	13	12.6	18.0	18	17.6	14.9	50	30	90
12-Nov-14		**10.2**	8.6		**20.0**	14.1	18	**29.9**	14.7	11	**16.9**	8.7	13	**19.0**	8.5	21	**32.7**	18.1	19	**31.6**	15.0	50	30	90
18-Nov-14		10.0			18.8		31	32.2	15.2	16	16.8	8.8	15	17.7	8.6	36	30.9	18.5	31	31.7	15.4	50	30	90
24-Nov-14		18.9			55.5		40	42.1	15.8	23	23.3	9.2	25	29.7	9.1	38	62.4	19.0	44	45.9	16.1	50	30	90
30-Nov-14							9		15.6	9		9.2	10		9.1	13		18.9	15		16.1	50	30	90
06-Dec-14		0.1			1.0		3	2.9	15.3	4	3.6	9.1	4	4.1	9.0	6	6.1	18.6	6	5.5	15.8	50	30	90
12-Dec-14		**6.5**	8.4		**11.8**	13.8	9	**10.8**	15.1	8	**10.7**	9.0	10	**11.4**	9.0	14	**15.1**	18.5	10	**19.2**	15.7	50	30	90
18-Dec-14		6.7			11.2		22	9.2	15.3	22	9.2	9.3	24	9.5	9.3	30	13.2	18.7	43	15.1	16.3	50	30	90
24-Dec-14		11.4			31.8		11	22.2	15.2	11	22.0	9.4	9	23.8	9.3	12	30.4	18.6	23	42.5	16.5	50	30	90
30-Dec-14							17		15.3	13		9.5	12		9.4	18		18.6	27		16.7	50	30	90
05-Jan-15		0.0			0.3		13	6.7	15.2	10	1.0	9.5	13	5.2	9.4	13	7.2	18.5	15	7.2	16.7	50	30	90
11-Jan-15		**4.9**	8.1		**6.8**	13.1	10	**13.0**	15.1	7	**8.0**	9.4	9	**9.9**	9.4	7	**22.6**	18.2	14	**16.1**	16.6	50	30	90
17-Jan-15		5.0			6.3		18	13.3	15.2	9	8.7	9.4	11	10.5	9.4	66	13.1	19.2	18	15.1	16.6	50	30	90
23-Jan-15		9.5			17.6		7	17.9	15.0	1	13.1	9.2	5	12.9	9.4	9	65.6	19.0	7	26.8	16.4	50	30	90
29-Jan-15							16		15.0	4		9.1	6		9.3	7		18.8	7		16.3	50	30	90
04-Feb-15		0.0			0.4		9	6.1	14.9	6	2.8	9.1	10	3.0	9.3	10	7.4	18.6	12	5.2	16.2	50	30	90
10-Feb-15		**4.0**	7.7		**8.5**	12.7	14	**11.3**	14.9	7	**5.4**	9.0	13	**8.1**	9.4	15	**10.7**	18.5	12	**9.9**	16.1	50	30	90
16-Feb-15		4.0			8.8		11	11.4	14.8	7	5.5	9.0	9	9.4	9.4	11	10.4	18.4	13	12.0	16.0	50	30	90
22-Feb-15		8.7			15.8		6	16.4	14.6	3	7.2	8.9	3	12.5	9.2	10	15.1	18.2	5	12.6	15.8	50	30	90
28-Feb-15							11		14.6	8		8.9	11		9.3	13		18.1	13		15.8	50	30	90
06-Mar-15							28		14.8	25		9.2	24		9.5	27		18.3	54		16.5	50	30	90
12-Mar-15		1.8			4.8		12	10.6	14.8	10	7.4	9.2	10	9.6	9.5	11	11.0	18.2	17	13.2	16.5	50	30	90
18-Mar-15		**3.5**	7.3		**7.9**	12.3	17	**17.5**	14.8	15	**13.1**	9.3	19	**14.7**	9.7	22	**19.8**	18.2	33	**26.0**	16.7	50	30	90
24-Mar-15		3.5			8.1		20	16.8	14.9	7	11.6	9.2	12	12.7	9.7	19	20.5	18.2	18	19.5	16.8	50	30	90
30-Mar-15		5.1			10.2		17	28.4	14.9	13	25.4	9.3	13	23.5	9.8	26	27.4	18.4	21	53.9	16.8	50	30	90
Min					**0.0**		**2.6**			**0.6**			**1.0**			**1.3**			**1.9**					
Median					**11.4**		**13.0**			**8.3**			**9.3**			**14.6**			**14.0**					
Max					**55.5**		**42.1**			**25.4**			**29.7**			**65.6**			**53.9**					
Capture							**98%**			**100%**			**100%**			**100%**			**100%**					

Deposited Dust - Quirindi Trains 2014-2015

	DDW30				DDW20				DDW13				DDE13				DDE20				DDE30				Guideline
	Total Matter	% Coal	% Vegetation/ Insects	% Dirt	Total Matter	% Coal	% Vegetation/ Insects	% Dirt	Total Matter	% Coal	% Vegetation/ Insects	% Dirt	Total Matter	% Coal	% Vegetation/ Insects	% Dirt	Total Matter	% Coal	% Vegetation/ Insects	% Dirt	Total Matter	% Coal	% Vegetation/ Insects	% Dirt	
April 2014	0.6	10%	20%	70%	0.8	10%	30%	60%	0.7	30%	30%	40%	0.2	10%	40%	50%	0.6	20%	20%	60%	1.1	10%	60%	30%	4.0
May 2014	1.0	10%	20%	65%	0.8	15%	25%	60%	0.7	20%	10%	70%	0.4	15%	25%	60%	0.6	10%	<1%	90%	2.0	<1%	20%	10%	4.0
June 2014	2.2	15%	35%	40%	1.5	15%	35%	40%	1.0	10%	40%	40%	1.9	10%	30%	60%	1.5	10%	30%	60%	2.7	10%	40%	30%	4.0
July 2014	1.6	15%	10%	75%	-	-	-	-	0.8	10%	5%	85%	0.9	5%	20%	75%	0.6	5%	25%	65%	0.8	5%	25%	70%	4.0
August 2014	0.4	10%	30%	60%	1.2	10%	35%	55%	1.2	40%	15%	45%	1.3	10%	25%	65%	3.2	10%	<1%	90%	0.7	10%	40%	50%	4.0
September 2014	1.9	30%	25%	40%	2.2	40%	15%	45%	3.0	50%	15%	35%	2.4	15%	35%	40%	1.0	20%	30%	50%	2.5	15%	30%	45%	4.0
October 2014	1.6	15%	20%	50%	1.7	20%	20%	45%	1.3	20%	25%	40%	1.6	25%	20%	40%	1.6	20%	25%	40%	1.2	20%	20%	45%	4.0
November 2014	2.3	25%	30%	25%	3.1	40%	10%	35%	1.6	80%	5%	10%	3.9	20%	10%	30%	2.1	40%	10%	40%	2.9	50%	10%	30%	4.0
December 2014	1.2	5%	15%	75%	3.1	10%	15%	20%	1.8	30%	20%	45%	2.8	30%	15%	55%	2.1	35%	15%	50%	1.8	15%	20%	65%	4.0
January 2015	0.7	5%	20%	75%	1.2	<1	25%	70%	1.0	<1	10%	85%	1.0	5%	15%	75%	3.8	5%	25%	40%	1.1	<1	25%	70%	4.0
February 2015																									4.0
March 2015																									4.0
ANNUAL AVERAGE	**1.4**				**1.7**				**1.3**				**1.6**				**1.7**				**1.7**				**4.0**
Average Coal %	**14.0%**				**20.0%**				**32.2%**				**14.5%**				**17.5%**				**16.9%**				**-**
Average Coal g/m2	**0.19**				**0.35**				**0.42**				**0.24**				**0.30**				**0.28**				**-**
MINIMUM	**0.4**				**0.8**				**0.7**				**0.2**				**0.6**				**0.7**				**-**
MAXIMUM	**2.3**				**3.1**				**3.0**				**3.9**				**3.8**				**2.9**				**4.0**

Note: All results are in the form of Insoluble Matter (g/m2/month)

SB2

EPL ID 10

Sample Date	Type	pH - lab	Electrical Conductivity uS/cm - lab	Suspended Solids	Nitrite as N mg/L	Nitrate as N mg/L	Nitrite + Nitrate as N mg/L	Total Kjeldahl Nitrogen as N mg/L	Total Nitrogen as N mg/L	Total Phosphorus as P mg/L	Reactive Phosphorus as P mg/L	Oil and Grease
5-Feb-07	Unknown	9	0.44	38		0.032			0.7	0.02	<0.02	<5
10-Jul-08	Unknown	8.6	470									
07-Oct-08	Unknown	7.5	375	41								<2
27-Oct-08	Unknown	7.4	425	120		<0.01			1.9	0.67	0.21	<1
15-Jan-09	Unknown	8.4	335	67		<0.01			1.1	0.21	0.12	<2
6/05/2009	Quarterly	8.58	376	17	<0.01	0.02	0.02	0.4	0.4	0.01	<0.01	<5
26/08/2009	Quarterly	8.16	389	6	<0.01	0.01	0.01	0.5	0.6	0.01	<0.01	<10
8/02/2010	Non-Rout	8.02	413	44								<5
15/02/2010	Non-Rout	8	338	30	0.01	0.09	0.1	0.9	1	0.12	0.04	<5
23/02/2010	Quarterly	7.99	338	5	<0.01	<0.01	<0.01	0.6	0.6	0.13	0.02	<5
11/05/2010	Quarterly	8.77	457	<1	<0.01	0.01	0.01	0.3	0.3	0.04	0.01	<5
28/07/2010	Wet Weather	8.33	393	17	<0.01	<0.01	<0.01	0.7	0.7	0.04	0.03	<5
12/08/2010	Wet Weather	7.52	389	6	<0.01	0.23	0.23	0.5	0.7	0.16	0.1	<5
19/08/2010	Quarterly	8.05	363	38	0	0.01	0.01	1	1	0.26	0.09	<5
25/10/2010	Wet Weather	8.27	417	16	<0.01	<0.01	<0.01	0.8	0.8	0.06	0.01	<5
2/11/2010	Controlled	8.34	427	20	<0.01	0.03	0.03	0.3	0.3	<0.01	<0.01	<5
16/11/2010	Wet Weather	8.59	397	11	<0.01	0.54	0.54	1	1.5	0.02	<0.01	<5
23/11/2010	Non-routine	8.64	411	13	<0.01	<0.01	<0.01	0.8	0.8	0.17	<0.01	<5
29/11/2010	Controlled	8.36	444	22	<0.01	0.01	0.01	0.7	0.7	<0.01	<0.01	<5
8/12/2010	Quarterly	8.71	422	11	<0.01	0.04	0.04	0.9	0.9	0.04	<0.01	<5
10/12/2010	Wet Weather	8.05	406	25	<0.01	0.02	0.02	1	1	0.04	0.02	<5
15/12/2010	Controlled	7.95	242	7	<0.01	0.01	0.01	0.2	0.2	0.04	0.05	<5
17/01/2011	Non-routine	8.72	418	20	<0.01	<0.01	<0.01	0.5	0.5	0.11	0.02	<5
3/03/2011	Quarterly	8.06	388	37	<0.01	0.02	0.02	0.1	0.1	<0.01	<0.01	<5
7/03/2011	Controlled	7.95	333	18	<0.01	0.02	0.02	0.3	0.3	<0.01	<0.01	<5
29/03/2011	Non-routine	8.96	346	28	<0.01	0.01	0.01	0.3	0.3	0.2	<0.01	<5
12/04/2011	Controlled	7.90	444	34	0.03	0.05			0.80	0.08	0.04	<5
12/05/2011	Quarterly	8.12	545	36	<0.01	0.04	0.04	1.00	1.00	<0.01	<0.01	<5
1/06/2011	Controlled	8.09	493	20	<0.01	0.04	0.04	1.1	1.1	0.07	<0.01	<5
16/06/2011	Controlled	8.17	510	28	<0.01	0.06	0.06	0.7	0.8	0.09	<0.01	<5
18/08/2011	Quarterly	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
27/09/2011	Non-routine	8.64	536	18	0.02	0.25	0.27	0.5	0.8	<0.01	<0.01	<5
18/10/2011	Non-routine	8.21	608	19	0.03	0.53	0.56	0.6	1.2	0.06	0.02	<5
23/11/2011	Quarterly	8.24	626	18	<0.01	0.04	0.04	0.5	0.5	0.05	<0.01	<5
25/11/2011	Wet Weather	7.8	407	34	0.01	0.35	0.36	<0.1	0.4	0.21	0.17	<5
13/12/2011	Controlled	7.92	464	<5	0.01	0.07	0.08	0.9	1	0.16	0.11	<5
20/12/2011	Controlled	7.98	468	12	0.01	0.04	0.04	0.3	0.3	0.09	0.06	<5
7/02/2012	Non-routine	8.59	411	12	<0.01	<0.01	<0.01	0.2	0.2	0.04	<0.01	<5
16/02/2012	Controlled	7.92	436	16	<0.01	0.02	0.02	0.4	0.4	0.02	<0.01	<5
23/02/2012	Quarterly	8.34	444	14	<0.01	<0.01	<0.01	0.4	0.4	0.03	<0.01	<5
10/05/2012	Quarterly	7.98	485	47	<0.01	0.01	0.01	1	1	0.11	<0.01	<5
13/07/2012	Non-routine	8.01	506	42	<0.01	0.16	0.16	0.7	0.9	0.21	0.08	<5
31/07/2012	Controlled	8.26	507	10	<0.01	<0.01	<0.01	0.6	0.60	0.10	0.06	<5
27/08/2012	Quarterly	8.75	553	9	<0.01	<0.01	<0.01	0.6	0.6	0.06	<0.01	<5
29/11/2012	Quarterly	9.08	589	33	<0.01	<0.01	<0.01	0.5	0.5	0.04	<0.01	<5
24/12/2012	Wet Weather	7.99	368	110	0.29	5.03	5.32	5.1	10.4	0.35	0.21	<5
26/01/2013	Non-routine	8.03	319	89	-	-	-	-	-	-	-	-
29/01/2013	Wet Weather	7.4	199	298	0.02	1.17	1.19	1.2	2.4	0.53	0.5	<5
25/02/2013	Wet Weather	7.97	281	62	<0.01	<0.01	<0.01	1	1	0.33	0.14	<5
12/03/2013	Quarterly	7.64	399	24	0.06	1.46	1.52	1.6	3.1	0.17	0.12	<5
20/03/2013	Non-routine				0.08	1.52	1.6	1.8	3.4	0.18	0.12	
25/06/2013	Quarterly	8.66	924	8	0.03	0.63	0.66	0.7	1.4	<0.01	<0.01	<5
12/08/2013	Controlled	8.44	1010	<5	<0.01	0.08	0.08	0.5	0.6	0.02	<0.01	<5
27/08/2013	Quarterly	8.37	1010	7	<0.01	0.01	0.01	0.6	0.6	0.02	<0.01	<5
14/11/2013	Quarterly	8.37	1300	44	<0.01	<0.01	<0.01	0.6	0.6	0.06	<0.01	<5
25/02/2014	Quarterly	9.04	1790	47	<0.01	<0.01	<0.01	0.9	0.9	0.04	<0.01	<5
22/05/2014	Quarterly	9.63	1950	125	<0.01	<0.01	<0.01	2.4	2.4	0.39	0.02	<5
7/08/2014	Quarterly	8.69	2150	36	<0.01	<0.01	<0.01	1.2	1.2	0.06	<0.01	<5
10/11/2014	Dry											
19/02/2015	Dry											

SB9			EPL ID 12									
Sample Date	Type	pH - lab	Electrical Conductivity uS/cm - lab	Suspended Solids	Nitrite as N mg/L	Nitrate as N mg/L	Nitrite + Nitrate as N mg/L	Total Kjeldahl Nitrogen as N mg/L	Total Nitrogen as N mg/L	Total Phosphorus as P mg/L	Reactive Phosphorus as P mg/L	Oil and Grease mg/L
11-Oct-07	Unknown	8.7	530	16	<0.01			0.67	0.08	<0.01	<2	
10-Jul-08	Unknown	7.9	575	37								
27-Oct-08	Unknown	7.5	215	360		0.65		1	0.44	0.08	<1	
14-Jan-09	Unknown	8.0	165	130		<0.01		2.5	0.71	0.36	<2	
6/05/2009	Quarterly	8.14	164	100	<0.01	0.64	0.64	0.3	0.9	0.05	0.02	<5
26/08/2009	Quarterly	7.78	177	107	0.02	0.65	0.67	1.2	1.8	0.22	<0.01	<10
10/11/2009	Quarterly	7.95	179	128	<0.01	0.22	0.22	3.1	3.3	0.4	0.02	<5
4/01/2010	Discharge	7.41	122	30								<5
8/02/2010	Non-Rout	8.21	142	38								5
15/02/2010	Discharge	7.9	129	138	<0.01	0.1	0.1	1.4	1.5	0.18	<0.01	<5
23/02/2010	Quarterly	7.92	134	113	<0.01	0.01	0.01	1.8	1.8	0.24	<0.01	<5
9/03/2010	Non-Rout	8.09	160	10								
28/04/2010	Non-routine	7.82	171	30								
5/05/2010	Controlled	7.98	173	46	0.02	<0.01	<0.01	1.6	1.6	0.35	0.04	<5
11/05/2010	Quarterly	8.08	180	120	<0.01	0.01	0.01	1.2	1.2	0.13	0.03	7
25/06/2010	Non-routine	8.55	245	3								<5
12/07/2010	Wet Weather	8.02	290	13		0.38	0.4	1.2	1.6	0.13	0.01	<5
28/07/2010	Wet Weather	7.64	268	22	0.02	0.58	0.59	1.5	2.1	0.11	0.05	<5
12/08/2010	Wet Weather	7.63	121	73	<0.01	0.41	0.41	0.8	1.2	0.28	0.18	<5
19/08/2010	Quarterly	7.66	131	295		0.4	0.4	1.1	1.5	0.38	0.16	<5
28/09/2010	Non-routine	8.24	133	42		0.03	0.03	1.5	1.5	0.36	0.04	10
11/11/2010	Wet Weather	7.38	164	160	0.01	0.34	0.35	1.8	2.2	0.41	0.04	<5
16/11/2010	Wet Weather	7.53	157	26	<0.01	0.81	0.81	1	1.8	0.06	0.05	5
23/11/2010	Controlled	7.57	149	31	<0.01	0.19	0.19	1.2	1.4	0.24	0.05	<5
8/12/2010	Quarterly	7.84	170	23	0.01	0.21	0.22	1	1.2	0.19	0.04	<5
10/12/2010	Wet Weather	7.25	95	137	<0.01	0.09	0.09	1.6	1.7	0.22	0.21	<5
18/12/2010	Controlled	7.36	131	31	<0.01	0.02	0.02	1.1	1.1	0.11	0.07	<5
3/03/2011	Quarterly	8	149	30	0.01	<0.01	0.02	<0.1	<0.1	<0.01	<0.01	<5
7/03/2011	Controlled	7.81	148	15	<0.01	0.03	0.03	1.4	1.4	0.14	<0.01	<5
29/03/2011	Non-routine	8.69	149	20	<0.01	0.29	0.29	1.1	1.4	0.22	<0.01	<5
12/04/2011	Controlled	8.13	528.00	20.00	0.12	5.87			9.00	0.04	0.02	<5
12/05/2011	Quarterly	7.95	634.00	28.00	0.21	4.13	4.34	2.30	6.60	<0.01	<0.01	<5
7/06/2011	Controlled	7.72	666	8	0.15	6.88	7.04	2.9	9.9	0.09	<0.01	<5
16/06/2011	Controlled	8.05	712	<5	0.13	7.26	7.39	1.4	8.8	<0.01	<0.01	<5
18/08/2011	Quarterly	9.19	681	7	0.12	3.67	3.79	0.9	4.7	<0.01	<0.01	<5
27/09/2011	Controlled	8.16	683	6	0.22	2.13	2.35	1.2	3.6	<0.01	<0.01	<5
16/10/2011	Wet Weather	7.72	658	6	0.1	2.22	2.32	1	3.3	0.05	0.03	<5
18/10/2011	Controlled	7.77	641	16	0.1	2.09	2.19	1.5	3.7	0.06	0.02	<5
23/11/2011	Quarterly	7.95	584	6	0.13	1.86	1.99	1.9	3.9	<0.01	<0.01	<5
25/11/2011	Wet Weather	7.42	493	40	0.1	2.23	2.33	2.3	4.6	0.18	0.08	<5
13/12/2011	Wet Weather	7.68	224	18	0.11	0.93	1.04	1.9	2.9	0.22	0.16	<5
20/12/2011	Controlled	7.67	214	14		<0.01	0.06	0.9	1	0.09	<0.01	<5
18/01/2012	Non-routine	7.99	248	41	<0.01	0.02	0.02	1.1	1.1	0.12	0.01	<5
2/02/2012	Wet Weather	7.92	404	32	0.06	2.39	2.45	2.7	5.2	0.08	0.04	<5
7/02/2012	Non-routine	9.24	308	47	<0.01	<0.01	0.01	0.4	0.4	0.06	<0.01	<5
16/02/2012	Controlled	7.18	325	41	0.03	0.3	0.33	0.9	1.2	0.17	<0.01	<5
23/02/2012	Quarterly	7.89	306	28	<0.01	<0.01	<0.01	0.5	0.5	0.04	<0.01	<5
		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
13/07/2012	Wet Weather	7.79	346	100	0.06	6.22	6.28	4.5	10.8	0.14	0.06	<5
6/08/2012	Controlled	7.97	732	33	0.2	3.96	4.16	1.6	5.8	0.09	0.01	<5
27/08/2012	Quarterly	8.36	323	7	0.16	2.99	3.15	2.2	5.4	0.16	<0.01	<5
3/09/2012	Non-routine	8.6	329	<5	0.17	2.67	2.84	2	4.8	0.02	<0.01	<5
25/09/2012	Controlled	8.49	353	<5	0.17	1.26	1.43	1.5	2.9	0.05	<0.01	<5
29/11/2012	Quarterly	8.36	418	20	0.01	0.08	0.09	0.7	0.8	0.02	<0.01	<5
24/12/2012	Wet Weather	7.2	166	1530	0.03	0.61	0.64	1.5	2.1	0.3	0.01	<5
26/01/2013	Non-routine	6.95	160	502	-	-	-	-	-	-	-	-
29/01/2013	Wet Weather	6.88	169	198	0.09	0.86	0.95	1	2	0.3	0.01	<5
25/02/2013	Wet Weather	7.28	158	82	<0.01	0.33	0.33	1.7	2	0.04	<0.01	<5
12/03/2013	Quarterly	7.53	236	327	<0.01	1.58	1.58	1.8	3.4	0.25	<0.01	<5
13/06/2013	Non-routine	7.86	184	50	0.01	0.4	0.41	0.6	1	0.3	<0.01	19
25/06/2013	arterly/Controll	7.95	203	48	0.03	0.87	0.9	0.6	1.5	0.01	<0.01	<5
27/08/2013	Quarterly	8.1	208	8	<0.01	0.7	0.7	0.7	1.4	0.05	<0.01	<5
14/11/2013	Quarterly	8.33	297	134	<0.01	0.05	0.05	0.7	0.8	0.12	<0.01	<5
21/11/2013	Controlled	7.7	396	14	0.11	3.45	3.56	0.8	4.4	<0.01	<0.01	<5
29/11/2013	Non-routine	7.82	329	13	0.07	2.19	2.26	2.3	4.6	0.01	<0.01	<5
17/12/2013	Controlled	7.98	356	11	0.1	2	2.1	0.5	2.6	0.05	<0.01	<5
18/02/2014	Quarterly	8.44	670	17	<0.01	0.01	0.01	0.6	0.6	0.03	<0.01	<5
22/05/2014	Quarterly	8.34	804	166	<0.01	<0.01	<0.01	0.3	0.3	0.03	<0.01	<5
7/08/2014	Quarterly	8.23	881	469	<0.01	0.02	0.02	2.7	2.7	0.68	<0.01	<5
10/11/2014	Dry											
19/02/2015	Dry											

SB10			EPL ID 14									
Sample Date	**Type**	**pH - lab**	**Electrical Conductivity uS/cm - lab**	**Suspended Solids**	**Nitrite as N mg/L**	**Nitrate as N mg/L**	**Nitrite + Nitrate as N mg/L**	**Total Kjeldahl Nitrogen as N mg/L**	**Total Nitrogen as N mg/L**	**Total Phosphorus as P mg/L**	**Reactive Phosphorus as P mg/L**	**Oil and Grease**
15-Jan-09	Unknown	7.1	255	35		0.11		1.3	0.58	0.47	<2	
6/05/2009	Quarterly	8.12	214	47	<0.01	0.09	0.09	0.6	0.7	0.08	0.02	<5
26/08/2009	Quarterly	7.88	282	60	0.01	<0.01	0.02	3.5	3.5	0.32	0.07	<10
15/02/2010	Non-Rout	7.93	180	464	0.02	1.6	1.62	2.8	4.4	0.32	0.11	<5
23/02/2010	Quarterly	7.68	189	48	0.03	1.03	1.06	1.3	2.4	0.25	0.09	<5
11/05/2010	Quarterly	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
28/07/2010	Wet Weather	7.92	199	132	0.01	1.07	1.08	1.6	2.7	0.17	0.11	<5
12/08/2010	Non-routine	7.3	91	68	<0.01	0.03	0.03	1.3	1.3	0.82	0.68	<5
19/08/2010	Quarterly	7.65	190	365		0.87	0.87	0.7	1.6	0.28	0.17	<5
16/11/2010	Non-routine	7.49	276	108	0.05	4.55	4.6	2.2	6.8	0.13	0.15	11
8/12/2010	Quarterly	7.71	274	148	0.02	2.33	2.35	1.6	4	0.18	0.17	<5
10/12/2010	Wet Weather	7.22	179	314	<0.01	0.76	0.76	<0.1	0.8	0.42	0.29	<5
3/03/2011	Quarterly	7.99	176	153	<0.01	0.17	0.17	<0.1	0.2	0.07	0.05	<5
12/05/2011	Quarterly	7.67	457	17	<0.01	<0.01	<0.01	0.2	0.2	<0.01	0.02	<5
18/08/2011	Quarterly	8.00	416	70	<0.01	<0.01	<0.01	<0.1	<0.1	0.04	<0.01	<5
18/10/2011	Non-routine	7.71	349	62	0.04	1.41	1.45	2.6	4	0.17	0.09	<5
25/10/2011	Controlled	7.43	352	<5	0.06	0.76	0.82	1.8	2.6	0.02	0.02	<5
23/11/2011	Quarterly	7.81	383	64	0.01	2.21	2.22	1.8	4	0.04	0.08	<5
26/11/2011	Wet Weather	7.6	342	106	0.03	3.61	3.64	1.2	4.8	0.21	0.16	<5
2/02/2012	Wet Weather	7.59	282	300	0.02	0.63	0.65	2.3	3	0.17	0.04	<5
16/02/2012	Non-routine	8.97	265	10	<0.01	0.02	0.02	0.6	0.6	0.18	<0.01	<5
23/02/2012	Quarterly	8.68	258	7	<0.01	0.01	0.01	0.3	0.3	0.03	<0.01	<5
10/05/2012	Quarterly	7.63	391	27	<0.01	0.13	0.13	0.6	0.7	0.07	<0.01	<5
13/07/2012	Non-routine	7.84	269	364	0.01	0.36	0.37	2.3	2.7	0.26	0.1	<5
27/08/2012	Quarterly	8.02	300	42	0.01	0.38	0.39	1.2	1.6	0.1	0.06	<5
29/11/2012	Quarterly	8.31	486	22	0.01	0.03	0.04	0.4	0.4	0.02	<0.01	<5
29/01/2013	Wet Weather	7.32	202	508	0.02	0.64	0.66	2	2.7	0.46	0.07	<5
12/03/2013	Quarterly	7.64	195	168	<0.01	0.39	0.39	1.2	1.6	0.19	0.06	<5
25/06/2013	Under construction											
27/08/2013	Under construction											
14/11/2013	Quarterly	7.73	168	1030	0.03	1.08	1.11	4	5.1	0.74	0.05	<5
25/02/2014	Quarterly	7.85	199	197	0.02	<0.01	0.02	10.5	10.5	1.92	0.38	<5
22/05/2014	Dry											
7/08/2014	Dry											
10/11/2014	Dry											
19/02/2015	Dry											

SD4

Sample Date	Type	pH - lab	Electrical Conductivity uS/cm - lab	Suspended Solids	Nitrite as N mg/L	Nitrate as N mg/L	Nitrite + Nitrate as N mg/L	Total Kjeldahl Nitrogen as N mg/L	Total Nitrogen as N mg/L	Total Phosphorus as P mg/L	Reactive Phosphorus as P mg/L	Oil and Grease
16-Aug-07	Unknown	7.8	400	58	<0.01			1.1	0.19	0.06	<2	
11-Oct-07	Unknown	8	220	17	<0.01			1.4	0.67	0.49	<2	
14-Jan-08	Unknown	8.9	270	15	1.1			1.1	0.39	0.21	<2	
09-Apr-08	Unknown	8.6	320	47		<0.01		2	0.22	0.18	<2	
08-Jul-08	Unknown	9.0	335	41		<0.01		2.2	0.24	0.02	<2	
15-Jan-09	Unknown	8.1	225	15		<0.01		2.9	0.78	0.96	<2	
6/05/2009	Quarterly	9.07	270	10	<0.01	<0.01	<0.01	1.1	1.1	0.13	0.1	<5
26/08/2009	Quarterly	8.7	252	16	<0.01	<0.01	<0.01	1	1	0.1	<0.01	<10
10/11/2009	Quarterly	9.16	241	48	<0.01	<0.01	<0.01	1.4	1.4	0.1	0.01	<5
23/02/2010	Quarterly	8.86	238	21	<0.01	<0.01	<0.01	1.3	1.3	0.05	<0.01	<5
11/05/2010	Quarterly	8.7	343	214	<0.01	0.02	0.02	0.8	0.8	0.23	0.02	<5
8/12/2010	Quarterly	9.18	196	8	<0.01	0.03	0.03	1.3	1.3	0.76	0.64	<5
3/03/2011	Quarterly	8.33	220	15	<0.01	0.03	0.03	0.6	0.6	0.78	0.76	<5
12/05/2011	Quarterly	7.82	281	20	<0.01	<0.01	<0.01	1.2	1.2	0.64	0.6	<5
18/08/2011	Quarterly	8.37	306	46	<0.01	0.02	0.02	<0.1	<0.1	0.49	0.37	<5
30/12/2011	Quarterly	7.49	155	66	<0.01	0.02	0.02	1.5	1.5	1.5	1.24	<5
23/02/2012	Quarterly	8.06	211	9	0.02	0.09	0.11	1.1	1.2	0.8	0.75	<5
10/05/2012	Quarterly	7.86	262	104	<0.01	0.3	0.3	13.7	14	2.11	0.55	<5
27/08/2012	Quarterly	8.51	284	8	0.02	0.09	0.11	0.8	0.9	0.77	0.43	<5
29/11/2012	Quarterly	8.84	328	6	<0.01	0.01	0.01	0.9	0.9	0.54	0.59	<5
13/03/2013	Quarterly	8.66	161	251	0.09	1.73	1.82	4	5.8	1	0.63	<5
25/06/2013	Quarterly	7.61	175	25	0.01	0.47	0.48	1	1.5	0.37	0.34	<5
27/08/2013	Quarterly	9.23	240	20	<0.01	0.01	0.01	0.9	0.9	0.21	0.18	<5
14/11/2013	Quarterly	8.51	339	24	<0.01	<0.01	<0.01	0.9	0.9	0.21	0.14	<5
25/02/2014	Quarterly	8.33	384	292	<0.01	0.02	0.02	1.4	1.4	0.31	0.07	<5
22/05/2014	Quarterly	8.56	398	15	<0.01	<0.01	<0.01	0.8	0.8	0.06	0.01	<5
7/08/2014	Quarterly	8.8	362	44	<0.01	0.03	0.03	1.4	1.4	0.08	<0.01	14
15/09/2014	Non-Routine	8.37	365	24	<0.01	0.03	0.03	1.2	1.2	0.05	<0.01	<5
10/11/2014	Quarterly	8.85	373	71	<0.01	0.07	0.07	1.3	1.4	0.11	0.01	<5
19/02/2015	Quarterly	8.37	531	116	<0.01	<0.01	<0.01	3.9	3.9	0.36	0.07	<5

SD5

Sample Date	Type	pH - lab	Electrical Conductivity uS/cm - lab	Suspended Solids	Nitrite as N mg/L	Nitrate as N mg/L	Nitrite + Nitrate as N mg/L	Total Kjeldahl Nitrogen as N mg/L	Total Nitrogen as N mg/L	Total Phosphorus as P mg/L	Reactive Phosphorus as P mg/L	Oil and Grease
11-Oct-07	Quarterly	8.2	180	14	0.02				2.3	0.94	0.83	<2
14-Jan-08	Quarterly	9	280	11	<0.01				1.8	0.42	0.35	<2
09-Apr-08	Quarterly	9.2	360	11		<0.01			0.58	0.08	0.04	<2
08-Jul-08	Quarterly	9.0	415	32		<0.01			6.1	0.01	0.02	<2
30-Oct-08	Quarterly	9.2	380			<0.01			0.58	0.01	0.03	<1
15-Jan-09	Quarterly	7.5	255	13		<0.01			1.8	0.03	0.02	<2
6/05/2009	Quarterly	9.03	329	29	<0.01	<0.01	<0.01	1.3	1.3	0.08	0.02	<5
26/08/2009	Quarterly	8.71	372	312	<0.01	<0.01	<0.01	3.6	3.6	0.33	<0.01	<10
10/11/2009	Quarterly	8.65	458	136	<0.01	0.03	0.03	3.5	3.6	0.24	<0.01	<5
23/02/2010	Quarterly	8.89	269	22	0.01	<0.01	<0.01	1.7	1.7	0.28	0.18	<5
11/05/2010	Quarterly	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
8/12/2010	Quarterly	8.48	212	43	<0.01	0.06	0.06	2.9	3	0.81	0.6	<5
3/03/2011	Quarterly	9.55	250	36	0.01	<0.01	0.02	1	1	0.24	0.2	<5
12/05/2011	Quarterly	8.21	316	69	<0.01	<0.01	<0.01	2.2	2.2	0.12	0.07	<5
18/08/2011	Quarterly	7.95	343	56	<0.01	0.02	0.02	1	1	0.26	0.16	<5
30/12/2012	Quarterly	7.48	135	14	0.02	0.14	0.16	2.1	2.3	1.49	1.44	<5
23/02/2012	Quarterly	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
10/05/2012	Quarterly	8.2	321	23	0.01	0.06	0.07	1.8	1.9	0.53	0.4	<5
27/08/2012	Quarterly	8.59	350	16	<0.01	<0.01	<0.01	1.4	1.4	0.26	0.16	<5
29/11/2012	Quarterly	8.89	362	109	<0.01	<0.01	<0.01	2.3	2.3	0.18	<0.01	<5
13/03/2013	Quarterly	7.13	112	10	<0.01	<0.01	<0.01	1.2	1.2	1.16	1.04	<5
25/06/2013	Quarterly	7.94	237	28	<0.01	0.1	0.1	1.3	1.4	0.73	0.67	<5
27/08/2013	Quarterly	8.18	273	5	<0.01	0.18	0.18	1.2	1.4	0.62	0.63	<5
14/11/2013	Quarterly	8.66	381	14	<0.01	0.02	0.02	0.9	0.9	0.48	0.44	<5
25/02/2014	Quarterly	8.65	457	71	<0.01	0.01	0.01	1.7	1.7	0.28	0.19	<5
22/05/2014	Dry											
7/08/2014	Dry											
10/11/2014	Dry											
19/02/2015	Dry											

VWD1

EPL ID 16

Sample Date	Type	pH - lab	Electrical Conductivity uS/cm - lab	Suspended Solids	Nitrite as N mg/L	Nitrate as N mg/L	Nitrite + Nitrate as N mg/L	Total Kjeldahl Nitrogen as N mg/L	Total Nitrogen as N mg/L	Total Phosphorus as P mg/L	Reactive Phosphorus as P mg/L	Oil and Grease
15-Jan-09		8.4	845	68		0.32			0.73	0.07	0.04	<2
6/05/2009	Quarterly	8.4	1080	5	0.04	3.97	4	0.9	4.9	<0.01	<0.01	<5
26/08/2009	Quarterly	8.29	977	14	0.01	1.67	1.68	1.2	2.9	<0.01	<0.01	<10
10/11/2009	Quarterly	8.27	1010	12	0.01	2.42	2.44	1	3.4	0.04	<0.01	<5
23/02/2010	Quarterly	8.03	1070	5	0.06	1.87	1.93	1.3	3.2	<0.01	<0.01	<5
11/05/2010	Quarterly	7.9	1220	148	0.04	2.31	2.35	0.8	3.2	<0.01	0.01	<5
19/08/2010	Quarterly	8.13	1010	16		1.32	1.32	1.1	2.4	0.52	0.04	<5
8/12/2010	Quarterly	8.27	941	<5	0.06	3.3	3.36	1.2	4.6	<0.01	<0.01	<5
3/03/2011	Quarterly	8.43	808	19	0.02	0.81	0.84	<0.1	0.8	<0.01	<0.01	<5
12/05/2011	Quarterly	7.9	1150	8	0.04	5.62	5.65	2.1	7.8	<0.01	<0.01	<5
18/08/2011	Quarterly	8.19	1050	11	0.03	3.8	3.83	0.4	4.2	<0.01	<0.01	<5
23/11/2011	Quarterly	8.32	954	8	0.03	1.45	1.48	0.4	1.9	<0.01	<0.01	<5
23/02/2012	Quarterly	8.04	912	6	0.15	3.91	4.06	1.6	5.7	0.03	<0.01	<5
10/05/2012	Quarterly	8.23	916	22	0.03	8.12	8.15	1.2	9.4	0.06	<0.01	<5
27/08/2012	Quarterly	8.72	918	11	0.01	0.1	0.11	0.6	0.7	<0.01	<0.01	<5
29/11/2012	Quarterly	Under construction										
12/03/2013	Quarterly	8.1	1040	18	0.08	2.87	2.95	1.7	4.6	<0.01	<0.01	<5
25/06/2013	Under construction											
27/08/2013	Under construction											
14/11/2013	Quarterly	8.73	1030	29	0.04	0.51	0.55	0.3	0.8	0.03	<0.01	<5
25/02/2014	Quarterly	8.29	1050	14	<0.01	0.55	0.55	0.2	0.8	<0.01	<0.01	<5
22/05/2014	Quarterly	8.5	1070	<5	0.01	0.48	0.49	0.3	0.8	<0.01	<0.01	<5
7/08/2014	Quarterly	8.38	1060	10	0.03	2.75	2.78	0.7	3.5	<0.01	<0.01	<5
10/11/2014	Quarterly	8.35	1100	6	0.03	2.29	2.29	0.5	2.8	<0.01	<0.01	<5
19/02/2015	Quarterly	8.47	1090	20	0.03	1.59	1.62	0.7	2.3	0.02	<0.01	<5

VWD2

Sample Date	Type	pH - lab	Electrical Conductivity uS/cm - lab	Suspended Solids	Nitrite as N mg/L	Nitrate as N mg/L	Nitrite + Nitrate as N mg/L	Total Kjeldahl Nitrogen as N mg/L	Total Nitrogen as N mg/L	Total Phosphorus as P mg/L	Reactive Phosphorus as P mg/L	Oil and Grease
23-Jan-09		8.0	1040			1.5			7.2	0.06	0.1	<2
6/05/2009	Quarterly	7.9	1220	20	0.28	6.24	6.52	2.6	9.1	0.02	<0.01	<5
26/08/2009	Quarterly	8.48	932	257	<0.01	0.04	0.04	0.6	0.6	0.04	<0.01	<10
23/02/2010	Quarterly	8.06	979	3	0.06	2.13	2.2	0.9	3.1	<0.01	<0.01	<5
11/05/2010	Quarterly	7.89	1200	280	0.35	14.4	14.7	4.6	19.3	0.01	<0.01	<5
19/08/2010	Quarterly	8.56	839	16	0	4.53	4.61	2.6	7.2	0.91	0.01	<5
8/12/2010	Quarterly	8.8	646	8	0.05	2.01	2.06	0.9	3	0.25	<0.01	<5
3/03/2011	Quarterly	8.81	659	51	0.02	0.02	0.04	<0.1	<0.1	<0.1	<0.01	<5
12/05/2011	Quarterly	7.64	1220	14	0.36	15.9	16.3	5.5	21.8	<0.01	<0.01	<5
18/08/2011	Quarterly	8.21	996	6	0.09	4.24	4.33	3.4	7.7	<0.1	<0.01	<5
23/11/2011	Quarterly	8.34	878	6	0.12	11.3	11.4	2.6	14	<0.01	<0.01	<5
23/02/2012	Quarterly	8.01	871	22	0.05	3.83	3.88	1.2	5.1	<0.01	<0.01	<5
10/05/2012	Quarterly	8.13	918	20	0.02	1.59	1.61	1.1	2.7	0.06	0.05	<5
27/08/2012	Quarterly	8.38	939	9	<0.01	0.58	0.58	0.4	1	0.15	<0.01	<5
29/11/2013	Quarterly	8.05	1120	6	0.06	8.55	8.61	2.4	11	<0.05	<0.01	<5
12/03/2013	Quarterly	8.36	805	24	0.06	2.44	2.5	0.9	3.4	0.01	<0.01	<5
25/06/2013	Quarterly	8.05	880	<5	0.05	0.86	0.91	0.7	1.6	<0.01	<0.01	<5
27/08/2013	Quarterly	8.44	963	12	<0.01	0.74	0.74	0.6	1.3	0.06	<0.01	<5
14/11/2013	Quarterly	8.25	1110	10	0.02	1.77	1.79	0.5	2.3	<0.01	<0.01	<5
25/02/2014	Quarterly	8.21	980	14	<0.01	0.39	0.39	0.2	0.6	0.01	<0.01	<5
22/05/2014	Quarterly	8.37	1070	<5	0.01	0.48	0.49	0.3	0.8	<0.01	<0.01	<5
7/08/2014	Quarterly	8.14	962	141	0.49	7.67	8.16	2.6	10.8	<0.1	<0.1	<5
10/11/2014	Quarterly	8.41	1070	38	0.05	4.86	4.91	0.7	5.6	<0.01	<0.01	<5
19/02/2015	Quarterly	8.09	1090	13	0.02	2.77	2.79	0.7	3.5	<0.01	<0.01	<5

VWD3

Sample Date	Type	pH - lab	Electrical Conductivity uS/cm - lab	Suspended Solids	Nitrite as N mg/L	Nitrate as N mg/L	Nitrite + Nitrate as N mg/L	Total Kjeldahl Nitrogen as N mg/L	Total Nitrogen as N mg/L	Total Phosphorus as P mg/L	Reactive Phosphorus as P mg/L	Oil and Grease
8/12/2010	Quarterly	8.09	912	<5	0.04	3.16	3.2	1	4.2	<0.01	<0.01	<5
3/03/2011	Quarterly	8.31	830	11	0.02	0.92	0.94	0.4	1.3	0.09	<0.01	<5
12/05/2011	Quarterly	7.81	1190	28	0.22	6.35	6.57	3.5	10.1	<0.01	<0.01	<5
18/08/2011	Quarterly	8.29	1040	8	0.08	4.98	5.06	1.8	6.9	<0.01	<0.01	<5
23/11/2011	Quarterly	8.37	925	6	0.08	4.15	4.23	1.2	5.4	<0.01	<0.01	<5
23/02/2012	Quarterly	8.38	851	64	0.12	8.37	8.49	2.4	10.9	0.03	<0.01	<5
10/05/2012	Quarterly	8.1	918	25	0.02	0.69	0.71	1	1.7	0.07	<0.01	<5
27/08/2012	Quarterly	8.48	888	14	0.06	3.5	3.56	0.6	4.2	0.05	<0.01	<5
29/11/2012	Quarterly	8.24	1120	218	0.06	9.07	9.13	1.9	11	0.06	<0.01	<5
12/03/2013	Quarterly	8.37	1050	6	0.11	5.33	5.44	1.6	7	<0.01	<0.01	<5
25/06/2013	Quarterly	8.41	1100	10	0.07	4.33	4.4	2	6.4	<0.01	<0.01	<5
27/08/2013	Quarterly	8.46	1080	19	0.04	3.55	3.59	1.6	5.2	0.08	<0.01	<5
14/11/2013	Quarterly	8.38	1190	13	0.04	2.95	2.99	0.9	3.9	0.02	<0.01	<5
25/02/2014	Quarterly	8.39	1120	42	0.02	0.88	0.9	0.6	1.5	0.02	<0.01	<5
22/05/2014	Quarterly	8.40	1090	15	0.02	0.90	0.92	0.5	1.4	<0.01	<0.01	<5
7/08/2014	Quarterly	8.29	1060	7	0.52	3.26	3.78	1.1	4.9	<0.01	<0.01	<5
10/11/2014	Quarterly	8.74	994	119	0.05	2.48	2.48	1.1	3.6	0.06	<0.01	8
19/02/2015	Quarterly	8.50	981	12	0.02	2.22	2.24	0.8	3.0	<0.01	<0.01	<5

VWD4

Sample Date	Type	pH - lab	Electrical Conductivity uS/cm - lab	Suspended Solids	Nitrite as N mg/L	Nitrate as N mg/L	Nitrite + Nitrate as N mg/L	Total Kjeldahl Nitrogen as N mg/L	Total Nitrogen as N mg/L	Total Phosphorus as P mg/L	Reactive Phosphorus as P mg/L	Oil and Grease
23/11/2011	Quarterly	8.27	928	18		7.93	7.95	3.2	11.2	0.04	<0.01	<5
23/02/2012	Quarterly	8.45	881	<5		1.61	1.65	1	2.6	0.02	<0.01	<5
10/05/2012	Quarterly	8.54	858	16	0.13	5.48	5.61	1.2	6.8	0.05	<0.01	<5
27/08/2012	Quarterly	8.52	942	67	<0.01	0.03	0.03	0.7	0.7	0.08	<0.01	<5
29/11/2012	Quarterly	8.75	894	17	0.04	1.89	1.93	0.8	2.7	0.08	<0.01	<5
12/03/2013	Quarterly	8.44	909	14	0.02	0.33	0.35	0.6	1	0.01	<0.01	<5
25/06/2013	Quarterly	8.58	986	5	<0.01	0.1	0.1	2.7	2.8	<0.01	<0.01	<5
27/08/2013	Quarterly	8.6	992	36	<0.01	0.22	0.22	0.6	0.8	0.02	<0.01	<5
14/11/2013	Quarterly	8.32	1130	14	0.03	1.42	1.45	0.6	2	0.02	<0.01	<5
25/02/2014	Quarterly	8.34	1050	8	0.01	0.41	0.42	0.4	0.8	<0.01	<0.01	<5
22/05/2014	Quarterly	8.44	1090	<5	<0.01	0.32	0.32	0.4	0.7	<0.01	<0.01	<5
7/08/2014	Quarterly	8.25	1060	6	0.52	10.9	11.4	1.8	13.2	0.02	<0.01	<5
10/11/2014	Quarterly	8.97	1030	16	0.07	4.78	4.78	1.0	5.8	<0.01	<0.01	<5
19/02/2015	Quarterly	7.91	1040	10	0.05	1.97	2.02	0.8	2.8	0.02	<0.01	<5

BGD

Sample Date	Type	pH - lab	Electrical Conductivity uS/cm - lab	Suspended Solids	Nitrite as N mg/L	Nitrate as N mg/L	Nitrite + Nitrate as N mg/L	Total Kjeldahl Nitrogen as N mg/L	Total Nitrogen as N mg/L	Total Phosphorus as P mg/L	Reactive Phosphorus as P mg/L	Oil and Grease
20/05/2010	Quarterly	8.32	496	216	<0.01	0.02	0.02	8.7	8.7	0.9	<0.01	11
19/08/2010	Quarterly	7.78	159	37		0.02	0.06	2.6	2.7	0.52	0.37	<5
8/12/2010	Quarterly	8.38	608	88	0.03	0.66	0.69	1.9	2.6	0.46	0.37	<5
3/03/2011	Quarterly	8.35	408	173	<0.01	0.07	0.07	1.6	1.7	0.55	0.29	<5
12/05/2011	Quarterly	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
18/08/2011	Quarterly	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
23/02/2012	Quarterly	7.95	304	35	<0.01	<0.01	<0.01	1.1	1.1	0.86	0.77	<5
10/05/2012	Quarterly	8	833	140	<0.01	0.02	0.02	1.5	1.5	0.37	0.08	<5
27/08/2012	Quarterly	8.08	364	150	<0.01	<0.01	<0.01	1.8	1.8	0.67	0.2	<5
29/11/2012	Quarterly	7.42	151	77	0.05	0.06	0.11	1.4	1.5	0.87	0.79	<5
13/03/2013	Quarterly	7.26	311	70	<0.01	<0.01	<0.01	1.8	1.8	1.07	0.43	<5
25/06/2013	Quarterly	8.01	322	116	<0.01	0.03	0.03	1.2	1.2	0.18	0.11	<5
27/08/2013	Quarterly	8	636	65	0.01	0.03	0.04	5.6	5.6	0.49	0.26	<5
14/11/2013	Dry											
25/02/2014	Dry											
22/05/2014	Dry											
7/08/2014	Dry											
10/11/2014	Dry											
19/02/2015	Dry											

QCU			EPL ID 25									
Sample Date	Type	pH - lab	Electrical Conductivity uS/cm - lab	Suspended Solids	Nitrite as N mg/L	Nitrate as N mg/L	Nitrite + Nitrate as N mg/L	Total Kjeldahl Nitrogen as N mg/L	Total Nitrogen as N mg/L	Total Phosphorus as P mg/L	Reactive Phosphorus as P mg/L	Oil and Grease
27-Jun-07	Unknown											
17-Jul-07	Unknown	8	0.94	4	-	-	-	-	-	-	-	<5
18-Jul-07	Unknown	7.9	990	7	-	-	-	-	-	0.1	0.07	<2
21-Aug-07	Unknown	7.5	0.1	92	-	0.037	-	-	1.2	0.84	-	<5
07-Oct-08	Unknown	7.9	400	327	-	-	-	-	-	-	<2	-
5/05/2010	Controlled	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
12/07/2010	Wet Weather	7.41	1790	41		0.03	0.03	0.5	0.5	0.08	0.02	<5
28/07/2010	Wet Weather	7.45	1680	33	<0.01	<0.01	<0.01	2.2	2.2	0.17	0.04	<5
12/08/2010	Wet Weather	7.6	256	22	<0.01	0.18	0.18	0.8	1	0.22	0.1	<5
19/08/2010	Quarterly	8.13	285	10		0.24	0.25	0.9	1.2	0.18	0.09	<5
25/10/2010	Wet Weather	7.89	370	20	0.02	0.22	0.23	1.8	2	0.18	0.12	<5
2/11/2010	Controlled	7.23	546	1	<0.01	0.39	0.39	0.1	0.5	0.08	0.02	<5
11/11/2010	Wet Weather	7.06	523	63	<0.01	0.66	0.66	1.2	1.9	0.21	0.01	<5
16/11/2010	Wet Weather	8.2	316	6	<0.01	0.49	0.49	0.8	1.3	0.09	0.08	<5
23/11/2010	Controlled	7.27	428	<5	<0.01	0.27	0.27	0.6	0.9	0.2	0.07	<5
29/11/2010	Controlled	7.02	591	<5	0.02	0.88	0.9	0.9	1.8	0.08	0.04	<5
8/12/2010	Quarterly	7.58	593	70	<0.01	0.15	0.15	0.9	1	0.24	0.22	<5
10/12/2010	Wet Weather	7.84	286	22	<0.01	0.02	0.02	<0.1	<0.1	0.18	0.18	<5
15/12/2010	Controlled	7.39	362	<5	<0.01	0.11	0.11	0.8	0.9	0.18	0.16	<5
18/12/2010	Controlled	7.05	661	<5	<0.01	0.8	0.8	<0.1	0.8	0.07	0.05	<5
17/01/2011	Non-routine	8.19	589	<5	<0.01	0.59	0.59	0.4	1	0.08	0.06	<5
3/03/2011	Quarterly	7.33	493	6	<0.01	0.54	0.54	<0.1	0.5	0.09	0.08	<5
7/03/2011	Controlled	7.04	414	6	<0.01	0.57	0.57	0.4	1	0.15	0.05	<5
29/03/2011	Non-routine	7.67	368	10	<0.01	0.61	0.61	0.2	0.8	0.17	0.11	<5
12/04/2011	Controlled	7.37	509	31	<0.01	0.45			0.8	0.10	0.05	<5
12/05/2011	Quarterly	7.20	376	11	<0.01	0.48	0.48	0.3	0.8	<0.01	<0.01	<5
1/06/2011	Controlled	7.37	465	8	<0.01	0.56	0.56	0.7	1.3	0.1	0.04	<5
7/06/2011	Controlled	7.46	461	12	<0.01	0.5	0.5	0.6	1.1	0.1	0.05	<5
16/06/2011	Controlled	7.44	479	12	<0.01	0.64	0.64	0.3	0.9	0.03	0.04	<5
18/08/2011	Quarterly	7.76	442	18	<0.01	0.31	0.31	<0.1	0.3	0.09	0.02	<5
27/09/2011	Controlled	8.02	448	14	<0.01	0.09	0.09	0.2	0.3	<0.01	<0.01	<5
16/10/2011	Wet Weather	7.51	466	34	<0.01	<0.01	<0.01	1	1	0.19	0.01	<5
18/10/2011	Controlled	7.63	464	21	<0.01	0.01	0.01	1	1	0.2	0.01	<5
23/11/2011	Quarterly	7.79	438	24	<0.01	<0.01	<0.01	0.6	0.6	0.11	<0.01	<5
25/11/2011	Wet Weather	7.65	405	40	<0.01	<0.01	<0.01	0.4	0.4	0.16	<0.01	<5
13/12/2011	Wet Weather	7.57	452	24	<0.01	0.28	0.28	0.8	1.1	0.15	0.06	<5
20/12/2011	Controlled	7.42	439	15		0.44	0.44	0.1	0.5	0.07	0.05	<5
18/01/2012	Non-routine	7.84	478	16	<0.01	0.03	0.03	0.5	0.5	0.12	0.01	<5
2/02/2012	Wet Weather	7.88	411	<5	<0.01	<0.01	<0.01	1.5	1.5	0.32	0.08	<5
7/02/2012	Non-routine	7.97	400	<5	<0.01	<0.01	<0.01	0.5	0.5	0.12	0.07	<5
16/02/2012	Controlled	7.42	450	10	<0.01	0.41	0.41	<0.1	0.4	<0.01	0.03	<5
23/02/2012	Quarterly	7.5	317	16	0.02	0.15	0.17	0.7	0.9	0.48	0.44	<5
10/05/2012	Quarterly	7.55	465	11	<0.01	0.43	0.43	0.2	0.6	0.1	0.03	<5
13/07/2012	Wet Weather	7.63	427	29	<0.01	0.23	0.23	0.4	0.6	0.14	0.04	<5
31/07/2012	Controlled	7.52	476	16	<0.01	0.06	0.06	<0.1	<0.1	0.07	<0.01	<5
6/08/2012	Controlled	7.52	528	95	<0.01	<0.01	<0.01	0.3	0.3	0.01	<0.01	<5
27/08/2012	Quarterly	7.99	472	56	<0.01	<0.01	<0.01	0.9	0.9	0.16	<0.01	<5
3/09/2012	Non-routine	7.68	476	22	0.01	0.42	0.43	0.5	0.9	0.14	0.03	<5
25/09/2012	Controlled	7.87	486	22	<0.01	0.03	0.03	0.4	0.4	0.1	0.01	<5
29/11/2012	Quarterly	8.03	467	18	<0.01	0.01	0.01	0.4	0.4	0.14	0.05	<5
24/12/2012	Wet Weather	8.36	507	102	<0.01	<0.01	<0.01	2.2	2.2	0.34	<0.01	<5
26/01/2013	Non-routine	7.46	451	154	-	-	-	-	-	-	-	-
29/01/2013	Wet Weather	6.94	97	64	0.02	0.5	0.52	1.5	2	0.64	0.51	<5
5/02/2013	Non-routine	7.08	171	30	<0.01	0.1	0.1	1.3	1.4	0.42	0.32	<5
25/02/2013	Wet Weather	7.65	436	<5	<0.01	0.02	0.02	0.6	0.6	0.14	0.03	<5
13/03/2013	Quarterly	7.39	467	<5	<0.01	0.26	0.26	0.4	0.7	0.06	0.01	<5
20/03/2013	Non-routine				<0.01	0.18	0.18	0.3	0.5	0.02	<0.01	<5
13/06/2013	Non-routine	7.8	458	18	<0.01	0.14	0.14	1.2	1.3	0.14	<0.01	<5
25/06/2013	arterly/Control	7.74	484	5	<0.01	0.32	0.32	<0.1	0.3	0.18	0.01	<5
12/08/2013	Controlled	7.93	467	10	<0.01	0.14	0.14	0.2	0.3	0.02	<0.01	<5
27/08/2013	Quarterly	7.9	470	25	<0.01	0.22	0.22	0.5	0.7	0.05	<0.01	<5
14/11/2013	Quarterly	7.59	490	30	0.01	0.07	0.08	0.6	0.7	0.13	0.02	<5
21/11/2013	Controlled	7.65	454	32	<0.01	0.01	0.01	0.4	0.4	0.04	<0.01	<5
17/12/2013	Controlled	8.08	499	58	<0.01	<0.01	<0.01	1.4	1.4	0.21	0.01	<5
25/02/2014	Quarterly	7.6	463	180	<0.01	<0.01	<0.01	5	5	0.9	<0.01	<5
22/05/2014	Quarterly	7.99	1690	63	<0.01	<0.01	<0.01	1.9	1.9	0.37	0.01	<5
7/08/2014	Quarterly	7.89	1600	14	<0.01	<0.01	<0.01	0.3	0.3	0.17	<0.01	<5
10/11/2015	Quarterly	7.89	1420	76	<0.01	0.02	0.02	3.0	3.0	0.26	<0.01	<5
19/02/2015	Quarterly	8.04	1540	33	<0.01	<0.01	<0.01	2.2	2.2	0.23	<0.01	<5

QCD			EPL ID 26									
Sample Date	Type	pH - lab	Electrical Conductivity uS/cm - lab	Suspended Solids	Nitrite as N mg/L	Nitrate as N mg/L	Nitrite + Nitrate as N mg/L	Total Kjeldahl Nitrogen as N mg/L	Total Nitrogen as N mg/L	Total Phosphorus as P mg/L	Reactive Phosphorus as P mg/L	Oil and Grease
27-Jun-07	Unknown	7.2	780	13	-	<0.01	-	0.55	0.5	0.14	<2	-
21-Aug-07	Unknown	7.4	-	125	0.24	-	-	0.8	0.71	-	<5	-
07-Oct-08	Unknown	7.5	380	21	-	-	-	-	-	-	<2	-
6/01/2010	Discharge	7.71	687	10	-	-	-	-	-	-	-	<5
15/02/2010	Discharge	7.82	861	10	<0.01	0.02	0.02	0.3	0.3	0.1	0.1	<5
5/05/2010	Controlled	7.99	1010	8	<0.01	<0.01	<0.01	0.3	0.3	0.15	0.02	<5
12/07/2010	Wet Weather	7.72	920	6		0.04	0.04	<0.1	<0.1	0.18	0.03	<5
28/07/2010	Wet Weather	7.2	813	6	<0.01	0.07	0.07	0.4	0.5	0.08	0.04	<5
12/08/2010	Wet Weather	7.39	231	105	<0.01	0.25	0.25	0.8	1	0.32	0.39	<5
19/08/2010	Quarterly	7.8	468	18		0.03	0.18	1.1	1.3	0.15	0.14	<5
25/10/2010	Wet Weather	7.81	924	7	<0.01	0.07	0.07	0.3	0.4	0.07	0.07	<5
2/11/2010	Controlled	7.68	808	10	<0.01	0.35	0.35	0.2	0.6	0.11	0.1	<5
11/11/2010	Wet Weather	7.71	897	9	<0.01	0.03	0.03	0.4	0.4	0.31	0.1	<5
16/11/2010	Wet Weather	7.57	488	19	<0.01	0.86	0.86	0.9	1.8	0.18	0.2	<5
23/11/2010	Controlled	7.54	563	18	0.02	0.14	0.16	0.7	0.9	0.31	0.11	<5
29/11/2010	Controlled	7.69	866	14	<0.01	0.15	0.15	0.6	0.8	0.2	0.08	<5
8/12/2010	Quarterly	7.02	560	<5	0.02	0.56	0.59	0.3	0.9	0.15	0.03	<5
10/12/2010	Wet Weather	7.66	240	55	0.03	<0.01	0.03	1.5	1.5	0.4	0.37	<5
15/12/2010	Controlled	7.41	471	12	<0.01	0.15	0.15	0.7	0.8	0.24	0.29	<5
18/12/2010	Controlled	7.6	777	13	<0.01	0.3	0.3	<0.1	0.3	0.12	0.11	<5
17/01/2011	Non-routine	7.69	705	24	<0.01	0.16	0.16	0.5	0.7	0.18	0.1	<5
3/03/2011	Quarterly	7.75	729	17	<0.01	0.12	0.12	0.1	0.2	0.22	0.08	<5
7/03/2011	Controlled	7.77	686	17	<0.01	0.12	0.12	0.2	0.3	0.2	0.08	<5
29/03/2011	Non-routine	8.05	766	19	<0.01	0.02	0.02	<0.1	<0.1	0.07	0.04	<5
12/04/2011	Controlled	7.93	839	8	<0.01	0.1			0.5	0.2	0.07	<5
12/05/2011	Quarterly	7.6	894	6	<0.01	0.12	0.12	0.2	0.3	<0.01	<0.01	<5
1/06/2011	Controlled	7.98	830	16	<0.01	0.18	0.18	0.6	0.8	0.17	0.04	<5
7/06/2011	Controlled	8.02	860	12	<0.01	0.13	0.13	0.4	0.5	0.08	0.05	<5
16/06/2011	Controlled	8.04	915	18	<0.01	0.15	0.15	0.5	0.6	0.07	0.03	<5
18/08/2011	Quarterly	8.05	869	16	<0.01	0.15	0.15	<0.1	0.2	0.05	0.04	<5
27/09/2011	Controlled	8.35	902	26	<0.01	<0.01	<0.01	0.3	0.3	0.06	0.03	<5
16/10/2011	Wet Weather	7.99	895	24	<0.01	0.02	0.02	0.3	0.3	0.09	0.05	<5
18/10/2011	Controlled	8.02	884	18	<0.01	0.02	0.02	0.3	0.3	0.08	0.05	<5
23/11/2011	Quarterly	8.02	868	15	<0.01	0.03	0.03	0.2	0.2	0.09	0.1	<5
25/11/2011	Wet Weather	7.94	810	13	<0.01	0.16	0.16	<0.1	0.2	0.2	0.1	<5
13/12/2011	Wet Weather	7.98	783	12	<0.01	0.18	0.18	0.4	0.6	0.14	0.09	<5
20/12/2011	Controlled	7.97	750	20		0.28	0.28	0.2	0.5	0.13	0.1	<5
18/01/2012	Non-routine	8.19	894	18	<0.01	0.16	0.16	0.1	0.3	0.16	0.07	<5
2/02/2012	Wet Weather	8.19	812	25	<0.01	0.08	0.08	0.4	0.5	0.12	0.08	<5
7/02/2012	Non-routine	7.84	499	20	<0.01	0.08	0.08	0.5	0.6	0.16	0.1	<5
16/02/2012	Controlled	8	807	20	<0.01	0.03	0.03	0.2	0.2	0.07	0.07	<5
23/02/2012	Quarterly	7.83	482	37	<0.01	0.08	0.08	0.9	1	0.39	0.31	<5
10/05/2012	Quarterly	7.97	849	11	<0.01	0.04	0.04	0.4	0.4	0.13	0.03	<5
13/07/2012	Wet Weather	7.97	773	15	<0.01	0.24	0.24	0.4	0.6	0.2	0.06	<5
31/07/2012	Controlled	8.04	822	8	<0.01	0.17	0.17	0.1	0.3	0.06	0.06	<5
6/08/2012	Controlled	8.02	829	8	<0.01	0.11	0.11	0.1	0.2	0.05	0.04	<5
27/08/2012	Quarterly	8.11	857	30	<0.01	<0.01	<0.01	0.1	0.1	<0.01	0.03	<5
3/09/2012	Non-routine	8.07	855	14	<0.01	0.04	0.04	0.4	0.4	0.12	0.04	<5
25/09/2012	Controlled	8.13	884	13	<0.01	0.02	0.02	0.2	0.2	0.1	0.06	<5
29/11/2012	Quarterly	7.98	815	<5	<0.01	<0.01	<0.01	0.2	0.2	0.21	0.15	<5
24/12/2012	Wet Weather	8.55	926	6	<0.01	0.02	0.02	0.5	0.5	0.14	0.14	<5
26/01/2013	Non-routine	7.7	853	47	-	-	-	-	-	-	-	-
29/01/2013	Wet Weather	7.02	112	182	0.02	0.42	0.44	1.4	1.8	0.6	0.44	<5
5/02/2013	Non-routine	7.47	438	36	<0.01	0.1	0.1	1.3	1.4	0.42	0.32	<5
25/02/2013	Wet Weather	7.87	774	14	<0.01	0.08	0.08	0.3	0.4	0.16	0.1	<5
13/03/2013	Quarterly	7.77	768	16	<0.01	0.05	0.05	0.3	0.4	0.22	0.18	<5
13/06/2013	Non-routine	7.94	807	11	<0.01	0.16	0.16	0.3	0.5	0.08	0.06	<5
25/06/2013	Quarterly/Controlled	7.95	850	<5	<0.01	0.14	0.14	0.2	0.3	0.08	0.05	<5
12/08/2013	Controlled	8.14	827	8	<0.01	0.04	0.04	0.2	0.2	0.06	0.04	<5
27/08/2013	Quarterly	8.05	826	11	<0.01	0.03	0.03	0.1	0.1	0.04	0.05	<5
14/11/2013	Quarterly	7.98	1010	16	<0.01	0.02	0.02	0.3	0.3	0.16	0.12	<5
21/11/2013	Controlled	7.92	884	20	<0.01	0.01	0.01	0.2	0.2	0.1	0.09	<5
17/12/2013	Controlled	8.32	942	25	<0.01	0.02	0.02	0.3	0.3	0.14	0.11	<5
25/02/2014	Quarterly	7.89	1080	26	<0.01	0.01	0.01	0.6	0.6	0.16	0.11	<5
22/05/2014	Quarterly	8.13	945	<5	<0.01	<0.01	<0.01	0.1	0.1	0.05	0.05	<5
7/08/2014	Quarterly	8.14	911	5	<0.01	0.02	0.02	<0.1	<0.1	0.04	0.03	<5
10/11/2014	Quarterly	8.00	1080	17	<0.01	<0.01	<0.01	0.3	0.3	0.16	0.10	<5
20/01/2015	Non-routine	8.03	1180	-	<0.01	<0.01	<0.01	0.5	0.5	0.15	0.05	-
19/02/2015	Quarterly	8.07	1170	8	<0.01	<0.01	<0.01	0.4	0.4	0.15	0.11	<5

WCU			EPL ID 23									
Sample Date	**Type**	**pH - lab**	**Electrical Conductivity uS/cm - lab**	**Suspended Solids**	**Nitrite as N mg/L**	**Nitrate as N mg/L**	**Nitrite + Nitrate as N mg/L**	**Total Kjeldahl Nitrogen as N mg/L**	**Total Nitrogen as N mg/L**	**Total Phosphorus as P mg/L**	**Reactive Phosphorus as P mg/L**	**Oil and Grease**
21-Aug-07	Unknown	7.9	0.19	165	0.84	-	-	1.7	0.55	-	<5	-
07-Oct-08	Unknown	7.7	905	6	-	-	-	1.4	<0.01	0.03	<2	-
6/01/2010	Discharge	7.87	1270	18	-	-	-	-	-	-	-	<5
15/02/2010	Discharge	7.84	1110	18	<0.01	<0.01	<0.01	0.6	0.6	0.25	0.22	<5
28/07/2010	Wet Weather	7.49	1210	92	0.01	3.8	3.81	2.2	6	0.13	0.08	<5
12/08/2010	Non-routine	7.62	323	148	<0.01	0.81	0.81	0.8	1.6	0.43	0.4	<5
19/08/2010	Quarterly	7.85	618	8		0.53	0.53	1.1	1.6	0.26	0.12	<5
25/10/2010	Non-routine	7.83	549	13	0.38	0.4	0.78	1.9	2.7	0.86	0.81	<5
11/11/2010	Non-routine	7.44	382	504	0.02	1.77	1.79	3.1	4.9	1.69	0.62	<5
16/11/2010	Non-routine	7.79	370	56	<0.01	1.07	1.07	1.1	2.2	0.52	0.58	7
8/12/2010	Quarterly	7.79	667	56	0.02	1.17	1.18	2.8	4	0.97	0.68	<5
10/12/2010	Wet Weather	7.67	299	65	<0.01	0.19	0.19	1.4	1.6	0.59	0.56	<5
3/03/2011	Quarterly	7.62	1170	15	0.03	3.38	3.41	0.4	3.8	0.07	0.03	<5
12/05/2011	Quarterly	7.42	1500	6	<0.01	4.44	4.44	1.5	5.9	<0.01	<0.01	<5
18/08/2011	Quarterly	8.01	1410	<5	0.02	3.28	3.30	0.3	3.6	0.08	0.03	<5
25/10/2011	Controlled	7.77	1330	44	0.03	3.25	3.28	1	4.3	0.14	0.08	<5
23/11/2011	Quarterly	8.02	1360	50	0.03	3.28	3.31	1.3	4.6	0.17	0.06	<5
26/11/2011	Wet Weather	7.64	148	261	<0.01	0.25	0.25	1.4	1.6	0.87	0.81	<5
2/02/2012	Wet Weather	7.79	93	53	0.01	0.33	0.34	0.8	1.1	0.66	0.52	<5
16/02/2012	Non-routine	7.94	1360	18	0.02	2.68	2.7	0.4	3.1	0.1	0.06	<5
23/02/2012	Quarterly	8.02	1360	45	0.02	3	3.02	0.9	3.9	0.06	0.04	<5
10/05/2012	Quarterly	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
13/07/2012	Non-routine	8.08	803	24	0.03	2.2	2.23	1.8	4	0.18	0.11	<5
27/08/2012	Quarterly	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
29/11/2012	Quarterly	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
29/01/2013	Wet Weather	7.78	452	<5	0.04	2.37	2.41	0.9	3.3	0.21	0.19	<5
13/03/2013	Quarterly	8.06	868	8	0.01	0.26	0.27	0.8	1.1	0.18	0.13	<5
25/06/2013	Dry											
27/08/2013	Dry											
14/11/2013	Quarterly	7.97	427	<5	0.06	0.14	0.2	0.8	1	0.35	0.27	<5
25/02/2014	Dry											
22/05/2014	Dry											
7/08/2014	Dry											
10/11/2014	Dry											
19/02/2015	Dry											

WCD			EPL ID 24									
Sample Date	Type	pH - lab	Electrical Conductivity uS/cm - lab	Suspended Solids	Nitrite as N mg/L	Nitrate as N mg/L	Nitrite + Nitrate as N mg/L	Total Kjeldahl Nitrogen as N mg/L	Total Nitrogen as N mg/L	Total Phosphorus as P mg/L	Reactive Phosphorus as P mg/L	Oil and Grease
21/08/2007	Unknown	7.9	0.21	690	-	1.2	-	-	2.3	0.96	-	<5
7/10/2008	Unknown	7.8	375	64	-	-	-	-	-	-	-	<2
6/01/2010	Discharge	8.16	668	54	-	-	-	-	-	-	-	<5
15/02/2010	Discharge	7.82	118	62	0.04	3.87	3.91	1.9	5.8	0.11	0.05	<5
11/05/2010	Quarterly	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
28/07/2010	Wet Weather	7.71	1130	32	0.03	0.9	0.93	1.7	2.6	0.29	0.2	<5
12/08/2010	Non-routine	7.6	324	130	<0.01	0.68	0.68	0.6	1.3	0.42	0.4	<5
19/08/2010	Quarterly	8.2	811	28	<0.01	0.54	0.56	0.6	1.2	0.53	0.2	<5
25/10/2010	Non-routine	7.86	587	200	<0.01	25.2	25.2	5.5	30.7	0.41	0.3	<5
11/11/2010	Non-routine	7.64	443	1640	0.09	19.4	19.4	4.2	23.6	1.27	0.34	<5
16/11/2010	Non-routine	7.69	426	690	0.11	10.5	10.6	3.2	13.8	0.54	0.46	<5
8/12/2010	Quarterly	7.49	177	14	<0.01	0.03	0.03	2	2	0.6	0.6	<5
10/12/2010	Wet Weather	7.69	273	305	0.01	1.78	1.79	2.2	4	0.69	0.64	<5
3/03/2011	Quarterly	8.23	1050	20	<0.01	0.05	0.05	0.1	0.2	0.23	0.14	<5
12/05/2011	Quarterly	8.00	1400	24	<0.01	0.61	0.61	0.4	1	<0.01	<0.01	<5
18/08/2011	Quarterly	8.41	1370	26	0.02	0.71	0.73	0.2	0.9	0.24	0.05	<5
25/10/2011	Controlled	8.11	1150	16	0.01	0.12	0.13	0.9	1	0.31	0.28	<5
23/11/2011	Quarterly	8.38	1310	32	<0.01	0.01	0.01	0.4	0.4	0.28	0.19	<5
25/11/2011	Wet Weather	7.82	162	1340	0.02	2.76	2.78	3	5.8	1.66	0.66	<5
2/02/2012	Wet Weather	7.86	224	1830	0.02	5.14	5.16	4	9.2	1.38	0.44	<5
16/02/2012	Non-routine	8.32	1120	9	<0.01	0.01	0.01	0.2	0.2	0.19	0.16	<5
23/02/2012	Quarterly	8.24	1220	25	<0.01	<0.01	<0.01	0.2	0.2	0.18	0.14	<5
10/05/2012	Quarterly	8.13	1320	18	0.02	0.62	0.64	0.5	1.1	0.21	0.14	<5
13/07/2012	Non-routine	8	524	522	0.22	16	16.2	2.9	19.1	0.65	0.42	<5
27/08/2012	Quarterly	8.47	1280	37	<0.01	0.03	0.03	0.8	0.8	0.06	<0.01	<5
29/11/2012	Quarterly	8.35	1260	36	<0.01	<0.01	<0.01	0.3	0.3	0.24	0.23	<5
29/01/2013	Wet Weather	7.34	210	202	0.09	2.64	2.73	1.9	4.6	0.74	0.62	<5
12/03/2013	Quarterly	8.31	1030	24	<0.01	<0.01	<0.01	0.5	0.5	0.23	0.21	<5
25/06/2013	Quarterly	8.26	1350	12	0.01	0.71	0.72	0.3	1	0.18	0.14	<5
27/08/2013	Quarterly	8.43	1270	15	<0.01	<0.01	<0.01	0.3	0.3	0.07	0.04	<5
14/11/2013	Quarterly	8.32	1390	19	<0.01	0.02	0.02	0.3	0.3	0.23	0.2	<5
25/02/2014	Quarterly	8.38	1350	27	<0.01	0.02	0.02	0.5	0.5	0.18	0.15	<5
22/05/2014	Quarterly	8.41	1350	16	<0.01	<0.01	<0.01	0.3	0.3	0.13	0.10	<5
7/08/2014	Quarterly	8.52	1320	10	<0.01	<0.01	<0.01	0.3	0.3	0.10	0.06	<5
10/11/2014	Quarterly	8.34	1400	38	<0.01	<0.01	<0.01	0.6	0.6	0.24	0.19	<5
20/01/2015	Non-routine	8.04	1220	-	<0.01	<0.01	<0.01	0.9	0.9	0.23	0.13	-
19/02/2015	Quarterly	8.32	1240	40	<0.01	<0.01	<0.01	0.8	0.8	0.24	0.16	<5

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DETERMINATION OF GROUNDWATER INTERCEPTION WERRIS CREEK COAL MINE

RAMBOLL ENVIRON

DETERMINATION OF GROUNDWATER INTERCEPTION
WERRIS CREEK COAL MINE

Revision	**03**
Date	**16/06/15**
Made by	**Fiona Robinson/Simon Gaskell**
Checked by	**Shaun Taylor**
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APPENDICES

Appendix 1
Water level data

Appendix 2
Water level logger data

1. INTRODUCTION

Werris Creek Coal Mine (WCCM) is situated in the northwest slopes and plains of New South Wales and is located 4km south of Werris Creek. The mine operates under project approval PA 10_0059 MOD 1.

1.1 Background

In 2005, Werris Creek Coal Mine (WCCM) commenced mining of the Greta Coal Measures – Werris Creek outlier, situated within the Werrie Basin. The coal measures overlie Werrie Basalt, which is directly beneath and surrounds the coal measures in all directions. The upper layers of the basalt have been shown to be highly weathered to form a clay aquitard providing confinement or semi-confinement between aquifers within the coal measures and underlying basalt hard rock.

Underground mining of part of the coal seam was undertaken prior to the commencement of open cut mining in 2005. The open cut operations are currently mining through the former underground mine workings. Underground mine workings were known to be saturated prior to commencement of operations. The mine plan intended to dewater these workings prior to encroachment and excavation, however due to the risk of spontaneous combustion the mine workings have been maintained saturated through the recirculation of water from the open cut.

Planning approval for the open cut mining operations was sought in two stages, representing the initial project and the Life of Mine (LOM) Project. Each stage was subject to a groundwater impact assessment which involved three dimensional modelling of the aquifer systems to assess impacts from the proposed operations. Modelling was based on measured groundwater levels for the project site and known or assumed geological parameters. Modelling for the second project approval, the LOM project, also included calibration of the initial model to observed site conditions.

Project Approval 10_0059 relates to the LOM project and Schedule 3 condition (23) of the project approval refers to the development of a Water Management Plan. The Water Management Plan includes requirements for surface water and groundwater monitoring and outlines trigger condition and contingency responses. This report addresses the following requirements of the water management plan:

1) Completion of an annual water balance to determine the groundwater interception; and
2) Assessment of groundwater variation against project triggers.

1.2 Study Objective

1.2.1 Objective 1

Mining operations occur within the coal measures of the Werrie Basin. Whilst not mining the surrounding basalt aquifer, the removal of groundwater from the coal measures can cause groundwater flow from the basalt aquifer to the coal measures to occur resulting in an incidental interception of groundwater from the basalt aquifer.

Objective 1 of this study is to determine the volume of groundwater intercepted from the basalt aquifer by the mining operations for the period April 2014 to March 2015.

1.2.2 Objective 2

During operations WCCM monitor a network of groundwater wells within the mine lease area and in surrounding private property. Wells are situated in both basalt and alluvial aquifers and are used for monitoring and water supply purposes. As part of the consent conditions, WCCM are required to undertake actions in the event that groundwater monitoring triggers are met. This trigger is:

- A reduction in 15% of the saturated thickness in private bores due to mining operations and outside of seasonal fluctuation.

Objective 2 of this report is to determine if the groundwater trigger has been met.

1.3 Scope of Work

The following scope of works was proposed to meet the project objectives.

1. Develop a water balance for the mining configuration for the period April 2014 and March 2015 and evaluate against observed water balance readings. Estimate a contribution associated within groundwater inflow;
2. Use the existing hydrogeological model (LOM model) to predict the volume of groundwater interception of the period;
3. Compare the hydrogeological model predictions with the water balance predictions;
4. Assess groundwater level reductions in private bores and determine the effects of seasonal variations. Compare these against triggers; and
5. Document the study in a report.

2. WATER BALANCE

A revised site Water Balance Model (WBM) has been prepared in order to check and calibrate groundwater inflows. A basic summary of the WBM used for this purpose representing flow to the open cut void is shown in **Figure 1**.

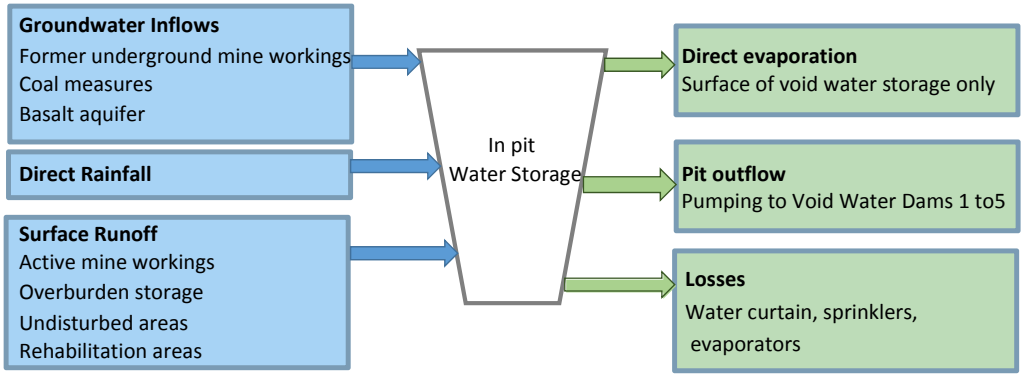


Figure 1 Site Conceptual Water Balance

Data measured at the site between April 2014 and March 2015 is presented in **Table 1**.

Table 1 Measured Water Balance Volumes (ML)

WCC Water Usage	March 2015	February 2015	January 2015	December 2014	November 2014	October 2014	September 2014	August 2014	July 2014	June 2014	May 2014	April 2014
Pit Dewatering	90.2	233.7	37.6	220.8	92.5	0	19.8	27.7	119.4	97.1	26.2	80.5
Dust Suppression (TLO, CP) & Other	3.7	3.7	2.8	4.1	4.3	3.6	3.6	3.7	3.7	3.3	3.2	5.3
Dust Suppression (Water Carts)	55.3	55.7	43	42.6	62	63.1	36.0	21.7	14.0	13.2	15.6	16.6
Water Recycled (Water Curtain/Sprinkler Inpit)	16	26	8	18.3	38.3	37.6	17.6	6.2	79.5	70	41.4	0
Void Water Dam Storage	615	680	606	705	569	565	678.5	720.3	722.2	676	650	674.8
In Pit Water Storage	50	82	169	128	261	263	141	62.7	0.0	0	0	10.6
Evaporator & Surface Sprinkers	108.7	121.7	135.2	54.8	52	66	10.6	9.1	17.4	0	5.9	8.9

To estimate the contribution from surface water runoff and direct rainfall to the pit void, daily rainfall data provided by the site was input to the WBM either directly to the void surface area or as a percentage of runoff from areas discharging into the void. The void surface area was approximated from the relationship between the geometry of the void space (using survey data provided by the site for the period) and the modelled volume of water in the void. This relationship is presented in **Figure 2**.

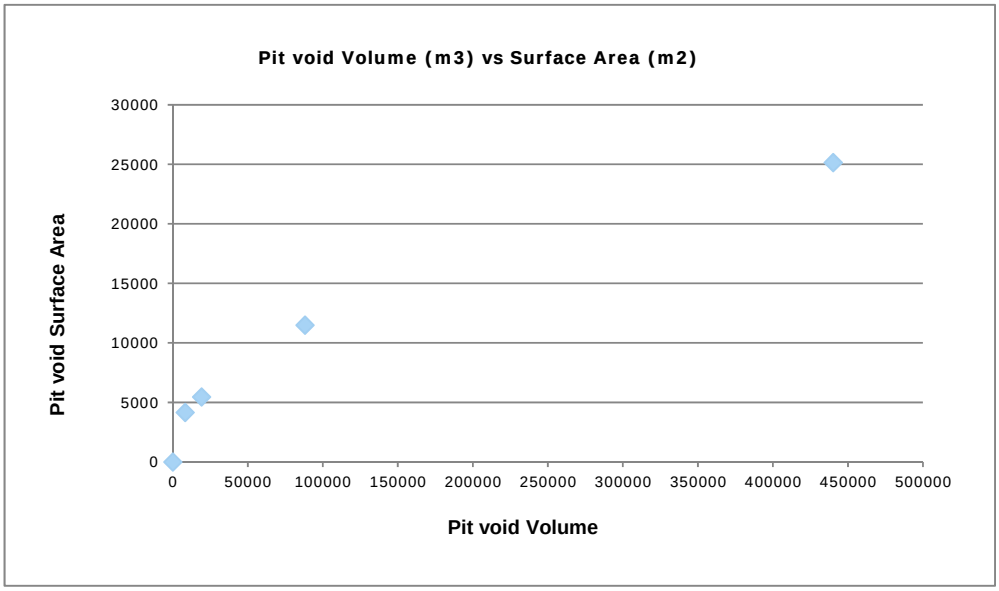


Figure 2 Relationship Between Pit Storage Volume and Surface Area

Evaporative losses from the void water surface are calculated on the basis of daily average evaporation (in mm derived from Bureau of Meteorology (BoM) monthly averages at Quirindi Post Office provided by BoM, which is the nearest location recording this data) from the surface area of the void. The surface area of the void changes as a result of the geometry of the void area and the volume of water predicted to be within it.

Open cut void water storage has been surveyed by the site surveyor since August 2012. Site water usage and consumption is monitoring monthly using water meters on key pipelines and survey of VWD storages. Water from the open cut void is pumped to five Void Water Dams located within the mine site boundary. These are named Void Water Dam (VWD) 1, 2, 3, 4 and 5. The monitoring data for open cut outflows, including information on estimated water curtain losses, were provided by WCC.

Table 2 summaries total water inputs and outputs for the 2014-2015 reporting period.

Table 2 WCC Void Water Usage April 2014 to March 2015.

WATER INPUTS				**+1117ML**
Void Water				
		Groundwater Bore (WAL29506)*	0.0ML	
		Rainfall Interception & Runoff#	672ML	
		Groundwater Intercepted (WAL32224)* #	56.0ML	
		Other Groundwater (Spoil, Underground) #	30.0ML	
		Recirculated back to Pit/UG[1]	358.9ML	
WATER OUTPUTS				**-1045.0ML**
Void Water	**Total Dust Suppression**		**620.1ML**	
		Haul Roads	438.8ML	
		Crushing Plant**	3.3ML	
		Train Load Out**	8.1ML	
		Pre-Strip Sprinkler[2]	169.9ML	
	Other		**424.9ML**	
		Workshop	32.5ML	
		Recirculated back to Pit/UG Losses[4]	36.2ML	
		Evaporators[3]	322.2ML	
		Inpit evaporation#	34ML	
NET WATER				**+72ML**

Note: Evaporation losses have been assumed as final storage levels or dams onsite have been used in estimating water in puts; * Volumes presented for the Water Access Licences (WAL) are for the AEMR reporting period and are not comparable with the NOW annual monitoring period July to June; ** Estimates as not metered the entire period; # Based on model by ENVIRON (2015). 1 - Metered volume of Water Recycled in pit for spontaneous combustion was 358.9ML; 2 – Metered volume of Water for Pre-Strip Sprinkler was 226.5ML adjusted by Environ by 25%; 3 – Metered volume of Water through Evaporators was 350.2ML adjusted by Environ by 8%; 4 - Recirculated back to Pit/UG Losses estimated by Environ to be 10%.

Three areas shown on **Figure 3**, were identified to provide runoff input to the void:

- the active open cut area including Overburden Emplacement (red area);
- bare/compacted soil area to the north of the active open cut area (green area); and
- undisturbed land to the north of the active open cut area ("old colliery" hill) (yellow area).

A simplified runoff model incorporating a single surface store/base flow store based on a modified version of the Boughton Australian Water Balance Model (AWBM)[1] was incorporated into the WBM to account for surface runoff from the open cut. This had been found to account for rainfall-runoff with a closer fit in a revision of Ramboll Environ's WBM completed in January 2015[2]. The undisturbed land and bare/compacted soil areas were modelled using a simplified runoff ratio of 20% and 60% respectively as per the original GSSE surface water assessment[3].

The measured values for pit dewatering (i.e. movement between the Void and VWDs), Dust Suppression, the Water Curtain/Sprinkler Input and Evaporator/Sprinklers (in use at the VWDs) were all input to the WBM from measured data. There was considered to be some potential for double-counting of evaporation rates from the VWDs. Initial calibration suggested that the Evaporator/Sprinklers overestimated the volume of water taken out of the VWDs. The eventual model used a figure which reduced the figures for the Evaporator by approximately 8% which appears to better correlate the modelled VWD volumes and those measured. Likewise, approximately 25% of the surface sprinkler use is above the workings and may find its way to the void. The total amounts for surface sprinklers have therefore been adjusted and entered into the WBM.

A summary of rainfall and runoff monthly totals is provided in **Table 3**.

[1] Boughton, W. (2004). The Australian Water Balance Model. Environmental Modelling & Software 19 (10), 943-956.

[2] ENVIRON (2015). LOM Project Modification, Evaluation of Site Water Balance.

[3] GSSE (2010). Surface Water Assessment, Life of Mine Project.

Table 3 Monthly Rainfall (mm) and WBM Estimated Runoff (ML)

Month	Rainfall (mm)	Runoff (ML)
April 2014	32.4	38.5
May 2014	21	29.5
June 2014	47.4	68.6
July 2014	22.4	29.7
August 2014	40.2	57.8
September 2014	36.6	45.7
October 2014	7.4	2.7
November 2014	31.2	19.2
December 2014	145.4	188.9
January 2015	67.8	84.7
February 2015	30.8	16.5
March 2015	20.6	16.0

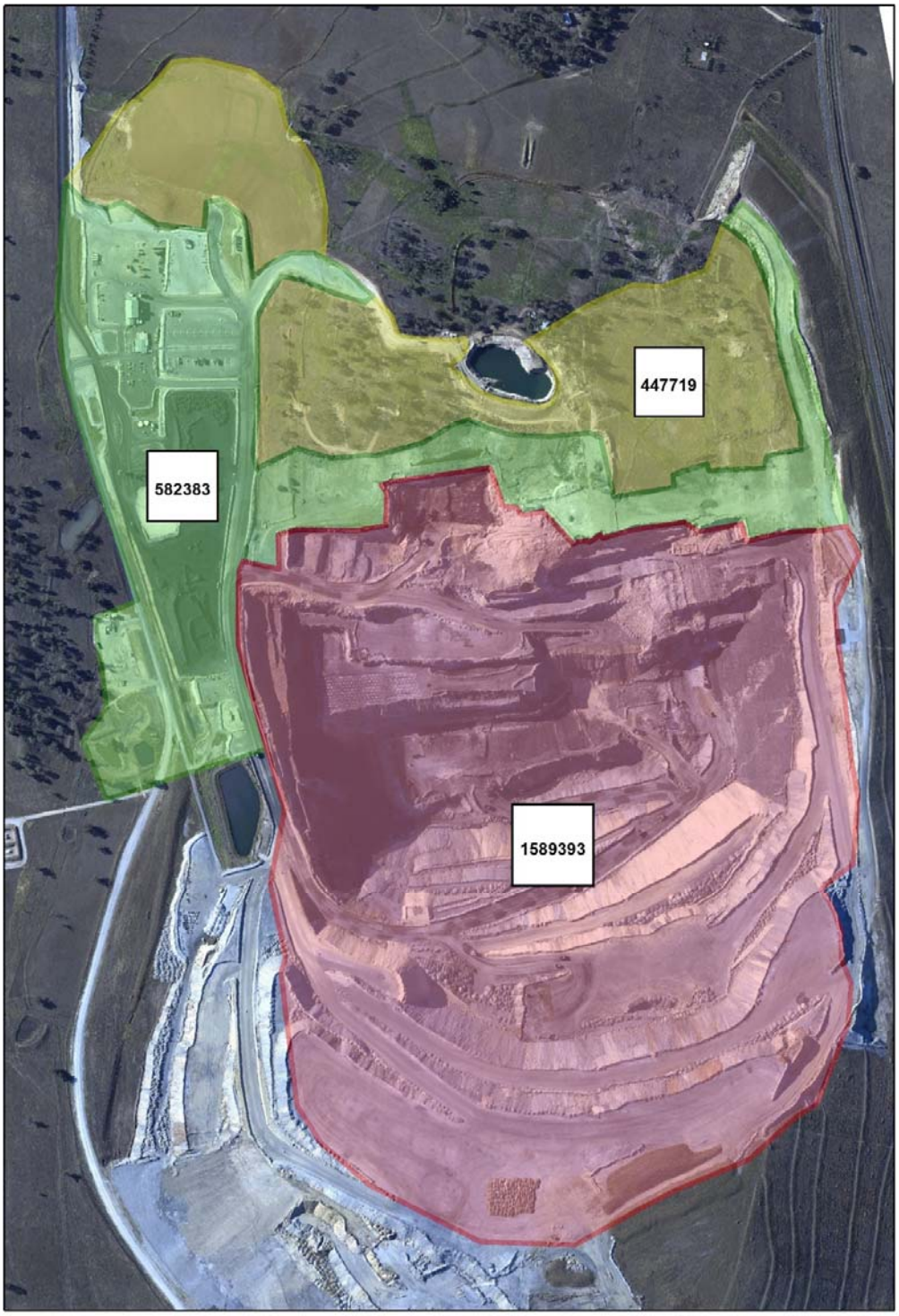


Figure 3 Catchment Areas in m^2.

3. PREDICTION OF GROUNDWATER INTERCEPTION

The total groundwater inflow for the monitoring period April 2014 to March 2015 was predicted from the hydrogeological model and is the contribution from the coal measures, the backfilled overburden and the Werrie Basalt. The predicted total groundwater inflow was predicted to be 86 ML (annual). This prediction was determined using the calibrated groundwater model developed for the assessment of impacts from the Life of Mine proposal.

The calculated groundwater flows from each groundwater component for the 2014-2015 period are tabulated in **Table 4**.

Table 4 Predicted Groundwater Inflow, Apr 2014 - Mar 2015 Monitoring Period

Description	Totals
Total groundwater inflow to void	86ML
Contribution of seepage from basalt (i.e. outside of basin)	56ML
Seepage from Coal Measures and workings	24ML
Seepage to void from overburden	6ML

Mining operations are now reaching the greatest depth of extraction and therefore the impacts to the basalt aquifer were expected to increase. This is reflected by the increase in groundwater inflow from the basalt aquifer of 35ML from the 2013-2014 modelled period to 56ML for the current period. Additionally, the contribution from the former mine workings has decreased, as extraction through the former workings progresses forward and the workings are increasingly depressurised. The model predicts that a change in storage occurred for the period, where water levels in the former workings were maintained by inflow (30ML) from the basalt aquifer. This volume is included in the total basalt aquifer contribution in **Table 4** as it was removed from the basalt aquifer, but has not been extracted from the pit.

4. VERIFICATION OF THE PREDICTED GROUNDWATER INTERCEPTION

The WBM was then run to check the predicted groundwater interception. Three groundwater inflow scenarios were modelled to determine the best fit against the WBM:

1. Groundwater inflow of 10 ML per year;
2. Groundwater inflow of 86 ML per year; and
3. Groundwater inflow of 300 ML per year.

Figure 4 to **Figure 6** present the volume of water in the void and the VWDs calculated from the WBM run between April 2014 and March 2015 versus site measurements. It has been estimated by WCCM that the reporting error for measurements may be as high as ± 10 ML per month. High and low bounds to the mine water measurements have been applied for comparison. Likewise, there is error associated with the modelling work of ± 10 ML per month which has also been applied to the model results.

Figure 4 Groundwater Inflow Scenario 1 (10ML per year) Measured Results vs WBM Results (ML)

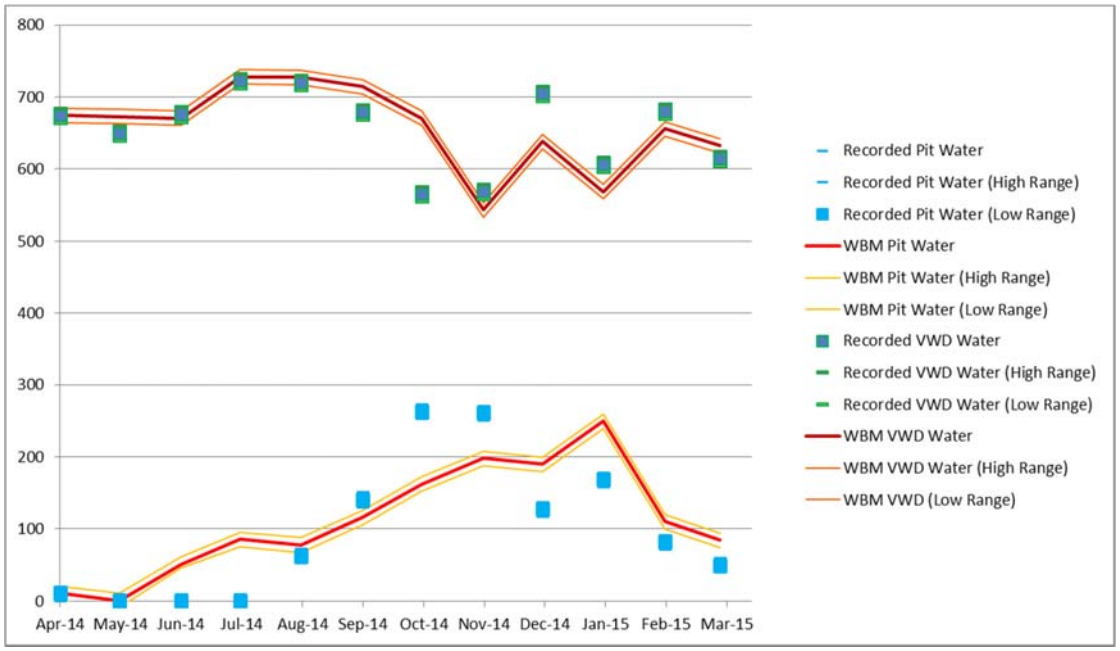


Figure 5 Groundwater Inflow Scenario 2 (86 ML per year) Measured Results vs WBM Results (ML)

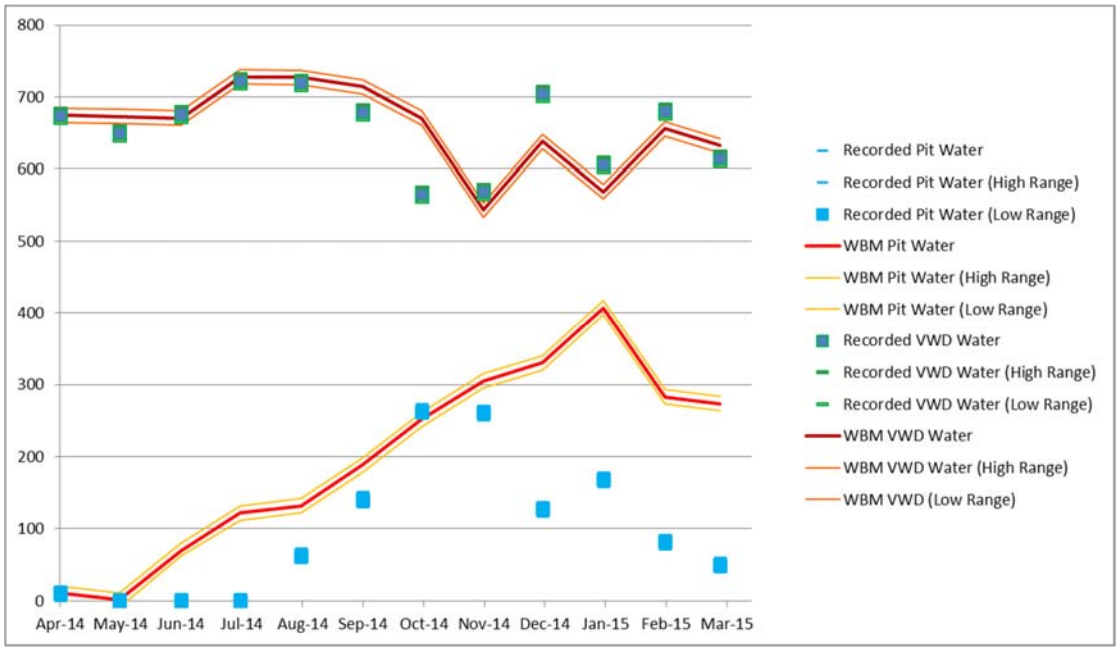


Figure 6 Groundwater Inflow Scenario 3 (300 ML per year) Measured Results vs WBM Results (ML)

Of the three scenarios modelled, Scenarios 1 and 2 appear to show the closest fit. For Scenario 1, 5 of the 12 recorded measurements are within the margin of error for the WBM predictions. There are 2 recorded measurements that are below the WBM line and 5 recorded measurements that are above the WBM line. By comparison, for Scenario 2, there are 2 recorded measurements that are above the WBM line and 6 recorded measurements that are below the WBM line. For Scenario 3, there are 9 recorded measurements that are below the WBM line and none that are above the WBM line.

The process of validating the groundwater model through the WBM has found a good correlation between the water balance and the predicted groundwater inflows when considering the water management of the site.

5. GROUNDWATER WELL MONITORING OBSERVATIONS

Groundwater wells monitored as part of the WCCM routine groundwater monitoring network are shown on **Figure 7**. Monitoring data is maintained in the WCCM database and is collected bimonthly. The trigger to identify impact to the groundwater table was based on a loss in saturated thickness in monitoring wells. However a number of the wells monitored are also used for groundwater extraction (stock and domestic or irrigation) as shown in **Table 5**.

Table 5 Monitoring wells used for extraction purpose, marked by *

Site	
Werrie Basalt Near WCC	MW1
	MW2*
	MW3
	MW4B
	MW5
	MW6
	MW27*
	MW36A
	MW36B
Werrie Basalt	MW8*
	MW10
	MW14
	MW17B*
	MW19A*
	MW20*
Quipolly Alluvium	MW7*
	MW12*
	MW13*
	MW13B*
	MW13D*
	MW15*
	MW16*
	MW17A*
	MW18A*
	MW21A*
	MW22A*
	MW22B*
	MW23A*
	MW23B*
	MW26*
	MW28A*
	MW32*

Due to extraction of groundwater lowering the water table, it is difficult to calculate impacts to saturated thickness that are occurring as a result of mine operations.

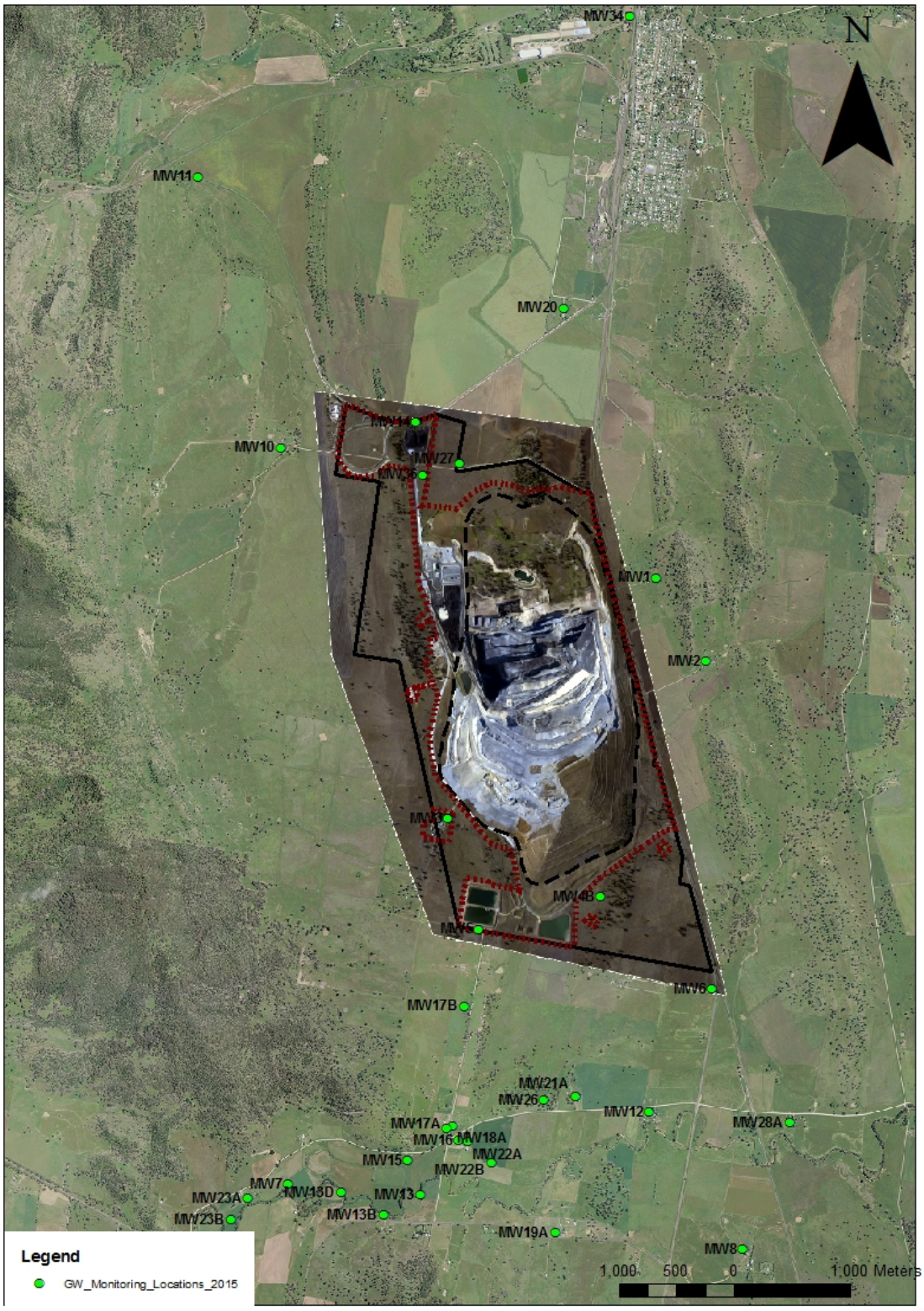


Figure 7 Groundwater Monitoring Program

A comparison of standing water level fluctuation compared to background wells was therefore undertaken using a cusum statistical analysis. This analysis compares trends in the water level movement to trends observed at a location that is considered remote from the mine and unaffected by mining operations. This approach enables an evaluation of trends in comparison to natural occurring trends.

Table 6 presents a summary of wells that were found to have trends varying from the background trends. Cusum analysis for all wells is attached in **Appendix 1**. Wells identified in **Table 6** include both monitoring and extraction wells. Comparison of the Basalt wells to the background well, MW8, is shown in **Figure 8**.

Table 6 Groundwater level variation in comparison to trigger levels

Aquifer	Location
Basalt	
MW1	Hillview
MW2	Railway View
MW6	Plain View
MW27	Cintra North Paddock
Quipolly Alluvium	
MW12	Hazeldene Bore
MW21A	Ryans Windmill

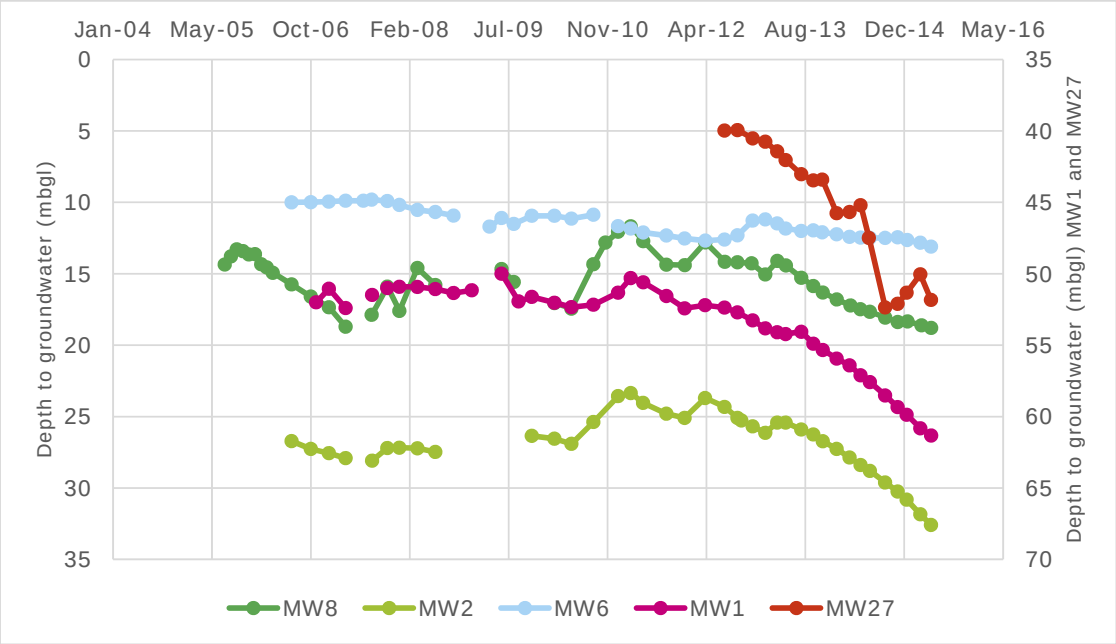


Figure 8 Comparison of water level trends at select Werrie Basalt wells.

Figure 8 shows that the background well observations are consistent with MW1 and MW2 with both showing a steadily declining trend. The cusum exceedance of MW8 indicates that it is experiencing a trend that is not consistent with the background trend at this location. As this well is remote from the site, and therefore not impacted by the site, the deviation from historical measurements is considered attributed to rainfall conditions, i.e. drought. A similar trend is observed at MW1 and MW2. MW27 shows a magnified declining trend with a more rapid rate of decrease. This is likely due to the use of the well for extraction purpose. The two rebound points observed in March 2014 and September 2014 are likely related to cessation of pumping and aquifer rebound. MW27 shows the effects of low rainfall level and extraction pumping.

Impacts from mining operations may also attribute to the declining trend however the validated groundwater model predicts that groundwater drawdown in the Werrie Basalt is limited to within the mining footprint as shown in **Figure 9.** Drawdown outside of seasonable variation is not

predicted to occur outside of the site boundary. In summary, the model predicts that no impacts from mining should occur to bores outside of the site boundary.

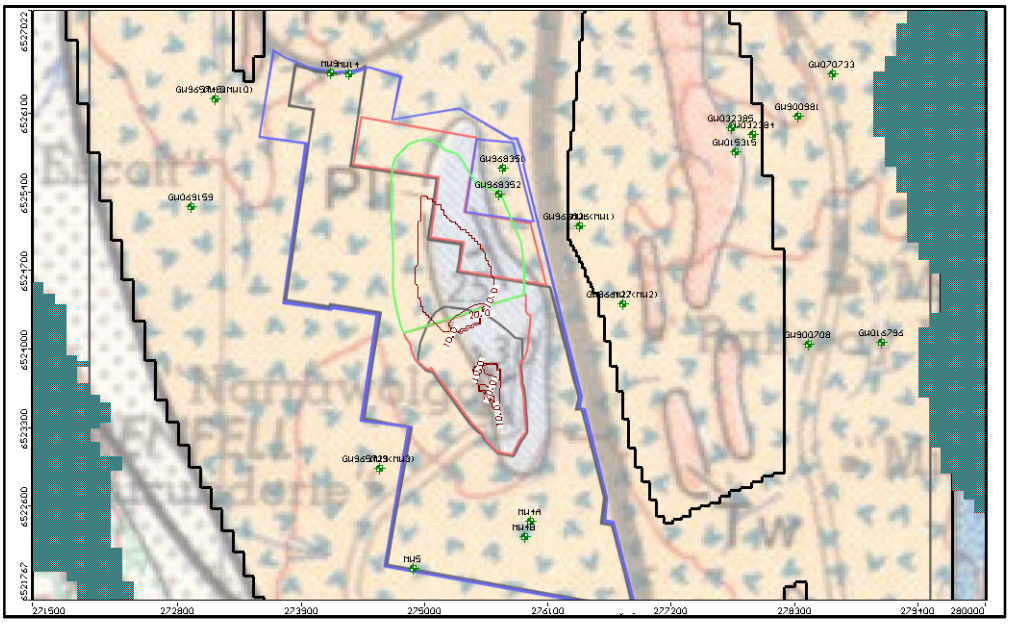


Figure 9 Predicted drawdown in the Werrie Basalt.

Figure 10 provides a comparison of MW12 and MW21a to the background bore MW28, which is considered to be upgradient and outside any potential mine related influence. All wells show a similar decline in the water table since November 2010 but more notable since August 2013. All wells are used for extraction purpose. The consistent decline in groundwater levels when compared to MW28 indicates that the decline is attributed to other factors, such as decreased rainfall.

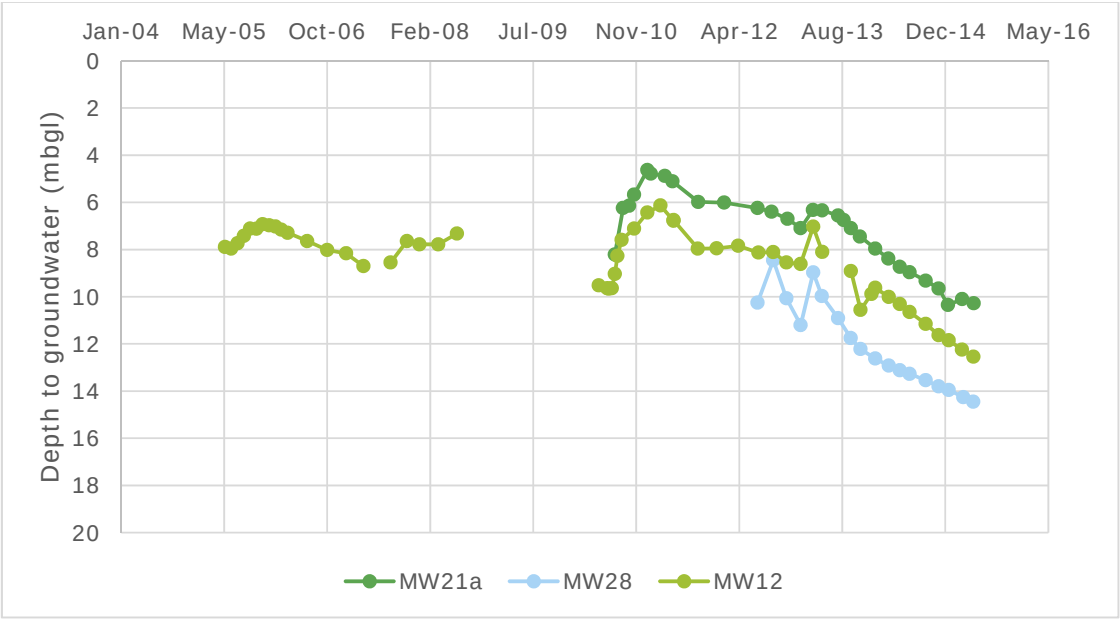


Figure 10 Comparison of water level trends at select Quipolly Creek wells.

Further evidence that the decline in groundwater levels is attributed to conditions outside of mining is shown by reviewing wells MW7 and MW13. Wells MW7 and MW13 are located in stretches of Quipolly Creek that are known to be spring fed and therefore have more consistent water levels. This is evident in the water level monitoring as depicted in **Figure 11**. If the mine was impacting on the Werrie Basalt baseflow contribution to the Quipolly Aquifer, this would be observed at the basalt fed springs near MW7 and MW13. The sharp fluctuations observed at

these locations is due to pumping of the wells. MW12 and MW21a have been included in **Figure 11** to highlight the differences in drawdown between the spring fed wells, and alluvium fed wells. It is also important to note that wells MW7 and MW13 would also be affected by alluvial flows to some extent.

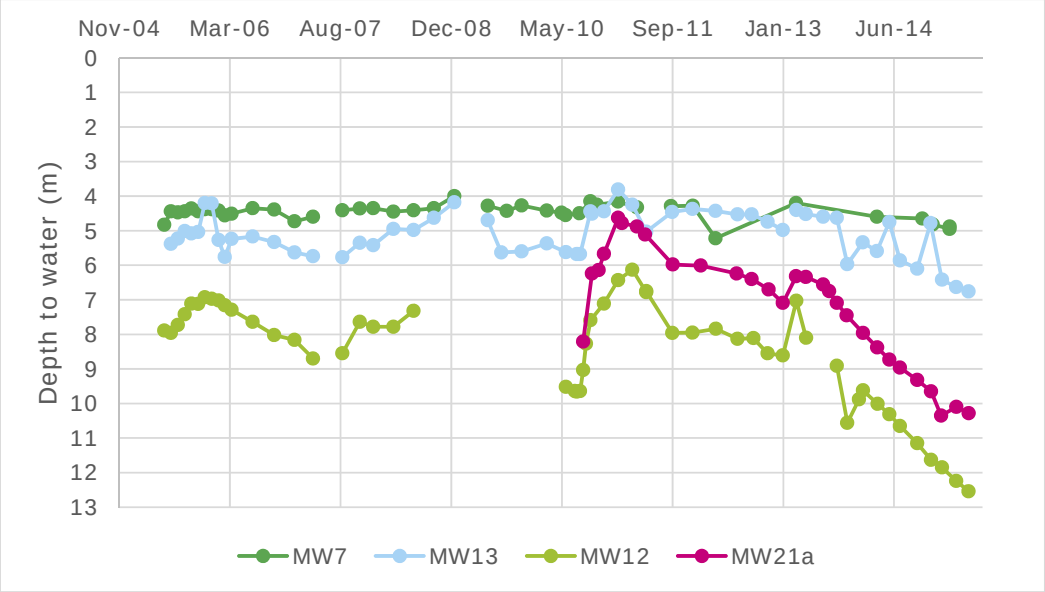


Figure 11 Water Level Fluctuation at MW7 and MW13

6. FURTHER DATA COLLECTION

Data loggers were installed in the following monitoring wells, Werrie Basalt MW1, MW6; and Quipolly Alluvium MW13, MW28 and MW26. The data loggers were to assess the response in both the aquifer systems to rainfall and to provide further evaluation of groundwater level trends. Data logger output is contained in **Appendix 2**.

Data loggers show a steadily declining trend throughout the monitored period and are consistent with observations across the project wide monitoring network. MW1 and MW6 in the Werrie Basalt show no response to rainfall and this would be expected for the deeper basalt aquifer. Further, these wells show no drawdown due to pumping (both wells are for monitoring purpose). Wells MW13 and MW26 show declining water levels and the effects of aquifer pumping shown by the 'shadow' of data points beneath the dominant line. Neither well shows a direct response to rainfall. MW28, also situated in the alluvium shows a slight response to rainfall during the December 2014 rainfall period, though overall a steadily declining trend. No pumping is evident.

A data logger was also installed in MW36 which is a new monitoring well installed north of the operation and within the Werrie Basalt. This well showed both a decreasing and increasing trend during the period.

Wells situated within the Quipolly Creek alluvium are highly rainfall dependent and likely dependent on stream flow to recharge the alluvium aquifer. Quipolly Creek has not run through the monitoring period due to insufficient rainfall.

7. CONCLUSIONS AND RECOMMENDATIONS

In accordance with the Annual Review requirement of the Project Approval an evaluation of inflow volumes to the mine void has been completed. This calculation has been undertaken by initially predicting the groundwater inflows using a calibrated model and then verifying the predictions by undertaking a water balance for the mine pit over a discrete period. The WBM found that the hydrogeological model was providing a good correlation with the WBM when considering the water management at the site.

This process has further validated the groundwater model developed for the LOM project, which was refined in 2012. At the time of the LOM impact assessment, this model benefitted from real time calibration data recorded during the initial mining scenarios and was therefore considered to be a robust representation of the groundwater system. Minor modification of the boundary conditions adopted in the model was undertaken in 2012 following changes to the management of groundwater within the former mine workings. On the basis of the WBM validation the predictions of impacts to the groundwater levels in the basalt aquifer are considered to remain valid.

Evaluation of groundwater levels in monitored wells was completed to assess if declining water levels are attributed to mining operations. Declining water levels are not considered to be attributed to the mining operations on the basis that:

- The hydrogeological model has been further validated and therefore the model prediction of drawdown in the Werrie Basalt similarly remains valid. The model predicted groundwater drawdown was restricted to within the mine lease area;
- Comparison of declining water levels to a background monitoring well in both the Werrie Basalt and the Quipolly Alluvium show comparable declining trends. This indicates that the decline in the water table is observed at locations remote from the site. Further, the background monitoring well MW8 was found to be declining outside background conditions suggesting abnormal conditions, for example a drought.
- Comparison of basalt spring fed wells in the Quipolly Alluvium has not identified a declining trend and indicates that the contribution from the Werrie Basalt remains consistent at these locations. If mine impacts were occurring to the Werrie Basalt a decline outside seasonable variation would be expected at these locations.

8. REFERENCES

RW Corkery & Co. Pty Ltd, 'Environmental Assessment for Werris Creek Coal Mine, Life of Mine Project', December 2010.

Bureau of Meteorology (http://www.bom.gov.au): Quirindi Post Office

9. LIMITATIONS

ENVIRON Australia Pty Ltd prepared this report in accordance with the scope of work as outlined in our proposal to Werris Creek Coal Pty Ltd in accordance with our understanding and interpretation of current regulatory standards.

Site conditions may change over time. This report is based on conditions encountered at the site at the time of the report and ENVIRON disclaims responsibility for any changes that may have occurred after this time.

The conclusions presented in this report represent ENVIRON's professional judgment based on information made available during the course of this assignment and are true and correct to the best of ENVIRON Australia Pty Ltd's knowledge as at the date of the assessment.

ENVIRON Australia Pty Ltd's did not independently verify all of the written or oral information provided to ENVIRON Australia Pty Ltd during the course of this investigation. While ENVIRON Australia Pty Ltd has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to ENVIRON Australia Pty Ltd was itself complete and accurate.

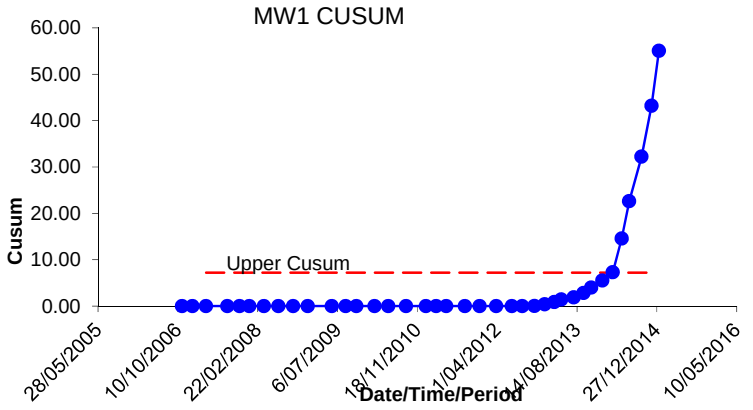
This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

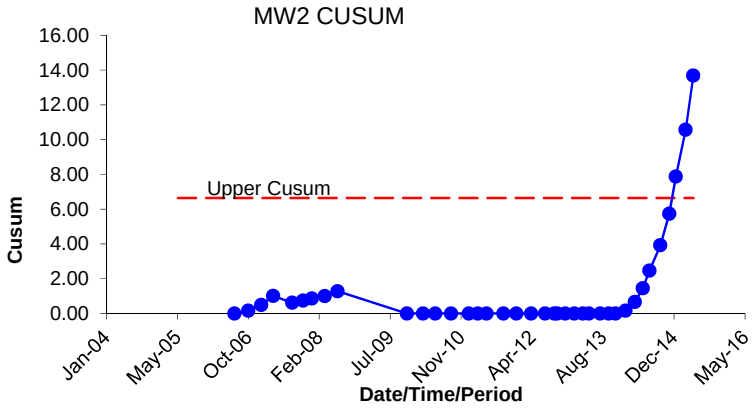
9.1 User Reliance

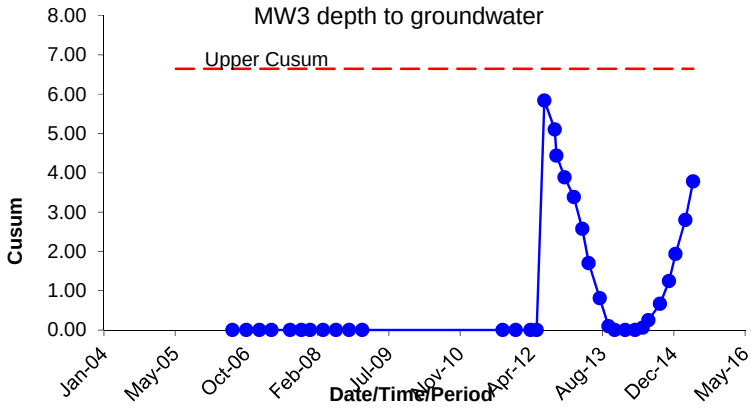
This report has been prepared exclusively for Werris Creek Coal Pty Ltd and may not be relied upon by any other person or entity without ENVIRON Australia Pty Ltd's express written permission.

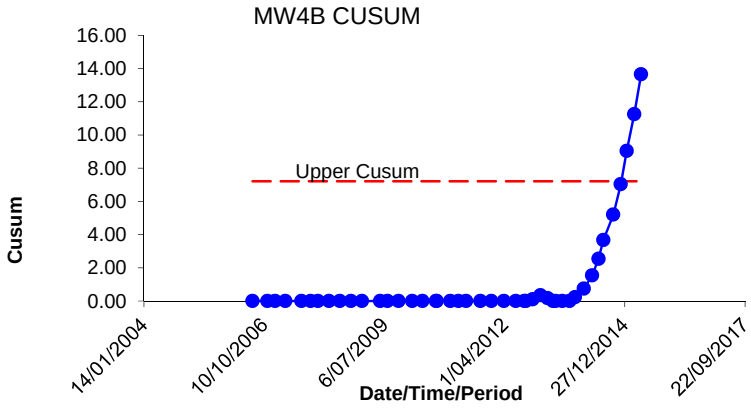
APPENDIX 1
CUSUM ANALYSIS

Cusum Analysis Werris Basalt
Monitoring Wells





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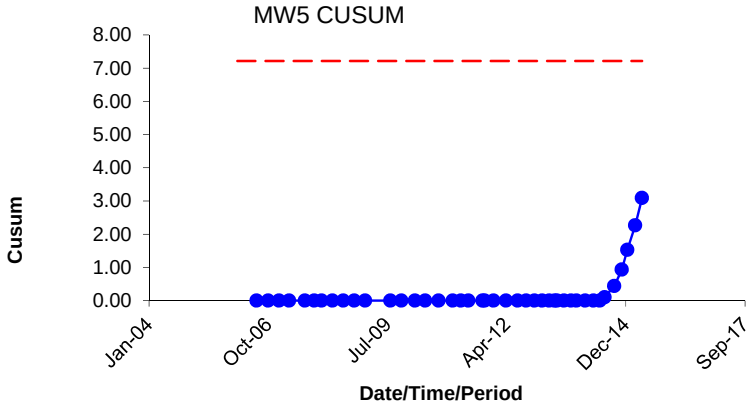
22/09/2017
Date/Time/Period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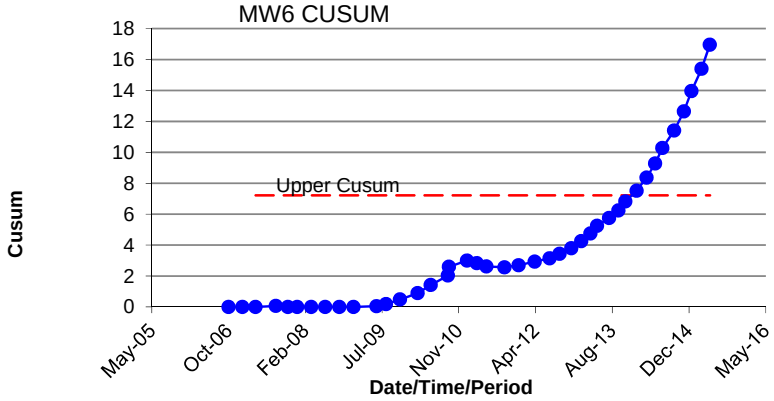
Sep-17
Date/Time/Period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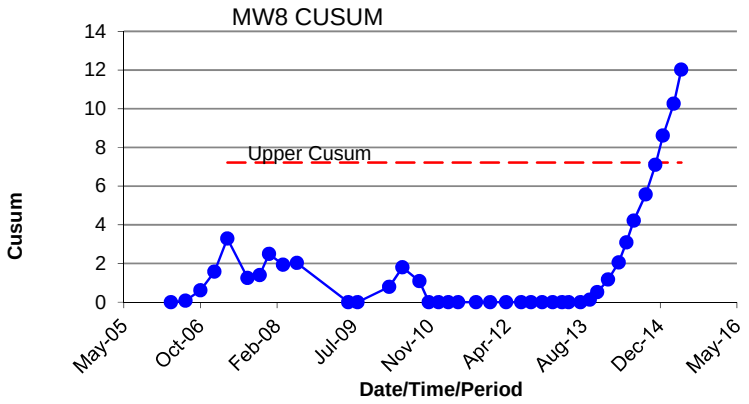
Date/Time/Period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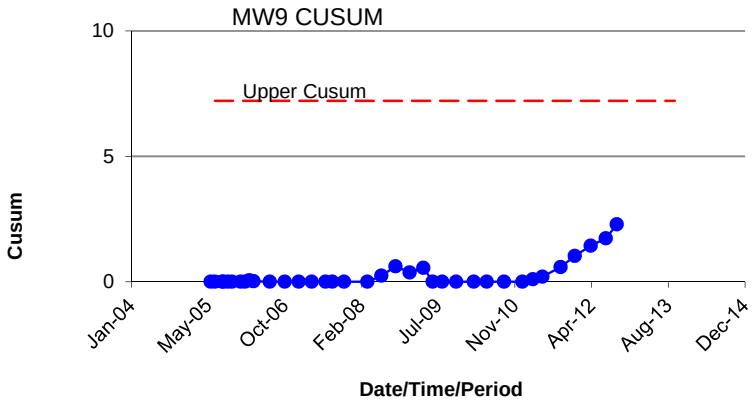
May-16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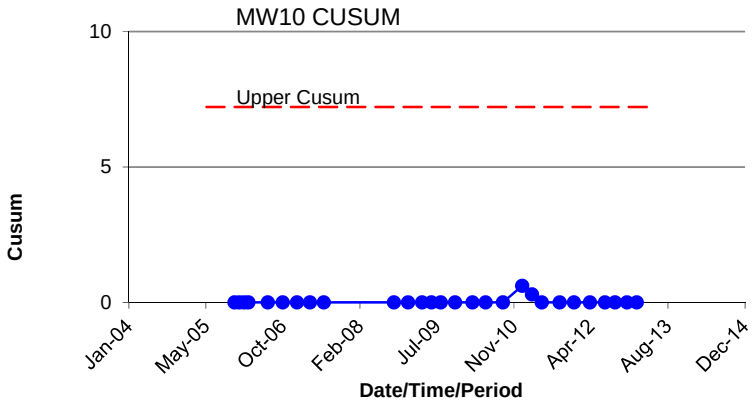
Aug-13
Dec-14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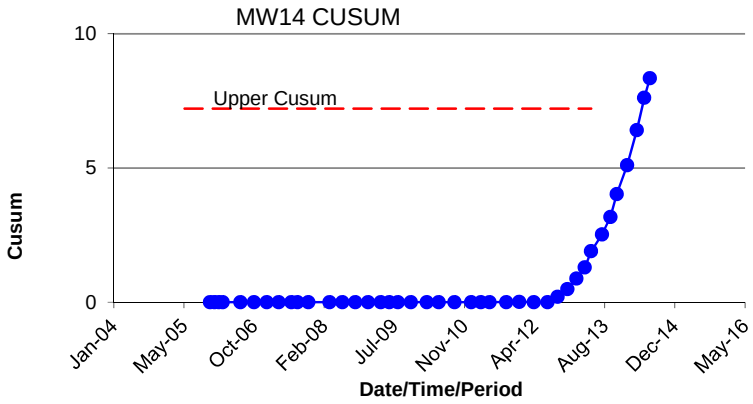
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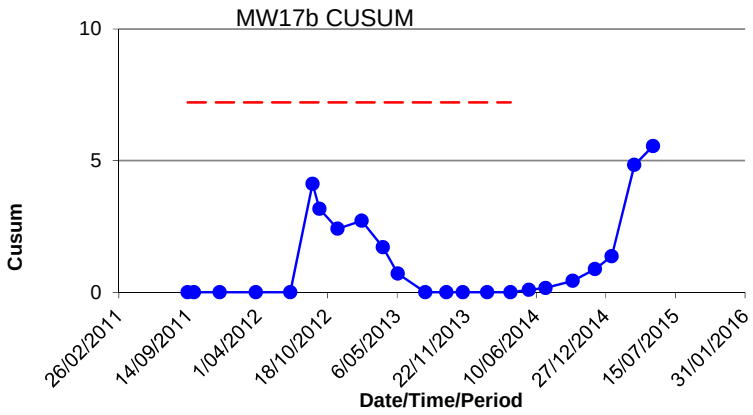
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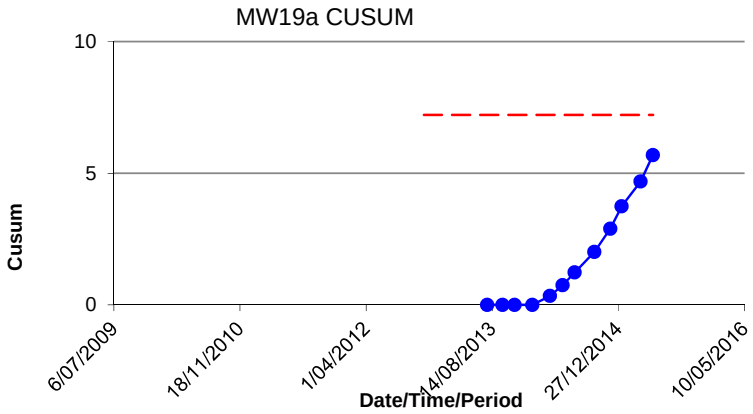
31/01/2016
Date/Time/Period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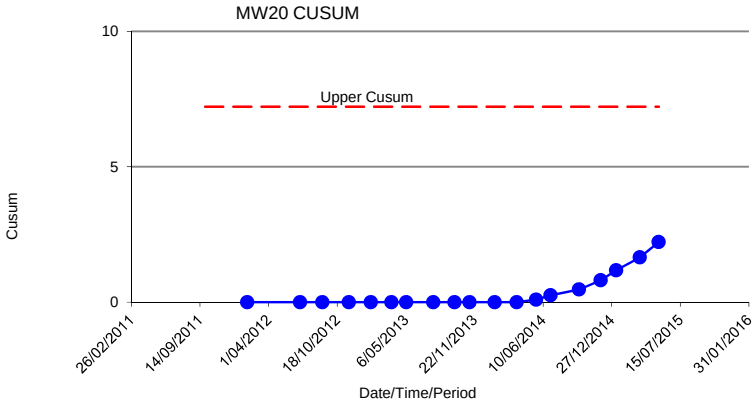
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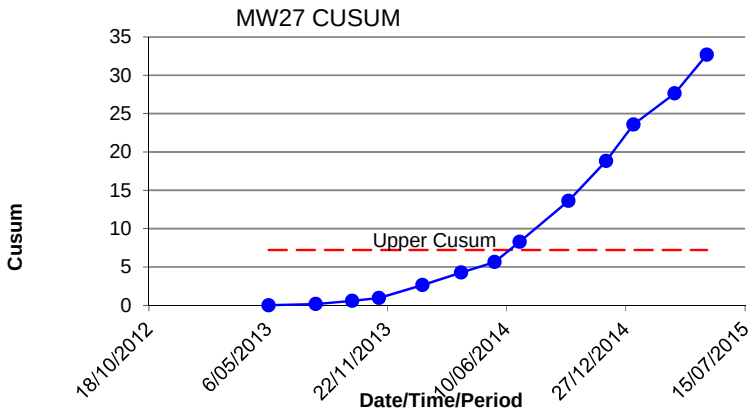
Date/Time/Period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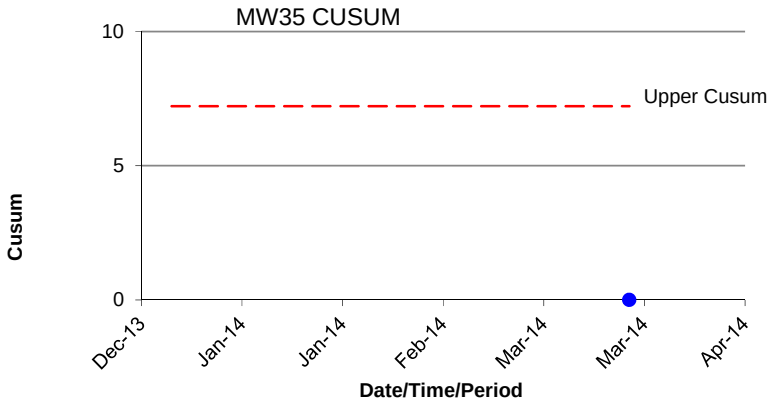
Date/Time/Period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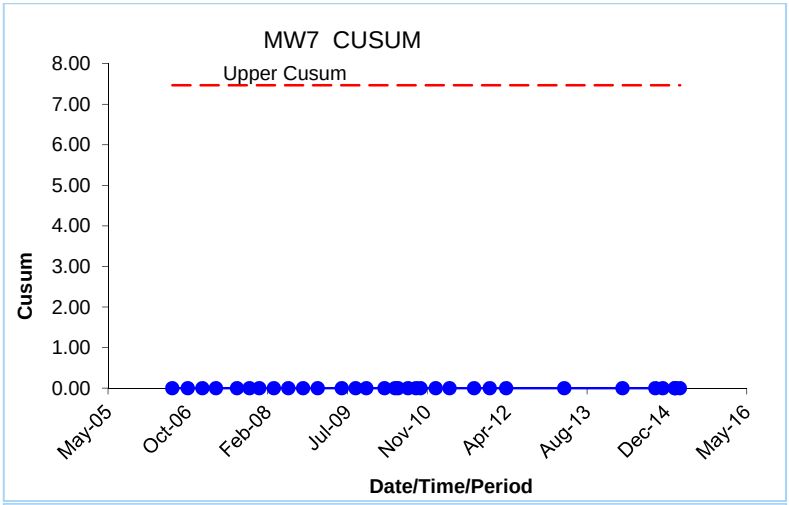
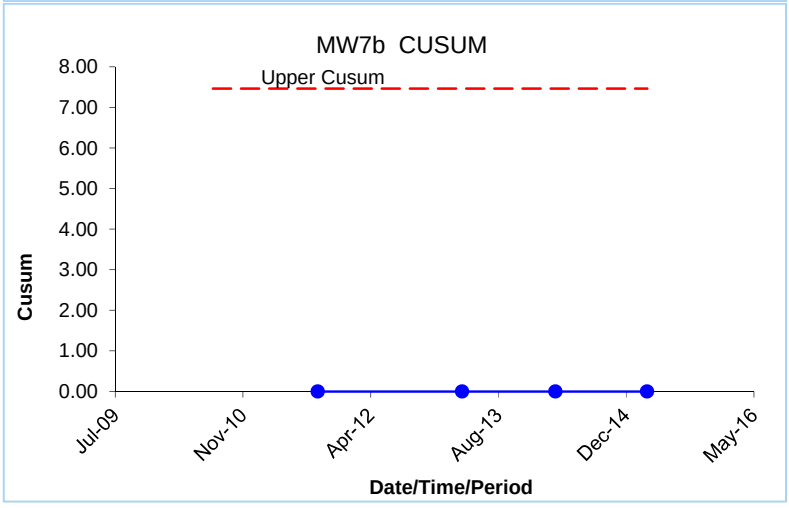
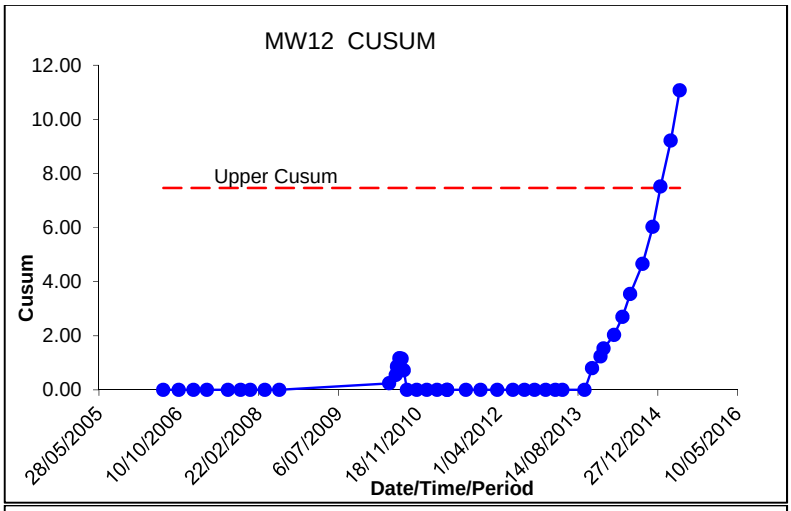
Date/Time/Period

Cusum Analysis Quipolly Creek
Monitoring Wells



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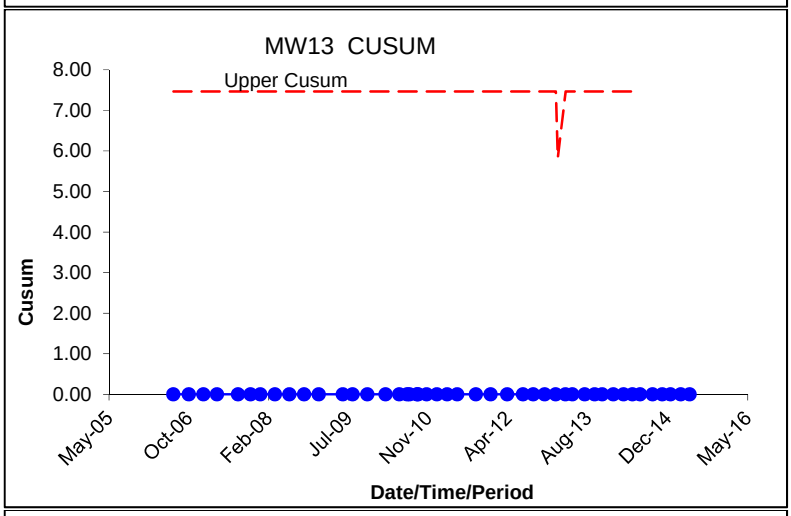
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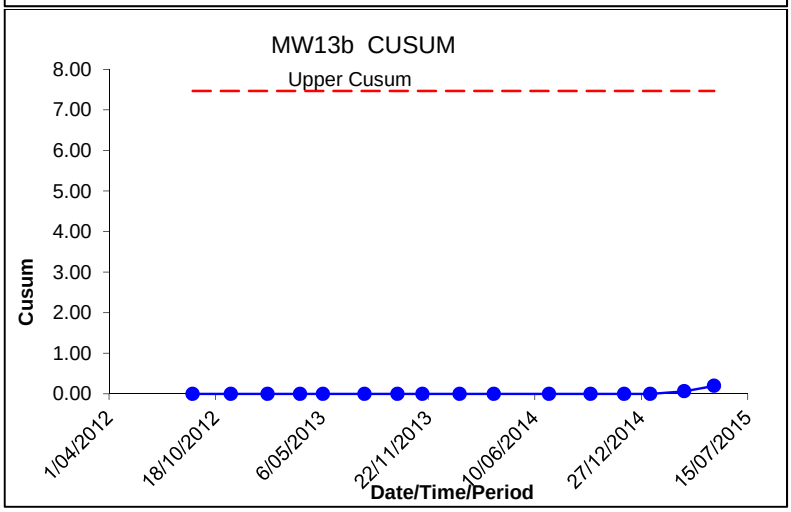
Date/Time/Period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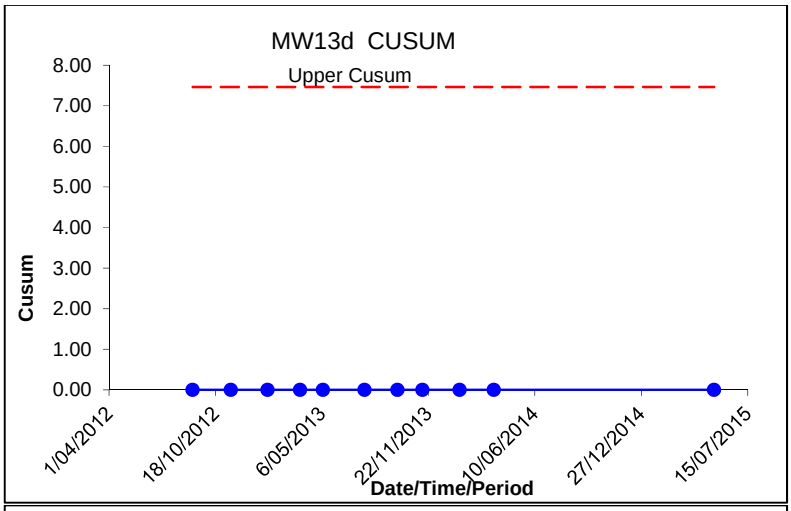
15/07/2015
Date/Time/Period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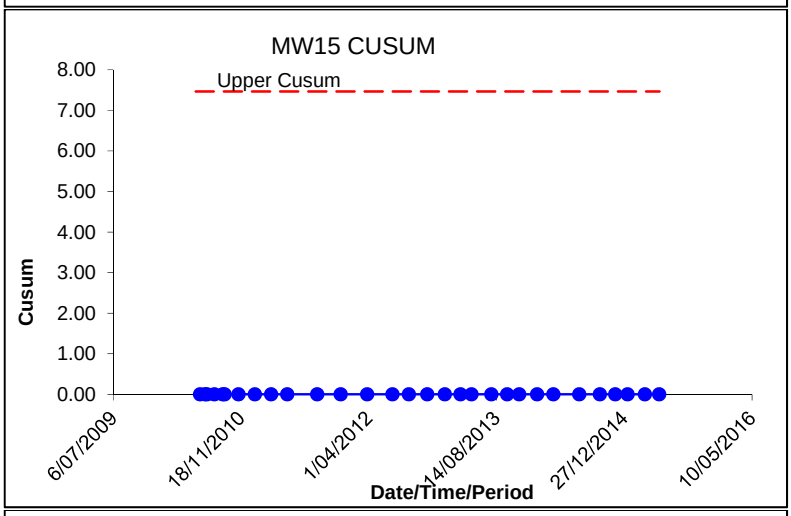
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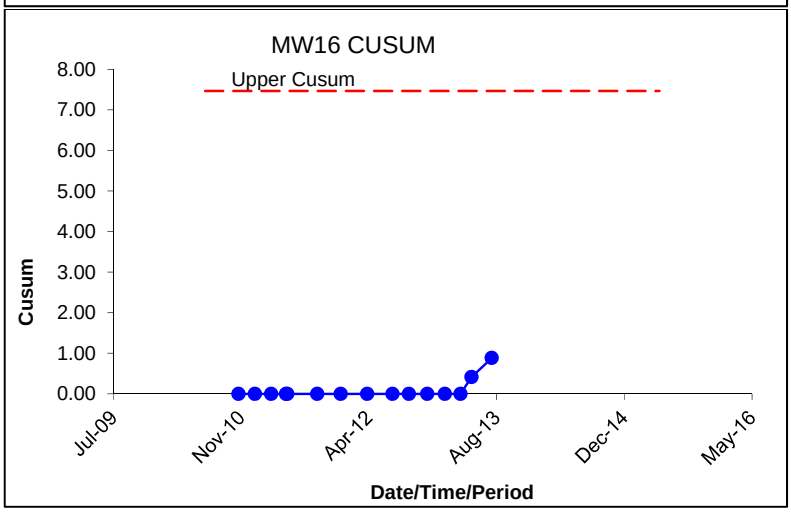
Date/Time/Period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Apr-12
Aug-13
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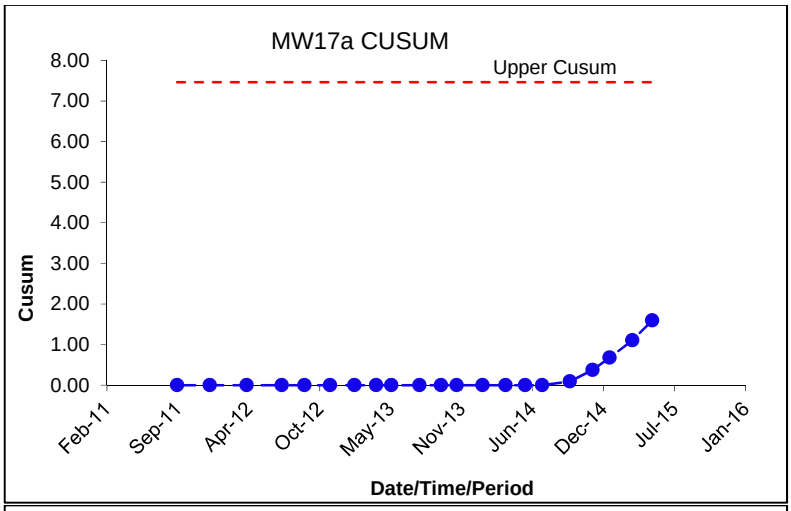
May-16
Date/Time/Period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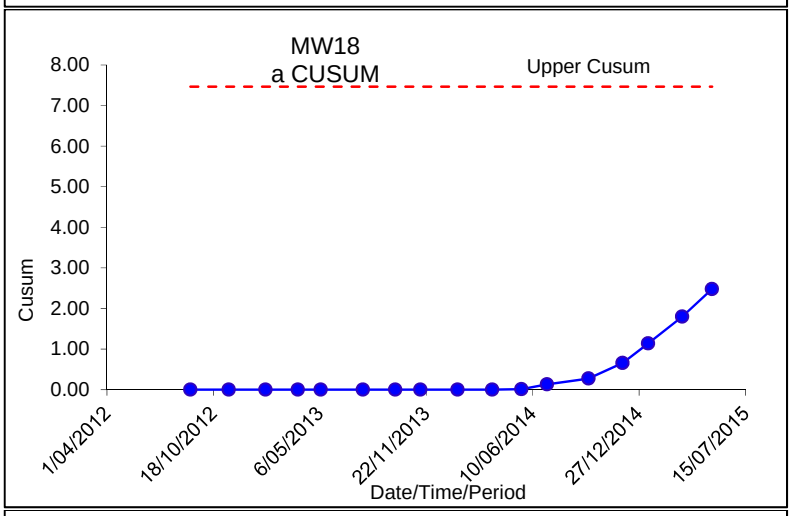
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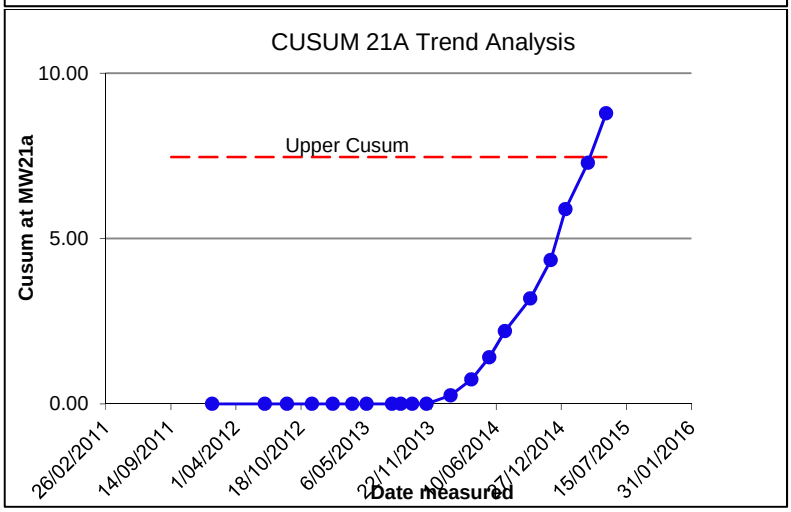
Date/Time/Period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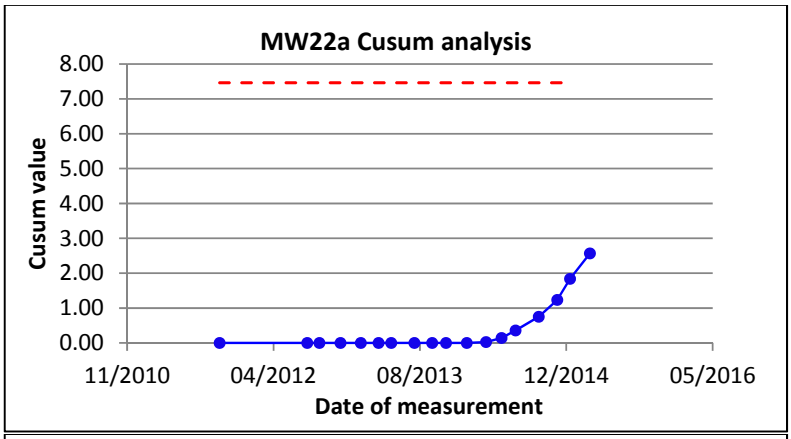
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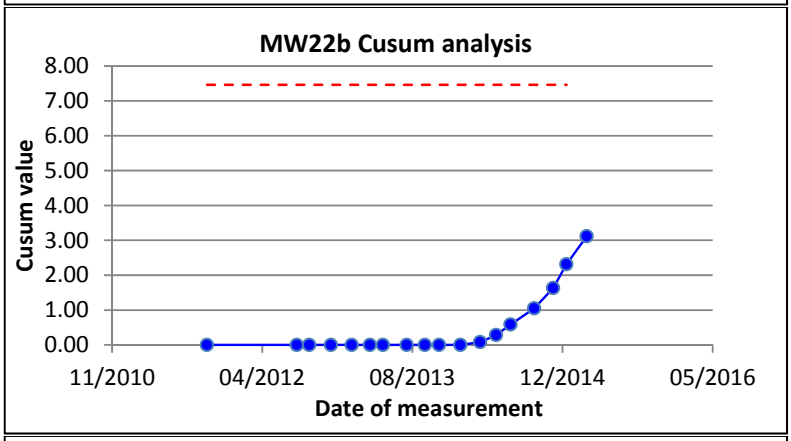
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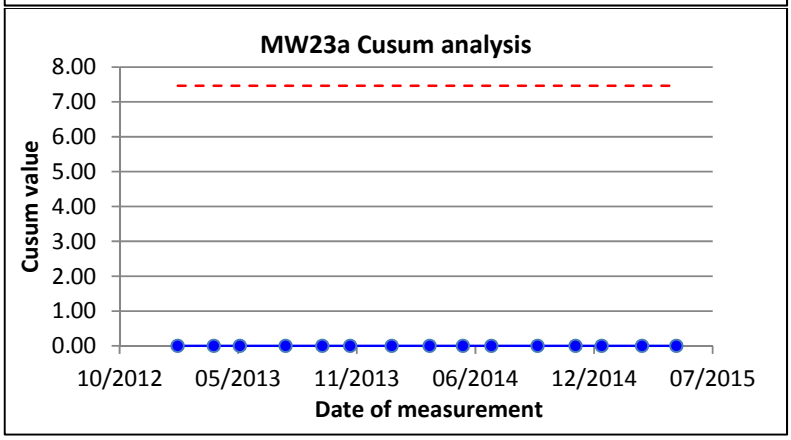
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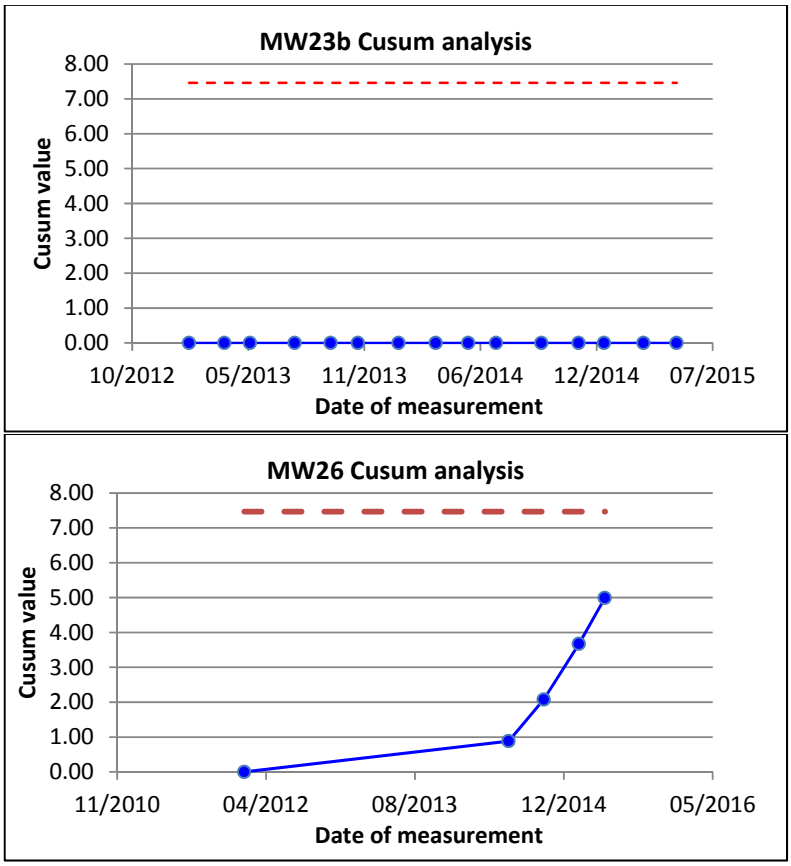
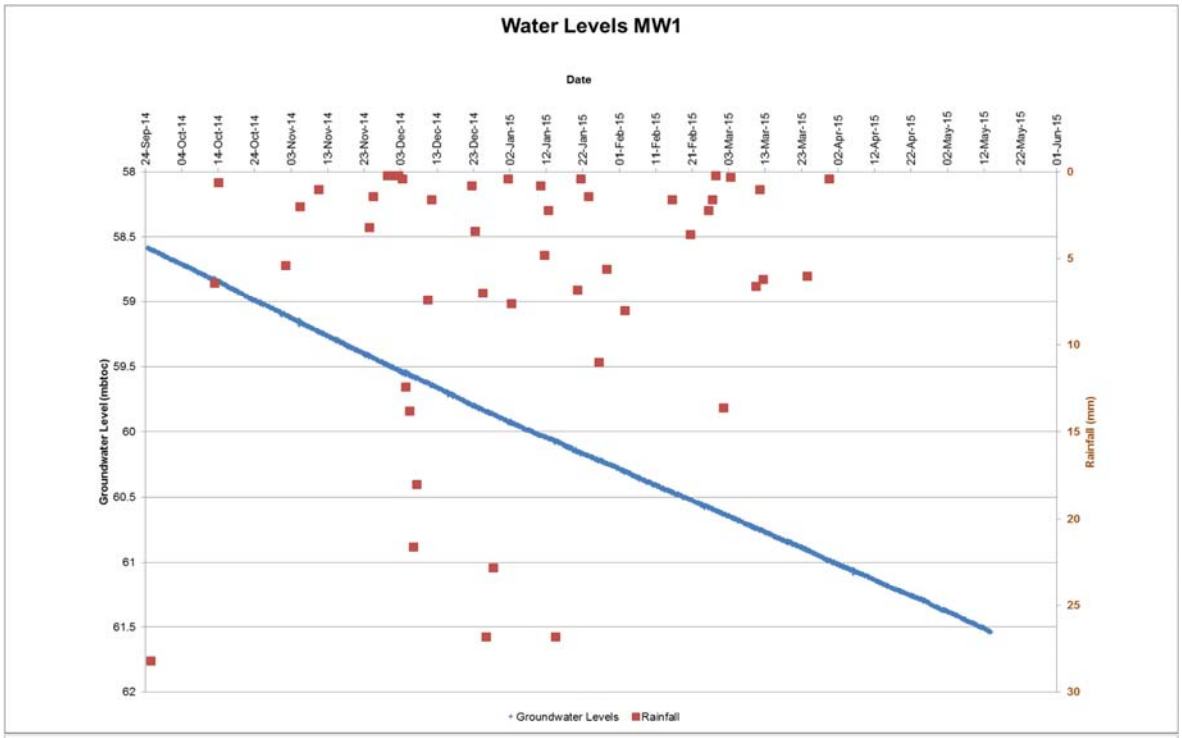
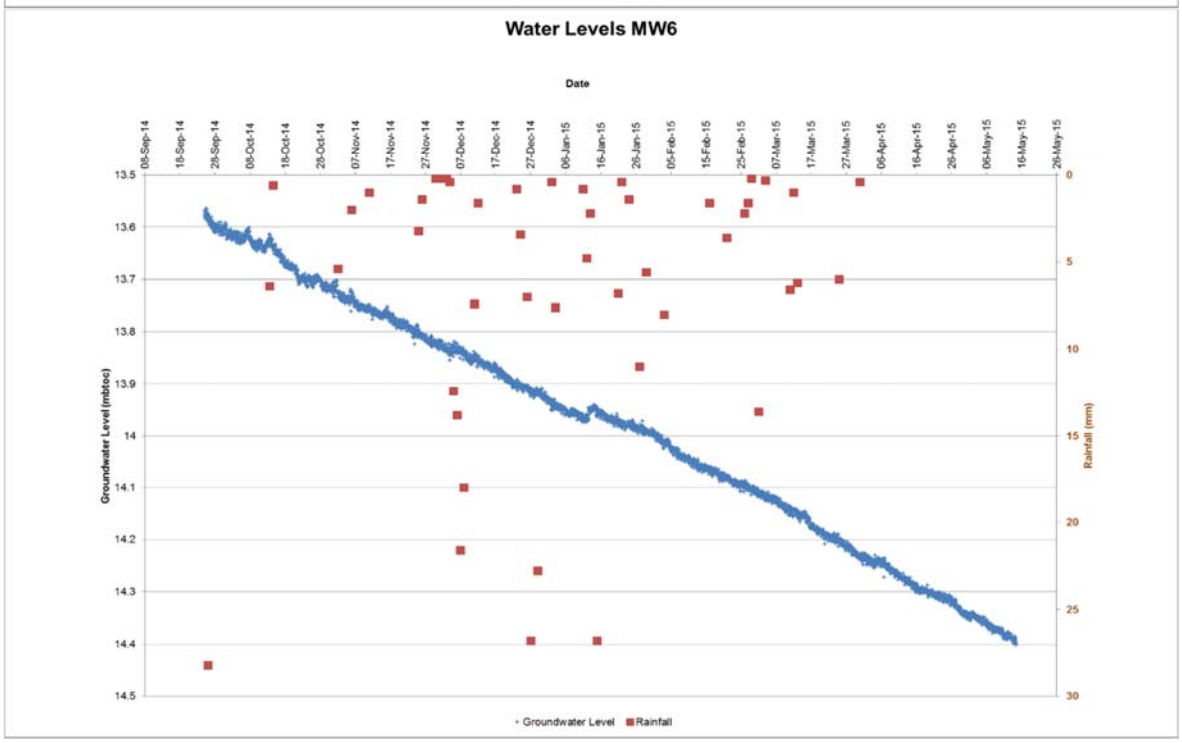
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
10/2012
05/2013
11/2013
06/2014
12/2014
07/2015
Date of measurement


MW23b Cusum analysis
Cusum value
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
10/2012
05/2013
11/2013
06/2014
12/2014
07/2015
Date of measurement

MW26 Cusum analysis
Cusum value
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
11/2010
04/2012
08/2013
12/2014
05/2016
Date of measurement

APPENDIX 2
WATER LEVEL LOGGER DATA


Water Levels MW1
Date
24-Sep-14
04-Oct-14
14-Oct-14
24-Oct-14
03-Nov-14
13-Nov-14
23-Nov-14
03-Dec-14
13-Dec-14
23-Dec-14
02-Jan-15
12-Jan-15
22-Jan-15
01-Feb-15
11-Feb-15
21-Feb-15
03-Mar-15
13-Mar-15
23-Mar-15
02-Apr-15
12-Apr-15
22-Apr-15
02-May-15
12-May-15
22-May-15
01-Jun-15
Groundwater Level (mbtoc)
58
58.5
59
59.5
60
60.5
61
61.5
62
Rainfall (mm)
0
5
10
15
20
25
30
Groundwater Levels
Rainfall


Water Levels MW6
Date
05-Sep-14
16-Sep-14
26-Sep-14
06-Oct-14
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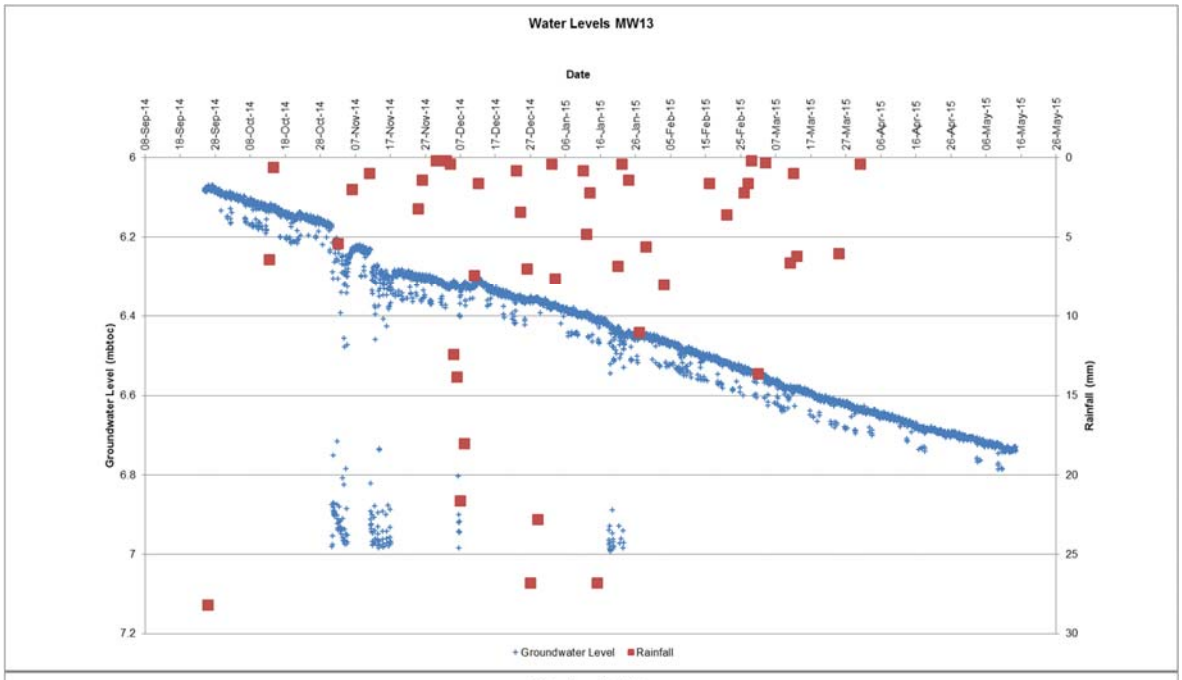
26-Oct-14
07-Nov-14
17-Nov-14
27-Nov-14
07-Dec-14
17-Dec-14
27-Dec-14
05-Jan-15
16-Jan-15
26-Jan-15
05-Feb-15
15-Feb-15
25-Feb-15
07-Mar-15
17-Mar-15
27-Mar-15
06-Apr-15
16-Apr-15
26-Apr-15
06-May-15
16-May-15
26-May-15
Groundwater Level (mbtoc)
13.5
13.6
13.7
13.8
13.9
14
14.1
14.2
14.3
14.4
14.5
Rainfall (mm)
0
5
10
15
20
25
30
Groundwater Level
Rainfall


Water Levels MW13
Date
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18-Sep-14
28-Sep-14
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18-Oct-14
28-Oct-14
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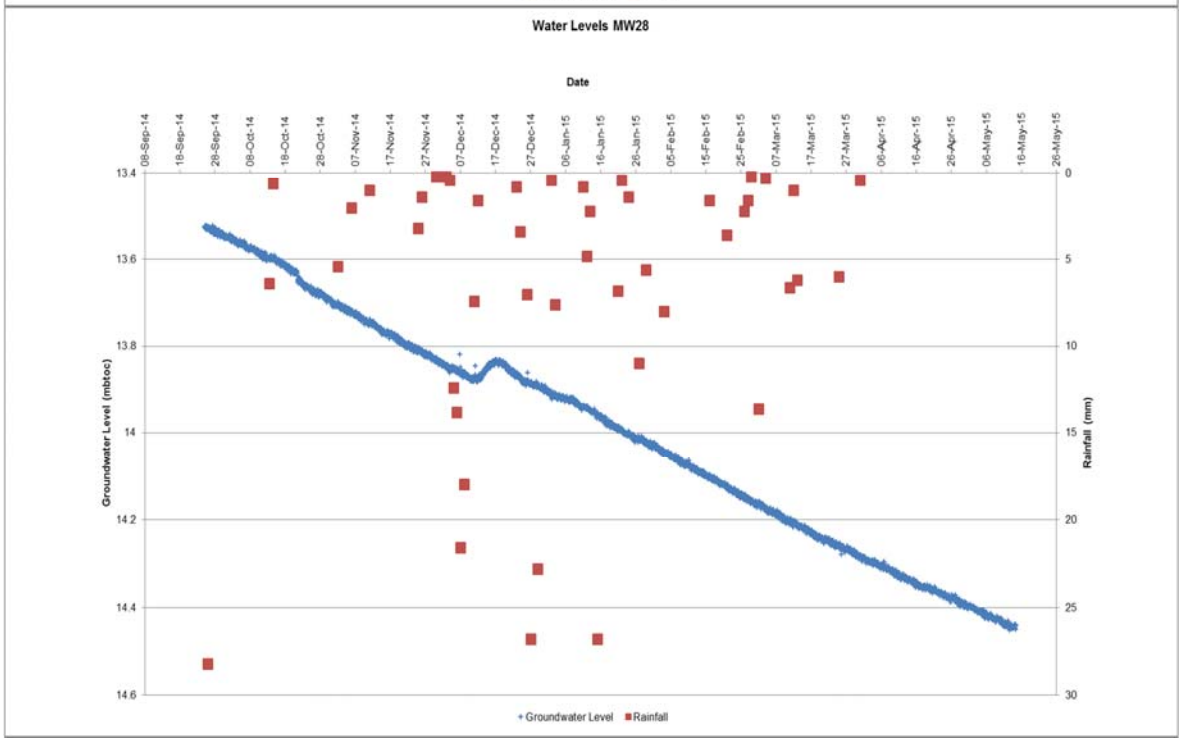
27-Nov-14
07-Dec-14
17-Dec-14
27-Dec-14
06-Jan-15
16-Jan-15
26-Jan-15
05-Feb-15
15-Feb-15
25-Feb-15
07-Mar-15
17-Mar-15
27-Mar-15
06-Apr-15
16-Apr-15
26-Apr-15
06-May-15
16-May-15
26-May-15
Groundwater Level (mbtoc)
6
6.2
6.4
6.6
6.8
7
7.2
Rainfall (mm)
0
5
10
15
20
25
30
Groundwater Level
Rainfall


Water Levels MW28
Date
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18-Sep-14
28-Sep-14
08-Oct-14
18-Oct-14
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27-Nov-14
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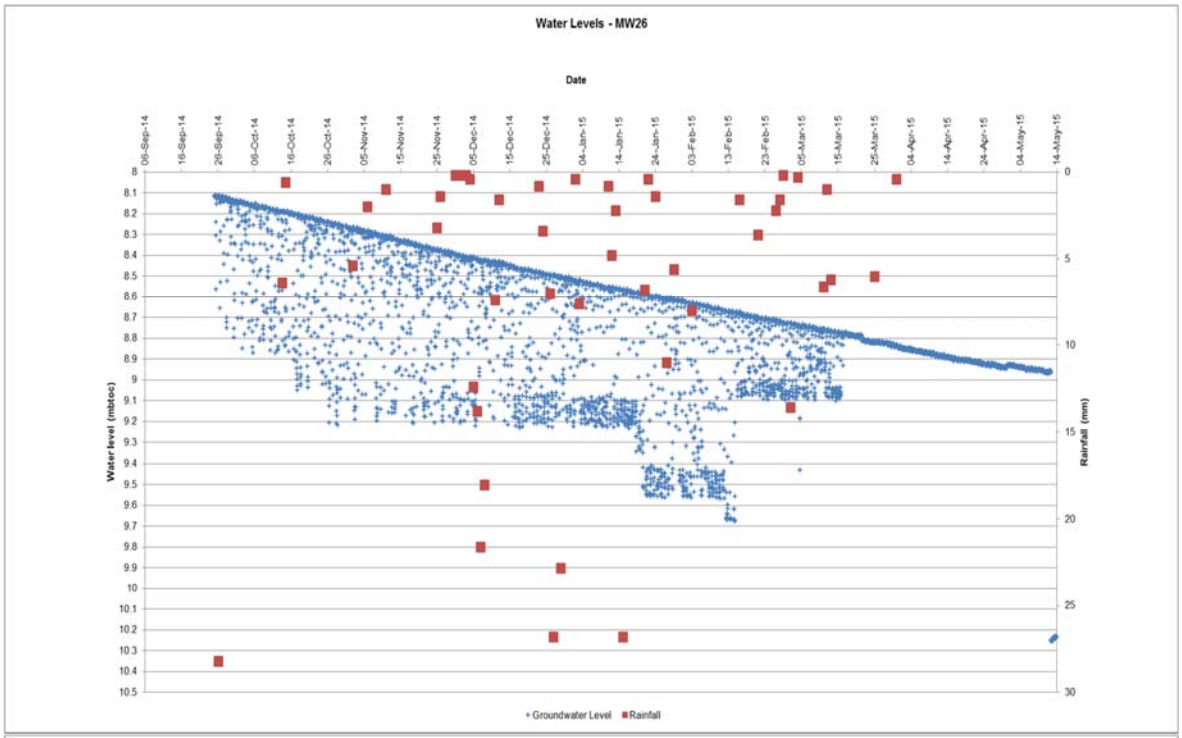
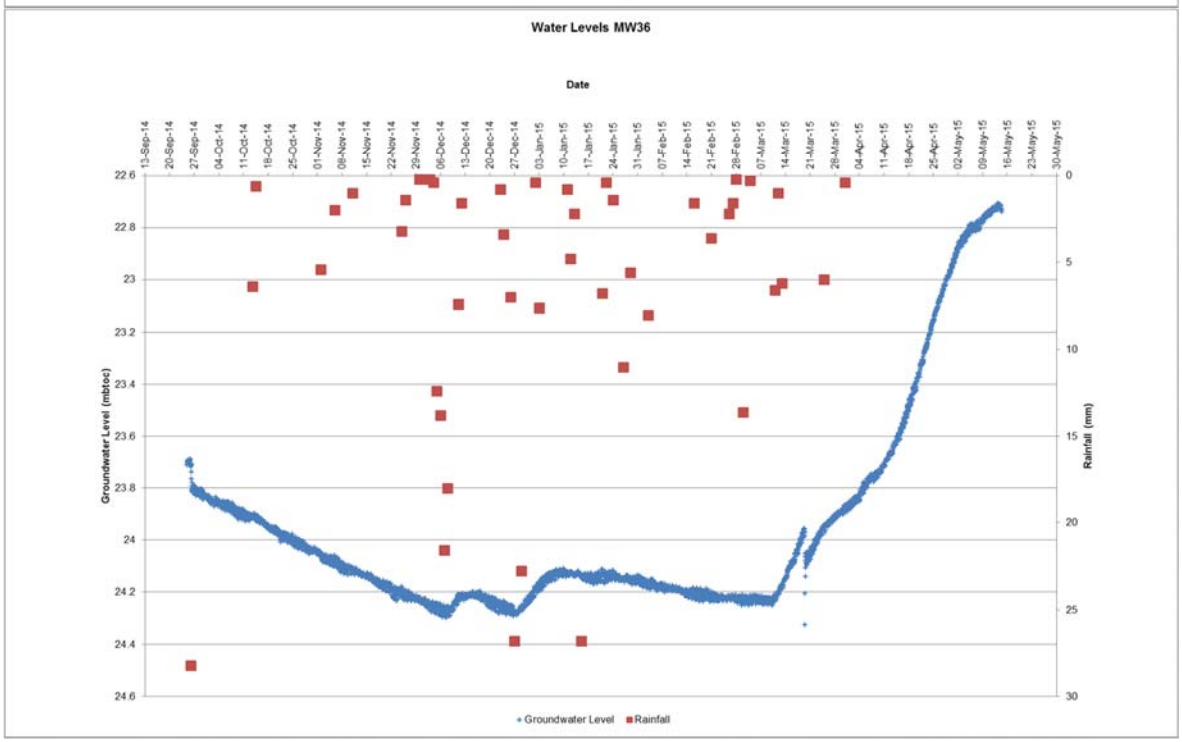
17-Dec-14
27-Dec-14
06-Jan-15
16-Jan-15
26-Jan-15
05-Feb-15
15-Feb-15
25-Feb-15
07-Mar-15
17-Mar-15
27-Mar-15
06-Apr-15
16-Apr-15
26-Apr-15
06-May-15
16-May-15
26-May-15
Groundwater Level (mbtoc)
13.4
13.6
13.8
14
14.2
14.4
14.6
Rainfall (mm)
0
5
10
15
20
25
30
Groundwater Level
Rainfall


Water Levels - MW26
Date
Water level (mbtoc)
Rainfall (mm)
Groundwater Level
Rainfall


Water Levels MW36
Date
Groundwater Level (mbtoc)
Rainfall (mm)
Groundwater Level
Rainfall

Mitchel Hanlon
Consulting Pty Ltd

17th April 2015

Our Ref: **15030**
Your Ref: **TBA**

Whitehaven Coal Limited
1435 Werris Creek Road
PO Box 125,
Werris Creek NSW 2341

Dear Andrew,

RE: Validation Assessment – Stockpiled Contaminated Material
Client: Whitehaven Werris Creek Coal
Location: 1435 Werris Creek Road, Werris Creek, NSW, 2341
Land: Lot 135 in DP 751017

Mitchel Hanlon Consulting Pty Ltd (MHC) was engaged by Mr Andrew Wright, Environmental Officer of Werris Creek Coal to undertake a validation assessment of the stockpiled contaminated material (soils) located within the 'Bio-Remediation Area' of the Whitehaven Werris Creek Coal operation.

This assessment is required as a large quantity (approximately 1,000m^3) of contaminated material (contaminated with various hydrocarbon fractions) was stockpiled (in 4 stockpiles) and remediated (via 'land-farming') following the investigation and subsequent remediation of the former workshop area at Whitehaven's Werris Creek Coal facility

The purpose of the assessment is to determine if the stockpiled contaminated material has been successfully remediated. The assessment is required to conform to the requirements of:

- UPSS Technical Note: *Site Validation Reporting* (DECCW, 2010);
- Contaminated Sites – *Guidelines for Consultants Reporting on Contaminated Sites* (EPA 1997); and
- NSW EPA Technical Note: *Investigating Service Station Sites* (EPA, 2014).

Scope of Works

The aim of the brief, as we understand it, is to carry out the necessary sampling and laboratory analysis of the stockpiled material to facilitate the preparation of a validation report confirming the successful remediation of the stockpiled material and facilitate its reuse onsite.

Specifically this report follows the EPA Guidelines for *Assessing Service Station Sites, December 1994* and Contaminated Sites: *Guidelines for Consultants Reporting on Contaminated Sites (2000)* and other relevant NSW EPA and ANZECC guidelines.

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www.mitchelhanlon.com.au ABN 51104 693 736

ENVIRONMENT NATURAL RESOURCES PLANNING PROJECT MANAGEMENT ENGINEERING SURVEYING BUILDING SERVICES
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RICS the mark of property professionalism worldwide

Background

The remediation works relate to a quantity of excavated material known to be contaminated with hydrocarbon fractions. The material was excavated and stockpiled required as the former workshop area was identified as containing hydrocarbon contamination associated with the storage and distribution of oil products and diesel. The soil assessment was required as Werris Creek Coal (WCC) intend to relocate the site office and crushing plant facilities to allow the dumping of waste rock within this area.

The aim of the Remediation Works was to remediate the hydrocarbon contamination present within the former workshop area to concentrations suitable for agricultural land use. This contamination was identified in the Site Investigation previously prepared by Mitchel Hanlon Consulting. The remediation works were undertaken in four (4) stages to allow the continued expansion of the nearby waste rock dump.

The excavation of the identified 'contaminated' material was undertaken by Werris Creek Coal and observed by Mitchel Hanlon Consulting.

The remediation works undertaken involved the 'scalping' of the surface soils within the workshop, excavation of any identified contaminated material and the stockpiling and subsequent bioremediation of the excavated material.

Given the relatively large area in which the contaminated areas were located and the separation distances available between the site and any potential receptor, the excavation and onsite bioremediation of the contaminated soil was deemed to be safe.

The excavated material was stockpiled within Werris Creek Coal's dedicated Bio-remediation Area (BRA), the BRA consists of a compacted surface contained within an earth bund. The stockpiled material was windrowed into four (4) individual stockpiles and subsequently land-farmed. Suitably remediated material may be reused as backfill on-site.

Land-farming involves spreading impacted soil in windrows over the ground surface and encouraging microbial activity through aeration. Land-farming aims to maximise oxygen transfer (aeration) within the soil through regular tilling in order to optimise aerobic degradation of organic constituents by soil microbes.

Evaporation of volatile petroleum hydrocarbons from the soil surface may also occur and reduce concentrations in soil during land-farming.

Stockpile Validation Works

The site was visited on 6th March 2015 by Mr Tim McLean (*Environmental Engineer*) and Mr Kevin Oszinski (*Environmental Scientist*) of Mitchel Hanlon Consulting for the purposes of obtaining a number of soil samples from the stockpiled material. These samples were obtained with the aim of validating the remediation of the stockpiled material.

The sampling works consisted of a visual inspection, field screening (using a Photoionisation Detector) of the stockpiled material and laboratory analysis of soils within the stockpiles. The samples were obtained utilising a systematic (evenly spaced distribution along the stockpiles) sampling regime.

If the soil analytical concentrations exceed the assessment criteria Table 1 or olfactory and visual indications are such that they are not considered suitable for re-use on site, then land-farming shall be continued.

Given that the project Sampling and Analysis Plan (SAP) was adopted prior to the gazettal of the amended National Environment Protection (*Assessment of Site Contamination*) Measure (NEPM), 1999 all validation data will be assessed in accordance with the un-amended NEPM, 1999 and NSW EPA Contaminated Sites – *Guidelines for Assessing Service Station Sites* (EPA, 1994).

Contaminants of Concern

Based on the works previously undertaken, the contaminants of concern for the stockpiled material are considered to be:

- Heavy Metals and other Metalloids (Arsenic, Cadmium, Copper, Chromium, Lead, Zinc and Mercury);
- Total Petroleum Hydrocarbons (TPH);
- Benzene, Toluene, Ethyl benzene, Total Xylene's (BTEX);
- Polynuclear/cyclic Aromatic Hydrocarbons (PAHs).

Application of Relevant Guidelines and Technical Notes

The NSW Environment Protection Authority refers to a number of guidelines relevant to the assessment of contaminated sites. The following guidelines were referenced during the investigation process:

- Technical Note: *Investigating Service Station Sites* (EPA, 2014) (formerly Contaminated Sites – *Guidelines for Assessing Service Station Sites* (EPA, 1994));
- UPSS Technical Note: *Site Validation Reporting* (DECCW, 2010);
- National Environment Protection Council (NEPC) (1999) National Environment Protection (*Assessment of Site Contamination*) Measure (NEPM);
- NSW EPA (1995) Contaminated Sites: *Sampling Design Guidelines*; and
- NSW EPA (1997) *Guidelines for Consultants Reporting on Contaminated Sites*.

Guidelines for Soil

As stated previously, given that the project Sampling and Analysis Plan (SAP) was adopted prior to the gazettal of the amended National Environment Protection (*Assessment of Site Contamination*) Measure (NEPM), 1999 all validation data will be assessed in accordance with the un-amended NEPM, 1999 and NSW EPA Contaminated Sites – *Guidelines for Assessing Service Station Sites* (EPA, 1994).

The investigation objective is to ensure that any contamination present at the site will not pose an unacceptable risk to human health or the environment.

Given that the site will potentially be returned to a state suitable for agricultural land, the 'Standard' Residential guidelines are considered to be the most appropriate contamination thresholds. These guideline levels are sourced from Table 5A in Schedule B (1) of the NEPM (NEPC, 1999) and these investigation levels are derived from toxicity of substances and estimated exposure of humans to the soil.

It is noted that the following thresholds [Refer to Table 1 (p4)] as stated by the relevant assessment criteria will apply to the soil testing carried out.

Table 1: Threshold Concentrations (Soil)

ANALYTE	HIL THRESHOLD[(a)/(b)] (mg/kg)
Heavy Metals / Metalloids	
Arsenic (total)	100 [(a)]
Cadmium	20 [(a)]
Chromium (total)	12% or 12,000 [(a)]
Copper	1,000 [(a)]
Zinc	7,000 [(a)]
Lead	300 [(a)]
Mercury	15 [(a)]
Hydrocarbon Fractions (TPH)	
$C_6 – C_9$	65 [(b)]
$C_{10} – C_{36}$	1,000 [(b)]
BTEX	
Benzene	1 [(b)]
Toluene	130 [(b)]
Ethylbenzene	50 [(b)]
Meta- & Para-Xylene	–
Ortho-Xylene	–
Total Xylene	25 [(b)]
Polynuclear/cyclic Aromatic Hydrocarbons (PAHs)	
Benzo(a)pyrene	1 [(b)]
Total PAHs	20 [(b)]

(a) – NEPM Schedule B (1) Investigation Levels for Soil and Groundwater 1999 ('A' Standard Residential)

(b) – NSW EPA Contaminated Sites: Guidelines for Assessing Service Station Sites

Soil Sampling Methodology

The samples obtained from the stockpiled material were sent for analysis by a NATA accredited laboratory to determine the presence of heavy metals and hydrocarbon fractions.

According to the NSW EPA (1994) – *Guidelines for Assessing Service Station Sites*, reuse of excavated material on-site requires validation sampling at a rate of one sample per 25 m^2. It is estimated that the four (4) stockpiles contain approximately 1,000m^3 of material excavated from the former workshop area. Therefore, based on the estimated volume of soil within stockpile, 40 samples are required to be obtained.

However, based upon field observations from the previous investigations (MHC, 2013) and that the material has been land farmed continually for a period of 18 months, the material is considered to be homogenous and a lower sampling density is deemed reasonable. As such, the collection of twenty five (25) soil samples (at a frequency of 1 sample per 40 m^3) is considered adequate for the purposes of validation. Soil samples obtained from each windrow will also be screened using a PID.

Excavated materials that meet the remediation assessment criteria may be reused as backfill on-site.

The sampling works will consist of a visual inspection, field screening (using a Photoionisation Detector) of the stockpiled material and laboratory analysis of soils within the stockpiles. The samples will be obtained utilising a systematic (evenly spaced distribution along the stockpiles) sampling regime. All samples will be obtained from the undisturbed bulk (approximately 0.3m deep) of the material.

A 'Trip Blank' will also be collected and sent for analysis.

Soil samples will be placed into glass jars, labelled with the sample number, depth of discrete sample collection, site reference and date before being placed in a chilled, darkened cooler.

All samples were forwarded to ALS Group (ALS) for testing in the following parameters:

- Specific Contaminate Concentration (SCC) analysis:
    - Heavy Metals and other Metalloids (Arsenic, Cadmium, Copper, Chromium, Lead, Zinc and Mercury);
    - Total Petroleum Hydrocarbons (TPH);
    - Benzene, Toluene, Ethyl benzene, Total Xylene's (BTEX); and
    - Polynuclear/cyclic Aromatic Hydrocarbons (PAHs).
- Toxicity Characteristic Leaching Procedure (TCLP) analysis:
    - Heavy Metals and other Metalloids (Arsenic, Cadmium, Copper, Chromium, Lead, Zinc and Mercury);
    - Total Petroleum Hydrocarbons (TPH);
    - Benzene, Toluene, Ethyl benzene, Total Xylene's (BTEX); and
    - Polynuclear/cyclic Aromatic Hydrocarbons (PAHs).

Soil samples for analysis were placed into glass jars, which were labelled with the test pit number, depth of discrete sample collection, site reference and date before being placed in a chilled, darkened cooler.

Laboratory Analysis

A total of 27 soil samples were obtained from within the four (4) stockpiles, the samples collected were sent to ALS Group (ALS) for analysis. The following analysis was performed:

- Specific Contaminate Concentration (SCC) analysis:
    - Heavy Metals and other Metalloids (Arsenic, Cadmium, Copper, Chromium, Lead, Zinc and Mercury);
    - Total Petroleum Hydrocarbons (TPH);
    - Benzene, Toluene, Ethyl benzene, Total Xylene's (BTEX); and
    - Polynuclear/cyclic Aromatic Hydrocarbons (PAHs).
- Toxicity Characteristic Leaching Procedure (TCLP) analysis:
    - Heavy Metals and other Metalloids (Arsenic, Cadmium, Copper, Chromium, Lead, Zinc and Mercury);
    - Total Petroleum Hydrocarbons (TPH);
    - Benzene, Toluene, Ethyl benzene, Total Xylene's (BTEX); and
    - Polynuclear/cyclic Aromatic Hydrocarbons (PAHs).

Quality Assurance & Quality Control

Quality control is achieved by using NATA registered laboratories using ASTM standard methods supported by internal duplicates, the checking of high, abnormal or otherwise anomalous results against background and other chemical results for the sample concerned.

Quality assurance is achieved by confirming that field results, or anticipated results based upon comparison with field observations, are consistent with laboratory results. Also, that sampling methods are uniform and decontamination is thorough. In addition, the laboratory undertakes additional duplicate analysis as part of their internal quality assurance program on the basis of one duplicate analysis for every 20 samples analysed. Given that 25 samples were obtained from the site, one (1) duplicate set and a trip blank were obtained.

Field observations are compared with laboratory results when they are not as expected. Confirmation, re-sampling and re-analysis of a sample are undertaken if the results are not consistent with field observations and/or measurements. In addition, field duplicate sample results have to be within the acceptable range of reproducibility. A discussion of the quality of internal laboratory results and field duplicate relative percentage difference (RPD) calculations are presented in below.

Soil samples were placed into glass jars, which were labelled with the borehole number, depth of discrete sample collection, site reference and date before being placed in a chilled, darkened cooler.

Fieldwork was conducted on 6th March 2015 by Mr Tim McLean (*Environmental Engineer*) and Mr Kevin Oszinski (*Environmental Scientist*) of Mitchel Hanlon Consulting Pty Ltd. Both Tim and Kevin have extensive training and experience in the collection of environmental soil samples and are also experienced in the collection and analysis of field QA/QC data.

For this project, a single (1) duplicate set (TP25 / 26) was obtained. The QA/QC sample was sent to ALS for analysis. Duplicate samples were analysed for Heavy Metals and other Metalloids (Arsenic, Cadmium, Copper, Chromium, Lead, Zinc and Mercury), TPH, BTEX, PAHs in soil.

N.B. Given the highly disturbed nature of the site and the subsequent uncertainty of the condition of the soils within the subject site, a field blank was not obtained from the site. However, a single (1) trip blank was obtained and forwarded to ALS for analysis.

Blind replicate / duplicate samples are two individual samples (sample pair) collected from the same sampling point and submitted to the same laboratory without notification that they have been replicated to provide information on the variation in analyte concentration between samples. At least one sample per twenty samples was analysed.

Trip blanks are used to document contamination attributable to shipping procedures for volatile components. For this project shipping was closely monitored, with collected samples immediately placed upright within a chilled and darkened cooler and passed directly from the field staff to the courier. This process is documented within the chain of custody documentation.

Laboratory QA/QC

Analysis for this project was completed by ALS Group (ALS). ALS is accredited by NATA (NATA Accreditation Number – 825) for the methods used. Details of this accreditation can be viewed at http://www.nata.asn.au/. Details of the samples sent to each laboratory and the analysis requested are contained in the chain of custody documentation held in Appendix C. The analytical methods are noted on the laboratory transcripts.

ALS complete laboratory control samples, laboratory blanks, sample duplicates, surrogate spikes and matrix spikes. Results are presented in the ALS report ES1505769 (Appendix C).

This report includes details of surrogates and spikes used, percent recoveries of surrogates and spikes used, the instrument detection limits, the method detection limits, the practical quantification limits and the reference samples results.

QA/QC Data Evaluation

The Relative Percentage Difference (RPD) is a key indicator for comparing quality control samples. The method for calculating RPD for quality control samples is outlined below.

$$\%RPD = \left[\frac{x_1 - x_2}{\left(\frac{x_1 + x_2}{2} \right)} \right] x100$$

Where: x_1 is the first duplicate value

x_2 is the second duplicate value

AS 4482.1 – 2005 outlines the recommended acceptance criteria for quality control samples. These acceptance criteria have been adopted for this assessment as our data quality indicator for the blind replicate samples. A threshold value of <50% of the mean concentration of analyte will be used as the acceptance criteria for the blind replicate samples.

Our adopted data quality indicators (DQIs) for precision acknowledge the intrinsic heterogeneity of organic chemical concentrations and low concentration of analytes in disturbed soil. This natural heterogeneity may potentially cause large variations in results between laboratory sub-samples (although all efforts are made to homogenise non-volatile duplicate samples).

Similarly, large variations in volatile chemical concentrations between duplicates may be unavoidable even when using best practice sampling methodology. This can occur especially as we seek to minimise the disturbance to the sample while splitting it which means a high degree of inherent heterogeneity is expected.

As such, the RPD criteria are considered to be a suitable measure for the reproducibility of results within a naturally heterogeneous media such as soil. A ≤50% RPD trigger value is used with any exceedences being discussed and assessed for acceptability.

The duplicate results and calculated RPDs are presented in Table 2 (p9).

Table 2: Calculated % RPD

ANALYTE	LOR	TRIP BLANK (BRA27)	REPLICATE SET REP 1 (BRA25)	REP 2 (BRA26)	CALC. %RPD
TPH					
$C_6 – C_9$	10	<10	<10	<10	*
$C_{10} – C_{14}$	50	<50	<50	<50	*
$C_{15} – C_{28}$	100	<100	300	280	6.89
$C_{29} – C_{36}$	100	<100	130	100	26.09
$C_{10} – C_{36}$	50	<50	430	380	12.35
TRH					
TRH $C_6 – C_{10}$	10	<10	<10	<10	*
TRH $C_6 – C_{10}$ – BTEX (F1)	10	<10	<10	<10	*
TRH $C_{10} – C_{16}$	50	<50	<50	<50	*
TRH $C_{16} – C_{34}$	100	<100	380	110	20.29
TRH $C_{34} – C_{40}$	100	<100	310	100	9.52
TRH $C_{10} – C_{40}$ (sum)	50	<50	490	410	17.78
TRH $C_{10} – C_{16}$ – Napth. (F2)	50	<50	<50	<50	*
BTEX					*
Benzene	0.2	<0.2	<0.2	<0.2	*
Toluene	0.5	<0.5	<0.5	<0.5	*
Ethyl-benzene	0.5	<0.5	<0.5	<0.5	*
Meta - & Para - Xylene	0.5	<0.5	<0.5	<0.5	*
Ortho-Xylene	0.5	<0.5	<0.5	<0.5	*
Total Xylene	0.5	<0.5	<0.5	<0.5	*
PAHs					
Benzo(a)pyrene	0.5	<0.5	<0.5	<0.5	*
Total PAHs	0.5	<0.5	<0.5	<0.5	*
Metals & Metalloids					
Arsenic (total)	5	<5	<5	<5	*
Cadmium	1	<1	<1	<1	*
Chromium (total)	2	<2	22	16	31.58
Copper	5	<5	26	39	40
Lead	5	<5	31	42	30.14
Zinc	5	<5	9	12	28.57
Mercury	0.1	<0.1	<0.1	<0.1	*

* No Values were able to be calculated as results were below reporting limits

Data Usability

It should be noted that AS4482.1 specify that typical Data Quality Indicators (DQIs) for precision should be ≤50% RPD. The standard also acknowledges that low concentrations and organic compounds in particular can be acceptably outside this range. The standard suggests that ≤50% RPD be used as a 'trigger' and values above this level of repeatability need to be noted and explained.

For split samples, because of error associated with field splitting, an RPD of between 80 and 150% (depending on the substance) will be allowed as the measurement data quality indicators (MDQIs). Soil heterogeneity due to the 'nugget effect' could result in significantly greater difference, particularly for metals.

Our adopted DQIs for precision acknowledge the intrinsic heterogeneity of metal and semi-volatile chemical concentrations in disturbed soil that may potentially cause large variations in results between laboratory sub-samples (although all efforts are made to homogenise non-volatile duplicate samples). Similarly, large variations in volatile chemical concentrations between duplicates may be unavoidable even when using best practice sampling methodology. This is especially so as we seek to minimise the disturbance to the sample while splitting it which means a high degree of inherent heterogeneity is expected.

Therefore, our adopted RPD criteria are considered to be a suitable measure for the reproducibility of results within a naturally heterogeneous media such as soil.

As such, the calculated RPD values are not considered grounds for rejecting the data i.e. the data is deemed to be accurate and precise. It should be noted that the calculated RPD results are for concentrations significantly below adopted guidelines.

Extraction and analysis of samples were all within the relevant prescribed holding times. The internal laboratory control results (blanks, duplicates and spikes) are considered to be acceptable.

Based on information presented in the sections above it can be confidently stated that the Data Quality Objectives for this project have been met and the data set is considered to be reliable.

Assessment Criteria

The following assessment criteria were adopted by Mitchel Hanlon Consulting:

- National Environment Protection (*Assessment of Site Contamination*) Measure 1999 – *B(1) Guideline on Investigation Levels for Soil and Groundwater – A 'Standard' Residential*; and
- NSW EPA (1994) *Guidelines for Assessing Service Station Sites*.

Discussion of Results

NATA Accredited laboratory results received from ALS are attached in Appendix D.

A brief overview of the results obtained as a result of the laboratory analysis has been provided below:

The results obtained for the stockpiled material indicate that the material contains elevated concentration of Total Petroleum Hydrocarbons (C_{10} – C_{36}) in excess of the threshold identified within the NSW EPA (1994) *Guidelines for Assessing Service Station Sites*.

Based upon the obtained results and the observations made during the site inspection, Mitchel Hanlon Consulting have subsequently deemed the stockpiled material to still be contaminated.

As such, without additional remediation the stockpiled material cannot yet be utilised as onsite fill material. Therefore it is recommended that the bio-remediation of the material be continued via further land farming. It is further recommended that the material be turned and incorporated every month for a further period of 12 months.

Recommendations

Based upon the obtained results and the observations made during the site inspection, Mitchel Hanlon Consulting have subsequently deemed the stockpiled material to still be contaminated.

As such, without additional remediation the stockpiled material cannot yet be utilised as fill material. It is therefore recommended that the bio-remediation of the material be continued via land farming.

It is suggested that:

- The material be turned and incorporated every month for a further period of 12 months;
- At the completion of the 12 month period a series of samples are to be obtained from the undisturbed bulk (approximately 0.3m deep) of the material at a suitable sampling density;
- The samples obtained should be sent for analysed by a NATA accredited laboratory for the contaminants of concern (as stated above);
- The results should then be compared against the relevant contaminant thresholds; and
- If the laboratory results indicate the contaminant concentrations are below the relevant threshold, the material can be utilised onsite as fill material.

It is, further recommended that records are kept to document the fate of the material stockpiled within the bio-remediation area at the completion of the bio-remediation works.

Yours Sincerely

Tim McLean
Environmental Engineer
B.Eng.Tech (*Environmental), UNE, Dip.Proj.Mgt, (TNE)*
MALGA, GradTIEAust, Ass. EIANZ

MITCHEL HANLON CONSULTING PTY LTD

Encl.

- Appendix A: Site Photos
- Appendix B: Chain of Custody & QA/QC Documentation
- Appendix C: Laboratory Results

Appendix A Site Photos

View West Over Bio-Remediation Area
(Stockpile 1 – Right and Stockpile 2 – Left)

View East over Stockpiled Material (Stockpile 1)

View West over Stockpile 1

View South over Stockpile 2 – 4

Appendix B Chain of Custody & QA/QC Documentation

CHAIN OF CUSTODY DOCUMENTATION

Australian Laboratory Services Pty Ltd

CLIENT: ALS-ACIRL GUNNEDAH LABORATORY
POSTAL ADDRESS: 5-7 Talbot Rd GUNNEDAH NSW 2380
SEND REPORT TO: Awright@whitehavencoal.com.au SEND INVOICE TO: Lesley.Moore@alsglobal.com
DATA NEEDED BY: REPORT NEEDED BY:
PROJECT ID: WCC Bio-remediation Area QUOTE NO.:
P.O. NO.: 9779 COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

LABORATORY BATCH NO.:
SAMPLERS: Andrew Wright
PHONE: 02 6742 0058 FAX: 02 6742 0068 E-MAIL:
REPORT FORMAT: HARD: ☐ FAX: ☐ DISK: ☐ BULLETIN BOARD: ☐ E-MAIL: ☐
QC LEVEL: QCS1: ☐ QCS2: ☐ QCS3: ☐ QCS4: ☐

FOR LAB USE ONLY
COOLER SEAL
Yes No
Broken Intact
COOLER TEMP deg C

SAMPLE DATA				CONTAINER DATA			ANALYSIS REQUIRED																					
SAMPLE ID		MATRIX	DATE	TIME	TYPE & PRESERVATIVE	NO.	Ph	TPH	BTEX	LEAD	ARSENIC	CADMIUM	COPPER	CHROMIUM	MERCURY	ZINC	PAHS		TCLP - TPH	TCLP - BTEX	TCLP - LEAD	TCLP - ARSENIC	TCLP - CADMIUM	TCLP - COPPER	TCLP - CHROMIUM	TCLP - MERCURY	TCLP - ZINC	TCLP - PAH	NOTES
1	BRA1	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
2	BRA2	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
3	BRA3	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
4	BRA4	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
5	BRA5	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
6	BRA6	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
7	BRA7	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
8	BRA8	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
9	BRA9	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
10	BRA10	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
11	BRA11	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
12	BRA12	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
13	BRA13	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
14	BRA14	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
15	BRA15	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
16	BRA16	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
17	BRA17	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
18	BRA18	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
19	BRA19	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
20	BRA20	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
21	BRA21	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
22	BRA22	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
23	BRA23	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
24	BRA24	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
25	BRA25	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
26	BRA26	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
27	BRA27	Soil	6/03/2015	10:30	Glass Jar, Natural	1		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	

RELINQUISHED BY:		RECEIVED BY	
NAME:	DATE:	NAME: David	DATE: 11/3
OF:	TIME:	OF: AW	TIME: 1220
NAME:	DATE:	NAME:	DATE:
OF:	TIME:	OF:	TIME:

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinced Jar; S = Solvent Washed Acid Rinced Glass Bottle; VC = Hydrochloric Acid Preserved Vial; VS = Sulfuric Acid Preserved Vial; BS = Sulfuric Acid Preserved Glass Bottle; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; O = Other.

Environmental Division
Sydney
Work Order
ES1505769

Telephone : +61-2-8784 8555

AUSTRALIAN LABORATORY SERVICES P/L

QUALITY CONTROL REPORT

Work Order	: **ES1505769**	Page	: 1 of 19
Client	: **WHITEHAVEN PTY LTD C/O ACIRL PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: A WRIGHT	Contact	: Client Services
Address	: PO BOX 446 SUMMER PARK QLD 4074	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: AWright@whitehavencoal.com.au	E-mail	: sydney@alsglobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: WCC BIO-REMEDIATION AREA	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 11-MAR-2015
Sampler	: AW	Issue Date	: 20-MAR-2015
Order number	: 9779		
		No. of samples received	: 27
Quote number	: SY-457-11	No. of samples analysed	: 27

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Inorganics
		Sydney Organics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 3863463)									
ES1505769-003	BRA3	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	11.8	10.8	8.7	0% - 50%
ES1505769-014	BRA14	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	7.3	6.9	5.5	No Limit
EA055: Moisture Content (QC Lot: 3863464)									
ES1505769-023	BRA23	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	4.4	2.9	41.5	No Limit
ES1505924-010	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	21.1	20.4	3.5	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 3861609)									
ES1505769-001	BRA1	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	7	5	29.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	13	12	12.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	8	9	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	34	34	0.0	No Limit
ES1505843-003	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	13	14	9.6	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	17	20	14.9	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	6	6	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	59	53	9.5	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 3862062)									
ES1505769-009	BRA9	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	22	24	7.2	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	27	29	9.2	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	9	9	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	32	32	0.0	No Limit
ES1505769-019	BRA19	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	9	8	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	5	5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	17	15	8.8	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	10	9	12.6	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	43	40	6.2	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3861610)									
ES1505769-001	BRA1	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES1505843-003	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3862063)									

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3862063) - continued									
ES1505769-009	BRA9	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES1505769-019	BRA19	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3855048)									
ES1505769-001	BRA1	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
ES1505769-011	BRA11	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3855048) - continued									
ES1505769-011	BRA11	EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3855054)									
ES1505769-021	BRA21	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3855045)									
ES1505769-001	BRA1	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES1505769-011	BRA11	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3855046)									
ES1505769-021	BRA21	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3855047)									
ES1505769-001	BRA1	EP071: C15 - C28 Fraction	----	100	mg/kg	420	400	5.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	360	320	11.5	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES1505769-011	BRA11	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3855053)									
ES1505769-021	BRA21	EP071: C15 - C28 Fraction	----	100	mg/kg	770	730	6.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	580	540	6.4	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3855045)									
ES1505769-001	BRA1	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
ES1505769-011	BRA11	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3855046)									
ES1505769-021	BRA21	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3855047)									
ES1505769-001	BRA1	EP071: >C16 - C34 Fraction	----	100	mg/kg	640	610	5.2	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	320	270	15.7	No Limit
		EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	<50	0.0	No Limit
ES1505769-011	BRA11	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3855053)									
ES1505769-021	BRA21	EP071: >C16 - C34 Fraction	----	100	mg/kg	1150	1020	11.3	0% - 50%
		EP071: >C34 - C40 Fraction	----	100	mg/kg	470	440	7.2	No Limit
		EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	60	60	0.0	No Limit
EP080: BTEXN (QC Lot: 3855045)									
ES1505769-001	BRA1	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
ES1505769-011	BRA11	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EP080: BTEXN (QC Lot: 3855046)									
ES1505769-021	BRA21	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005C: Leachable Metals by ICPAES (QC Lot: 3861616)									
ES1505769-001	BRA1	EG005C: Cadmium	7440-43-9	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG005C: Arsenic	7440-38-2	0.1	mg/L	<0.1	<0.1	0.0	No Limit
		EG005C: Chromium	7440-47-3	0.1	mg/L	<0.1	<0.1	0.0	No Limit
		EG005C: Copper	7440-50-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
		EG005C: Lead	7439-92-1	0.1	mg/L	<0.1	<0.1	0.0	No Limit
		EG005C: Zinc	7440-66-6	0.1	mg/L	<0.1	<0.1	0.0	No Limit
ES1505769-010	BRA10	EG005C: Cadmium	7440-43-9	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG005C: Arsenic	7440-38-2	0.1	mg/L	<0.1	<0.1	0.0	No Limit
		EG005C: Chromium	7440-47-3	0.1	mg/L	<0.1	<0.1	0.0	No Limit
		EG005C: Copper	7440-50-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
		EG005C: Lead	7439-92-1	0.1	mg/L	<0.1	<0.1	0.0	No Limit
		EG005C: Zinc	7440-66-6	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EG005C: Leachable Metals by ICPAES (QC Lot: 3861617)									
ES1505769-021	BRA21	EG005C: Cadmium	7440-43-9	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG005C: Arsenic	7440-38-2	0.1	mg/L	<0.1	<0.1	0.0	No Limit
		EG005C: Chromium	7440-47-3	0.1	mg/L	<0.1	<0.1	0.0	No Limit
		EG005C: Copper	7440-50-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
		EG005C: Lead	7439-92-1	0.1	mg/L	<0.1	<0.1	0.0	No Limit
		EG005C: Zinc	7440-66-6	0.1	mg/L	<0.1	<0.1	0.0	No Limit
ES1505923-001	Anonymous	EG005C: Cadmium	7440-43-9	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG005C: Arsenic	7440-38-2	0.1	mg/L	<0.1	<0.1	0.0	No Limit
		EG005C: Chromium	7440-47-3	0.1	mg/L	<0.1	<0.1	0.0	No Limit
		EG005C: Copper	7440-50-8	0.1	mg/L	0.6	0.6	0.0	No Limit
		EG005C: Lead	7439-92-1	0.1	mg/L	<0.1	<0.1	0.0	No Limit
		EG005C: Zinc	7440-66-6	0.1	mg/L	0.7	0.7	0.0	No Limit
EG035C: Leachable Mercury by FIMS (QC Lot: 3865818)									
ES1505769-001	BRA1	EG035C: Mercury	7439-97-6	0.0010	mg/L	<0.0010	<0.0010	0.0	No Limit
ES1505769-011	BRA11	EG035C: Mercury	7439-97-6	0.0010	mg/L	<0.0010	<0.0010	0.0	No Limit
EG035C: Leachable Mercury by FIMS (QC Lot: 3865819)									
ES1505769-021	BRA21	EG035C: Mercury	7439-97-6	0.0010	mg/L	<0.0010	<0.0010	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 3861609)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	101	92	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	96.3	87	121
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	94.8	80	136
EG005T: Copper	7440-50-8	5	mg/kg	<5	32.0 mg/kg	102	93	127
EG005T: Lead	7439-92-1	5	mg/kg	<5	40.0 mg/kg	96.0	86	124
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	96.9	81	133
EG005T: Total Metals by ICP-AES (QCLot: 3862062)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	108	92	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	98.9	87	121
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	96.6	80	136
EG005T: Copper	7440-50-8	5	mg/kg	<5	32.0 mg/kg	100	93	127
EG005T: Lead	7439-92-1	5	mg/kg	<5	40.0 mg/kg	96.2	86	124
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	100	81	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3861610)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	85.4	70	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3862063)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	88.4	70	105
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3855048)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	4 mg/kg	113	80	124
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	4 mg/kg	109	77	123
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	4 mg/kg	111	79	123
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	4 mg/kg	112	77	123
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	4 mg/kg	119	79	123
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	4 mg/kg	115	79	123
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	4 mg/kg	114	79	123
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	4 mg/kg	114	79	125

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3855048) - continued								
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	4 mg/kg	114	73	121
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	4 mg/kg	113	81	123
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	4 mg/kg	104	70	118
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	4 mg/kg	111	77	123
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	4 mg/kg	108	76	122
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	4 mg/kg	106	71	113
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	4 mg/kg	102	71.7	113
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	4 mg/kg	109	72.4	114
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3855054)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	4 mg/kg	115	80	124
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	4 mg/kg	113	77	123
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	4 mg/kg	115	79	123
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	4 mg/kg	113	77	123
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	4 mg/kg	118	79	123
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	4 mg/kg	111	79	123
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	4 mg/kg	111	79	123
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	4 mg/kg	115	79	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	4 mg/kg	113	73	121
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	4 mg/kg	110	81	123
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	4 mg/kg	113	70	118
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	4 mg/kg	106	77	123
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	4 mg/kg	114	76	122
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	4 mg/kg	109	71	113
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	4 mg/kg	108	71.7	113
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	4 mg/kg	109	72.4	114
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3855045)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	82.0	68.4	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3855046)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	106	68.4	128

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3855047)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	109	71	131
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	300 mg/kg	105	74	138
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	111	64	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3855053)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	101	71	131
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	300 mg/kg	103	74	138
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	109	64	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3855045)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	79.1	68.4	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3855046)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	106	68.4	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3855047)								
EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	250 mg/kg	108	70	130
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	350 mg/kg	119	74	138
EP071: >C34 - C40 Fraction	----	50	mg/kg	<100	150 mg/kg	106	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3855053)								
EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	250 mg/kg	106	70	130
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	350 mg/kg	104	74	138
EP071: >C34 - C40 Fraction	----	50	mg/kg	<100	150 mg/kg	111	63	131
EP080: BTEXN (QCLot: 3855045)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	96.6	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	92.7	62	128
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	90.2	58	118
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	87.6	60	120
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	88.8	60	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	80.2	62	138
EP080: BTEXN (QCLot: 3855046)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	89.2	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	95.9	62	128
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	93.1	58	118

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080: BTEXN (QCLot: 3855046) - continued								
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	92.2	60	120
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	94.6	60	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	116	62	138

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005C: Leachable Metals by ICPAES (QCLot: 3861616)								
EG005C: Arsenic	7440-38-2	0.1	mg/L	<0.1	0.1 mg/L	95.0	80	124
EG005C: Cadmium	7440-43-9	0.05	mg/L	<0.05	0.1 mg/L	94.1	80	118
EG005C: Chromium	7440-47-3	0.1	mg/L	<0.1	0.1 mg/L	94.8	84	116
EG005C: Copper	7440-50-8	0.1	mg/L	<0.1	0.1 mg/L	95.0	84	116
EG005C: Lead	7439-92-1	0.1	mg/L	<0.1	0.1 mg/L	103	83	117
EG005C: Zinc	7440-66-6	0.1	mg/L	<0.1	0.1 mg/L	91.4	79	123
EG005C: Leachable Metals by ICPAES (QCLot: 3861617)								
EG005C: Arsenic	7440-38-2	0.1	mg/L	<0.1	0.1 mg/L	110	80	124
EG005C: Cadmium	7440-43-9	0.05	mg/L	<0.05	0.1 mg/L	93.9	80	118
EG005C: Chromium	7440-47-3	0.1	mg/L	<0.1	0.1 mg/L	96.7	84	116
EG005C: Copper	7440-50-8	0.1	mg/L	<0.1	0.1 mg/L	95.1	84	116
EG005C: Lead	7439-92-1	0.1	mg/L	<0.1	0.1 mg/L	93.5	83	117
EG005C: Zinc	7440-66-6	0.1	mg/L	<0.1	0.1 mg/L	94.7	79	123
EG035C: Leachable Mercury by FIMS (QCLot: 3865818)								
EG035C: Mercury	7439-97-6	0.001	mg/L	<0.0010	0.010 mg/L	92.3	79	119
EG035C: Leachable Mercury by FIMS (QCLot: 3865819)								
EG035C: Mercury	7439-97-6	0.001	mg/L	<0.0010	0.010 mg/L	89.6	79	119
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3859994)								
EP075(SIM): Naphthalene	91-20-3	0.2	µg/L	<1.0	5 µg/L	79.1	58.6	119
EP075(SIM): Acenaphthylene	208-96-8	0.2	µg/L	<1.0	5 µg/L	90.6	63.6	114
EP075(SIM): Acenaphthene	83-32-9	0.2	µg/L	<1.0	5 µg/L	87.8	62.2	113
EP075(SIM): Fluorene	86-73-7	0.2	µg/L	<1.0	5 µg/L	94.2	63.9	115
EP075(SIM): Phenanthrene	85-01-8	0.2	µg/L	<1.0	5 µg/L	98.7	62.6	116

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3859994) - continued								
EP075(SIM): Anthracene	120-12-7	0.2	µg/L	<1.0	5 µg/L	97.2	64.3	116
EP075(SIM): Fluoranthene	206-44-0	0.2	µg/L	<1.0	5 µg/L	100	63.6	118
EP075(SIM): Pyrene	129-00-0	0.2	µg/L	<1.0	5 µg/L	99.9	63.1	118
EP075(SIM): Benz(a)anthracene	56-55-3	0.2	µg/L	<1.0	5 µg/L	92.2	64.1	117
EP075(SIM): Chrysene	218-01-9	0.2	µg/L	<1.0	5 µg/L	87.0	62.5	116
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.2	µg/L	<1.0	5 µg/L	92.2	61.7	119
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.2	µg/L	<1.0	5 µg/L	92.1	61.7	117
EP075(SIM): Benzo(a)pyrene	50-32-8	0.2	µg/L	<0.5	5 µg/L	90.1	63.3	117
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.2	µg/L	<1.0	5 µg/L	94.8	59.9	118
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.2	µg/L	<1.0	5 µg/L	97.0	61.2	117
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.2	µg/L	<1.0	5 µg/L	99.8	59.1	118
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3860002)								
EP075(SIM): Naphthalene	91-20-3	0.2	µg/L	<1.0	5 µg/L	82.7	58.6	119
EP075(SIM): Acenaphthylene	208-96-8	0.2	µg/L	<1.0	5 µg/L	92.0	63.6	114
EP075(SIM): Acenaphthene	83-32-9	0.2	µg/L	<1.0	5 µg/L	88.2	62.2	113
EP075(SIM): Fluorene	86-73-7	0.2	µg/L	<1.0	5 µg/L	96.2	63.9	115
EP075(SIM): Phenanthrene	85-01-8	0.2	µg/L	<1.0	5 µg/L	99.6	62.6	116
EP075(SIM): Anthracene	120-12-7	0.2	µg/L	<1.0	5 µg/L	99.8	64.3	116
EP075(SIM): Fluoranthene	206-44-0	0.2	µg/L	<1.0	5 µg/L	99.6	63.6	118
EP075(SIM): Pyrene	129-00-0	0.2	µg/L	<1.0	5 µg/L	102	63.1	118
EP075(SIM): Benz(a)anthracene	56-55-3	0.2	µg/L	<1.0	5 µg/L	104	64.1	117
EP075(SIM): Chrysene	218-01-9	0.2	µg/L	<1.0	5 µg/L	104	62.5	116
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.2	µg/L	<1.0	5 µg/L	97.5	61.7	119
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.2	µg/L	<1.0	5 µg/L	90.1	61.7	117
EP075(SIM): Benzo(a)pyrene	50-32-8	0.2	µg/L	<0.5	5 µg/L	93.4	63.3	117
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.2	µg/L	<1.0	5 µg/L	97.8	59.9	118
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.2	µg/L	<1.0	5 µg/L	93.1	61.2	117
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.2	µg/L	<1.0	5 µg/L	105	59.1	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859993)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859993) - continued								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	2000 µg/L	104	59	129
EP071: C15 - C28 Fraction	----	100	µg/L	<100	3000 µg/L	100	71	131
EP071: C29 - C36 Fraction	----	50	µg/L	<50	2000 µg/L	102	62	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3860001)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	2000 µg/L	100	59	129
EP071: C15 - C28 Fraction	----	100	µg/L	<100	3000 µg/L	102	71	131
EP071: C29 - C36 Fraction	----	50	µg/L	<50	2000 µg/L	98.8	62	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3865822)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	75.8	75	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3865823)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	105	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3859993)								
EP071: >C10 - C16 Fraction	>C10_C16	100	µg/L	<100	2500 µg/L	97.3	58.9	131
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	3500 µg/L	95.4	73.9	138
EP071: >C34 - C40 Fraction	----	50	µg/L	<100	1500 µg/L	100	67	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3860001)								
EP071: >C10 - C16 Fraction	>C10_C16	100	µg/L	<100	2500 µg/L	98.5	58.9	131
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	3500 µg/L	97.7	73.9	138
EP071: >C34 - C40 Fraction	----	50	µg/L	<100	1500 µg/L	102	67	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3865822)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	75.5	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3865823)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	107	75	127
EP080: BTEXN (QCLot: 3865822)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	97.0	70	124
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	94.2	65	129
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	95.0	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	92.9	69	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	92.6	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	89.0	70	124

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080: BTEXN (QCLot: 3865823)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	105	70	124
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	101	65	129
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	94.8	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	93.6	69	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	99.9	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	97.7	70	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005T: Total Metals by ICP-AES (QCLot: 3861609)							
ES1505769-001	BRA1	EG005T: Arsenic	7440-38-2	50 mg/kg	98.2	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	99.0	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	102	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	105	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	100	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	98.5	70	130
EG005T: Total Metals by ICP-AES (QCLot: 3862062)							
ES1505769-009	BRA9	EG005T: Arsenic	7440-38-2	50 mg/kg	95.7	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	99.6	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	100	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	104	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	97.7	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	97.5	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3861610)							
ES1505769-001	BRA1	EG035T: Mercury	7439-97-6	5 mg/kg	97.2	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3862063)							
ES1505769-009	BRA9	EG035T: Mercury	7439-97-6	5 mg/kg	100	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3855048)							
ES1505769-001	BRA1	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	92.7	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3855048) - continued							
ES1505769-001	BRA1	EP075(SIM): Pyrene	129-00-0	10 mg/kg	91.9	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3855054)							
ES1505769-021	BRA21	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	76.9	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	82.6	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3855045)							
ES1505769-001	BRA1	EP080: C6 - C9 Fraction	----	32.5 mg/kg	84.7	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3855046)							
ES1505769-021	BRA21	EP080: C6 - C9 Fraction	----	32.5 mg/kg	126	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3855047)							
ES1505769-001	BRA1	EP071: C10 - C14 Fraction	----	560 mg/kg	108	73	137
		EP071: C15 - C28 Fraction	----	2370 mg/kg	98.2	53	131
		EP071: C29 - C36 Fraction	----	1695 mg/kg	109	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3855053)							
ES1505769-021	BRA21	EP071: C10 - C14 Fraction	----	560 mg/kg	112	73	137
		EP071: C15 - C28 Fraction	----	2370 mg/kg	84.9	53	131
		EP071: C29 - C36 Fraction	----	1695 mg/kg	105	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3855045)							
ES1505769-001	BRA1	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	80.5	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3855046)							
ES1505769-021	BRA21	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	119	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3855047)							
ES1505769-001	BRA1	EP071: >C10 - C16 Fraction	>C10_C16	902 mg/kg	117	73	137
		EP071: >C16 - C34 Fraction	----	3190 mg/kg	114	53	131
		EP071: >C34 - C40 Fraction	----	1087 mg/kg	108	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3855053)							
ES1505769-021	BRA21	EP071: >C10 - C16 Fraction	>C10_C16	902 mg/kg	113	73	137
		EP071: >C16 - C34 Fraction	----	3190 mg/kg	101	53	131
		EP071: >C34 - C40 Fraction	----	1087 mg/kg	106	52	132
EP080: BTEXN (QCLot: 3855045)							
ES1505769-001	BRA1	EP080: Benzene	71-43-2	2.5 mg/kg	78.4	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	82.8	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	86.2	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	81.0	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080: BTEXN (QCLot: 3855045) - continued							
ES1505769-001	BRA1	EP080: ortho-Xylene	95-47-6	2.5 mg/kg	81.1	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	71.1	70	130
EP080: BTEXN (QCLot: 3855046)							
ES1505769-021	BRA21	EP080: Benzene	71-43-2	2.5 mg/kg	88.6	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	96.2	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	98.1	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	100	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	96.9	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	80.9	70	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005C: Leachable Metals by ICPAES (QCLot: 3861616)							
ES1505769-002	BRA2	EG005C: Arsenic	7440-38-2	1 mg/L	102	70	130
		EG005C: Cadmium	7440-43-9	0.250 mg/L	101	70	130
		EG005C: Chromium	7440-47-3	1 mg/L	103	70	130
		EG005C: Copper	7440-50-8	1 mg/L	101	70	130
		EG005C: Lead	7439-92-1	1 mg/L	98.3	70	130
		EG005C: Zinc	7440-66-6	1 mg/L	114	70	130
EG005C: Leachable Metals by ICPAES (QCLot: 3861617)							
ES1505769-022	BRA22	EG005C: Arsenic	7440-38-2	1 mg/L	94.9	70	130
		EG005C: Cadmium	7440-43-9	0.250 mg/L	95.3	70	130
		EG005C: Chromium	7440-47-3	1 mg/L	101	70	130
		EG005C: Copper	7440-50-8	1 mg/L	96.4	70	130
		EG005C: Lead	7439-92-1	1 mg/L	93.2	70	130
		EG005C: Zinc	7440-66-6	1 mg/L	100	70	130
EG035C: Leachable Mercury by FIMS (QCLot: 3865818)							
ES1505769-002	BRA2	EG035C: Mercury	7439-97-6	0.0100 mg/L	88.0	70	130
EG035C: Leachable Mercury by FIMS (QCLot: 3865819)							
ES1505769-022	BRA22	EG035C: Mercury	7439-97-6	0.0100 mg/L	89.7	70	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3855045)										
ES1505769-001	BRA1	EP080: C6 - C9 Fraction	----	32.5 mg/kg	84.7	----	70	130	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3855045)										
ES1505769-001	BRA1	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	80.5	----	70	130	----	----
EP080: BTEXN (QCLot: 3855045)										
ES1505769-001	BRA1	EP080: Benzene	71-43-2	2.5 mg/kg	78.4	----	70	130	----	----
		EP080: Toluene	108-88-3	2.5 mg/kg	82.8	----	70	130	----	----
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	86.2	----	70	130	----	----
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	81.0	----	70	130	----	----
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	81.1	----	70	130	----	----
		EP080: Naphthalene	91-20-3	2.5 mg/kg	71.1	----	70	130	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3855046)										
ES1505769-021	BRA21	EP080: C6 - C9 Fraction	----	32.5 mg/kg	126	----	70	130	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3855046)										
ES1505769-021	BRA21	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	119	----	70	130	----	----
EP080: BTEXN (QCLot: 3855046)										
ES1505769-021	BRA21	EP080: Benzene	71-43-2	2.5 mg/kg	88.6	----	70	130	----	----
		EP080: Toluene	108-88-3	2.5 mg/kg	96.2	----	70	130	----	----
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	98.1	----	70	130	----	----
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	100	----	70	130	----	----
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	96.9	----	70	130	----	----
		EP080: Naphthalene	91-20-3	2.5 mg/kg	80.9	----	70	130	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3855047)										
ES1505769-001	BRA1	EP071: C10 - C14 Fraction	----	560 mg/kg	108	----	73	137	----	----
		EP071: C15 - C28 Fraction	----	2370 mg/kg	98.2	----	53	131	----	----
		EP071: C29 - C36 Fraction	----	1695 mg/kg	109	----	52	132	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3855047)										
ES1505769-001	BRA1	EP071: >C10 - C16 Fraction	>C10_C16	902 mg/kg	117	----	73	137	----	----
		EP071: >C16 - C34 Fraction	----	3190 mg/kg	114	----	53	131	----	----
		EP071: >C34 - C40 Fraction	----	1087 mg/kg	108	----	52	132	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3855048)										
ES1505769-001	BRA1	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	92.7	----	70	130	----	----

Sub-Matrix: **SOIL**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3855048) - continued										
ES1505769-001	BRA1	EP075(SIM): Pyrene	129-00-0	10 mg/kg	91.9	----	70	130	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3855053)										
ES1505769-021	BRA21	EP071: C10 - C14 Fraction	----	560 mg/kg	112	----	73	137	----	----
		EP071: C15 - C28 Fraction	----	2370 mg/kg	84.9	----	53	131	----	----
		EP071: C29 - C36 Fraction	----	1695 mg/kg	105	----	52	132	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3855053)										
ES1505769-021	BRA21	EP071: >C10 - C16 Fraction	>C10_C16	902 mg/kg	113	----	73	137	----	----
		EP071: >C16 - C34 Fraction	----	3190 mg/kg	101	----	53	131	----	----
		EP071: >C34 - C40 Fraction	----	1087 mg/kg	106	----	52	132	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3855054)										
ES1505769-021	BRA21	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	76.9	----	70	130	----	----
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	82.6	----	70	130	----	----
EG005T: Total Metals by ICP-AES (QCLot: 3861609)										
ES1505769-001	BRA1	EG005T: Arsenic	7440-38-2	50 mg/kg	98.2	----	70	130	----	----
		EG005T: Cadmium	7440-43-9	50 mg/kg	99.0	----	70	130	----	----
		EG005T: Chromium	7440-47-3	50 mg/kg	102	----	70	130	----	----
		EG005T: Copper	7440-50-8	250 mg/kg	105	----	70	130	----	----
		EG005T: Lead	7439-92-1	250 mg/kg	100	----	70	130	----	----
		EG005T: Zinc	7440-66-6	250 mg/kg	98.5	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3861610)										
ES1505769-001	BRA1	EG035T: Mercury	7439-97-6	5 mg/kg	97.2	----	70	130	----	----
EG005T: Total Metals by ICP-AES (QCLot: 3862062)										
ES1505769-009	BRA9	EG005T: Arsenic	7440-38-2	50 mg/kg	95.7	----	70	130	----	----
		EG005T: Cadmium	7440-43-9	50 mg/kg	99.6	----	70	130	----	----
		EG005T: Chromium	7440-47-3	50 mg/kg	100	----	70	130	----	----
		EG005T: Copper	7440-50-8	250 mg/kg	104	----	70	130	----	----
		EG005T: Lead	7439-92-1	250 mg/kg	97.7	----	70	130	----	----
		EG005T: Zinc	7440-66-6	250 mg/kg	97.5	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3862063)										
ES1505769-009	BRA9	EG035T: Mercury	7439-97-6	5 mg/kg	100	----	70	130	----	----

Sub-Matrix: **WATER**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit

Sub-Matrix: **WATER**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EG005C: Leachable Metals by ICPAES (QCLot: 3861616)										
ES1505769-002	BRA2	EG005C: Arsenic	7440-38-2	1 mg/L	102	----	70	130	----	----
		EG005C: Cadmium	7440-43-9	0.250 mg/L	101	----	70	130	----	----
		EG005C: Chromium	7440-47-3	1 mg/L	103	----	70	130	----	----
		EG005C: Copper	7440-50-8	1 mg/L	101	----	70	130	----	----
		EG005C: Lead	7439-92-1	1 mg/L	98.3	----	70	130	----	----
		EG005C: Zinc	7440-66-6	1 mg/L	114	----	70	130	----	----
EG005C: Leachable Metals by ICPAES (QCLot: 3861617)										
ES1505769-022	BRA22	EG005C: Arsenic	7440-38-2	1 mg/L	94.9	----	70	130	----	----
		EG005C: Cadmium	7440-43-9	0.250 mg/L	95.3	----	70	130	----	----
		EG005C: Chromium	7440-47-3	1 mg/L	101	----	70	130	----	----
		EG005C: Copper	7440-50-8	1 mg/L	96.4	----	70	130	----	----
		EG005C: Lead	7439-92-1	1 mg/L	93.2	----	70	130	----	----
		EG005C: Zinc	7440-66-6	1 mg/L	100	----	70	130	----	----
EG035C: Leachable Mercury by FIMS (QCLot: 3865818)										
ES1505769-002	BRA2	EG035C: Mercury	7439-97-6	0.0100 mg/L	88.0	----	70	130	----	----
EG035C: Leachable Mercury by FIMS (QCLot: 3865819)										
ES1505769-022	BRA22	EG035C: Mercury	7439-97-6	0.0100 mg/L	89.7	----	70	130	----	----

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES1505769**	Page	: 1 of 13
Client	: WHITEHAVEN PTY LTD C/O ACIRL PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: A WRIGHT	Contact	: Client Services
Address	: PO BOX 446 SUMMER PARK QLD 4074	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: AWright@whitehavencoal.com.au	E-mail	: sydney@alsglobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: WCC BIO-REMEDIATION AREA	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 11-MAR-2015
Sampler	: AW	Issue Date	: 20-MAR-2015
Order number	: 9779		
		No. of samples received	: 27
Quote number	: SY-457-11	No. of samples analysed	: 27

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with recommended holding times (USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content							
Soil Glass Jar - Unpreserved (EA055-103)							
BRA1, BRA2, BRA3, BRA4, BRA5, BRA6, BRA7, BRA8, BRA9, BRA10, BRA11, BRA12, BRA13, BRA14, BRA15, BRA16, BRA17, BRA18, BRA19, BRA20, BRA21, BRA22, BRA23, BRA24, BRA25, BRA26, BRA27	**06-MAR-2015**	**----**	----	----	**18-MAR-2015**	20-MAR-2015	✓
EG005C: Leachable Metals by ICPAES							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG005C)							
BRA1, BRA2, BRA3, BRA4, BRA5, BRA6, BRA7, BRA8, BRA9, BRA10, BRA11, BRA12, BRA13, BRA14, BRA15, BRA16, BRA17, BRA18, BRA19, BRA20, BRA21, BRA22, BRA23, BRA24, BRA25, BRA26, BRA27	**14-MAR-2015**	**17-MAR-2015**	10-SEP-2015	✓	**18-MAR-2015**	10-SEP-2015	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
BRA1, BRA2, BRA3, BRA4, BRA5, BRA6, BRA7, BRA8	**06-MAR-2015**	**17-MAR-2015**	02-SEP-2015	✓	**17-MAR-2015**	02-SEP-2015	✓
Soil Glass Jar - Unpreserved (EG005T)							
BRA9, BRA10, BRA11, BRA12, BRA13, BRA14, BRA15, BRA16, BRA17, BRA18, BRA19, BRA20, BRA21, BRA22, BRA23, BRA24, BRA25, BRA26, BRA27	**06-MAR-2015**	**17-MAR-2015**	02-SEP-2015	✓	**18-MAR-2015**	02-SEP-2015	✓
EG035C: Leachable Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG035C)							
BRA1, BRA2, BRA3, BRA4, BRA5, BRA6, BRA7, BRA8, BRA9, BRA10, BRA11, BRA12, BRA13, BRA14, BRA15, BRA16, BRA17, BRA18, BRA19, BRA20, BRA21, BRA22, BRA23, BRA24, BRA25, BRA26, BRA27	**14-MAR-2015**	**----**	----	----	**19-MAR-2015**	11-APR-2015	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T)							
BRA1, BRA2, BRA3, BRA4, BRA5, BRA6, BRA7, BRA8	**06-MAR-2015**	**17-MAR-2015**	03-APR-2015	✓	**18-MAR-2015**	03-APR-2015	✓
Soil Glass Jar - Unpreserved (EG035T)							
BRA9, BRA10, BRA11, BRA12, BRA13, BRA14, BRA15, BRA16, BRA17, BRA18, BRA19, BRA20, BRA21, BRA22, BRA23, BRA24, BRA25, BRA26, BRA27	**06-MAR-2015**	**17-MAR-2015**	03-APR-2015	✓	**19-MAR-2015**	03-APR-2015	✓
EN33: TCLP Leach							
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN33a)							
BRA1, BRA2, BRA3, BRA4, BRA5, BRA6, BRA7, BRA8, BRA9, BRA10, BRA11, BRA12, BRA13, BRA14, BRA15, BRA16, BRA17, BRA18, BRA19, BRA20, BRA21, BRA22, BRA23, BRA24, BRA25, BRA26, BRA27	**06-MAR-2015**	**---**	20-MAR-2015	----	**14-MAR-2015**	20-MAR-2015	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
BRA21, BRA22, BRA23, BRA24, BRA25, BRA26, BRA27	**14-MAR-2015**	**17-MAR-2015**	21-MAR-2015	✓	**17-MAR-2015**	26-APR-2015	✓
Amber Glass Bottle - Unpreserved (EP071)							
BRA1, BRA2, BRA3, BRA4, BRA5, BRA6, BRA7, BRA8, BRA9, BRA10, BRA11, BRA12, BRA13, BRA14, BRA15, BRA16, BRA17, BRA18, BRA19, BRA20	**14-MAR-2015**	**17-MAR-2015**	21-MAR-2015	✓	**18-MAR-2015**	26-APR-2015	✓
Soil Glass Jar - Unpreserved (EP071)							
BRA1, BRA2, BRA3, BRA4, BRA5, BRA6, BRA7, BRA8, BRA9, BRA10, BRA11, BRA12, BRA13, BRA14, BRA15, BRA16, BRA17, BRA18, BRA19, BRA20, BRA21, BRA22, BRA23, BRA24, BRA25, BRA26, BRA27	**06-MAR-2015**	**17-MAR-2015**	20-MAR-2015	✓	**18-MAR-2015**	26-APR-2015	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
BRA21, BRA22, BRA23, BRA24, BRA25, BRA26, BRA27	**14-MAR-2015**	**17-MAR-2015**	21-MAR-2015	✓	**17-MAR-2015**	26-APR-2015	✓
Amber Glass Bottle - Unpreserved (EP075(SIM))							
BRA1, BRA2, BRA3, BRA4, BRA5, BRA6, BRA7, BRA8, BRA9, BRA10, BRA11, BRA12, BRA13, BRA14, BRA15, BRA16, BRA17, BRA18, BRA19, BRA20	**14-MAR-2015**	**17-MAR-2015**	21-MAR-2015	✓	**18-MAR-2015**	26-APR-2015	✓
Soil Glass Jar - Unpreserved (EP075(SIM))							
BRA21, BRA22, BRA23, BRA24, BRA25, BRA26, BRA27	**06-MAR-2015**	**17-MAR-2015**	20-MAR-2015	✓	**17-MAR-2015**	26-APR-2015	✓
Soil Glass Jar - Unpreserved (EP075(SIM))							
BRA1, BRA2, BRA3, BRA4, BRA5, BRA6, BRA7, BRA8, BRA9, BRA10, BRA11, BRA12, BRA13, BRA14, BRA15, BRA16, BRA17, BRA18, BRA19, BRA20	**06-MAR-2015**	**17-MAR-2015**	20-MAR-2015	✓	**18-MAR-2015**	26-APR-2015	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
BRA1, BRA2, BRA3, BRA4, BRA5, BRA6, BRA7, BRA8, BRA9, BRA10, BRA11, BRA12, BRA13, BRA14, BRA15, BRA16, BRA17, BRA18, BRA19, BRA20, BRA21, BRA22, BRA23, BRA24, BRA25, BRA26, BRA27	**19-MAR-2015**	**19-MAR-2015**	02-APR-2015	✓	**19-MAR-2015**	02-APR-2015	✓
Soil Glass Jar - Unpreserved (EP080)							
BRA21, BRA22, BRA23, BRA24, BRA25, BRA26, BRA27	**06-MAR-2015**	**13-MAR-2015**	20-MAR-2015	✓	**16-MAR-2015**	20-MAR-2015	✓
Soil Glass Jar - Unpreserved (EP080)							
BRA1, BRA2, BRA3, BRA4, BRA5, BRA6, BRA7, BRA8, BRA9, BRA10, BRA11, BRA12, BRA13, BRA14, BRA15, BRA16, BRA17, BRA18, BRA19, BRA20	**06-MAR-2015**	**13-MAR-2015**	20-MAR-2015	✓	**19-MAR-2015**	20-MAR-2015	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Amber VOC Vial - Sulfuric Acid (EP080)							
BRA1, BRA2, BRA3, BRA4, BRA5, BRA6, BRA7, BRA8, BRA9, BRA10, BRA11, BRA12, BRA13, BRA14, BRA15, BRA16, BRA17, BRA18, BRA19, BRA20, BRA21, BRA22, BRA23, BRA24, BRA25, BRA26, BRA27	**19-MAR-2015**	**19-MAR-2015**	02-APR-2015	✓	**19-MAR-2015**	02-APR-2015	✓
Soil Glass Jar - Unpreserved (EP080)							
BRA21, BRA22, BRA23, BRA24, BRA25, BRA26, BRA27	**06-MAR-2015**	**13-MAR-2015**	20-MAR-2015	✓	**16-MAR-2015**	20-MAR-2015	✓
Soil Glass Jar - Unpreserved (EP080)							
BRA1, BRA2, BRA3, BRA4, BRA5, BRA6, BRA7, BRA8, BRA9, BRA10, BRA11, BRA12, BRA13, BRA14, BRA15, BRA16, BRA17, BRA18, BRA19, BRA20	**06-MAR-2015**	**13-MAR-2015**	20-MAR-2015	✓	**19-MAR-2015**	20-MAR-2015	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	4	40	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	3	27	**11.1**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	4	39	**10.3**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	4	39	**10.3**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	3	27	**11.1**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	3	27	**11.1**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	2	27	**7.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	39	**5.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	39	**5.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	2	27	**7.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	2	27	**7.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	2	27	**7.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	39	**5.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	39	**5.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	2	27	**7.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	2	27	**7.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	2	27	**7.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	39	**5.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	39	**5.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	2	27	**7.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	2	27	**7.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Leachable Mercury by FIMS	EG035C	3	27	**11.1**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Leachable Metals by ICPAES	EG005C	4	32	**12.5**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Leachable Mercury by FIMS	EG035C	2	27	**7.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Leachable Metals by ICPAES	EG005C	2	32	**6.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	2	28	**7.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	2	27	**7.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
TRH Volatiles/BTEX	EP080	2	27	**7.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Leachable Mercury by FIMS	EG035C	2	27	**7.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Leachable Metals by ICPAES	EG005C	2	32	**6.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	2	28	**7.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	2	27	**7.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	2	27	**7.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Leachable Mercury by FIMS	EG035C	2	27	**7.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Leachable Metals by ICPAES	EG005C	2	32	**6.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055-103	SOIL	In-house. A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Leachable Metals by ICPAES	EG005C	SOIL	In house: referenced to APHA 21st ed., 3120; USEPA SW 846 - 6010: The ICPAES technique ionises leachate sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (2013) Schedule B(3)
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 21st ed., 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Leachable Mercury by FIMS	EG035C	SOIL	In house: referenced to AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the TCLP solution. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	(USEPA SW 846 - 8015A) Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40.
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	SOIL	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	SOIL	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals in TCLP Leachate	EN25C	SOIL	USEPA SW846-3005 Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3)
TCLP for Non & Semivolatile Analytes	EN33a	SOIL	In house QWI-EN/33 referenced to USEPA SW846-1311: The TCLP procedure is designed to determine the mobility of both organic and inorganic analytes present in wastes. The standard TCLP leach is for non-volatile and Semivolatile test parameters.

Preparation Methods	Method	Matrix	Method Descriptions
TCLP for Volatile Analytes (Zero Headspace Extraction)	EN33Za	SOIL	In house QWI-EN/33 referenced to USEPA SW846-1311: ZHE (Toxicity Characteristic Leach Procedure - Zero Headspace Extraction) An extraction procedure to determine the mobility of volatile organic and inorganic analytes under specific conditions. This technique is compliant with NEPM (2013) Schedule B(3) (Method 101)
Separatory Funnel Extraction of Liquids	ORG14	SOIL	USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In-house, Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

- **No Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

Appendix C Laboratory Results

Mitchel Hanlon Consulting Pty Ltd

95% Upper Confidence Limit - Mean Contaminant Concentration

STOCKPILE VALIDATION – WHITEHAVEN COAL LIMITED, WERRIS CREEK COAL
Bio-Remediation Area, 1435 Werris Creek Road, WERRIS CREEK

Samples - SCC Results [1]

			Total Metals							Polynuclear Aromatic Hydrocarbons																		Total Petroleum Hydrocarbons					Total Recoverable Petroleum Hydrocarbons							BTEX							
ALS Sample ID [1]	MHC Sample ID	Sample Depth	Arsenic	Cadmium	Chromium	Copper	Zinc	Lead	Mercury	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b+j)fluoranthene	Benzo(k)fluoranthene	Benzo(e)pyrene	Indeno(1,2,3-cd)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,i)perylene	Total PAHs	C_6-C_9 Fraction	C_{10} - C_{14} Fraction	C_{15} - C_{28} Fraction	C_{29} - C_{36} Fraction	C_{10} - C_{36} Fraction (sum)	TRH C_6-C_{10} Fraction	TRH C_6-C_{10} Frac. - BTEX (F1)	TRH C_{10} - C_{16}	TRH C_{16} - C_{34}	TRH C34 - C_{40}	TRH $>C_{10}$-C_{40} Fraction (sum)	TRH $>C_{10}$ - C_{16} - Napthalene (F2)	Benzene	Toluene	Ethylbenzene	Meta- & Para-Xylene	Ortho-Xylene	Total Xylene	Sum of BTEX	Napthalene
	Unit	m	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	LOR	-	5	1	2	5	5	5	0.1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	10	50	100	100	50	10	10	50	100	100	50	50	0.2	0.5	0.5	0.5	0.5	0.5	0.2	1
ES1505769-001	BHA01	0.30	<5	<1	***7***	***13***	***34***	***8***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***420***	***360***	***780***	<10	<10	<50	***640***	***320***	***960***	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-002	BHA02	0.30	<5	<1	***8***	***21***	***50***	***10***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	***260***	***2,950***	***1,820***	***5,030***	<10	<10	***690***	***3,810***	***1,610***	***6,110***	***690***	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-003	BHA03	0.30	<5	<1	***14***	***22***	***33***	***9***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***1,240***	***260***	***1,500***	<10	<10	***21***	***1,260***	***240***	***1,710***	***210***	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-004	BHA04	0.30	<5	<1	***9***	***16***	***31***	***8***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***630***	***270***	***900***	<10	<10	***110***	***750***	***240***	***1,100***	***110***	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-005	BHA05	0.30	<5	<1	***15***	***22***	***35***	***9***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***540***	***160***	***700***	<10	<10	***70***	***600***	***140***	***810***	***70***	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-006	BHA06	0.30	<5	<1	***10***	***25***	***42***	***9***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	***0.7***	***0.7***	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	***1.4***	<10	<50	***570***	***300***	***870***	<10	<10	***80***	***750***	***240***	***1,070***	***80***	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-007	BHA07	0.30	<5	<1	***4***	***10***	***32***	***8***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***370***	***220***	***590***	<10	<10	<50	***500***	***190***	***690***	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-008	BHA08	0.30	<5	<1	***5***	***11***	***35***	***8***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***560***	***160***	***720***	<10	<10	***90***	***620***	***130***	***840***	***90***	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-009	BHA09	0.30	<5	<1	***22***	***27***	***32***	***9***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***780***	***390***	***1,170***	<10	<10	***110***	***970***	***320***	***1,400***	***110***	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-010	BHA10	0.30	<5	<1	***17***	***21***	***32***	***8***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***500***	***130***	***630***	<10	<10	***60***	***550***	***100***	***710***	***60***	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-011	BHA11	0.30	<5	<1	***37***	***42***	***25***	***10***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-012	BHA12	0.30	<5	<1	***13***	***28***	***37***	***8***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***630***	***380***	***1,010***	<10	<10	***80***	***860***	***280***	***1,220***	***80***	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-013	BHA13	0.30	***6***	<1	***9***	***18***	***46***	***10***	<0.1	<0.5	<0.5	<0.5	<0.5	***0.8***	<0.5	***1.3***	***1.2***	***0.8***	***0.6***	***0.6***	<0.5	<0.5	<0.5	<0.5	<0.5	***5.3***	<10	<50	***840***	***700***	***1,540***	<10	<10	***80***	***1,280***	***630***	***1,990***	***80***	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-014	BHA14	0.30	***5***	<1	***6***	***12***	***37***	***9***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***690***	***710***	***1,400***	<10	<10	<50	***1,140***	***620***	***1,760***	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-015	BHA15	0.30	***6***	<1	***5***	***10***	***38***	***11***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***580***	***320***	***900***	<10	<10	***80***	***750***	***280***	***1,110***	***80***	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-016	BHA16	0.30	***6***	<1	***10***	***20***	***34***	***10***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***440***	***150***	***590***	<10	<10	<50	***510***	***140***	***650***	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-017	BHA17	0.30	<5	<1	***15***	***26***	***52***	***11***	<0.1	<0.5	<0.5	<0.5	<0.5	***0.6***	<0.5	***0.7***	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	***1.3***	<10	***90***	***4,390***	***2,160***	***6,640***	<10	<10	***350***	***5,740***	***1,610***	***7,700***	***350***	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-018	BHA18	0.30	<5	<1	***19***	***23***	***28***	***8***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***410***	<100	***410***	<10	<10	***60***	***430***	<100	***490***	***60***	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-019	BHA19	0.30	***5***	<1	***9***	***17***	***43***	***10***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***650***	***560***	***1,210***	<10	<10	***60***	***1,010***	***520***	***1,590***	***60***	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-020	BHA20	0.30	<5	<1	***7***	***18***	***68***	***12***	<0.1	<0.5	<0.5	<0.5	<0.5	***0.6***	<0.5	<0.5	***0.8***	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	***1.4***	<10	***210***	***4,160***	***3,950***	***8,320***	<10	<10	***620***	***6,320***	***3,770***	***10,700***	***620***	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-021	BHA21	0.30	<5	<1	***10***	***17***	***43***	***10***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***770***	***580***	***1,350***	<10	<10	***60***	***1,150***	***470***	***1,680***	***60***	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-022	BHA22	0.30	<5	<1	***20***	***24***	***20***	***9***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***360***	<100	***360***	<10	<10	<50	***340***	<100	***340***	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-023	BHA23	0.30	<5	<1	***9***	***17***	***58***	***13***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***540***	***110***	***650***	<10	<10	***110***	***550***	<100	***660***	***100***	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-024	BHA24	0.30	<5	<1	***14***	***21***	***30***	***7***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	***60***	***660***	<100	***720***	<10	<10	***220***	***560***	<100	***780***	***220***	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-025[#]	BHA25	0.30	<5	<1	***22***	***26***	***31***	***9***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***300***	***130***	***430***	<10	<10	<50	***380***	***110***	***490***	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-026[#]	BHA26	0.30	<5	<1	***16***	***39***	***42***	***12***	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	***280***	***100***	***380***	<10	<10	<50	***310***	***100***	***410***	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
ES1505769-027^	BHA27	0.30	<5	<1	<2	<5	<5	<5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1
	Calculated Mean		5.60	*	12.77	21.00	38.00	9.42	*	*	*	*	*	0.67	*	0.90	0.90	0.65	0.55	0.55	*	*	*	*	*	2.35	*	155.00	970.40	632.73	1,552.00	*	*	163.94	1,271.20	574.29	1,878.80	173.89	*	*	*	*	*	*	*	*
	Calculated 95% UCL [2]		**6.02**	*	**15.19**	**23.60**	**41.50**	**9.92**	*	*	*	*	*	**0.78**	*	**1.24**	**1.16**	**0.91**	**0.64**	**0.64**	*	*	*	*	*	**4.03**	*	**236.47**	**1,352.90**	**963.76**	**2,239.84**	*	*	**241.89**	**1,812.97**	**890.57**	**2,734.87**	**250.67**	*	*	*	*	*	*	*	*
	Contaminant Threshold Values	**HIL [3/4]**	**100 [3]**	**20 [3]**	**12,000 [3]**	**1,000 [3]**	**7,000 [3]**	**300 [3]**	**15 [3]**	-	-	-	-	-	-	-	-	-	-	-	-	**1 [4]**	-	-	-	**20 [4]**	**65 [4]**	-	-	-	**1,000 [4]**	-	-	-	-	-	-	-	**1 [4]**	**130 [4]**	**50 [4]**	-	-	**25 [4]**	-	-

(1) Analysis preformed by ALS Global (NATA Accredited Laboratory - 825)
(2) Stated 95% Upper Confidence Limit calculated using Equation 6, page 22 of NSW EPA Sampling Design Guidelines 1995
(3) Relevant thresholds obtained from NEPM Schedule B (1) Investigation Levels for Soil and Groundwater 1999 ('A' Standard Residential)
(4) Relevant thresholds obtained from NSW EPA Contaminated Sites: Guidelines for Assessing Service Station Sites
df $_{(\alpha = 0.05)}$ = 1.708 - obtained from Table B, page 23 of NSW EPA Sampling Design Guidelines 1995
*** No Values were able to be calculated as results were below reporting limits**
[#] Indicates Intra-laboratory Duplicates, ^ Indicates Trip Blank
Indicates Value Approaching Relevant Thresholds
Indicates Value in excess of Relevant Thresholds

Mitchel Hanlon Consulting Pty Ltd

95% Upper Confidence Limit - Mean Contaminant Concentration

STOCKPILE VALIDATION – WHITEHAVEN COAL LIMITED, WERRIS CREEK COAL
Bio-Remediation Area, 1435 Werris Creek Road, WERRIS CREEK

Samples - TCLP Results (1)

			Total Metals							Polynuclear Aromatic Hydrocarbons																		Total Petroleum Hydrocarbons					Total Recoverable Petroleum Hydrocarbons							BTEX							
ALS Sample ID (1)	MHC Sample ID	Sample Depth	Arsenic	Cadmium	Chromium	Copper	Zinc	Lead	Mercury	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b+j)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1.2.3.cd)pyrene	Dibenz(a.h)anthracene	Benzo(g.h.i)perylene	Total PAHs	C_6-C_9 Fraction	C_{10} - C_{14} Fraction	C_{15} - C_{28} Fraction	C_{29} - C_{36} Fraction	C_{10} - C_{36} Fraction (sum)	TRH C_6-C_{10} Fraction	TRH C_6-C_{10} Frac. - BTEX (F1)	TRH C_{10} - C_{16}	TRH C_{16} - C_{34}	TRH C34 - C_{40}	TRH >C_{10}-C_{40} Fraction (sum)	TRH >C_{10} - C_{16} - Napthalene (F2)	Benzene	Toluene	Ethylbenzene	Meta- & Para-Xylene	Ortho-Xylene	Total Xylene	Sum of BTEX	Napthalene
	Unit	*m*	*mg/L*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*	*µg/kg*
	LOR	-	0.1	0.05	0.1	0.1	0.1	0.1	0.001	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.1	0.1	0.1	0.5	20	50	100	50	50	20	20	100	100	100	100	100	1	2	2	2	2	2	1	5
ES1505769-001	BHA01	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-002	BHA02	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-003	BHA03	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-004	BHA04	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-005	BHA05	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-006	BHA06	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-007	BHA07	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-008	BHA08	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-009	BHA09	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-010	BHA10	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-011	BHA11	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-012	BHA12	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-013	BHA13	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-014	BHA14	0.30	<0.1	<0.05	<0.1	***0.1***	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-015	BHA15	0.30	<0.1	<0.05	<0.1	<0.1	***0.1***	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-016	BHA16	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-017	BHA17	0.30	<0.1	<0.05	<0.1	<0.1	***0.1***	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-018	BHA18	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-019	BHA19	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-020	BHA20	0.30	<0.1	<0.05	<0.1	<0.1	***0.3***	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-021	BHA21	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-022	BHA22	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-023	BHA23	0.30	<0.1	<0.05	<0.1	<0.1	***0.1***	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-024	BHA24	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-025#	BHA25	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-026#	BHA26	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
ES1505769-027^	BHA27	0.30	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5
	Calculated Mean	-	*	*	*	*	0.14	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Calculated 95% UCL (2)	-	*	*	*	*	**0.21**	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Contaminant Threshold Values	**TCLP1** (5)		**5**	**1**	**5**	**-**	**-**	**5**	**0.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.04**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.5**	**14.4**	**30**	**-**	**-**	**50**	**-**	**-**

(1) Analysis preformed by ALS Global (NATA Accredited Laboratory - 825)
(2) Stated 95% Upper Confidence Limit calculated using Equation 6, page 22 of NSW EPA Sampling Design Guidelines 1995
(5) Relevant thresholds obtained from Table 2 page 17 of the NSW DECCW Waste Classification Guidelines - Part 1
$df_{(\alpha = 0.05)}$ = 1.708 - obtained from Table B, page 23 of NSW EPA Sampling Design Guidelines 1995
*** No Values were able to be calculated as results were below reporting limits**
 # Indicates Intra-laboratory Duplicates, ^ Indicates Trip Blank
Indicates Value Approaching Relevant Thresholds
Indicates Value in excess of Relevant Thresholds

CERTIFICATE OF ANALYSIS

Work Order	: **ES1505769**	Page	: 1 of 39
Client	: **WHITEHAVEN PTY LTD C/O ACIRL PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: A WRIGHT	Contact	: Client Services
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Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: WCC BIO-REMEDIATION AREA	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: 9779		
C-O-C number	: ----	Date Samples Received	: 11-MAR-2015
Sampler	: AW	Issue Date	: 20-MAR-2015
Site	: ----		
		No. of samples received	: 27
Quote number	: SY-457-11	No. of samples analysed	: 27

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.**
- **Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID: BRA1	BRA2	BRA3	BRA4	BRA5
				Client sampling date / time: 06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30
				ES1505769-001	ES1505769-002	ES1505769-003	ES1505769-004	ES1505769-005
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	**4.3**	**9.3**	**11.8**	**7.4**	**8.4**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**7**	**8**	**14**	**9**	**15**
Copper	7440-50-8	5	mg/kg	**13**	**21**	**22**	**16**	**22**
Zinc	7440-66-6	5	mg/kg	**34**	**50**	**33**	**31**	**35**
Lead	7439-92-1	5	mg/kg	**8**	**10**	**9**	**8**	**9**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	**9.2**	**9.2**	**9.1**	**6.0**	**9.0**
After HCl pH	----	0.1	pH Unit	**1.5**	**1.5**	**1.6**	**1.5**	**1.5**
Extraction Fluid Number	----	1	-	**1**	**1**	**1**	**1**	**1**
Final pH	----	0.1	pH Unit	**5.0**	**5.2**	**5.2**	**5.0**	**5.0**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	**0.6**	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	**0.6**	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	Client sample ID	BRA1	BRA2	BRA3	BRA4	BRA5
				Client sampling date / time	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30
					ES1505769-001	ES1505769-002	ES1505769-003	ES1505769-004	ES1505769-005
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	0.6	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	1.2	1.2	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	260	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		420	2950	1240	630	540
C29 - C36 Fraction	----	100	mg/kg		360	1820	260	270	160
^ C10 - C36 Fraction (sum)	----	50	mg/kg		780	5030	1500	900	700
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	>C10_C16	50	mg/kg		<50	690	210	110	70
>C16 - C34 Fraction	----	100	mg/kg		640	3810	1260	750	600
>C34 - C40 Fraction	----	100	mg/kg		320	1610	240	240	140
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		960	6110	1710	1100	810
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	690	210	110	70
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		96.6	95.0	102	100	93.3
2-Chlorophenol-D4	93951-73-6	0.1	%		101	99.7	108	106	100
2.4.6-Tribromophenol	118-79-6	0.1	%		94.2	116	123	115	109
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		111	111	118	115	110

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BRA1	BRA2	BRA3	BRA4	BRA5
			Client sampling date / time	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30
Compound	CAS Number	LOR	Unit	ES1505769-001	ES1505769-002	ES1505769-003	ES1505769-004	ES1505769-005
EP075(SIM)T: PAH Surrogates - Continued								
Anthracene-d10	1719-06-8	0.1	%	100	100	106	104	98.9
4-Terphenyl-d14	1718-51-0	0.1	%	111	107	116	113	108
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	81.0	88.0	80.9	92.2	91.6
Toluene-D8	2037-26-5	0.1	%	106	102	108	117	111
4-Bromofluorobenzene	460-00-4	0.1	%	88.1	90.1	91.3	98.3	98.3

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	BRA6	BRA7	BRA8	BRA9	BRA10
				Client sampling date / time	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30
					ES1505769-006	ES1505769-007	ES1505769-008	ES1505769-009	ES1505769-010
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		**9.2**	**5.3**	**8.3**	**5.9**	**6.0**
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		**10**	**4**	**5**	**22**	**17**
Copper	7440-50-8	5	mg/kg		**25**	**10**	**11**	**27**	**21**
Zinc	7440-66-6	5	mg/kg		**42**	**32**	**35**	**32**	**32**
Lead	7439-92-1	5	mg/kg		**9**	**8**	**8**	**9**	**8**
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EN33: TCLP Leach									
Initial pH	----	0.1	pH Unit		**8.3**	**8.9**	**9.0**	**8.9**	**9.1**
After HCl pH	----	0.1	pH Unit		**1.5**	**1.5**	**1.6**	**1.6**	**1.5**
Extraction Fluid Number	----	1	-		**1**	**1**	**1**	**1**	**1**
Final pH	----	0.1	pH Unit		**5.0**	**4.9**	**4.9**	**5.8**	**5.1**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		**0.7**	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		**0.7**	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg		**1.4**	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	Client sample ID	BRA6	BRA7	BRA8	BRA9	BRA10
				Client sampling date / time	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30
					ES1505769-006	ES1505769-007	ES1505769-008	ES1505769-009	ES1505769-010
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	0.6	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	1.2	1.2	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		570	370	560	780	500
C29 - C36 Fraction	----	100	mg/kg		300	220	160	390	130
^ C10 - C36 Fraction (sum)	----	50	mg/kg		870	590	720	1170	630
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	>C10_C16	50	mg/kg		80	<50	90	110	60
>C16 - C34 Fraction	----	100	mg/kg		750	500	620	970	550
>C34 - C40 Fraction	----	100	mg/kg		240	190	130	320	100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		1070	690	840	1400	710
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		80	<50	90	110	60
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		100	96.4	98.3	94.6	92.4
2-Chlorophenol-D4	93951-73-6	0.1	%		106	100	102	102	97.3
2.4.6-Tribromophenol	118-79-6	0.1	%		117	114	119	120	112
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		119	110	112	109	106

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	BRA6	BRA7	BRA8	BRA9	BRA10
				Client sampling date / time	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30
					ES1505769-006	ES1505769-007	ES1505769-008	ES1505769-009	ES1505769-010
EP075(SIM)T: PAH Surrogates - Continued									
Anthracene-d10	1719-06-8	0.1	%		**98.8**	**101**	**103**	**98.8**	**98.9**
4-Terphenyl-d14	1718-51-0	0.1	%		**111**	**110**	**112**	**107**	**108**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**87.5**	**82.2**	**79.5**	**87.4**	**81.4**
Toluene-D8	2037-26-5	0.1	%		**116**	**107**	**106**	**120**	**109**
4-Bromofluorobenzene	460-00-4	0.1	%		**92.5**	**90.1**	**90.3**	**99.3**	**91.9**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	BRA11	BRA12	BRA13	BRA14	BRA15
				Client sampling date / time	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30
					ES1505769-011	ES1505769-012	ES1505769-013	ES1505769-014	ES1505769-015
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		**19.9**	**8.4**	**4.7**	**7.3**	**4.0**
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	**6**	**5**	**6**
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		**37**	**13**	**9**	**6**	**5**
Copper	7440-50-8	5	mg/kg		**42**	**28**	**18**	**12**	**10**
Zinc	7440-66-6	5	mg/kg		**25**	**37**	**46**	**37**	**38**
Lead	7439-92-1	5	mg/kg		**10**	**8**	**10**	**9**	**11**
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EN33: TCLP Leach									
Initial pH	----	0.1	pH Unit		**9.0**	**7.9**	**8.7**	**9.0**	**9.0**
After HCl pH	----	0.1	pH Unit		**1.6**	**1.5**	**1.5**	**1.4**	**1.5**
Extraction Fluid Number	----	1	-		**1**	**1**	**1**	**1**	**1**
Final pH	----	0.1	pH Unit		**5.8**	**5.0**	**5.0**	**5.0**	**4.9**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	**0.8**	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	**1.3**	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	**1.2**	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	**0.8**	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	**0.6**	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	**0.6**	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg		<0.5	**5.3**	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	Client sample ID	BRA11	BRA12	BRA13	BRA14	BRA15
				Client sampling date / time	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30
					ES1505769-011	ES1505769-012	ES1505769-013	ES1505769-014	ES1505769-015
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	0.7	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	1.2	1.2	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	630	840	690	580
C29 - C36 Fraction	----	100	mg/kg		<100	380	700	710	320
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	1010	1540	1400	900
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	>C10_C16	50	mg/kg		<50	80	80	<50	80
>C16 - C34 Fraction	----	100	mg/kg		<100	860	1280	1140	750
>C34 - C40 Fraction	----	100	mg/kg		<100	280	630	620	280
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	1220	1990	1760	1110
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	80	80	<50	80
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		91.7	96.7	92.0	100	94.9
2-Chlorophenol-D4	93951-73-6	0.1	%		96.9	100	97.3	106	102
2.4.6-Tribromophenol	118-79-6	0.1	%		107	112	119	118	121
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		108	114	105	113	108

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BRA11	BRA12	BRA13	BRA14	BRA15
			Client sampling date / time	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30
Compound	CAS Number	LOR	Unit	ES1505769-011	ES1505769-012	ES1505769-013	ES1505769-014	ES1505769-015
EP075(SIM)T: PAH Surrogates - Continued								
Anthracene-d10	1719-06-8	0.1	%	99.0	84.1	94.4	102	97.9
4-Terphenyl-d14	1718-51-0	0.1	%	110	99.6	102	110	106
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	95.0	93.2	87.9	96.0	102
Toluene-D8	2037-26-5	0.1	%	91.7	106	107	110	126
4-Bromofluorobenzene	460-00-4	0.1	%	91.2	85.6	99.7	101	114

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	BRA16	BRA17	BRA18	BRA19	BRA20
				Client sampling date / time	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30
					ES1505769-016	ES1505769-017	ES1505769-018	ES1505769-019	ES1505769-020
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		**4.0**	**9.9**	**7.4**	**5.6**	**5.6**
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		**6**	<5	<5	**5**	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		**10**	**15**	**19**	**9**	**7**
Copper	7440-50-8	5	mg/kg		**20**	**26**	**23**	**17**	**18**
Zinc	7440-66-6	5	mg/kg		**34**	**52**	**28**	**43**	**68**
Lead	7439-92-1	5	mg/kg		**10**	**11**	**8**	**10**	**12**
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EN33: TCLP Leach									
Initial pH	----	0.1	pH Unit		**8.8**	**8.8**	**9.2**	**8.7**	**9.0**
After HCl pH	----	0.1	pH Unit		**1.5**	**1.6**	**1.5**	**1.5**	**1.4**
Extraction Fluid Number	----	1	-		**1**	**1**	**1**	**1**	**1**
Final pH	----	0.1	pH Unit		**5.0**	**5.1**	**5.3**	**5.0**	**5.1**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	**0.6**	<0.5	<0.5	**0.6**
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	**0.7**	<0.5	<0.5	**0.8**
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg		<0.5	**1.3**	<0.5	<0.5	**1.4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	Client sample ID	BRA16	BRA17	BRA18	BRA19	BRA20
				Client sampling date / time	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30
					ES1505769-016	ES1505769-017	ES1505769-018	ES1505769-019	ES1505769-020
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	0.6	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	1.2	1.2	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	90	<50	<50	210
C15 - C28 Fraction	----	100	mg/kg		440	4390	410	650	4160
C29 - C36 Fraction	----	100	mg/kg		150	2160	<100	560	3950
^ C10 - C36 Fraction (sum)	----	50	mg/kg		590	6640	410	1210	8320
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	>C10_C16	50	mg/kg		<50	350	60	60	620
>C16 - C34 Fraction	----	100	mg/kg		510	5740	430	1010	6320
>C34 - C40 Fraction	----	100	mg/kg		140	1610	<100	520	3770
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		650	7700	490	1590	10700
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	350	60	60	620
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		99.6	96.1	103	93.9	98.7
2-Chlorophenol-D4	93951-73-6	0.1	%		105	101	112	102	105
2.4.6-Tribromophenol	118-79-6	0.1	%		117	124	116	120	121
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		113	109	119	107	112

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BRA16	BRA17	BRA18	BRA19	BRA20
			Client sampling date / time	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30
Compound	CAS Number	LOR	Unit	ES1505769-016	ES1505769-017	ES1505769-018	ES1505769-019	ES1505769-020
EP075(SIM)T: PAH Surrogates - Continued								
Anthracene-d10	1719-06-8	0.1	%	104	96.1	107	96.4	96.1
4-Terphenyl-d14	1718-51-0	0.1	%	111	103	117	105	105
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	96.3	77.4	83.2	92.8	91.7
Toluene-D8	2037-26-5	0.1	%	116	93.6	97.5	109	114
4-Bromofluorobenzene	460-00-4	0.1	%	105	85.4	91.8	98.3	98.9

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	BRA21	BRA22	BRA23	BRA24	BRA25
				Client sampling date / time	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30
					ES1505769-021	ES1505769-022	ES1505769-023	ES1505769-024	ES1505769-025
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		**5.4**	**3.7**	**4.4**	**7.2**	**7.8**
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		**10**	**20**	**9**	**14**	**22**
Copper	7440-50-8	5	mg/kg		**17**	**24**	**17**	**21**	**26**
Zinc	7440-66-6	5	mg/kg		**43**	**20**	**58**	**30**	**31**
Lead	7439-92-1	5	mg/kg		**10**	**9**	**13**	**7**	**9**
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EN33: TCLP Leach									
Initial pH	----	0.1	pH Unit		**9.0**	**8.9**	**9.0**	**9.0**	**9.1**
After HCl pH	----	0.1	pH Unit		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Extraction Fluid Number	----	1	-		**1**	**1**	**1**	**1**	**1**
Final pH	----	0.1	pH Unit		**5.0**	**5.0**	**5.2**	**5.2**	**5.2**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	Client sample ID	BRA21	BRA22	BRA23	BRA24	BRA25
				Client sampling date / time	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30
					ES1505769-021	ES1505769-022	ES1505769-023	ES1505769-024	ES1505769-025
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	0.6	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	1.2	1.2	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	60	<50
C15 - C28 Fraction	----	100	mg/kg		770	360	540	660	300
C29 - C36 Fraction	----	100	mg/kg		580	<100	110	<100	130
^ C10 - C36 Fraction (sum)	----	50	mg/kg		1350	360	650	720	430
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	>C10_C16	50	mg/kg		60	<50	110	220	<50
>C16 - C34 Fraction	----	100	mg/kg		1150	340	550	560	380
>C34 - C40 Fraction	----	100	mg/kg		470	<100	<100	<100	110
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		1680	340	660	780	490
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		60	<50	110	220	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		103	105	109	100	96.1
2-Chlorophenol-D4	93951-73-6	0.1	%		107	109	113	116	103
2.4.6-Tribromophenol	118-79-6	0.1	%		88.4	92.1	80.3	87.6	87.5
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		103	106	99.9	101	99.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BRA21	BRA22	BRA23	BRA24	BRA25
			Client sampling date / time	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30	06-MAR-2015 10:30
Compound	CAS Number	LOR	Unit	ES1505769-021	ES1505769-022	ES1505769-023	ES1505769-024	ES1505769-025
EP075(SIM)T: PAH Surrogates - Continued								
Anthracene-d10	1719-06-8	0.1	%	96.4	101	91.7	94.8	96.2
4-Terphenyl-d14	1718-51-0	0.1	%	98.6	104	93.3	95.5	99.8
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	77.4	86.5	126	76.6	80.1
Toluene-D8	2037-26-5	0.1	%	95.4	89.2	87.8	97.2	98.4
4-Bromofluorobenzene	460-00-4	0.1	%	92.2	86.9	87.6	93.8	95.6

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BRA26	BRA27	----	----	----
			Client sampling date / time	06-MAR-2015 10:30	06-MAR-2015 10:30	----	----	----
Compound	CAS Number	LOR	Unit	ES1505769-026	ES1505769-027	----	----	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	**6.3**	<1.0	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	**16**	<2	----	----	----
Copper	7440-50-8	5	mg/kg	**39**	<5	----	----	----
Zinc	7440-66-6	5	mg/kg	**42**	<5	----	----	----
Lead	7439-92-1	5	mg/kg	**12**	<5	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	----	----	----
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	**8.9**	**7.1**	----	----	----
After HCl pH	----	0.1	pH Unit	**1.5**	**1.4**	----	----	----
Extraction Fluid Number	----	1	-	**1**	**1**	----	----	----
Final pH	----	0.1	pH Unit	**5.4**	**4.9**	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BRA26	BRA27	----	----	----
				Client sampling date / time	06-MAR-2015 10:30	06-MAR-2015 10:30	----	----	----
Compound	CAS Number	LOR	Unit		ES1505769-026	ES1505769-027	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	**0.6**	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	**1.2**	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg		<50	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg		**280**	<100	----	----	----
C29 - C36 Fraction	----	100	mg/kg		**100**	<100	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		**380**	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	----	----	----
>C10 - C16 Fraction	>C10_C16	50	mg/kg		<50	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg		**310**	<100	----	----	----
>C34 - C40 Fraction	----	100	mg/kg		**100**	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		**410**	<50	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	----	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	----	----	----
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg		<1	<1	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		**103**	**101**	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%		**107**	**113**	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%		**86.3**	**76.6**	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		**106**	**101**	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BRA26	BRA27	----	----	----
			Client sampling date / time	06-MAR-2015 10:30	06-MAR-2015 10:30	----	----	----
Compound	CAS Number	LOR	Unit	ES1505769-026	ES1505769-027	----	----	----
EP075(SIM)T: PAH Surrogates - Continued								
Anthracene-d10	1719-06-8	0.1	%	98.5	92.1	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	98.4	95.4	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	115	120	----	----	----
Toluene-D8	2037-26-5	0.1	%	116	89.0	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	127	91.8	----	----	----

Analytical Results

Sub-Matrix: **TCLP LEACHATE** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	BRA1	BRA2	BRA3	BRA4	BRA5
				Client sampling date / time	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00
					ES1505769-001	ES1505769-002	ES1505769-003	ES1505769-004	ES1505769-005
EG005C: Leachable Metals by ICPAES									
Arsenic	7440-38-2	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	7440-43-9	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Chromium	7440-47-3	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Copper	7440-50-8	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Lead	7439-92-1	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Zinc	7440-66-6	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
EG035C: Leachable Mercury by FIMS									
Mercury	7439-97-6	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	56-55-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons									
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									

Analytical Results

Sub-Matrix: TCLP LEACHATE (Matrix: WATER)				Client sample ID	BRA1	BRA2	BRA3	BRA4	BRA5
				Client sampling date / time	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00
Compound	CAS Number	LOR	Unit		ES1505769-001	ES1505769-002	ES1505769-003	ES1505769-004	ES1505769-005
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		**27.8**	**20.1**	**21.4**	**19.4**	**20.7**
2-Chlorophenol-D4	93951-73-6	0.1	%		**42.9**	**40.2**	**42.3**	**38.6**	**39.4**
2.4.6-Tribromophenol	118-79-6	0.1	%		**51.8**	**53.9**	**56.3**	**55.4**	**54.3**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		**53.8**	**50.3**	**54.3**	**47.6**	**42.4**
Anthracene-d10	1719-06-8	0.1	%		**59.8**	**54.2**	**58.0**	**58.1**	**58.3**
4-Terphenyl-d14	1718-51-0	0.1	%		**64.5**	**60.2**	**61.8**	**66.0**	**61.8**

Analytical Results

Sub-Matrix: **TCLP LEACHATE** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	BRA6	BRA7	BRA8	BRA9	BRA10
				Client sampling date / time	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00
					ES1505769-006	ES1505769-007	ES1505769-008	ES1505769-009	ES1505769-010
EG005C: Leachable Metals by ICPAES									
Arsenic	7440-38-2	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	7440-43-9	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Chromium	7440-47-3	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Copper	7440-50-8	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Lead	7439-92-1	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Zinc	7440-66-6	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
EG035C: Leachable Mercury by FIMS									
Mercury	7439-97-6	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	56-55-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons									
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									

Analytical Results

Sub-Matrix: TCLP LEACHATE (Matrix: WATER)				Client sample ID	BRA6	BRA7	BRA8	BRA9	BRA10
				Client sampling date / time	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00
Compound	CAS Number	LOR	Unit		ES1505769-006	ES1505769-007	ES1505769-008	ES1505769-009	ES1505769-010
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		**20.9**	**21.1**	**18.7**	**15.5**	**18.0**
2-Chlorophenol-D4	93951-73-6	0.1	%		**40.6**	**42.3**	**37.7**	**35.1**	**43.0**
2.4.6-Tribromophenol	118-79-6	0.1	%		**51.6**	**53.6**	**50.8**	**69.4**	**69.0**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		**42.1**	**36.6**	**36.1**	**32.0**	**42.8**
Anthracene-d10	1719-06-8	0.1	%		**57.5**	**60.4**	**57.5**	**58.9**	**60.9**
4-Terphenyl-d14	1718-51-0	0.1	%		**63.1**	**62.6**	**61.7**	**68.2**	**68.3**

Analytical Results

Sub-Matrix: **TCLP LEACHATE** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	BRA11	BRA12	BRA13	BRA14	BRA15
				Client sampling date / time	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00
					ES1505769-011	ES1505769-012	ES1505769-013	ES1505769-014	ES1505769-015
EG005C: Leachable Metals by ICPAES									
Arsenic	7440-38-2	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	7440-43-9	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Chromium	7440-47-3	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Copper	7440-50-8	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Lead	7439-92-1	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Zinc	7440-66-6	0.1	mg/L		<0.1	<0.1	<0.1	**0.1**	**0.1**
EG035C: Leachable Mercury by FIMS									
Mercury	7439-97-6	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	56-55-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons									
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									

Analytical Results

Sub-Matrix: TCLP LEACHATE (Matrix: WATER)			Client sample ID	BRA11	BRA12	BRA13	BRA14	BRA15
			Client sampling date / time	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00
Compound	CAS Number	LOR	Unit	ES1505769-011	ES1505769-012	ES1505769-013	ES1505769-014	ES1505769-015
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
>C10 - C16 Fraction	>C10_C16	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	<100	<100	<100	<100
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**15.2**	**15.5**	**14.0**	**16.2**	**14.6**
2-Chlorophenol-D4	93951-73-6	0.1	%	**36.4**	**37.6**	**31.4**	**38.2**	**35.9**
2.4.6-Tribromophenol	118-79-6	0.1	%	**62.4**	**70.2**	**62.9**	**65.9**	**68.5**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**37.5**	**46.3**	**42.8**	**55.4**	**48.6**
Anthracene-d10	1719-06-8	0.1	%	**58.9**	**63.3**	**55.8**	**60.9**	**61.6**
4-Terphenyl-d14	1718-51-0	0.1	%	**67.8**	**70.9**	**63.7**	**65.9**	**69.2**

Analytical Results

Sub-Matrix: **TCLP LEACHATE** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	BRA16	BRA17	BRA18	BRA19	BRA20
				Client sampling date / time	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00
					ES1505769-016	ES1505769-017	ES1505769-018	ES1505769-019	ES1505769-020
EG005C: Leachable Metals by ICPAES									
Arsenic	7440-38-2	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	7440-43-9	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Chromium	7440-47-3	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Copper	7440-50-8	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Lead	7439-92-1	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Zinc	7440-66-6	0.1	mg/L		<0.1	**0.1**	<0.1	<0.1	**0.3**
EG035C: Leachable Mercury by FIMS									
Mercury	7439-97-6	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	56-55-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons									
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									

Analytical Results

Sub-Matrix: TCLP LEACHATE (Matrix: WATER)				Client sample ID	BRA16	BRA17	BRA18	BRA19	BRA20
				Client sampling date / time	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00
Compound	CAS Number	LOR	Unit		ES1505769-016	ES1505769-017	ES1505769-018	ES1505769-019	ES1505769-020
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		**14.8**	**13.9**	**14.9**	**14.7**	**15.6**
2-Chlorophenol-D4	93951-73-6	0.1	%		**33.7**	**34.1**	**34.8**	**33.0**	**39.2**
2.4.6-Tribromophenol	118-79-6	0.1	%		**66.1**	**66.0**	**60.8**	**68.1**	**56.7**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		**57.8**	**58.3**	**51.8**	**55.2**	**53.5**
Anthracene-d10	1719-06-8	0.1	%		**57.0**	**54.1**	**57.1**	**61.3**	**60.8**
4-Terphenyl-d14	1718-51-0	0.1	%		**64.3**	**61.9**	**60.5**	**65.4**	**65.9**

Analytical Results

Sub-Matrix: **TCLP LEACHATE** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	BRA21	BRA22	BRA23	BRA24	BRA25
				Client sampling date / time	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00
					ES1505769-021	ES1505769-022	ES1505769-023	ES1505769-024	ES1505769-025
EG005C: Leachable Metals by ICPAES									
Arsenic	7440-38-2	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	7440-43-9	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Chromium	7440-47-3	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Copper	7440-50-8	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Lead	7439-92-1	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Zinc	7440-66-6	0.1	mg/L		<0.1	<0.1	**0.1**	<0.1	<0.1
EG035C: Leachable Mercury by FIMS									
Mercury	7439-97-6	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	56-55-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons									
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									

Analytical Results

Sub-Matrix: TCLP LEACHATE (Matrix: WATER)			Client sample ID	BRA21	BRA22	BRA23	BRA24	BRA25
			Client sampling date / time	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00	14-MAR-2015 12:00
Compound	CAS Number	LOR	Unit	ES1505769-021	ES1505769-022	ES1505769-023	ES1505769-024	ES1505769-025
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
>C10 - C16 Fraction	>C10_C16	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	13.3	14.4	18.0	15.6	15.8
2-Chlorophenol-D4	93951-73-6	0.1	%	34.1	31.8	41.2	34.0	33.0
2.4.6-Tribromophenol	118-79-6	0.1	%	63.7	60.9	73.6	65.0	52.0
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	52.2	46.9	72.9	55.1	48.9
Anthracene-d10	1719-06-8	0.1	%	61.1	55.5	68.2	63.8	58.2
4-Terphenyl-d14	1718-51-0	0.1	%	70.0	62.6	74.0	73.3	64.6

Analytical Results

Sub-Matrix: TCLP LEACHATE (Matrix: WATER)				Client sample ID	BRA26	BRA27	----	----	----
				Client sampling date / time	14-MAR-2015 12:00	14-MAR-2015 12:00	----	----	----
Compound	CAS Number	LOR	Unit		ES1505769-026	ES1505769-027	----	----	----
EG005C: Leachable Metals by ICPAES									
Arsenic	7440-38-2	0.1	mg/L		<0.1	<0.1	----	----	----
Cadmium	7440-43-9	0.05	mg/L		<0.05	<0.05	----	----	----
Chromium	7440-47-3	0.1	mg/L		<0.1	<0.1	----	----	----
Copper	7440-50-8	0.1	mg/L		<0.1	<0.1	----	----	----
Lead	7439-92-1	0.1	mg/L		<0.1	<0.1	----	----	----
Zinc	7440-66-6	0.1	mg/L		<0.1	<0.1	----	----	----
EG035C: Leachable Mercury by FIMS									
Mercury	7439-97-6	0.0010	mg/L		<0.0010	<0.0010	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L		<1.0	<1.0	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L		<1.0	<1.0	----	----	----
Acenaphthene	83-32-9	1.0	µg/L		<1.0	<1.0	----	----	----
Fluorene	86-73-7	1.0	µg/L		<1.0	<1.0	----	----	----
Phenanthrene	85-01-8	1.0	µg/L		<1.0	<1.0	----	----	----
Anthracene	120-12-7	1.0	µg/L		<1.0	<1.0	----	----	----
Fluoranthene	206-44-0	1.0	µg/L		<1.0	<1.0	----	----	----
Pyrene	129-00-0	1.0	µg/L		<1.0	<1.0	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L		<1.0	<1.0	----	----	----
Chrysene	218-01-9	1.0	µg/L		<1.0	<1.0	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L		<1.0	<1.0	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	<1.0	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	<1.0	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		<1.0	<1.0	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		<1.0	<1.0	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L		<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L		<0.5	<0.5	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C10 - C14 Fraction	----	50	µg/L		<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L		<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L		<50	<50	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									

Analytical Results

Sub-Matrix: TCLP LEACHATE (Matrix: WATER)				Client sample ID	BRA26	BRA27	----	----	----
				Client sampling date / time	14-MAR-2015 12:00	14-MAR-2015 12:00	----	----	----
Compound	CAS Number	LOR	Unit		ES1505769-026	ES1505769-027	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		**14.8**	**15.7**	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%		**34.0**	**35.1**	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%		**52.8**	**57.3**	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		**48.9**	**57.2**	----	----	----
Anthracene-d10	1719-06-8	0.1	%		**57.0**	**63.6**	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%		**62.1**	**69.2**	----	----	----

Analytical Results

Sub-Matrix: **ZHE LEACHATE** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	BRA1	BRA2	BRA3	BRA4	BRA5
				Client sampling date / time	19-MAR-2015 12:00	19-MAR-2015 12:00	19-MAR-2015 12:00	19-MAR-2015 12:00	19-MAR-2015 12:00
					ES1505769-001	ES1505769-002	ES1505769-003	ES1505769-004	ES1505769-005
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**79.6**	**102**	**97.9**	**105**	**98.9**
Toluene-D8	2037-26-5	0.1	%		**96.8**	**113**	**114**	**113**	**115**
4-Bromofluorobenzene	460-00-4	0.1	%		**87.7**	**102**	**103**	**106**	**104**

Analytical Results

Sub-Matrix: ZHE LEACHATE (Matrix: WATER)				Client sample ID	BRA6	BRA7	BRA8	BRA9	BRA10
				Client sampling date / time	19-MAR-2015 12:00	19-MAR-2015 12:00	19-MAR-2015 12:00	19-MAR-2015 12:00	19-MAR-2015 12:00
Compound	CAS Number	LOR	Unit		ES1505769-006	ES1505769-007	ES1505769-008	ES1505769-009	ES1505769-010
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		101	94.3	96.6	100	104
Toluene-D8	2037-26-5	0.1	%		113	113	114	116	109
4-Bromofluorobenzene	460-00-4	0.1	%		104	101	101	106	103

Analytical Results

Sub-Matrix: ZHE LEACHATE (Matrix: WATER)				Client sample ID	BRA11	BRA12	BRA13	BRA14	BRA15
				Client sampling date / time	19-MAR-2015 12:00	19-MAR-2015 12:00	19-MAR-2015 12:00	19-MAR-2015 12:00	19-MAR-2015 12:00
Compound	CAS Number	LOR	Unit		ES1505769-011	ES1505769-012	ES1505769-013	ES1505769-014	ES1505769-015
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**95.8**	**113**	**105**	**108**	**104**
Toluene-D8	2037-26-5	0.1	%		**114**	**115**	**116**	**112**	**119**
4-Bromofluorobenzene	460-00-4	0.1	%		**105**	**108**	**106**	**105**	**108**

Analytical Results

Sub-Matrix: **ZHE LEACHATE** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	BRA16	BRA17	BRA18	BRA19	BRA20
				Client sampling date / time	19-MAR-2015 12:00	19-MAR-2015 12:00	19-MAR-2015 12:00	19-MAR-2015 12:00	19-MAR-2015 12:00
					ES1505769-016	ES1505769-017	ES1505769-018	ES1505769-019	ES1505769-020
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**101**	**106**	**96.5**	**97.6**	**97.3**
Toluene-D8	2037-26-5	0.1	%		**112**	**116**	**114**	**114**	**117**
4-Bromofluorobenzene	460-00-4	0.1	%		**104**	**108**	**100**	**100**	**101**

Analytical Results

Sub-Matrix: **ZHE LEACHATE** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	BRA21	BRA22	BRA23	BRA24	BRA25
				Client sampling date / time	19-MAR-2015 12:00	19-MAR-2015 12:00	19-MAR-2015 12:00	19-MAR-2015 12:00	19-MAR-2015 12:00
					ES1505769-021	ES1505769-022	ES1505769-023	ES1505769-024	ES1505769-025
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**112**	**118**	**135**	**101**	**116**
Toluene-D8	2037-26-5	0.1	%		**112**	**112**	**128**	**97.1**	**110**
4-Bromofluorobenzene	460-00-4	0.1	%		**100**	**102**	**112**	**88.5**	**99.1**

Analytical Results

Sub-Matrix: ZHE LEACHATE (Matrix: WATER)				Client sample ID	BRA26	BRA27	----	----	----
				Client sampling date / time	19-MAR-2015 12:00	19-MAR-2015 12:00	----	----	----
Compound	CAS Number	LOR	Unit		ES1505769-026	ES1505769-027	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	----	----	----
Toluene	108-88-3	2	µg/L		<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	----	----	----
^ Total Xylenes	1330-20-7	2	µg/L		<2	<2	----	----	----
^ Sum of BTEX	----	1	µg/L		<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	<5	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		131	117	----	----	----
Toluene-D8	2037-26-5	0.1	%		120	115	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%		108	101	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	72.8	133.2
Toluene-D8	2037-26-5	73.9	132.1
4-Bromofluorobenzene	460-00-4	71.6	130.0

Sub-Matrix: **TCLP LEACHATE**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10.0	44
2-Chlorophenol-D4	93951-73-6	14	94
2.4.6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27.4	113
4-Terphenyl-d14	1718-51-0	32	112

Sub-Matrix: **ZHE LEACHATE**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

Werris Creek Coal Mine

Annual Flora and Fauna Monitoring Report

Prepared for
Werris Creek Coal Pty. Ltd.

28 May 2015

DOCUMENT TRACKING

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Template 08/05/2014

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Abbreviations

Abbreviation	Description
ANOSIM	Analysis of Similarity
BOA	Biodiversity Offset Area
BOMP	Biodiversity Offset Management Plan
DoE	Commonwealth Department of the Environment
DNG	Derived Native Grassland
DP&I	Department of Planning and Infrastructure
ELA	Eco Logical Australia Pty Ltd
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999
LOM	Life of Mine
LFA	Landscape Function Analysis
nMDS	Non-metric Multidimensional Scaling
OEH	NSW Office of Environment and Heritage
PA	Project Approval
TSC Act	NSW *Threatened Species Conservation Act* 1995
SEWPaC	Former Commonwealth Department of Sustainability, Environment, Water, Population and Communities (now DoE)
SSA	Soil Surface Assessment
WCC	Werris Creek Coal Pty Ltd

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Key findings

A summary of site performance per monitoring site and recommended management actions is presented in the table below. Monitoring data from these sites represents the performance of the vegetation communities in the four condition classes; however, the monitoring sites are a point location and are only representative of the condition of the communities across the biodiversity offset area, though some sites appear to be influenced by localised factors. The following provides a summary of the monitoring of the different condition types.

Intact woodland sites (condition class 4) appear to be performing well. Vegetation cover at all class 4 woodland monitoring sites is dominated by native species. The main management issues with class 4 woodland, is an increase in the exotic plant cover and number of exotic plant species since 2012. Dry weather conditions prior to flora monitoring in 2014 may have influenced this change. However, woodland sites continue to have a lower exotic plant cover than native grassland and disturbed sites and all class 4 monitoring sites are dominated by native species. Ongoing management of noxious weeds needs to continue to prevent their spread.

Areas of Derived Native Grassland (DNG) (condition class 3) generally fell below the performance criteria for the number of native species. However, native species cover was generally moderate to high at these sites and exceeded performance criteria (with some exceptions). The mean number of native species at these DNG sites has remained relatively constant over monitoring events since 2012 and do not seem to be accumulating new native species rapidly. Natural regeneration of canopy species was only observed in one DNG monitoring site. Ongoing management of noxious weeds in DNG needs to continue to prevent the spread. At Year 2 of the five year period for natural regeneration, it appears that active revegetation of canopy species may be required at year 5.

Areas of scattered trees and cleared land (condition classes 1 & 2) are generally in poor condition when compared to DNG and woodland sites. The poor performance of condition class 1 and 2 sites is expected given the recent history of disturbance over a long period of time compared to the relatively short period of restoration management. These areas are generally dominated by exotic groundcover, have relatively low native species diversity and a large number of exotic species. Older areas of rehabilitation were the best performing of the disturbed sites and show promising signs of what can be achieved in the rehabilitation areas. Continued management of exotic species is a priority for these areas.

Areas of condition class 2 White Box woodland that has previously been cultivated and cleared land were some of the worst performing sites. Improving the number and cover of native species in these areas may need an intensive management approach similar to that of rehabilitation areas.

A total of 119 fauna species were recorded during the 2014 fauna monitoring surveys. These consisted of 73 bird, 20 reptile, 23 mammal and 3 frog species. Ten fauna species listed under the *Threatened Species Conservation Act* 1995 (TSC Act) and/or the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) were recorded during the 2014 survey period. The vulnerable species; *Scoteanax rueppellii* (Greater Broad-nosed Bat), was recorded during 2014 surveys but has not been recorded during previous fauna monitoring events.

Bat and bird communities were generally similar between habitats within the Werris Creek Biodiversity Offset Area (BOA) and rehabilitation areas. However, the mean number of birds and bird species per site were less within rehabilitation areas. Some variation in both bird and bat communities was observed between years.

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The following table provides a summary of site performance and key recommendations per site, which is representative of the monitoring stratification zone sampled. Section 4 provides further recommendations on monitoring approach and recommended changes to the BOMP.

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Biometric vegetation type	Condition class No. (Site)	Overall site performance against performance measures that have been set for a 5 year target								Comments on underperforming sites and management action
		NNS	NOC	NMS	NGC	ES	LO	SSA	FA	
	2 (7)						N/A	N/A		This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be implemented for red measures. NNS reduced in 2014, NOC continues to be low and does not appear to be showing signs of improvement and active regeneration may be appropriate. ES cover remains relatively high. At this stage, in accordance with the BOMP (WCC 2013), with ES continuing to perform poorly continued weed management is required to control exotic species. Note, this site is positioned in a highly disturbed location (next to old soil stock pile) in the zone and does not accurately reflect overall zone condition – a new site will be established in a more representative location and therefore, traffic light colouring has not been provided.
White Box grassy woodland	2 (16)						N/A	N/A		This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber measures could be addressed through appropriate management actions. NNS, NOC and NGC all remain low and, given observed low resilience, active revegetation may be appropriate for this site unless future monitoring indicates large improvements. ES cover remains high. Weed management is an ongoing issue for the BOA and weed spraying should continue. There is a strategy in place (scalping and seeding native grasses) to improve NNS and NOC for this site to be implemented in the next 12 months.
	3 (1)						N/A	N/A		This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be implemented for red measures. ES is relatively high and Scotch Thistle (noxious weed) requires continued management. NNS has improved in 2014;

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Biometric vegetation type	Condition class No. (Site)	Overall site performance against performance measures that have been set for a 5 year target								Comments on underperforming sites and management action
		NNS	NOC	NMS	NGC	ES	LO	SSA	FA	
										however, NOC continues to be low, and ES cover remains high, though weed cover has reduced by 20% since 2012 and 40% since 2010. Nevertheless, weed management should continue in accordance with the BOMP.
	3 (2)						N/A	N/A		This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be implemented for red measures. NNS is improving. NOC continues to be low though there are signs of regeneration. ES cover has increased and the presence of Scotch Thistle and St Johns Wort (noxious weed) require continued management
	3 (8)						N/A	N/A		This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be implemented for red measures. NNS is continuing to decline since 2012 and active revegetation would be appropriate, NOC continues to be low, and ES cover remains relatively high with Scotch Thistle (noxious weed) requiring continued management. That said, weed management should continue in accordance with the BOMP.
	3 (12)						N/A	N/A		This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be implemented for red measures. NNS is continuing to decline since 2012 and active revegetation would be appropriate, NOC continues to be low, and ES cover remains high. Weed management should continue in accordance with the BOMP.
	3 (19)						N/A	N/A		This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber measures could be considered through

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Biometric vegetation type	Condition class No. (Site)	Overall site performance against performance measures that have been set for a 5 year target								Comments on underperforming sites and management action
		NNS	NOC	NMS	NGC	ES	LO	SSA	FA	
										appropriate management actions. NNS has remained stable since 2012, NOC continues to be low, and ES cover remains high. Therefore, weed management should continue in accordance with the BOMP.
	3 (21)						N/A	N/A		This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber measures could be considered through appropriate management actions. NOC continues to be low. Revegetation using tube stock may be necessary if NOC does not show signs of improvement in medium term. ES appears to have increased and weed management should continue in accordance with the BOMP.
	3 (27)						N/A	N/A		This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber measures could be considered through appropriate management actions. NOC continues to be low, which is expected given it's a DNG site. Revegetation using tube stock may be necessary if NOC does not show signs of improvement in medium term.
	4 (3)						N/A	N/A		This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be implemented for red measures. NNS is less than the PC, though has improved since 2012. Native species diversity fluctuates depending on climatic conditions in respective years. ES St Johns Wort (noxious weed) requires continued management. Future monitoring of diversity will inform actual performance of the site.
	4 (11)									This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be

Biometric vegetation type	Condition class No. (Site)	Overall site performance against performance measures that have been set for a 5 year target								Comments on underperforming sites and management action
		NNS	NOC	NMS	NGC	ES	LO	SSA	FA	
										implemented for red measures. NNS is less than the PC and has reduced from previous years of monitoring. Native species diversity fluctuates depending on climatic conditions in respective years. Future monitoring of diversity will inform actual performance of the site. ES cover has significantly reduced from 2010, though the presence of St Johns Wort requires targeted weed management. Future LFA monitoring will inform whether SSA results are a downward trend.
	4 (13)						N/A	N/A		This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber measures could be considered through appropriate management actions. ES cover is relatively high and Paterson's Curse (noxious weed) requires management.
	4 (17)									This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber measures could be considered through appropriate management actions. NNS remains stable but is less than the PC. Native species diversity fluctuates depending on climatic conditions in respective years. Future monitoring of diversity will inform actual performance of the site. Future LFA monitoring will inform whether SSA results are a downward trend.
	4 (24)						N/A	N/A		NNS is now meeting the PC. NGC has reduced, though this may be a natural variation.
Yellow Box – Blakely's Red Gum grassy	4 (5)						N/A	N/A		This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be implemented for amber measures. NNS has remained stable but is below

Biometric vegetation type	Condition class No. (Site)	Overall site performance against performance measures that have been set for a 5 year target								Comments on underperforming sites and management action
		NNS	NOC	NMS	NGC	ES	LO	SSA	FA	
woodland										performance criteria. ES cover remains high and is slightly increased from the previous year, though is markedly reduced from 2010. Nevertheless, weed management should continue in accordance with the BOMP.
White Cypress Pine – Silver-leaved Ironbark – Tumbledown Red Gum open shrubby forest	4 (10)						N/A	N/A		This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be implemented for amber measures. ES remains high and has markedly increased since 2013 - weed management should continue in accordance with the BOMP.
	4 (18)						N/A	N/A		NNS and NMS are below PC, though diversity is relative stable in comparison to the previous 2012 monitoring results. Current management in accordance with the BOMP and continued monitoring of trends is considered adequate
White Box-White Cypress Pine shrubby open forest	4 (22)						N/A	N/A		NNS is now meeting PC. NMS is below PC, though diversity is relative stable in comparison to the previous 2012 monitoring results. Current management in accordance with the BOMP and continued monitoring of trends is considered adequate.
	3 (23)						N/A	N/A		This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber and red measures could be considered through appropriate management actions. NNS, NOC and NMS are all below PC, though trends from previous years are stable. ES has markedly increased from previous years and the presence of St Johns Wort (noxious weed) requires weed management.

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Biometric vegetation type	Condition class No. (Site)	Overall site performance against performance measures that have been set for a 5 year target								Comments on underperforming sites and management action
		NNS	NOC	NMS	NGC	ES	LO	SSA	FA	
Plains Grass grassland on basaltic black earth soils	3 (25)						N/A	N/A		This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber and red measures could be considered through appropriate management actions. NNS is well below PC and does not appear to be improving, therefore, active revegetation would be appropriate. ES cover is relatively high at 26%, but has reduced significantly from 72% in 2012. The intention is to burn this site with an aim to improve NNS over time.
Rough-barked Apple riparian forb/grass open forest	3 (20)						N/A	N/A		This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber and red measures could be considered through appropriate management actions. NNS, NOC, NMS continues to be below PC. ES has increased since 2013 and continued management in accordance with the BOMP is still necessary. Active revegetation is considered appropriate in the area that this site represents.
Mine rehab	1 (6)									Whilst NNS and NOC is below PC, there has been substantial improvement in these attributes when compared to previous years of monitoring. ES is high and has increased from the previous monitoring year. Future LFA monitoring will inform whether SSA results are a downward trend. Current management regimes in accordance with the BOMP are expected to improve the poorly performing attributes.
	1 (14)									This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber measures could be considered through appropriate management actions. NNS remains low, NOC remains low and LFA results are poor too. Given this is a rehab site, improvements responding

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Biometric vegetation type	Condition class No. (Site)	Overall site performance against performance measures that have been set for a 5 year target								Comments on underperforming sites and management action
		NNS	NOC	NMS	NGC	ES	LO	SSA	FA	
										to management regimes in accordance with the BOMP will take some time, though current management in accordance with the BOMP is considered appropriate. ES cover has actually increased since 2012 and requires further treatment.
	1 (26)									This is the 1st year of monitoring for this site, with performance measured against the 5 year target, therefore there are four more years before this target should be met. Never the less, amber measures could be considered through appropriate management actions. NNS and NOC is low and LFA results are poor too. Given this is a rehab site, improvements responding to management regimes in accordance with the BOMP will take some time, though current management in accordance with the BOMP is considered appropriate. ES cover has actually increased since 2012 and requires further treatment.
Cleared	1 (9)						N/A	N/A		This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be implemented for red measures. NNS is low, though this may be a reflection of past disturbance and low resilience of the site and surrounds. NOC remains low but there is a likely lag period between the plantings that have been established and cover score readings. ES cover has decreased slightly since 2013, but requires continued treatment of environmental weeds and Scotch Thistle (noxious weed).
	1 (15)						N/A	N/A		This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, red and amber measures could be considered through appropriate management actions. NNS reduced in 2013, though this may be an artefact of poor climatic conditions and it is hoped that native seed blown in from adjacent paddocks will colonise the area in time. NOC continues

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Biometric vegetation type	Condition class No. (Site)	Overall site performance against performance measures that have been set for a 5 year target								Comments on underperforming sites and management action
		NNS	NOC	NMS	NGC	ES	LO	SSA	FA	
										to be low, and ES cover remains high and requires continued treatment.

1 Introduction

Werris Creek Coal Pty Ltd (WCC) was granted Project Approval (PA 10_0059) on 25 October 2011 from the then Department of Planning and Infrastructure (DP&I) and on 21 December 2011 (EPBC 2010/5571) from the then Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) for the Life of Mine (LOM) project. As a condition of PA10_0059, WCC were required to update the Biodiversity Offset Strategy (BOS) in the form of a Biodiversity Offset Management Plan (BOMP) (WCC 2013). The BOMP relates to management of biodiversity within the LOM footprint and the approximate 1,319 ha of land identified for management under the BOS, including the former Eurunderee, Hillview, Marengo and Railway View properties, the Mine Site (Narrawolga) and Greenslopes (WCC 2013).

Eco Logical Australia (ELA) was commissioned by WCC to undertake winter bird surveys and spring flora and fauna monitoring in 2014.

A description of the BOA (location, climate) and the vegetation communities supported within the BOA, including their condition and area covered, is provided in Section 4 of the BOMP (WCC 2013).

ELA's scope of works was to:

- Record data using Floristic, Landscape Function Analysis (LFA), Biometric vegetation condition assessment and standard census of the key vertebrate fauna groups (bats, nocturnal birds and mammals, diurnal birds, reptiles and amphibians) within previously established monitoring plots
- Where applicable, compare data to the benchmark condition or performance criteria for vegetation communities specified in Section 7.1 of the Werris Creek Coal BOMP (WCC 2013) and assess the progressive trajectory of the BOA towards self-sustainability
- Report the findings from the 2010, 2011, 2012, 2013 and 2014 (current survey)

1.1 Report structure

This report has been set out in the following manner:

- **Key findings** - summary of the key findings of the monitoring works and analysis
- **Introduction** - provides background information to the current report
- **Methodology** - details the methods used to collect and analyse information
- **Results** – reports the findings of the monitoring works and analysis including comparing individual site performance to established performance criteria
- **Conclusion and recommendations** – discusses the findings of the report and provides recommendations for management activities

1.2 Management activities in the BOA and rehabilitation areas in 2014

The key management actions undertaken by WCC for the BOA over the reporting period have been:

- Weed Management: Predominately herbicide spraying treating environmental and noxious weeds over 1030 ha of the BOA and Rehabilitation areas
- Fire Management: Controlled burns covering 110ha of the Railway View, Mine Site and Eurunderee BOA in August and September 2014 for both hazard reduction and ecological

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restoration purposes. Maintenance slashing of fire breaks across the BOA was undertaken during the year

- Grazing Management: Continued to exclude grazing from the Mine Site and parts of Eurunderee, Railway View and Marengo since December 2010 and the remainder of the BOA since September 2012
- Fencing Management: Replacement of old boundary fences with new fauna friendly fencing at Railway View (850m) and Marengo (900m) and 3350m of old internal fences within the BOA were permanently removed
- Revegetation: Replacement planting of 82 trees in Black Gully, North & Flat Paddock of Marengo BOA in March 2015
- Habitat Augmentation: Placement of rock piles in March 2015 on Marengo BOA
- BOA Security and Bond: Continued negotiation with DP&I regarding acceptance of Section 88E application of the Conveyancing Act 1919 to register covenants on each land title of the BOA
- Vegetation Clearing: Ecologists engaged to undertake inspections and monitoring of 13ha of vegetation to be cleared for mining in May 2015
- Rehabilitation: Completed 25ha of new rehabilitation on the post mining landform at WCC and seeded with 70kg of local providence native grass seed collected from the Eurunderee BOA
- Seed Collection: Collected 30kg of selected native grass species (Kangaroo Grass - Themeda australis, Tall Redleg Grass - Bothriochloa biloba, Tall Oats Grass - Themeda avenacea) that are locally uncommon within the BOA likely due to previous history of grazing with 1000 plants to be propagated for Spring 2015 and planted in clusters within the monitoring plots of the BOA and rehabilitation areas
- Pest Management: Annual sand pad monitoring program identified Eastern Grey Kangaroos as high abundance; foxes as medium abundance (same as the previous year) and rabbits, pig, hare, cats and dogs as scarce. Using this information, WCC increase pest control programs to quarterly across the entire BOA targeting foxes with a poisoned bait (1080) take rate of 25.9% in Winter 2014 and 24.0% in Spring 2014 and two shoots culled a total of 96 Eastern Grey Kangaroos, 6 pigs, 5 foxes, 5 rabbits and 2 hares
- Signage: Native fauna hazard signs were installed along the Mine Access Road adjacent to the BOA during May 2014.

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2 Methodology

Seven vegetation types have been mapped within the BOA and are described in accordance with the Biometric Vegetation Types (BVT) used as a state-wide standard by the NSW Office of Environment and Heritage (OEH) (note: due to recent changes with the vegetation type database, these BVT reflect the vegetation types described in the Werris Creek Coal BOMP, rather than the new Plant Community Types (PCT) provided in the new vegetation type database. Vegetation types were mapped across the entire BOA, and trimmed to the boundary of the offset site after the mapping was completed (Figure 1). A description of the vegetation communities supported within the BOA, including their area covered, is provided in the BOMP (WCC 2013).

2.1 Floristic and biometric data collection

Floristic and Landscape Function Analysis (LFA) data was collected between 29 September and 3 October 2014 by ELA ecologists, Antony von Chrismar and Emily Mowat. Floristic data was collected from 26 sites; analogue sites established in condition class 4 vegetation sites (3, 5, 10, 11, 13, 17, 18, 22 and 24), condition class 3 vegetation sites (1, 2, 8, 12, 19, 21, 20, 23, 25 and 27), Condition Class 2 sites (7 and 16) and condition class 1 sites (6, 9, 14, 15 and 26). Floristic data collection for each site involved compilation of a species list and cover/abundance scores from within a 20 x 20 m plot. A 50 m transect was used to collect information on native and exotic plant cover, overstorey and midstorey cover, consistent with the Biobanking Assessment Methodology (DECC 2008).

Sites 26 and 27 were added during 2014 due to increasing area of rehabilitated land (site 26) and in response to fire management activities (site 27).

2.2 Landscape Function Analysis data collection

LFA data was collected from a total of 5 sites. Three LFA sites were monitored within the rehabilitation area (sites 6, 14 and 26) and two analogue sites were monitored within condition class 4 vegetation of the target vegetation type for the rehabilitation areas (sites 11 and 17). Landscape Function Analysis methods followed the method for Landscape Organisation and the Soil Surface Assessment, as provided in Tongway and Hindley (2004).

2.3 Fauna

Fauna survey was completed by Antony von Chrismar and Dan McKenzie for winter bird surveys and Pete Knock and Dan McKenzie for the remaining spring fauna survey.

2.3.1 Winter bird surveys

Winter bird surveys were conducted over 3 days between the 20 and 22 of August 2014, targeting threatened nectivorous species such as the *Anthochaera phrygia* (Regent Honeyeater) and *Lathamus discolor* (Swift Parrot). Spring fauna field investigations were undertaken over 10 days between the 20 and 31 of October 2014. During this time, surveys for birds, herpetofauna, microchiropteran bats and nocturnal fauna were conducted.

2.3.2 Bird and reptile surveys

Bird surveys were conducted during winter and spring at four permanent points over a 250 m transect. Each bird species and the number of each species occurring within a 50 m radius of each point were recorded. Five minutes were spent at each survey point, with a total of 20 minutes spent surveying each transect.

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Reptile surveys were conducted during spring over a 2 ha area surrounding each survey point by a single surveyor over 30 minutes. Searches included both passive observations of basking or foraging reptiles complimented with active searches such as the turning of rocks and logs.

Both reptile and bird survey were conducted twice at each site, once during the morning and once in the afternoon.

2.3.3 Spotlight and call playback

Spotlight surveys were conducted at each site over 1 person hour and involved a meander over approximately a 2 ha area surrounding each site after last light, searching the trees and ground for fauna with a spotlight.

Call playback was conducted at four locations and involved broadcasting the calls of *Phascolarctos cinereus* (Koala), *Tyto novaehollandiae* (Masked Owl), *Ninox connivens* (Barking Owl) and *Ninox strenua* (Powerful Owl) with a loudhailer for 5 minutes for each species followed by 10 minutes of quiet listening.

2.3.4 Microchiropteran bats

Microchiropteran bats were surveyed using either Anabat or Songmeter ultrasonic recording devices. Bat calls were recorded during the first four hours after dusk over two nights at each fauna survey site. Technical issues prevented the collection of data from woodland sites 17 and 22 and Derived Native Grasslands (DNG) sites 19 and 23.

Calls for each species were identified to three levels of confidence (possible, probable and definite). Only definite calls were used as an index of activity for each species when comparing habitat use by species. The total number of calls (regardless of confidence level) were used as an index of activity when comparing overall activity per site.

2.4 Data analysis

Data analysis in the form of a non-metric multidimensional scaling (nMDS) plot has been undertaken to compare bat and bird monitoring results for monitoring sites across years. This allows for measures of similarity of fauna species presence between the sites, which is particularly important when measuring fauna usage between rehabilitation sites, DNG, sites in degraded condition (Class 2 and 1 sites) and woodland sites (Class 4 sites). MDS plots allow multi-parametric data, such as species presence/absence, to be displayed in two dimensions. Sites with similar community compositions will appear close to each other on nMDS plots, while those that are less similar will appear further apart (Clarke & Warwick 2001). For repeated longitudinal sampling of monitoring sites it is possible to then detect and map changes in a community over time (Clarke and Warwick 2001).

In terms of the analysis of fauna data, an nMDS analysis of the similarity of bird and microchiropteran bat assemblages between habitat types and between years, using counts (birds) and an index of activity (bats), has been undertaken.

All column graphs display the mean, with error bars representing the standard error.

2.4.1 Diurnal bird analysis

The largest number of each species observed at one of the four survey points at each monitoring location was analysed for each monitoring location using nMDS analysis of similarity. The largest number of each species observed during a single observation period (either am or pm) was also

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recorded and the mean number of both species and individuals observed at each habitat type was compared between habitat types and between years.

2.4.2 Microchiropteran bat call analysis

Calls for each species were identified to three levels of confidence (possible, probable and definite). Only definite calls were used as an index of activity for each species and were incorporated into an nMDS analysis of similarity. The total numbers of calls (regardless of confidence level) were used as an index of activity when comparing the mean overall activity between habitat types.

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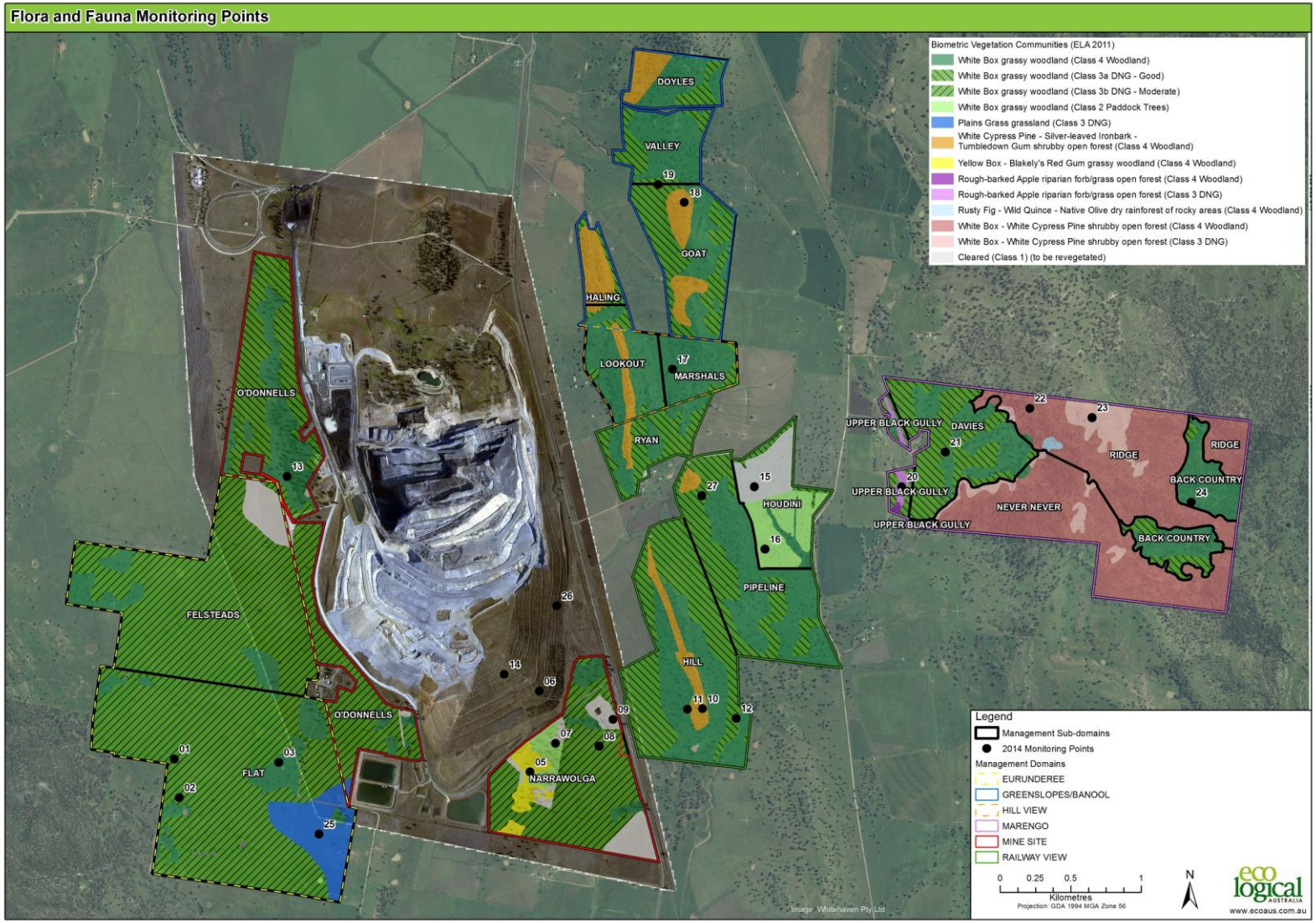

Figure 1: Flora and fauna monitoring locations and vegetation communities - 2014

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2.5 Weather conditions

During 2014 conditions were generally hot and dry with mean monthly maximum and minimum temperatures generally exceeding the long term monthly averages. Rainfall to the end of October totalled 316 mm, only 72% of the long term median rainfall for this period and less than half the long term annual median.

Weather during the flora and fauna monitoring works reflected this hot and dry trend. Maximum temperature during fauna monitoring works averaged 33 ^{o}C and only 12 mm of rain was recorded for the month of October. **Table 1 & 2** provides the weather records for the monitoring period and long-term trends for the area from the nearest weather station, Quirindi, NSW (BoM 2014).

Table 1: Weather observations during the monitoring period

Month	Day	Temperature		Rainfall (mm)	Temp (^{o}C)	RH (%)	Wind speed (km/hr and direction)
		Min (^{o}C)	Max (^{o}C)				
August							
19	Tues	8.4	16.5	5.2	11	94	Calm
20	Wed	6.5	18.5	0	12.6		19W
21	Thur	3.4	20	0	14		19W
22	Fri	3	20.4	0	13		Calm
23	Sat	4	20	0	12.2		Calm
September							
29	Mon	6	28	0	21	50	Calm
30	Tues	10.2	30	0	22	44	Calm
October							
1	Wed	9	23	0	21	28	4?
2	Thur	2	24	0	15	49	Calm
3	Fri	4	28	0	19	65	Calm
21	Tues	9	26	0	16	58	Calm
22	Wed	9	29	0	17	45	Calm
23	Thur	12.4	32	0	21	51	Calm
24	Fri	12	34	0	24	48	Calm
25	Sat	15.4	36	0	30	41	Calm
26	Sun	16	38	0	30	27	Calm
27	Mon	13.8	36	0	26	44	Calm
28	Tues	12	30	0	21	51	Calm
29	Wed	8	31	0	21	48	Calm
30	Thur	10	34	0	22	65	Calm
31	Fri	10.2	37	0	26	48	Calm

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Table 2: Monthly temperature and rainfall to the end of October 2014 and long-term monthly averages

Month	Monthly mean min. temp 2014 (°C)	Mean min. temp 1907-2014 (°C)	Monthly mean max. temp 2014 (°C)	Mean max. temp 1907-2014 (°C)	Rainfall 2014 (mm)	Median rainfall 1882-2014 (mm)
January	17.9	16.4	35.9	32.3	6.8	68.6
February	17.6	16.1	33.3	31.3	30.6	49.4
March	15.2	13.5	29.4	29.3	81.1	39.4
April	11.1	9.0	25.8	25.0	5.8	34.1
May	6.2	5.0	21.4	20.5	15.5	35.3
June	4.0	2.8	16.9	16.6	53.4	39.0
July	1.0	1.6	16.3	15.9	36.3	39.6
August	-	2.4	-	18.0	40.8	39.7
September	5.5	5.0	22.4	21.6	34	38.7
October	-	8.7	-	25.3	12	54.0
Annual	-	8.9	-	24.6	316.3	678.3

Red numbers indicate data missing from Quirindi Weather Station that was sourced from Tamworth Airport Weather Station. Dashes indicate gaps in records from both Quirindi Weather Station and Tamworth Airport Weather Station.

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3 Results

This section provides information on the performance criteria provided in the BOMP (WCC 2013), and additional performance criteria for Landscape Function Analysis has also been provided consistent with the 2013 monitoring report (ELA 2014). Performance criteria in the BOMP has been derived from state wide biometric vegetation type benchmarks set by OEH. A traffic light colour coding system has then been applied, whereby RED sites are under performing and need management intervention, AMBER sites are performing poorly and may require future management intervention depending on future monitoring results and GREEN sites are meeting performance criteria and do not require any additional targeted management actions or intervention.

Monitoring sites have been situated in eight different vegetation types with four different condition classes. These condition classes are described in **Table 3** below**.**

Table 3: Condition classes of vegetation surrounding Werris Creek Coal Mine

Condition description	Condition class
Woodland	4
Derived Native Grassland (DNG)	3
Canopy trees only (understorey previously cropped and/or dominated by exotic species)	2
Cleared (formerly cultivated land without canopy trees and mine rehabilitation)	1

3.1 Floristic and biometric data

The floristic and biometric data collected during monitoring is summarised below, with the full floristic plot data and other data provided in **Volume 2**. These attributes are assessed against the performance criteria identified in the Werris Creek Coal Mine BOMP below.

3.1.1 Number of native species

Overall, the number of native species per site has remained relatively constant between monitoring years (**refer to section 3 in volume 2 for further analysis**) with the average number of species per site varying between 12 and 13.5 during 2012, 2013 and 2014 monitoring events. Monitoring years 2010 and 2011 were excluded from this averaging as the number and condition of sites sampled differed from subsequent years.

Further analysis of the number of native species within woodland (condition class 4), DNG (condition class 3) and more disturbed sites (condition classes 1 & 2) also revealed that the number of native species has remained relatively constant over monitoring years (**refer to section 3 in volume 2 for further analysis**).

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Only five of the 26 monitoring sites are currently meeting the performance criteria for number of native species. These sites are primarily located within woodland habitats (condition class 4) with one site in DNG; which is expected of the better condition vegetation to have higher resilience and respond sooner given the relatively short time of restoration management. It should be noted that floristic species diversity can vary considerably with seasonal and climatic variance, as can the abundance of exotic species. Therefore, sites that are underperforming against the performance criteria could be due to unfavourable environmental conditions (i.e. hot and below average rainfall as experienced in 2013 and 2014) or that the rehabilitation and cleared site are not expected to achieve the performance criteria after such a short period of restoration management..

The following table provides the number of native species that have been recorded in 2014 compared to previous years and the traffic light system has been used to identify which sites require active management to meet the performance criteria.

Table 4 : Number of native species within each 20 x 20 m plot in comparison to performance criteria

Biometric vegetation type	Condition class (site no.)	Performance criteria	No. native species				
			2010	2011	2012	2013	2014
White Box grassy woodland	2 (7)	23	10	10	14	9	8
	2 (16)		-	-	3	6	7
	3b (1)		2	8	9	7	12
	3b (2)		10	12	9	13	15
	3b (8)		2	14	9	6	4
	3b (12)		5	13	10	6	4
	3a (19)		-	-	13	18	14
	3a (21)		-	-	11	18	15
	3a (27)		-	-	-	-	23
	4 (3)		8	29	15	19	22
	4 (11)		19	24	19	13	21
	4 (13)		-	-	23	23	29
	4 (17)		-	-	19	18	18
	4 (24)		-	-	19	20	25
Yellow Box – Blakely's Red Gum grassy woodland	4 (5)	23	9	18	17	14	14
White Cypress Pine – Silver-leaved Ironbark – Tumbledown Red Gum open shrubby forest	4 (10)	30	7	12	14	15	14
	4 (18)		-	-	22	25	31
White Box-White Cypress Pine shrubby open forest	4 (22)	26	-	-	25	24	30
	3 (23)		-	-	13	14	14
Plains Grass grassland on basaltic black earth soils	3 (25)	17	-	-	7	7	7
Rough-barked Apple riparian forb/grass open forest	3 (20)	25	-	-	6	12	9
Mine rehab	1 (6)	23	3	5	14	13	13

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Biometric vegetation type	Condition class (site no.)	Performance criteria	No. native species				
			2010	2011	2012	2013	2014
	1 (14)		-	-	6	5	7
	1 (26)		-	-	-	-	5
Cleared land (formerly cultivated land)	1 (9)	23	5	5	5	4	5
	1 (15)		-	-	2	2	3

Discussion of performance and actions

The class 4 woodland on average appears to be meeting the performance criteria for the number of native species. Sites1, 2, 3, 5, 6, 10, 11, 17, 19, 21 and 23 all fall below the performance criteria for the number of native species. However, these sites have shown some improvement in the performance criteria and under current management are likely to continue to accumulate species over time.

Sites 7, 8, 9, 12, 16, 25were all underperforming as expected given their condition at the commencement of restoration under the BOMP. These sites may require action in the form of active revegetation in order to achieve their performance targets. Sites 14 and 26 are rehabilitation sites and, therefore, have already been subject to revegetation, with improved results in number of native species expected to occur in time. It should be noted that the current performance criteria target is based on the state wide vegetation type benchmark, rather than local data and it may be appropriate to review these performance targets in light of the potential of vegetation classes based on the monitoring data collected to date.

3.1.2 Native overstorey cover and overstorey regeneration

Native overstorey is a completion criteria established in the BOMP (WCC 2013). The following provides a description of the results from the 2014 monitoring event, as well as a comparison of these results with previous years of monitoring and the performance criteria (**Table 5**). Observations of overstorey regeneration within monitoring plots have been added to this table to show how sites are progressing given that it takes greater than 10 years from initial regeneration/revegetation to establish overstorey cover. A measure of overstorey regeneration or planting abundance and health may be a valuable performance criteria attribute to measure, which could be added in future BOMP revisions.

Table 5: Native overstorey cover (%) in comparison to performance criteria

Biometric vegetation type	Condition class (site no.)	Performance criteria (%)	Native overstorey cover (%)					Overstorey regeneration 2014
			2010	2011	2012	2013	2014	
White Box grassy woodland	2 (7)	6-25	0	0	1.7	0	0	0
	2 (16)		-	-	0	1.5	0.5	0
	3 (1)		0	0	0	0	0	1 (planted)
	3 (2)		0	0	0.5	0	0	1
	3 (8)		0	0	0	0	0	1 (planted)
	3 (12)		0	0	0	0	0	1 (planted
	3a (19)		-	-	0	0	0	0
	3a (21)		-	-	0	0	0	0

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Biometric vegetation type	Condition class (site no.)	Performance criteria (%)	Native overstorey cover (%)					Overstorey regeneration 2014
			2010	2011	2012	2013	2014	
	3a (27)		-	-	-	-	0	0
	4 (3)		5	12.5	17.5	19.5	8	1
	4 (11)		26	24.5	10	20	12.2	1
	4 (13)		-	-	8.5	13	4.7	0
	4 (17)		-	-	6	15	8	1
	4 (24)		-	-	19.5	14	5.6	1
Yellow Box – Blakely's Red Gum grassy woodland	4 (5)	6-25	5	12	15	4.5	6.7	0
White Cypress Pine – Silver-leaved Ironbark – Tumbledown Red Gum open shrubby forest	4 (10)	6-40	0	0	0	1	0	1
	4 (18)		-	-	22	5.5	6	1
White Box-White Cypress Pine shrubby open forest	4 (22)	6-25	-	-	27.5	22.5	6.5	0.5
	3 (23)		-	-	0	0	0	0
Plains Grass grassland on basaltic black earth soils	3 (25)	0	-	-	0	0	0	0
Rough-barked Apple riparian forb/grass open forest	3 (20)	6-25	-	-	0	0	0	1 (planted)
Mine rehab	1 (6)	6-25	0	0	0	2.5	7.5	1 (planted)
	1 (14)		-	-	0	0	0	1 (planted)
	1 (26)		-	-	-	-	0	1 (planted)
Cleared land (formerly cultivated land)	1 (9)	6-25	0	0	0	0	0	0
	1 (15)		-	-	0	0	0	0

Discussion of performance and actions

The majority of sites within class 4 vegetation are meeting the minimum completion criteria with the exception of sites 13, 24 and 10. Sites 13 and 24 met the completion criteria in previous years and the average cover over all monitoring events exceeds performance criteria. No evidence of dieback at these sites was observed and it may be that this apparent change in canopy cover is due to variability in values arising from the estimation of canopy cover.

Overstorey species were observed to be regenerating at most sites within class 4 vegetation, with the exception of site 5 (Yellow Box – Blakely's Red Gum grassy woodland) and site 13 (White Box grassy woodland). All Class 4 vegetation sites have had grazing removed and have many mature trees. As such, it is likely that overstorey regeneration and eventually cover will meet completion criteria in the future.

Vegetation classes 3, 2 and 1 are previously cleared and/or cultivated sites and overstorey cover is generally low to non-existent. Natural overstorey regeneration was observed at site 2 with plantings of overstorey species observed at sites 1, 8, 12 and 20.

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Sites within vegetation classes 3, 2 and 1 currently lack a regenerating overstorey included sites 7, 9, 15, 16, 19, 21, 23, 25 and 27. Planting of local provenance canopy species should be considered in land surrounding sites 7, 9, 15 and 16 in order to meet performance targets. It appears that past soil disturbance (cropping) has removed any seed bank from the soil and altered soil structure making natural regeneration unlikely to occur.

Mine rehabilitation areas have been planted with tube stock. Planted trees within site 6 have reached 4 - 5 m height and this site is currently meeting performance criteria for native overstorey cover. This site was planted in 2008, which demonstrates the minimum period of time required to achieve overstorey cover.

3.1.3 Native midstorey cover

Native midstorey cover is a completion criteria established in the BOMP (WCC 2013). The following provides the results from the spring 2014 monitoring event and compares these results with previous years of monitoring and the performance criteria (**Table 6**).

Table 6: Native midstorey cover (%) in reference to performance criteria

Biometric vegetation type	Condition class (site no.)	Performance criteria (%)	Native midstorey cover (%)				
			2010	2011	2012	2013	2014
White Box grassy woodland	2 (7)	0-5	0	0	0	0	0
	2 (16)		-	-	0	0	0
	3 (1)		0	0	0	0	0
	3 (2)		0	0	0	0	0
	3 (8)		0	0	0	0	0
	3 (12)		0	0	0	0	0
	3a (19)		-	-	0	0	0
	3a (21)		-	-	0	0	0
	3a (27)		-	-	-	-	0
	4 (3)		0	0	0	0	0
	4 (11)		0	0	0	0	0
	4 (13)		-	-	0	0	0
	4 (17)		-	-	0	0	0
	4 (24)		-	-	1.5	2	0
Yellow Box – Blakely's Red Gum grassy woodland	4 (5)	0-5	0	0	0	0	0
White Cypress Pine – Silver-leaved Ironbark – Tumbledown Red Gum open shrubby forest	4 (10)	6-25	0	0	0	0	0
	4 (18)		-	-	0	0	0.1
White Box-White Cypress Pine shrubby open forest	4 (22)	6-25	-	-	8.5	2	0.7
	3 (23)		-	-	0	0	0
Plains Grass grassland on basaltic black earth soils	3 (25)	0	-	-	0	0	0
Rough-barked Apple riparian forb/grass open forest	3 (20)	0-5	-	-	0	0	0
Mine rehab	1 (6)	0-5	0	0	4	0	0

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Biometric vegetation type	Condition class (site no.)	Performance criteria (%)	Native midstorey cover (%)				
			2010	2011	2012	2013	2014
	1 (14)		-	-	0	0	0
	1 (26)		-	-	-	-	0
Cleared land (formerly cultivated land)	1 (9)	0-5	0	0	0	0	0
	1 (15)		-	-	0	0	0

Discussion of performance and action

As midstorey cover is naturally low in many of the vegetation communities within the BOA the performance criteria for midstorey cover is 0-5%. As a result, the majority of sites are currently meeting this performance criterion.

White Cypress Pine – Silver-leaved Ironbark – Tumbledown Red Gum open shrubby forest and White Box-White Cypress Pine shrubby open forest have a slightly higher performance criteria of 6-25% cover. These communities are not currently meeting this performance criterion, with only sites 18 and 22 possessing a midstorey. Sites within these vegetation types may require management intervention to encourage midstorey regeneration depending on future monitoring results, but at this stage no further actions are required.

Apparent small changes in midstorey cover at sites 22 and 24 are likely to be a result of the methods used to estimate cover than any actual changes in midstorey cover.

3.1.4 Native ground cover

Native ground cover (shrubs < 1 m, native grasses and native herbs) is a completion criteria established in the BOMP (WCC 2013). Greater than 100 % native cover has been recorded for several sites due to the way overall native ground cover has been calculated. The cover of grasses, other (herbs and sedges etc.) and shrubs have been recorded separately using the biometric method and then tallied together to get a measure of total native groundcover. In instances where one type of groundcover vegetation regularly overtops another, a score of greater than 100% is possible.

Overall native groundcover appears to have increased slightly across the BOA between 2012 and 2014 (**refer to section 3 in Volume 2**). Data from 2010 and 2011 sampled a smaller number of sites over a range of condition classes and were excluded from the overall comparison between years.

Native groundcover within woodland and grassland sites has remained relatively stable or increased slightly over monitoring years. Native groundcover in disturbed areas (condition classes 1 and 2) was quite variable with some sites having little or no native groundcover and others (particularly older rehabilitation areas) having a large groundcover of native plant species.

Although the amount of native groundcover is variable within previously disturbed sites, these areas continue to have a much reduced native groundcover than in grassland and woodland sites in 2014. **Table 7** provides a summary of the results from the 2014 monitoring period and previous years.

Table 7: Native groundcover cover (%) in comparison to performance criteria

Biometric vegetation type	Condition	Performance	Native ground cover (%)

	class (site no.)	criteria (%)	2010	2011	2012	2013	2014
White Box grassy woodland	2 (7)	33-45	20	18	26	30	52
	2 (16)		-	-	0	0	0
	3 (1)		4	46	36	46	88
	3 (2)		32	58	74	76	98
	3 (8)		4	64	72	80	86
	3 (12)		33	80	54	58	70
	3a (19)		-	-	98	84	106
	3a (21)		-	-	82	94	56
	3a (27)		-	-	-	-	62
	4 (3)		32	90	98	96	122
	4 (11)		40	80	80	88	108
	4 (13)		-	-	58	94	120
	4 (17)		-	-	56	98	106
	4 (24)		-	-	80	92	68
Yellow Box – Blakely's Red Gum grassy woodland	4 (5)	33-45	50	78	74	70	106
White Cypress Pine – Silver-leaved Ironbark – Tumbledown Red Gum open shrubby forest	4 (10)	26-45	36	80	96	80	78
	4 (18)		-	-	92	90	82
White Box-White Cypress Pine shrubby open forest	4 (22)	6-25	-	-	64	86	58
	3 (23)		-	-	92	86	90
Plains Grass grassland on basaltic black earth soils	3 (25)	0	-	-	42	30	84
Rough-barked Apple riparian forb/grass open forest	3 (20)	0-5	-	-	52	48	54
Mine rehabilitation	1 (6)	0-5	0	8	54	74	78
	1 (14)		-	-	28	30	42
	1 (26)		-	-	-	-	12
Cleared land (formerly cultivated land)	1 (9)	0-5	8	20	34	30	59
	1 (15)		-	-	2	2	4

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Discussion of performance and actions

Native groundcover met or exceeded the performance criteria for most sites, with the exception of plot 16 within class 2 white box grassy woodland. The area surrounding this site has previously been cropped and contained primarily exotic species and bare soil.

Overall the mean native groundcover per site in 2014 was 73% and appears to have increased since 2012. However, native ground cover at some sites appears to have changed substantially since the previous year. A substantial reduction in native cover appears to have occurred at 3 monitoring sites; 21, 22 and 24. An increase in the amount of native groundcover recorded, occurred at the majority of monitoring sites, with a substantial increase recorded at sites 1, 5 and 25.

Performance criteria for native species cover within Plains Grass grassland, Rough-barked Apple forest, Mine rehabilitation and cleared land has a minimum value of 0. Thus monitoring sites such as 15, where only a 4% native cover was recorded still meet the performance criteria. A revised performance criterion that is more ambitious could be developed for native species cover in these areas.

Native cover was especially low in the formerly cultivated land at site 15, newly rehabilitated land at site 26 and also class 2 woodland surrounding site 16 where no native ground cover was recorded. Site 16 has been marked red in **Table 7** as it is considered to be underperforming, no improvement in native cover having been observed over the last three monitoring events and active revegetation is recommended. Sites 15 and 26 where native vegetation cover is low (but may still be meeting performance criteria) have been marked in amber, therefore, no active management is necessary at this stage.

3.1.5 Exotic species richness, cover and problem species

The control of noxious and environmental weeds within the rehabilitation and biodiversity offset areas is a completion criteria established in the BOMP (WCC 2013). **Table 8** provides the results from the 2014 monitoring event and compares these results with previous years of monitoring and the performance criteria. **Table 9** presents exotic plant cover as a percentage of total groundcover in 2014 to highlight the sites that are dominated by exotic species.

Sites where the number of exotic species has remained stable or increased have been issued a green colour, where they have increased slightly they have been issued amber, and where they have significantly increased red has been issued. For exotic plant cover, where sites had a score of below 50%, they have been considered to be under control, meet the performance criteria and have been issued a green colour, where it is approaching or greater than 50% amber has been applied, and where cover is in excess of 50% red has been applied. Where noxious weeds are present, red has been applied and for sites without noxious weeds green has been applied.

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Table 8: Number of exotic species, exotic species cover and noxious weeds at each monitoring site

Biometric vegetation type	Condition class (site no.)	Performance criteria	No. exotic species					Exotic species cover					Noxious species*				
			10	11	12	13	14	10	11	12	13	14	10	11	12	13	14
White Box grassy woodland	2 (7)	Noxious and environmental weeds are under control within rehabilitation or biodiversity offset areas	11	14	12	14	13	88	84	26	54	88	-	-	-	-	-
	2 (16)		-	-	10	12	9	-	-	8	86	72	-	-	-	XO	-
	3 (1)		11	25	15	16	8	90	72	70	54	50	-	-	-	HP	OA
	3 (2)		20	25	12	19	12	88	36	28	24	40	-	XO	-	HP	OA, HP
	3 (8)		9	23	9	16	16	94	50	46	20	52	-	-	-	-	OA
	3 (12)		15	17	16	9	11	76	67	82	34	60	-	-	-	-	-
	3 (19)		-	-	11	10	14	-	-	8	16	34	-	-	-	-	-
	3 (21)		-	-	14	5	12	-	-	20	6	60	-	-	-	-	-
	3 (27)		-	-	-	-	15	-	-	-	-	42				-	-
	4 (3)		25	23	13	17	13	70	22	4	4	14	EP, HP	-	-	HP	HP
	4 (11)		19	16	10	9	13	80	40	6	12	26	EP	-	XS	HP	HP
	4 (13)		-	-	6	8	11	-	-	8	6	62	-	-	-	HP	EP
	4 (17)		-	-	2	6	9	-	-	2	2	34	-	-	-	-	-
	4 (24)		-	-	1	2	8	-	-	0	0	0	-	-	-	-	-
Yellow Box – Blakely's Red Gum grassy woodland	4 (5)		14	19	12	19	17	78	32	30	30	44	-	-	-	-	-

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Biometric vegetation type	Condition class (site no.)	Performance criteria	No. exotic species					Exotic species cover					Noxious species*				
			10	11	12	13	14	10	11	12	13	14	10	11	12	13	14
White Cypress Pine – Silver-leaved Ironbark – Tumbledown Red Gum open shrubby forest	4 (10)		19	19	12	9	14	88	70	30	20	76	EP	EP	-	HP	-
	4 (18)		-	-	0	2	4	-	-	0	0	14	-	-	XS	-	-
White Box-White Cypress Pine shrubby open forest	4 (22)		-	-	1	1	2	-	-	0	0	16	-	-	-	-	-
	3 (23)		-	-	7	7	14	-	-	6	14	54	-	-	-	HP	HP
Plains Grass grassland on basaltic black earth soils	3 (25)		-	-	14	21	5	-	-	72	20	26	-	-	-	HP, EP	-
Rough-barked Apple riparian forb/grass open forest	3 (20)		-	-	9	16	17	-	-	70	52	80	-	-	OS	-	-
Mine Rehab	1 (6)		16	19	15	13	15	50	94	18	26	80	-	-	-	-	-
	1 (14)		-	-	19	18	17	-	-	24	40	60	-	-	HP	-	-
	1 (26)		-	-	-	-	15	-	-	-		52	-	-	-	-	-
Cleared land (formerly cultivated land)	1 (9)		20	16	12	11	17	94	40	64	70	68	-	-	HP	-	OA
	1 (15)		-	-	9	9	9	-	-	12	96	96	-	-	-	-	-

EP = *Echium plantagineum* (Paterson's Curse), HP = *Hypericum perforatum* (St. Johns Wort), OA = *Onopordum acanthium* (Scotch Thistle), OS =*Opuntia stricta* (Prickly Pear), XO = *Xanthium occidentale* (Noogoora Burr)

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Table 9: Exotic species cover as % of total cover 2014

Biometric vegetation type	Condition class (site no.)	Exotic species cover as % of total cover 2014
White Box grassy woodland	2 (7)	63
	2 (16)	100
	3 (1)	36
	3 (2)	29
	3 (8)	38
	3 (12)	46
	3a (19)	24
	3a (21)	52
	3a (27)	40
	4 (3)	10
	4 (11)	19
	4 (13)	34
	4 (17)	24
	4 (24)	0
Yellow Box – Blakely's Red Gum grassy woodland	4 (5)	29
White Cypress Pine – Silver-leaved Ironbark – Tumbledown Red Gum open shrubby forest	4 (10)	49
	4 (18)	15
White Box-White Cypress Pine shrubby open forest	4 (22)	22
	3 (23)	37
Plains Grass grassland on basaltic black earth soils	3 (25)	24
Rough-barked Apple riparian forb/grass open forest	3 (20)	60
	1 (6)	51

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Biometric vegetation type	Condition class (site no.)	Exotic species cover as % of total cover 2014
Mine Rehab	1 (14)	59
	1 (26)	81
Cleared land (formerly cultivated land)	1 (9)	54
	1 (15)	96

Discussion of performance and actions

Number of exotic plant species

The average number of exotic species per monitoring site has remained relatively stable from 2012 to 2014 with a mean of 10.04 species per site in 2012 (SE = ±1.0) to 11.6 species in 2014 (SE = ± 0.84) (**refer to section 3 of Volume 2**).

The average number of exotic species per monitoring site in woodland sites appears to have slightly increased since 2012 with a mean of 6.3 species per site in 2012 (SE = ±1.7) to 10.1 species per site in 2014 (SE = ±1.5). The number of exotic species in both grassland and disturbed sites have remained relatively stable since 2012. Exotic plant cover does fluctuate between years due to seasonal variation, with the recent dry period and timing of the monitoring has possibly influenced these increases in cover.

On average disturbed sites had a substantially larger number of exotic species; (mean =14.6, SE = ±1.3) than woodland sites (mean = 10.1, SE = 1.5). The number of exotic plant species outnumbered native species at all class 1 and 2 vegetation monitoring sites (Mine rehab, cleared and cultivated areas). This was also the case at sites 5 (Yellow Box – Blakely's Red Gum grassy woodland), 8 and 12 (White box grassy woodland DNG) and 20 (Rough-barked Apple riparian forb/grass open forest).

Changes in the number of exotic species recorded between 2013 and 2014 occurred at almost all sites. The number of exotic species recorded decreased at 8 of the 24 sites monitored during 2014 and increased at 14 sites. A substantial reduction in the number of weed species recorded occurred at site 25 (Plains grass grassland) with 16 fewer exotic species recorded in 2014 than in the previous year.

Exotic plant cover

A substantial increase in exotic cover between 2013 and 2014 was recorded with a mean of 28.6% (SE =± 5.3) exotic cover per site recorded in 2013, compared with a mean of 50.3% (SE =± 5.2) cover in 2014 (**refer to section 3 in Volume 2**). Exotic plant cover at woodland sites appears to have increased since 2012 and 2013, with grassland sites displaying similar exotic cover those recorded in 2012. Exotic cover at disturbed sites appears to have increased dramatically since 2012 but remain similar to those recorded in 2013.

Large increases in the amount of exotic cover from the previous year occurred at sites 6, 10, 13 and 21. A reduced exotic plant cover from the previous year was observed at sites 1, 9 and 16.

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Exotic species cover is very high (> 70%) at sites 6 and 26 (mine rehabilitation areas), 7 and 16 (formerly cultivated land with canopy species remaining), 10 (White Cypress Pine – Silver-leaved Ironbark – Tumbledown Red Gum open shrubby forest) and 15 (Cleared formerly cultivated land).

Large apparent increases in exotic cover at woodland sites 10 and 13 are surprising. Site 13 has a large number of native species (and is exceeding the performance criteria) and also has a very large cover of native groundcover species. Site 10 falls below performance criteria for the number of native species but also displays a large amount of native groundcover. Exotic species with a higher cover/abundance score at these sites were *Bromus hordeaceus* (Soft Brome), *Carthamus lanatus* (Saffron thistle), *Lolium* spp. (Ryegrass), *Medicago sativa* (Lucerne) and an unidentified *Medicago* sp.

Exotic cover exceeded native cover at all class 1 and 2 vegetation monitoring sites (Mine rehab, cleared and cultivated areas). More than 80% of groundcover at Sites 15, 16, and 26 which seemed to be driven by high cover/abundance scores for *Bromus spp.*, *Lolium* spp., *Avena spp.*and *Sonchus oleraceus* (Common Sowthistle). Exotic groundcover also dominated native ground cover at Sites 20 (Rough-barked Apple riparian forb/grass open forest) and 21 (White Box grassy woodland DNG). Exotic cover at these sites seems to be driven by *Pennisetum clandestinum* (Kikuyu Grass), *Lolium rigidum* (Wimmera Ryegrass), *Bromus catharticus* and *Bromus hordeaceus* (Soft Brome). These areas should be considered to be underperforming in terms of exotic species cover and will require continued monitoring and weed management.

Noxious Weeds

Noxious weeds were detected within 8 monitoring plots at sites 1, 2, 3, 8, 9, 11, 13 and 23. These were *Onopordum acanthium* (Scotch Thistle), *Hypericum perforatum* (St. Johns Wort), *Echium plantagineum* (Paterson's Curse) and *Opuntia stricta* (Prickly Pear). These species are listed by DPI (2014) as control class 4 within the Liverpool Plains and *O. stricta* is listed as a weed of national significance.

The noxious weed *Onopordum acanthium* was detected at two new sites in 2014 (site 8 (condition class 3) and 9 (condition class 1)). However, noxious weeds had disappeared from sites 10, 16 and 25 where they were detected in the previous year potentially indicating that the weed control program is being effective at managing noxious weeds.

3.2 Landscape Function Analysis

Landscape Function Analysis (LFA) has been used to monitor the soil surface condition of the rehabilitation sites (sites 6, 14 and 26) against the two analogue sites (sites 11 and 17). The following presents the spring 2014 landscape organisation and soil surface assessment results for these sites, as well as data from previous years, where available.

In interpreting the LFA results, the Landscape Organisation results are presented as an index, which essentially provides a proportion of the transect occupied by patches - patches being landscape elements that are relatively permanent and provide stable, resource accumulating structures, such as grassy tussocks, ground cover and logs. Therefore, a higher Landscape Organisation index implies a more stable transect that is less prone to erosion. The SSA results go one step further than this and provide an index on stability, infiltration and nutrient cycling for all patch and inter-patch types for the whole of landscape (transect).

When analysing trends in monitoring data, long-term, multi-year monitoring is far more informative, as variables such as climatic conditions and different monitoring technicians can influence results. The earliest LFA data recorded was in spring 2010 at site 6 and site 11.

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In order to measure site performance, a suggested performance criteria have been provided, though these were developed in the 2013 spring monitoring report and are not provided in the current version of the BOMP (WCC 2013). The performance criteria for each vegetation sampling unit has been developed by calculating the average score from the respective analogue sites.

3.2.1 Landscape Organisation

The Landscape Organisation index has been presented for each of the sites monitored through LFA in **Table 10** below, with the results of previous years monitoring also provided.

Table 10: Landscape Organisation (LO) for rehabilitation sites (6, 14 & 26) and analogue sites (11 & 17)

Biometric vegetation type	Condition class (site no.)	Performance criteria	Landscape Organisation				
			2010	2011	2012	2013	2014
White Box grassy woodland	4 (11)	0.86	1	0.96	0.47	1.0	1.0
	4 (17)		-	-	0.44	0.99	0.97
Mine Rehab	1 (6)		1	0.96	0.88	0.88	1.0
	1 (14)		-	0.8	-	0.52	0.56
	1 (26)		-	-	-	-	0.26

3.2.2 Soil surface assessment

Although the Landscape Organisation provides an indication of soil surface stability, the SSA results presented for these same sites in **Table 11**, provides a more accurate picture of how these transects are functioning by way of soil surface stability, infiltration and nutrient cycling.

Table 11: Soil Surface Assessment results for rehabilitation sites (6, 14 & 26) and analogue sites (11 & 17).

Biometric vegetation type	Condition class (Site no.)	Performance criteria			2010			2011			2012			2013			2014		
		S	I	N	S	I	N	S	I	N	S	I	N	S	I	N	S	I	N
White Box grassy woodland	4 (11)	63	34	30	69	39	36	59	35	30	64	33	26	59	28	27	67	38	34
	4 (17)				-	-	-	-	-	-	51	27	21	63	32	26	67	38	35
Cleared land(Mine Rehab Site)	1 (6)	63	34	30	66	45	36	61	40	27	43	27	17	59	34	25	55	36	31
	1 (14)				-	-	-	-	-	-	39	25	18	49	26	18	53	30	23
	1(26)																47	27	17

S = Stability; I = Infiltration; N = Nutrient cycling.

Discussion of performance and actions

Rehabilitation site 6 (planted in 2008) is meeting the performance criteria for Landscape Organisation, Infiltration and Nutrient cycling values. However, in terms of stability, site 6 was below the performance criteria, but is considered to be tracking well towards meeting the performance criteria. Rehabilitation site 14 (planted in 2011) and 26 (planted in 2014) had scores below the performance criteria for all measurements. This is expected for young rehabilitation and, in time (provided management is adequate), it is expected that these scores will increase. Continued monitoring of this site should observe this trend.

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3.3 Fauna

3.3.1 Summary of fauna results and threatened and migratory species

A total of 119 species were recorded during the 2014 fauna monitoring surveys. These consisted of 73 bird, 20 reptile, 23 mammal and 3 frog species. Species lists for both winter and spring 2014 are provided in **Volume 2**.

Ten fauna species listed under the *Threatened Species Conservation Act* 1995 (TSC Act) and/or the *Environmenl Protection and Biodiversity Conservation Act* 1999 (EPBC Act) were recorded during the 2014 survey period. There were seven threatened or migratory bird species recorded, five of which were listed as vulnerable under the TSC Act and two as migratory species. Three micro-bat species listed as vulnerable under the TSC Act were also recorded (**Table 12**). However, one species; *Falsistrellus tasmaniensis* (Eastern False Pipistrelle), was only recorded as a possible identification and *Nyctophilus* spp. are difficult to identify on the basis of calls and possibly includes the EPBC Act and TSC Act listed vulnerable species *Nyctophilus corbeni* (Corben's Long-eared Bat). The vulnerable species: *Scoteanax rueppellii* (Greater Broad-nosed Bat), was recorded during 2014 surveys but has not been recorded during previous fauna monitoring events.

Table 12: Threatened species recorded during 2014 fauna monitoring

Scientific name	Species	TSC act	EPBC act	Location
Aves				
Chthonicola sagittata	Speckled Warbler	V	-	Site 22
Circus assimilis	Spotted Harrier	V	-	Site 13
Hieraaetus morphnoides	Little Eagle	V	-	Mine Site
Glossopsitta pusilla	Little Lorikeet	V	-	Site 5
Merops ornatus	Rainbow bee-eater	-	M	Sites 18 & 20
Myiagra cyanoleuca	Satin Flycatcher	-	M	Site 20
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	-	Site 23
Mammalia				
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Site 11 (possible)
Saccolaimus flaviventrus	Yellow-bellied Sheathtail Bat	V	-	Sites 1, 6, 9 , 24 (definite) Site 3 (possible)
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Site 8, 11 (definite) , 10 (probable)

3.3.2 Comparison between bird communities in different habitats at Werris Creek

The overall bird communities did not differ between habitats (ANOSIM Global R = 0.08, P=0.19), with all four habitats, woodland, DNG, cleared and rehab, containing *Eolophus roseicapilla* (Galah) and *Platycercus eximius* (Eastern Rosella) among their dominant species (**Figure 2**). The only pairwise

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comparison between habitats that was significant was that between woodland and cleared land (ANOSIM Pairwise R = 0.57, P=0.001). Both of these habitats had Galah and Eastern Rosella as dominant species, but the woodland had more *Glossopsitta concinna* (Musk Lorikeet) and *Pardalotus striatus* (Striated Pardalote), whereas the cleared land had more *Cracticus tibicen* (Australian Magpie), *Malurus cyaneus* (Superb Fairy-wren), *Corvus coronoides* (Australian Raven) and *Cisticola exilis* (Golden-headed Cisticola).

Bird communities in each of the woodland sites resembled each other more closely than the communities of the DNG and cleared land. This is indicated by the tighter cluster of sites in the MDS plot (**Figure 2**). Woodland sites had bird communities dominated by *Eolophus roseicapilla* (Galah), *Platycercus eximius* (Eastern Rosella), *Manorina melanocephala* (Noisy Miner), Striated Pardalote and Musk Lorikeet.

The bird community of the rehabilitated sites was no different to that of woodland and DNG sites (ANOSIM P = 0.93 and 0.98 respectively), as indicated by their position in the MDS plot. Apart from Eastern Rosella and Galah, the dominant bird species in the rehabilitated sites were *Psephotus haematonotus* (Red-rumped Parrot), Noisy Miner, Australian Magpie, and *Cracticus nigrogularis* (Pied Butcherbird).

On average a smaller number of birds were observed at each mine rehabilitation site than in other habitat types (**Figure 3**). Similar numbers of birds per site were observed in cleared, grassland, woodland and formerly cultivated sites with a canopy. The mean number of species observed per site followed a similar pattern to the number of individual birds per site, with less species observed in mine rehabilitation sites. However, a similar number of species per site were observed in cleared, grassland, woodland and formerly cultivated sites with a canopy.

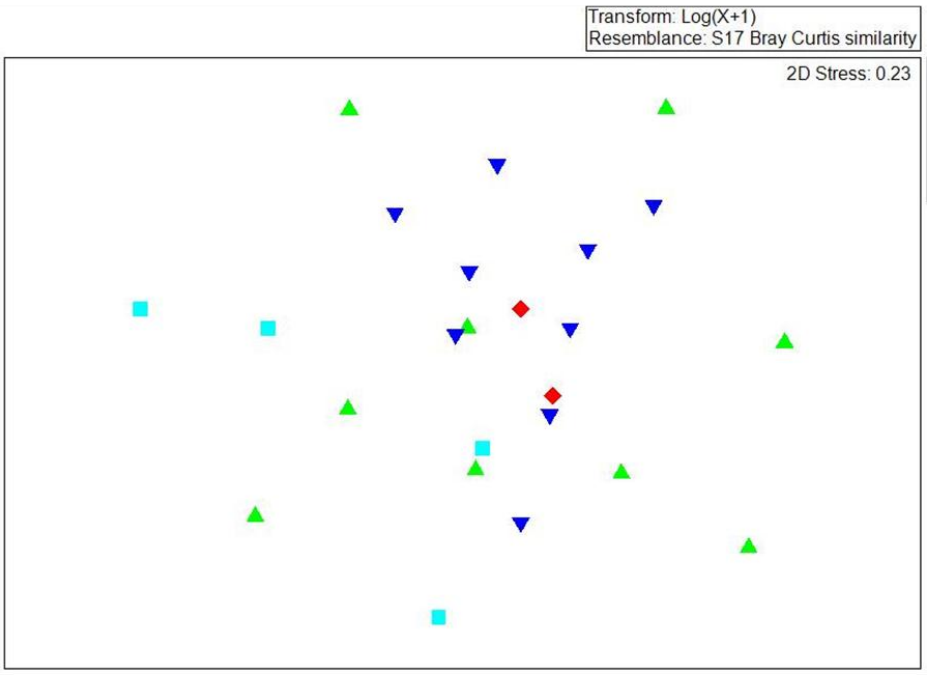

Figure 2: MDS plot for bird communities in different habitats at Werris Creek during 2014. Dark blue represents woodland, green is Derived Native Grassland, pale blue is cleared land, and red is rehabilitated land.

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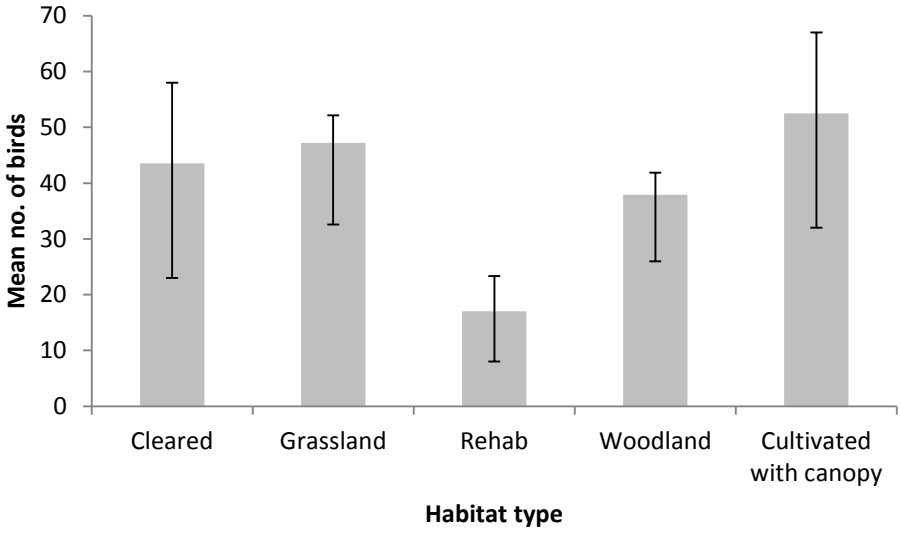

Figure 3: Mean number of birds recorded at a single bird survey per habitat type in 2014

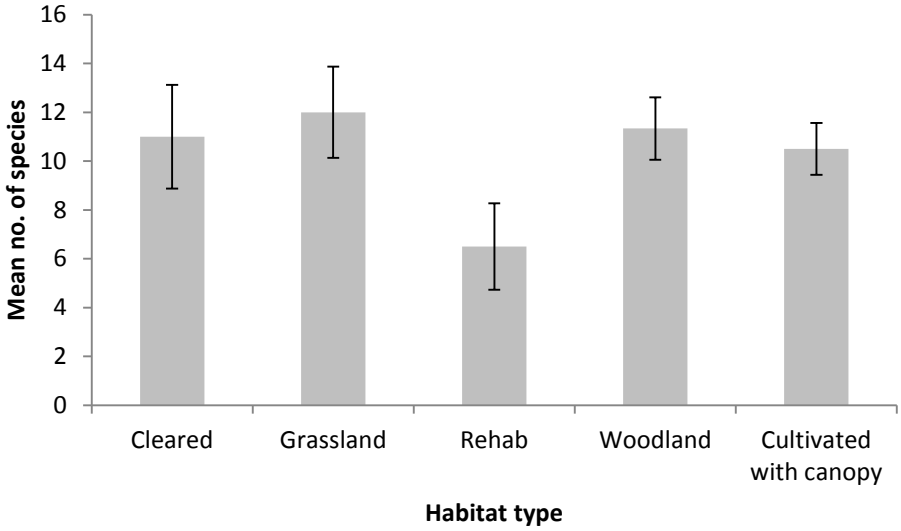

Figure 4: Mean number of bird species per site during 2014

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3.3.3 Comparisons between bird communities and habitat over 2010-2014

In all surveys since 2010, bird communities at rehabilitated sites have had similar species to those of woodland and DNG (Pairwise ANOSIM P=0.85 and 0.99), but were less similar to cleared land (**Figure 2** Pairwise ANOSIM P=0.18). All four habitats contained Galah, Australian Magpie, Red-rumped Parrot, and Eastern Rosella, and these species contributed to the overlap observed in the MDS between habitats (**Figure 5**). Cleared sites more frequently had Golden-headed Cisticola and Superb Fairy-wren than rehabilitated sites, but more of the rehabilitated sites had Pied Butcherbird, Noisy Miner, and Striated Pardalote.

The bird communities at woodland sites were more similar to each other than the bird communities of other habitat types, and had very little overlap with cleared sites (**Figure 5**). More woodland sites had Noisy Miner, Striated Pardalote, Pied Butcherbird, and *Coracina novaehollandiae* (Black-faced Cuckoo-shrike) than cleared sites, but Golden-headed Cisticola, Superb Fairy-wren, and Australian Raven occurred more regularly at cleared sites.

Although woodland and rehabilitated sites had similar species in their bird communities, Striated Pardalote and Black-faced Cuckoo-shrike occurred more frequently at woodland sites, and *Sturnus vulgaris* (European Starling) and Red-rumped Parrot occurred more frequently at rehabilitated sites. The higher frequency of European Starling at rehabilitation sites reflect the adjacent disturbance of these sites and continuing to monitor the presence and abundance of this species as an indicator may be informative of change and improvement in the ecological structure and condition of the mine site over time. Most other species, including Musk Lorikeet, *Ocyphaps lophotes* (Crested Pigeon), *Alisterus scapularis* (Australian King Parrot) and *Dacelo novaeguineae* (Laughing Kookaburra), occurred at similar frequencies in both habitats.

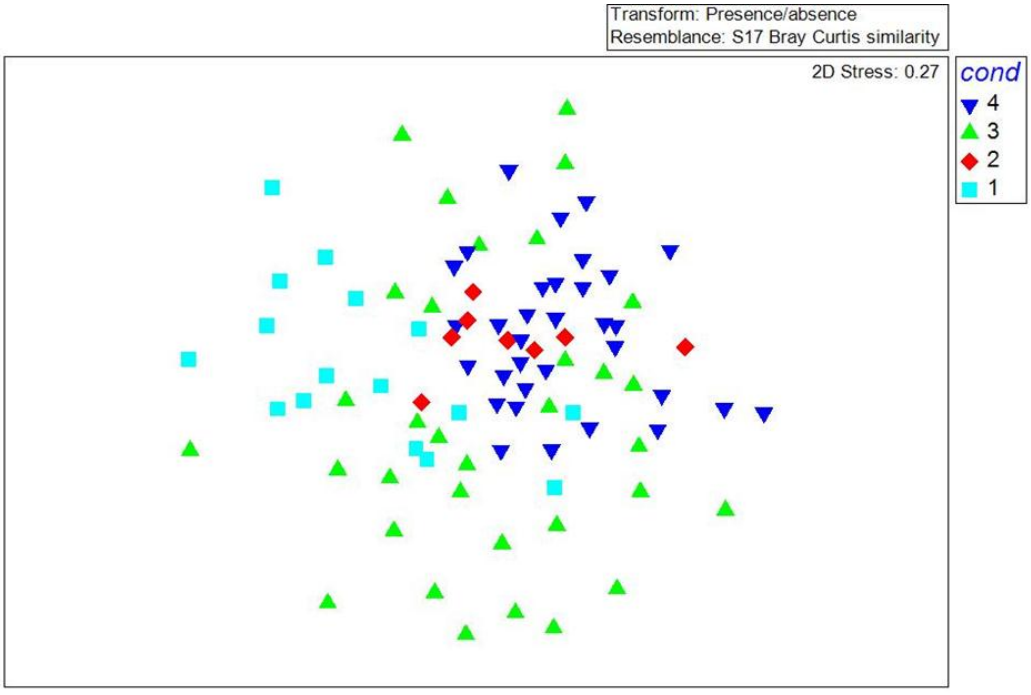

Figure 5: MDS plot for bird species in communities of different habitats at Werris Creek from 2010 to 2014. Dark blue represents woodland, green is Derived Native Grassland, pale blue is cleared land, and red is rehabilitated land.

3.3.4 Comparisons of bird communities through time

A notable pattern that emerges from the MDS plot of bird communities through time, displayed in **Figure 6** with different symbols for each year, is that the points for each year become more widely dispersed. In MDS, points that are close to each other represent communities that have similar species, while those that are far apart are made of different species. The overall trend in Werris Creek bird communities indicates that sites become less similar to each other every year.

In 2010, site data is clustered toward the centre of the plot, indicating that bird communities during that year are similar between sites. During this year, the average bird communities were characterised by Starling, Galah, and Striated Pardalote. The communities had changed by 2011 (ANOSIM Pairwise R = 0.39, P = 0.002), with Australian Magpie occurring more frequently at sites, and European Starling and Grey Butcherbird becoming slightly less common. Other species that were encountered at more sites in 2011 than 2010 include Black-shouldered Kite, Superb Fairy-wren, Sulphur-crested Cockatoo and Musk Lorikeet.

More sites were added in 2012. Nevertheless, the bird communities averaged over all sites differed to the previous year (ANOSIM Pairwise R = 0.209, P = 0.009). In 2012, Musk Lorikeet, Sulphur-crested Cockatoo, Striated Pardalote, and European Starling occurred at fewer sites. European Starlings were also slightly less common in 2013, along with Pied Butcherbird, Nankeen Kestrel and Magpie Lark. In 2014, Musk Lorikeet, and Striated Pardalote were more common than in the previous year, while Red-rumped Parrot and Noisy Miner occurred at fewer sites. European Starling decreased slightly, occurring at the same number of sites as in 2012.

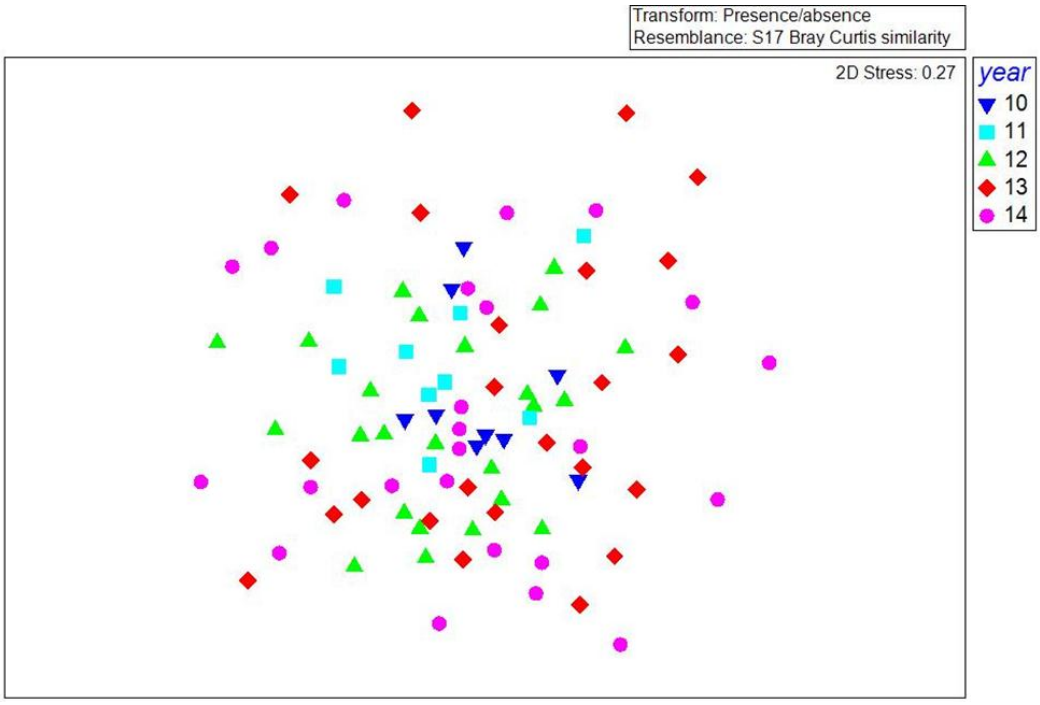

Figure 6: MDS of bird communities from 2010 to 2014 with symbols coloured by year

3.3.1 Analysis of microbat recording

The most widely recorded species of microbat was *Chalinolobus gouldii* (Gould's Wattled Bat). This species was recorded with high confidence at 19 of the 20 sites where bat call recording took place. *Mormopterus* sp. 3 (Inland Freetail Bat), *Mormopterus* sp. 4 (South-eastern Freetail Bat), *Nyctophilus*

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spp. (Long-eared Bats), *Scotorepens balstoni* (Inland Broad-nosed Bat) and *Vespadelus vulturnus* (Little Forest Bat) were also widely recorded and were recorded with high confidence at greater than 75% of sites.

Mormopterus ridei ((formerly *Mormopterus* sp. 2) Ride's Freetail Bat), *Saccolaimus flaviventris* (Yellow-bellied Sheathtail Bat), *Scoteanax rueppellii* (Greater Broad-nosed Bat) and *Vespadelus regulus* (Southern Forest Bat) were all recorded at fewer than 5 of the 20 bat monitoring sites.

The total number of recorded bat vocalisations varied widely within vegetation condition classes and habitat types (**Figure 7**). The smallest number of bat vocalisations recorded was within a relatively new area of mine rehabilitation and also plains grassland, site 14 and 25 respectively. Both sites are some distance from mature trees (which provide insects and are also where many species of bats roost). The highest levels of bat activity were recorded at sites 20 and 11. Site 20 is located within a riparian area and site 11 is located within class 4 White Box woodland.

Mine rehabilitation areas (Sites 6 and 14) differed widely in the amount of bat activity. Bat activity at site 6 (an older area of mine rehabilitation) was similar to many grassland and woodland sites, while site 14 had one of the lowest activity levels of all sites, which may be an indication of improved habitat structure provided by the more structurally developed rehabilitation.

The number of bat species recorded also varied within habitat types but overall the mean number of bat species per habitat type was similar (**Figure 8**).

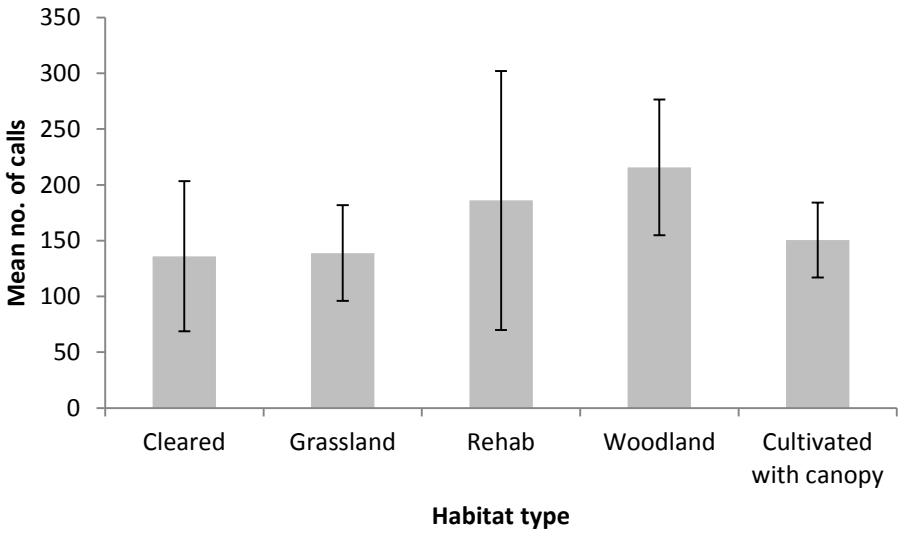

Figure 7: Mean number of bat vocalisations (including short and low quality calls) per habitat type

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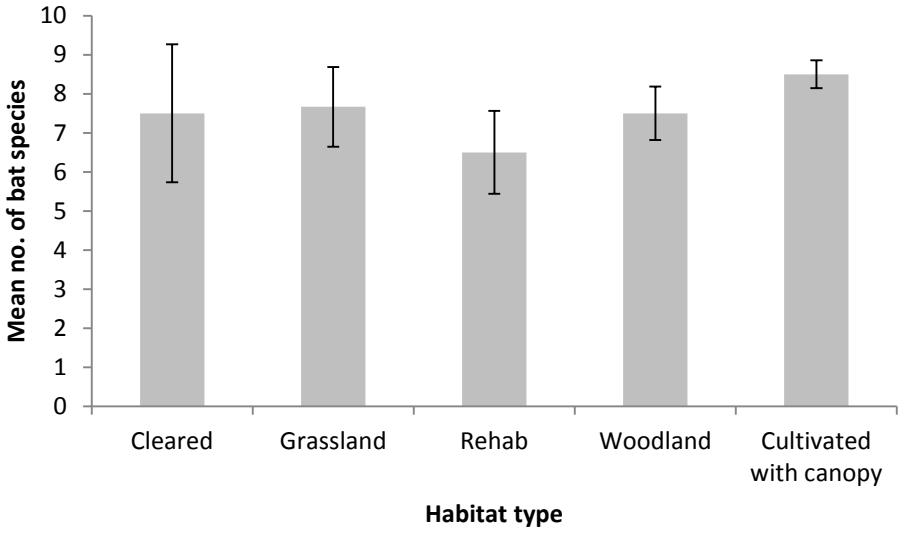

Figure 8: Mean number of bat species detected within each habitat

Analysis of bat communities between years found that bat communities changed each year of survey (ANOSIM Global R=0.297, P<0.01), with the most active species across all sites shifting annually (**Table 13:** Most active bat species over monitoring years. Despite these changes through time, there was no difference between the bat communities in each habitat within years (**Figure 9)**

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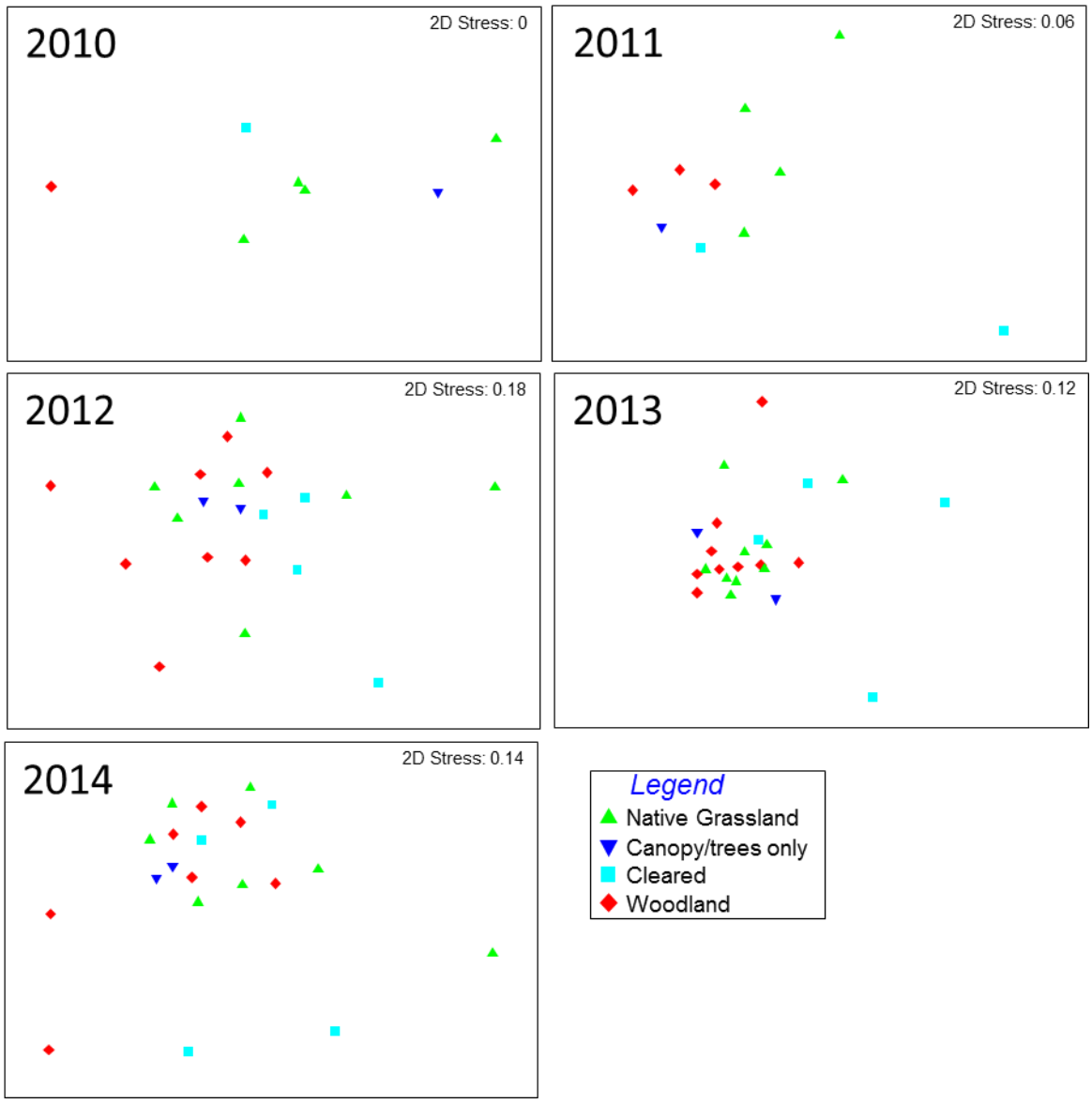

Figure 9: nMDS plots showing similarities between the bat communities of each habitat for 2010-2014. Green represents native grassland sites, blue triangles represent sites with canopy trees only, blue squares represent cleared land, and red represents woodland.

Table 13: Most active bat species over monitoring years

Species	Scientific Name	Mean no of "definite" calls
	2010	
White-striped Freetail Bat	*Austronomus australis*	3.7
Gould's Wattled Bat	*Chalinolobus gouldii*	1.69
Inland Freetail Bat	*Mormopterus* 'species 3'	1.22
	2011	
Little Forest Bat	*Vespadelus vulturnus*	2.61
Chocolate Wattled Bat	*Chalinolobus morio*	2.55
Gould's Wattled Bat	*Chalinolobus gouldii*	2.47
	2012	
Inland Freetail Bat	*Mormopterus* 'species 3'	4.39
Little Forest Bat	*Vespadelus vulturnus*	2.57
Gould's Wattled Bat	*Chalinolobus gouldii*	1.85
	2013	
Gould's Wattled Bat	*Chalinolobus gouldii*	4.5
Inland Freetail Bat	*Mormopterus* 'species 3'	4.24
White-striped Freetail Bat	*Austronomus australis*	2.61
	2014	
Inland Freetail Bat	*Mormopterus* 'species 3'	3.54
South-eastern Freetail Bat	*Mormopterus* 'species 4'	3.4
Gould's Wattled Bat	*Chalinolobus gouldii*	2.42

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4 Conclusion and recommendations

The following section provides a summary and discusses the findings of the 2014 monitoring program. **Table 14** provides an overview of site performance using the traffic light system as described previously and key recommended land management activities.

4.1 Class 4 woodland

Class 4 woodland within the Werris Creek BOA appears to be performing well. The mean number of native plant species per site was much greater than in other habitat types. Four of the nine monitoring plots are meeting performance criteria for the number of native species present, with three of the five remaining plots approaching performance criteria. Site 10 (White Cypress Pine – Silver-leaved Ironbark – Tumbledown Red Gum open shrubby forest) was the only woodland site that failed to reach 50% of the performance criteria for number of native species.

Vegetation cover at all Class 4 woodland monitoring sites is dominated by native species with the mean cover of exotic species making up only 22.4% of total groundcover. Overstorey and midstorey cover was generally low but met the minimum performance criteria at the majority of monitoring sites. Overstorey and midstorey cover is expected to increase over time, with natural overstorey regeneration observed at seven of the nine woodland monitoring sites. Regeneration was not observed at site 5 (Yellow Box – Blakely's Red Gum grassy woodland) and site 13 (White Box grassy woodland). These sites should continue to be managed to encourage overstorey regeneration. Native groundcover met performance criteria at all sites. However, a large reduction in native groundcover from the previous year was recorded at sites 24 and 22.

The main management issues with Class 4 woodland is the apparent overall increase in exotic plant cover and number of exotic plant species since 2012. The noxious weeds *Hypericum perforatum* (St. Johns Wort) and *Echium plantagineum* (Paterson's Curse) within the White Box grassy woodland should continued to be managed. Dry weather conditions prior to flora monitoring in 2014 may have influenced this change, with ecological niches opening up as plant species unable to cope with drought have declined. However, woodland sites continue to have a lower exotic plant cover than native grassland and disturbed sites and are dominated by native species.

4.2 Class 3 Derived Native Grassland

DNG generally fell below the performance criteria for number of native species, and overstorey cover. However, this was expected with overstorey, given that grassland lacks a canopy. Site 27 (a new White Box DNG site which had recently been burnt) was the only grassland site to meet the performance criteria for number of native species. Site 25 (Plains Grass grassland), Site 20 (Rough-barked Apple riparian forb/grass open forest DNG) and sites 8 and 12 (White box woodland DNG) were particularly depauperate, with less than 10 native species at each site. The mean number of native species at these grassland and DNG sites has remained relatively constant over monitoring events since 2012 and do not seem to be accumulating new native species rapidly. However, the mean number of native species in DNG sites remains substantially larger than disturbed sites (condition class 1 and 2).

Natural regeneration of canopy species was only observed in one of the DNG monitoring locations (Site 2). Overstorey species planted at sites 1, 8, 12 and 20 in previous years have survived, though their growth is slow. Continued planting and maintenance of these plantings is considered necessary.

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Native groundcover met performance criteria at all sites. However, performance criteria for native species cover within Plains Grass grassland and Rough-barked Apple forest DNG has a minimum value of 0, which is a more than achievable target. As native species cover of these sites was well above 0, it is recommended that the performance criteria target be adjusted to reflect their improvement and target climax community. A substantial reduction in native groundcover from previous years was recorded at site 21 likely due to burning of the grassland for fire management and recolonisation of native species is expected to occur in the coming years.

The mean exotic cover at grassland sites was similar to that recorded during 2012, but appears to have increased since the previous year. Large increases in exotic cover since 2013 appear to have occurred at sites 8, 12, 21 in White Box grassy woodland DNG and sites 20 and 23 in Rough-barked Apple riparian forb/grass open forest DNG and White Box-White Cypress Pine shrubby open forest respectively. However, sites 20 (Rough-barked Apple riparian forb/grass open forest DNG) and 21 (White Box grassy woodland DNG) were the only areas where exotic cover exceeded native cover. Site 23 also experienced a doubling in the number of exotic species.

The noxious weeds St. Johns Wort and Prickly Pear were observed at sites 1, 2, 8 and 23 and will require further control as part of ongoing weed management program.

4.3 Disturbed Land (Condition Classes 1 and 2)

Rehabilitation areas, cleared formerly cultivated land and formerly cultivated land with a native canopy (condition classes 1 and 2) are generally in poor condition when compared to grassland and woodland sites. These areas will require a high level of continued land management if they are to eventually meet performance criteria targets.

The number of native plant species in disturbed sites remains similar to previous years with a mean of only 5 native species per plot and none of the monitoring sites are meeting the performance criteria of 23 species. The mean number of native plant species in disturbed sites remains much lower than in DNG (11.5 species) and woodland areas (22.75 species).

Native overstorey is low to non-existent at the majority of monitoring plots within disturbed land and is not meeting performance criteria. No natural regeneration of canopy species was observed.

The older rehabilitation area where site 6 is located is continuing to show strong signs of improvement, with the canopy meeting the minimum performance criteria for overstorey cover.

Native groundcover within disturbed land appears to have increased since 2012. However, these values are still well below the performance criteria target. Site 16 is the worst performing of disturbed sites in regard to native groundcover, with no native groundcover recorded at all and is not meeting performance criteria. Site 15 and 26 also display a very low native groundcover; however, the performance criteria for these areas is also very low (0-5%) and as such these sites are still meeting performance criteria.

Exotic species cover is greater than native groundcover at all disturbed sites and appears to have increased substantially since 2012. Although disturbed sites possess high exotic species cover and contain a large number of exotic species, few noxious weed species were observed within disturbed sites. However, Prickly Pear was observed at site 9 (Cleared land) and will require further control as part of ongoing weed management program.

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4.4 Fauna

A total of 119 fauna species, including ten fauna species listed under the *Threatened Species Conservation Act* 1995 (TSC Act) and/or the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) were recorded during the 2014 survey period. One threatened species (Greater Broad-nosed Bat) was detected that has not previously been recorded during annual monitoring.

Analysis of bird survey data over time revealed that bird communities change between years and that bird communities at monitoring sites seem to become less similar to each other every year.

Analysis of bird species since 2010 between habitat types has indicated that rehabilitated sites have similar bird species to those of woodland and DNG but were less similar to cleared land, which may be a positive indication of habitat structure improvement on the rehabilitation sites. The bird communities at woodland sites were more similar to each other than the bird communities of other habitat types.

Analysis of bird communities during 2014 also suggests that communities were similar between habitats as the only pairwise comparison between habitats that was significant, was that between woodland and cleared land. However, a smaller number of individual birds and bird species were observed at each mine rehabilitation site than in other habitat types in 2014. Similar numbers of birds per site and species per site were observed in cleared, grassland, woodland and formerly cultivated sites with a canopy.

There was no significant difference between microbat communities over different habitat types, however, there were differences between years.

Variables such as weather, abundance of food, shelter, mates, breeding sites and numbers of predatory and aggressive species are all likely to influence bird and bat communities over time. Therefore, it is not surprising that changes in these communities are occurring from year to year. The reason why bird communities at monitoring sites seem to become less similar to each other every year remains unclear. However, as vegetation changes occurring within the BOA over this time period appear to be minimal, it seems likely that this is related to broader landscape-wide changes.

Surprisingly, differences in bird and bat communities between habitat types appear to be minimal despite differences in vegetation communities and structural differences (grassland vs. woodland). This may be due to the mobility of bird and bat species and the proximity of woodland areas and grassland to all sites. In addition, common species in the surrounding agricultural landscape that often utilise a combination of open woodland and grassland, such as Galahs, Eastern Rosella, Red-rumped Parrot Australian Magpie, Pied Butcherbird and Australian Raven occur at many of the monitoring sites regardless of habitat type. This is also the case with microbat species, where several common species such as Gould's Wattled Bat were detected at most monitoring sites.

However, as expected, given the structural differences in vegetation, a smaller number of individual birds and bird species were observed at each mine rehabilitation site than in other habitat types in 2014.

Table 14 provides a summary of how each site performed against performance criteria in 2014 and recommended management actions that are considered necessary.

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Table 14: Individual site performance for Werris Creek rehabilitation and biodiversity offset areas.

Biometric vegetation type	Condition class No. (Site)	Overall site performance against performance measures that have been set for a 5 year target								Comments on underperforming sites and management action
		NNS	NOC	NMS	NGC	ES	LO	SSA	FA	
White Box grassy woodland	2 (7)						N/A	N/A		This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be implemented for red measures. NNS reduced in 2014, NOC continues to be low and does not appear to be showing signs of improvement and active regeneration may be appropriate. ES cover remains relatively high. At this stage, in accordance with the BOMP (WCC 2013), with ES continuing to perform poorly continued weed management is required to control exotic species. Note, this site is positioned in a highly disturbed location (next to old soil stock pile) in the zone and does not accurately reflect overall zone condition – a new site will be established in a more representative location and therefore, traffic light colouring has not been provided.
	2 (16)						N/A	N/A		This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber measures could be addressed through appropriate management actions. NNS, NOC and NGC all remain low and, given observed low resilience, active revegetation may be appropriate for this site unless future monitoring indicates large improvements. ES cover remains high. Weed management is an ongoing issue for the BOA and weed spraying should continue. There is a strategy in place (scalping and seeding native grasses) to improve NNS and NOC for this site to be implemented in the next 12 months.
	3 (1)						N/A	N/A		This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be implemented for red measures. ES is relatively high and Scotch Thistle (noxious weed) requires continued management. NNS has improved in 2014;

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Biometric vegetation type	Condition class No. (Site)	Overall site performance against performance measures that have been set for a 5 year target								Comments on underperforming sites and management action
		NNS	NOC	NMS	NGC	ES	LO	SSA	FA	
										however, NOC continues to be low, and ES cover remains high, though weed cover has reduced by 20% since 2012 and 40% since 2010. Nevertheless, weed management should continue in accordance with the BOMP.
	3 (2)						N/A	N/A		This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be implemented for red measures. NNS is improving. NOC continues to be low though there are signs of regeneration. ES cover has increased and the presence of Scotch Thistle and St Johns Wort (noxious weed) require continued management
	3 (8)						N/A	N/A		This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be implemented for red measures. NNS is continuing to decline since 2012 and active revegetation would be appropriate, NOC continues to be low, and ES cover remains relatively high with Scotch Thistle (noxious weed) requiring continued management. That said, weed management should continue in accordance with the BOMP.
	3 (12)						N/A	N/A		This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be implemented for red measures. NNS is continuing to decline since 2012 and active revegetation would be appropriate, NOC continues to be low, and ES cover remains high. Weed management should continue in accordance with the BOMP.
	3 (19)						N/A	N/A		This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber measures could be considered through

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Biometric vegetation type	Condition class No. (Site)	Overall site performance against performance measures that have been set for a 5 year target								Comments on underperforming sites and management action
		NNS	NOC	NMS	NGC	ES	LO	SSA	FA	
										appropriate management actions. NNS has remained stable since 2012, NOC continues to be low, and ES cover remains high. Therefore, weed management should continue in accordance with the BOMP.
	3 (21)						N/A	N/A		This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber measures could be considered through appropriate management actions. NOC continues to be low. Revegetation using tube stock may be necessary if NOC does not show signs of improvement in medium term. ES appears to have increased and weed management should continue in accordance with the BOMP.
	3 (27)						N/A	N/A		This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber measures could be considered through appropriate management actions. NOC continues to be low, which is expected given it's a DNG site. Revegetation using tube stock may be necessary if NOC does not show signs of improvement in medium term.
	4 (3)						N/A	N/A		This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be implemented for red measures. NNS is less than the PC, though has improved since 2012. Native species diversity fluctuates depending on climatic conditions in respective years. ES St Johns Wort (noxious weed) requires continued management. Future monitoring of diversity will inform actual performance of the site.
	4 (11)									This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be

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Biometric vegetation type	Condition class No. (Site)	Overall site performance against performance measures that have been set for a 5 year target								Comments on underperforming sites and management action
		NNS	NOC	NMS	NGC	ES	LO	SSA	FA	
										implemented for red measures. NNS is less than the PC and has reduced from previous years of monitoring. Native species diversity fluctuates depending on climatic conditions in respective years. Future monitoring of diversity will inform actual performance of the site. ES cover has significantly reduced from 2010, though the presence of St Johns Wort requires targeted weed management. Future LFA monitoring will inform whether SSA results are a downward trend.
	4 (13)						N/A	N/A		This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber measures could be considered through appropriate management actions. ES cover is relatively high and Paterson's Curse (noxious weed) requires management.
	4 (17)									This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber measures could be considered through appropriate management actions. NNS remains stable but is less than the PC. Native species diversity fluctuates depending on climatic conditions in respective years. Future monitoring of diversity will inform actual performance of the site. Future LFA monitoring will inform whether SSA results are a downward trend.
	4 (24)						N/A	N/A		NNS is now meeting the PC. NGC has reduced, though this may be a natural variation.
Yellow Box – Blakely's Red Gum grassy	4 (5)						N/A	N/A		This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be implemented for amber measures. NNS has remained stable but is below

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Biometric vegetation type	Condition class No. (Site)	Overall site performance against performance measures that have been set for a 5 year target								Comments on underperforming sites and management action
		NNS	NOC	NMS	NGC	ES	LO	SSA	FA	
woodland										performance criteria. ES cover remains high and is slightly increased from the previous year, though is markedly reduced from 2010. Nevertheless, weed management should continue in accordance with the BOMP.
White Cypress Pine – Silver-leaved Ironbark – Tumbledown Red Gum open shrubby forest	4 (10)						N/A	N/A		This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be implemented for amber measures. ES remains high and has markedly increased since 2013 - weed management should continue in accordance with the BOMP.
	4 (18)						N/A	N/A		NNS and NMS are below PC, though diversity is relative stable in comparison to the previous 2012 monitoring results. Current management in accordance with the BOMP and continued monitoring of trends is considered adequate
White Box-White Cypress Pine shrubby open forest	4 (22)						N/A	N/A		NNS is now meeting PC. NMS is below PC, though diversity is relative stable in comparison to the previous 2012 monitoring results. Current management in accordance with the BOMP and continued monitoring of trends is considered adequate.
	3 (23)						N/A	N/A		This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber and red measures could be considered through appropriate management actions. NNS, NOC and NMS are all below PC, though trends from previous years are stable. ES has markedly increased from previous years and the presence of St Johns Wort (noxious weed) requires weed management.

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Biometric vegetation type	Condition class No. (Site)	Overall site performance against performance measures that have been set for a 5 year target								Comments on underperforming sites and management action
		NNS	NOC	NMS	NGC	ES	LO	SSA	FA	
Plains Grass grassland on basaltic black earth soils	3 (25)						N/A	N/A		This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber and red measures could be considered through appropriate management actions. NNS is well below PC and does not appear to be improving, therefore, active revegetation would be appropriate. ES cover is relatively high at 26%, but has reduced significantly from 72% in 2012. The intention is to burn this site with an aim to improve NNS over time.
Rough-barked Apple riparian forb/grass open forest	3 (20)						N/A	N/A		This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber and red measures could be considered through appropriate management actions. NNS, NOC, NMS continues to be below PC. ES has increased since 2013 and continued management in accordance with the BOMP is still necessary. Active revegetation is considered appropriate in the area that this site represents.
Mine rehab	1 (6)									Whilst NNS and NOC is below PC, there has been substantial improvement in these attributes when compared to previous years of monitoring. ES is high and has increased from the previous monitoring year. Future LFA monitoring will inform whether SSA results are a downward trend. Current management regimes in accordance with the BOMP are expected to improve the poorly performing attributes.
	1 (14)									This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, amber measures could be considered through appropriate management actions. NNS remains low, NOC remains low and

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Biometric vegetation type	Condition class No. (Site)	Overall site performance against performance measures that have been set for a 5 year target								Comments on underperforming sites and management action
		NNS	NOC	NMS	NGC	ES	LO	SSA	FA	
										LFA results are poor too. Given this is a rehab site, improvements responding to management regimes in accordance with the BOMP will take some time, though current management in accordance with the BOMP is considered appropriate. ES cover has actually increased since 2012 and requires further treatment.
	1 (26)									This is the 1st year of monitoring for this site, with performance measured against the 5 year target, therefore there are four more years before this target should be met. Never the less, amber measures could be considered through appropriate management actions. NNS and NOC is low and LFA results are poor too. Given this is a rehab site, improvements responding to management regimes in accordance with the BOMP will take some time, though current management in accordance with the BOMP is considered appropriate. ES cover has actually increased since 2012 and requires further treatment.
Cleared	1 (9)						N/A	N/A		This is the 4th year of monitoring for the site and performance is measured against the 5 year target; therefore management actions should be implemented for red measures. NNS is low, though this may be a reflection of past disturbance and low resilience of the site and surrounds. NOC remains low but there is a likely lag period between the plantings that have been established and cover score readings. ES cover has decreased slightly since 2013, but requires continued treatment of environmental weeds and Scotch Thistle (noxious weed).
	1 (15)						N/A	N/A		This is the 3rd year of monitoring for this site, with performance measured against the 5 year target, therefore there are two more years before this target should be met. Never the less, red and amber measures could be considered through appropriate management actions. NNS reduced in 2013, though this

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Biometric vegetation type	Condition class No. (Site)	Overall site performance against performance measures that have been set for a 5 year target								Comments on underperforming sites and management action
		NNS	NOC	NMS	NGC	ES	LO	SSA	FA	
										may be an artefact of poor climatic conditions and it is hoped that native seed blown in from adjacent paddocks will colonise the area in time. NOC continues to be low, and ES cover remains high and requires continued treatment.

NNS = Number of Native Species, NOC = Native Overstorey Cover, OR = Overstorey Regeneration, NMS = Native Midstorey, NES= Number of Exotic Species, ESC= Exotic Species Cover, ES% total = exotic species as a proportion of total cover, NW = Noxious Weeds LO = Landscape Organisation Index SSA = Soil Surface Assessment

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4.5 Other recommendations

The following provides a list of recommendations that relate to setting performance criteria and future monitoring methods. These recommendations should be considered when it comes time to revise the BOMP.

- Performance targets should be broken down in to Performance Criteria, that is a short term (eg. 5 year target), and Completion Criteria, that is the end point target and which is appropriate to the local climatic conditions and resilience potential for the site. Performance Criteria should vary depending on the condition of the zone being monitored, with more disturbed/lower resilience sites (Class 1 and 2) having a more achievable Performance Criteria than intact sites (Class 4). Completion Criteria, rather than being based on the state wide vegetation type benchmark database, should be based on averages or ranges derived from the four years of monitoring of class 4 sites (ie local benchmark data). This approach would enable more realistic targets that are based on achievable timelines, ultimately allowing for better reporting on the success of land management.
- Whilst the current performance measures provided in the floristic and biometric monitoring are informative, it may be worth considering adding performance measures such as number of healthy plantings or regenerating canopy trees. This would inform the success of any active regeneration and could be added in future BOMP revisions
- The revision of fauna monitoring methods should be considered. It may be appropriate to remove un-informative survey methods that are returning limited data, such as herpetological surveys, or to reduce the intensity or frequency of monitoring events.
- Bird monitoring and statistical analysis should start to look at comparing the presence and abundance of key species in woodland, DNG and cleared/rehab sites, which may inform structural changes.
- As part of the next BOMP revision, vegetation mapping and types in the BOA should be adjusted to reflect the new Plant Community Types. This may require some merging of vegetation communities.It should be noted that the current performance criteria targets for biometric measures are based on the state wide vegetation type benchmarks, rather than local data and it may be appropriate to review these performance targets in light of the potential of vegetation classes based on the monitoring data collected to date. This could be done as part of the next BOMP revision.
- A revised performance criterion for cleared sites that is more ambitious (i.e >0-5%) could be developed for native species cover in particular, which could be done as part of the next BOMP revision.

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Werris Creek Coal Mine

Annual Flora and Fauna Monitoring Report Volume 2 – Monitoring Data

Prepared for
Werris Creek Coal Pty. Ltd.

27 May 2015

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1 Photo Monitoring Points

See photographs supplied on disc

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2 Biometric Monitoring Data

Table 1: Biometric data collected from each monitoring site in 2014

Monitoring Site	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL
1	12	0	0	86	0	2	50	0	1	0
2	15	0	0	84	0	14	40	0	1	6.5
3	22	8	0	70	2	50	14	2	1	20
5	14	6.7	0	64	0	42	44	1	0	96.5
6	13	7.5	0	72	0	6	80	0	1	24
7	8	0	0	48	0	4	88	0	0	76.5
8	4	0	0	84	0	2	52	0	1	30
9	5	0	0	50	0	9	68	0	0	54
10	14	0	0	60	0	18	76	1	1	0
11	21	12.2	0	62	0	46	26	3	1	66
12	4	0	0	44	0	26	60	0	1	0
13	29	4.7	0	74	0	46	62	3	0	28
14	7	0	0	36	0	6	60	0	1	31
15	3	0	0	2	0	2	96	0	0	0
16	7	0.5	0	0	0	0	72	1	0	0
17	18	8	0	62	0	44	34	1	1	23
18	31	6	0.1	50	6	26	14	6	1	55
19	14	0	0	84	0	22	34	0	0	0
20	9	0	0	32	0	22	80	0	1	5
21	15	0	0	32	0	24	60	0	0	0
22	30	6.5	0.7	24	0	34	16	0	0.5	29
23	14	0	0	38	0	52	54	0	0	0
24	25	5.6	0	38	2	28	0	0	1	41.5
25	7	0	0	78	0	6	26	0	0	0
26	5	0	0	12	0	0	52	0	1	39
27	23	0	0	50	0	12	42	0	0	0

NPS= native plant species, NOS = native overstory, NMS = native midstory, NGCG = native groundcover - grasses, NGCS = native groundcover - shrubs, NGCO = native groundcover – other, EPC = exotic plant cover, OR= overstory regeneration, FL= length of fallen logs (m)

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3 Graphic representation of performance criteria between years

3.1 Number of native flora species

Overall, the number of native flora species per site has remained relatively constant between monitoring years (**Figure 1)** with the average number of species per site varying between 12 and 13.5 during 2012, 13 and 14 monitoring events. Monitoring years 2010 and 2011 were excluded from analysis as the number and condition of sites sampled differed from subsequent years.

Further analysis of the number of native species within woodland (condition class 4) (**Figure 2**), Derived Native Grassland (DNG) (condition class 3) (**Figure 3**) and more disturbed sites (condition classes 1 & 2) (**Figure 4**) also revealed that the number of native species has remained relatively constant over monitoring years.

The number of native species varied substantially between habitats during 2014 (**Figure 5**). The mean number of native species ranged from 5.4 (disturbed areas within condition class 1 and 2) and 11.5 for DNG (condition class 3) to 22.8 species within woodland habitats (condition class 4).

Only five of the 26 monitoring sites are currently meeting the performance criteria for number of native species. These sites are primarily located within woodland habitats (condition class 4) with one site in derived native grassland.

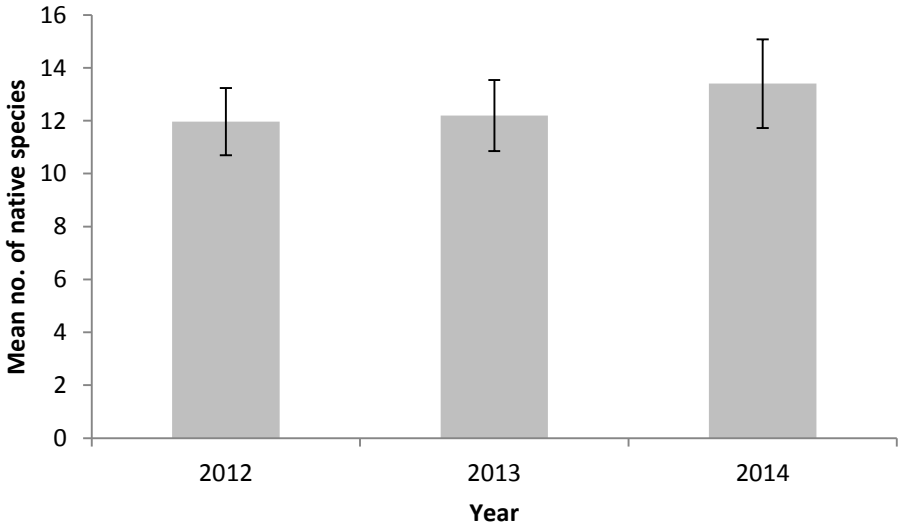

Figure 1: Mean number of native species per site 2012-2014

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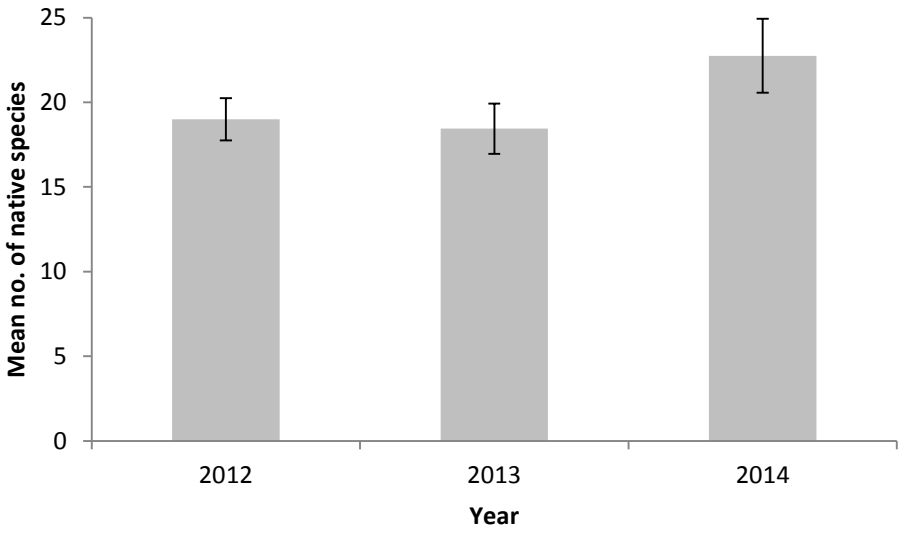

Figure 2: Mean number of native plant species per site in class 4 woodland habitats 2012-2014

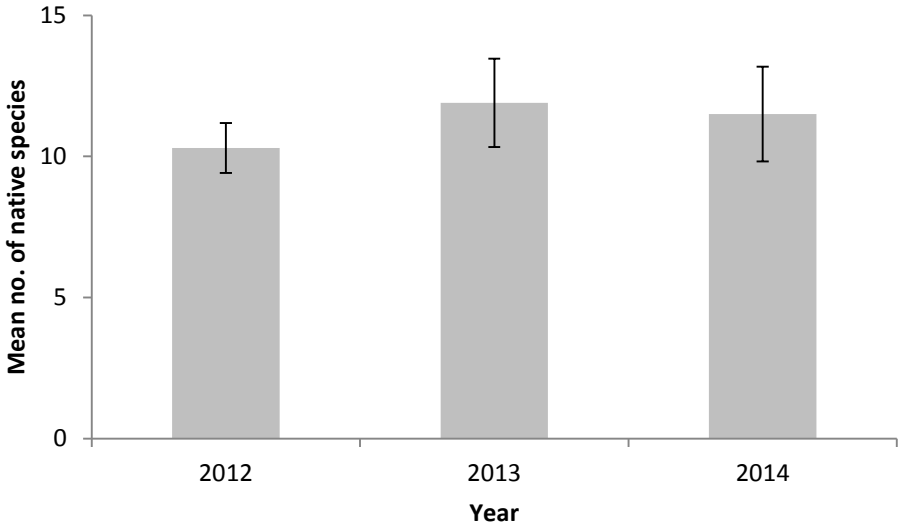

Figure 3 Mean number of native plant species per site in class 3 native grassland 2012-2014

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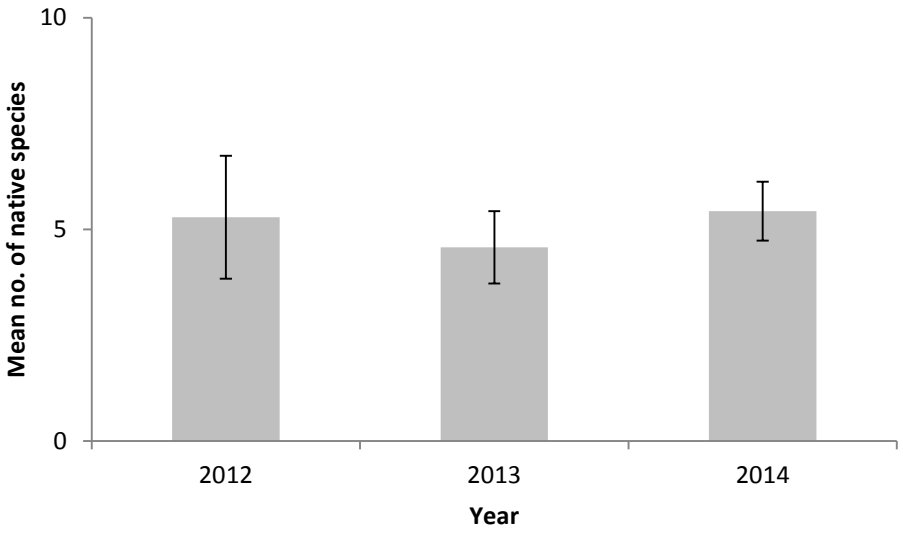

Figure 4: Average number of native plant species per site each monitoring year for class 1 and 2 (rehabilitated, cleared and cultivated sites)

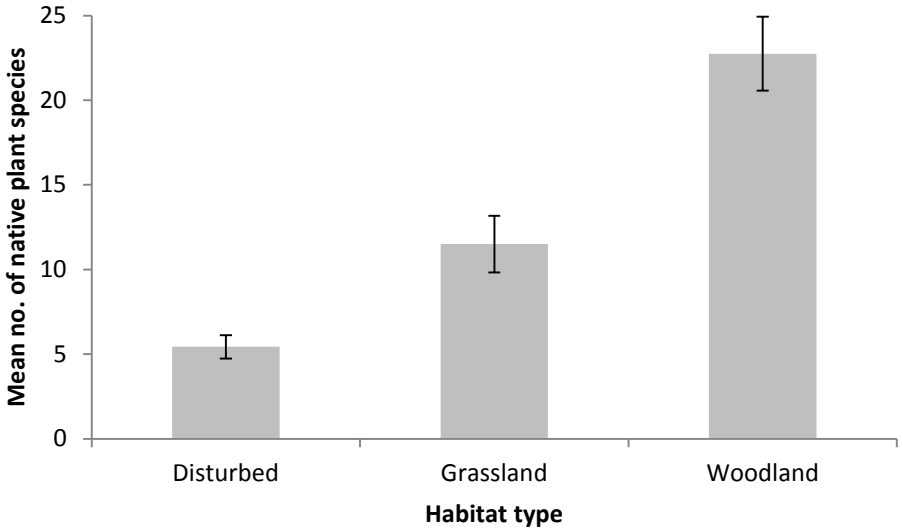

Figure 5: Comparison between the mean numbers of native species per site within each habitat type 2014

3.2 Native ground cover

Overall native groundcover appears to have increased slightly across the BOA between 2012 and 2014 (**Figure 6**). Data from 2010 and 2011 sampled a smaller number of sites over a range of condition classes and were excluded from the overall comparison between years.

Native groundcover within woodland and grassland sites has remained relatively stable or increased slightly over monitoring years (**Figure 7**, **Figure 8**). Native groundcover in disturbed areas (condition classes 1 and 2) was quite variable with some sites having little or no native groundcover and others (particularly older rehabilitation areas) having a large groundcover of native plant species (**Figure 9**).

Although the amount of native groundcover is variable within previously disturbed sites, these areas continue to have a much reduced native groundcover than in grassland and woodland sites in 2014 (**Figure 10**)

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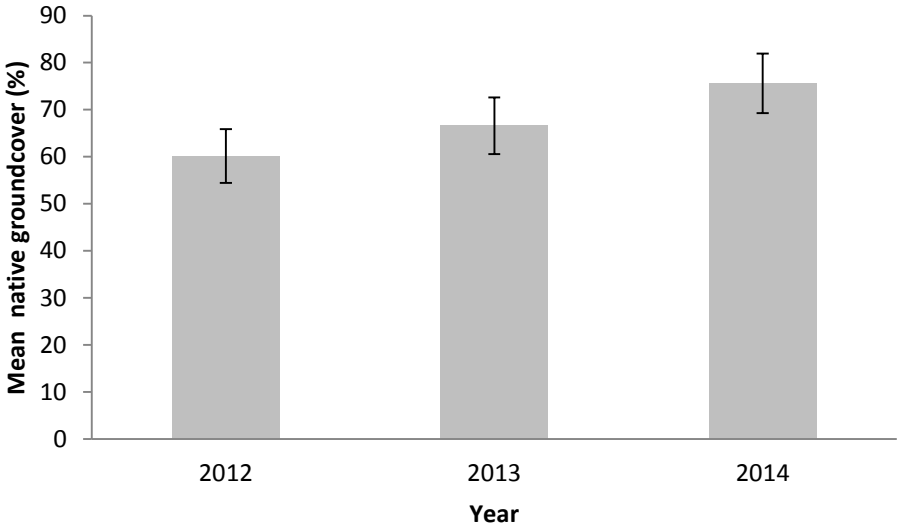

Figure 6: Mean native groundcover over all monitoring plots 2012-14

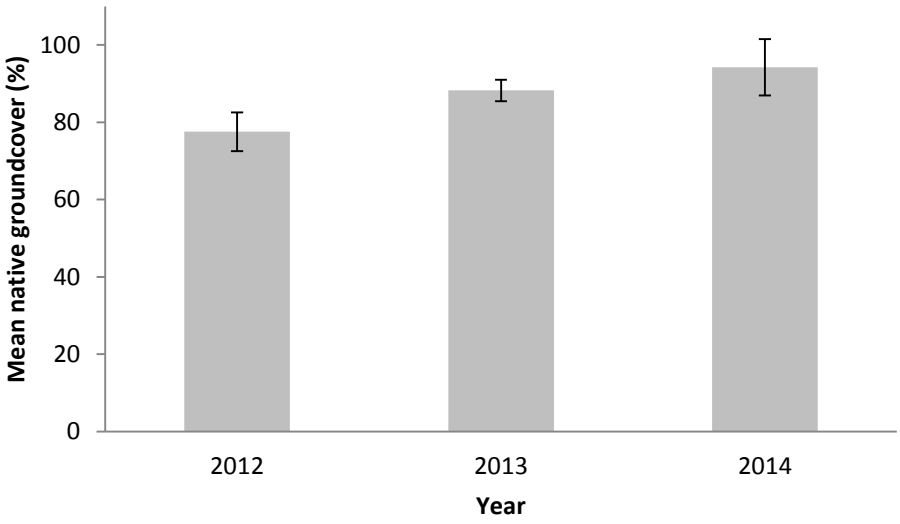

Figure 7: Comparison of mean native groundcover since 2012 within woodland monitoring plots

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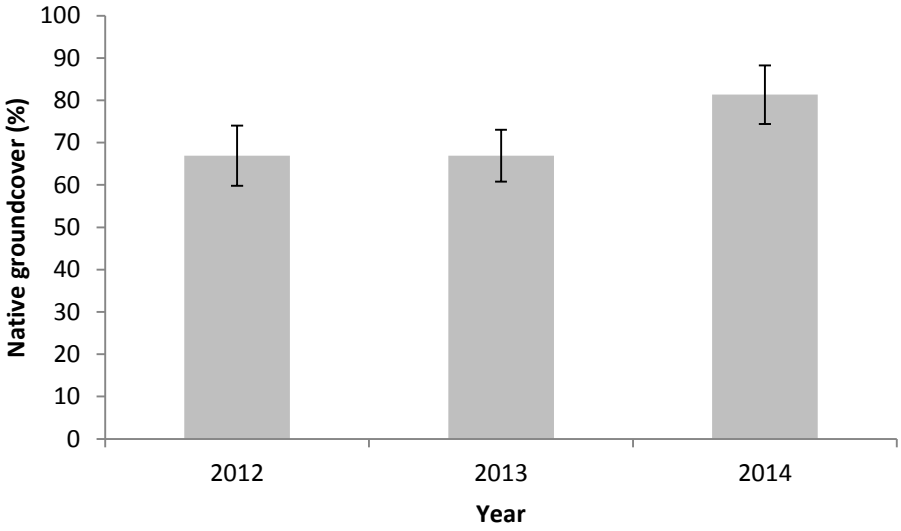

Figure 8: Comparison of mean native groundcover since 2012 within grassland monitoring plots

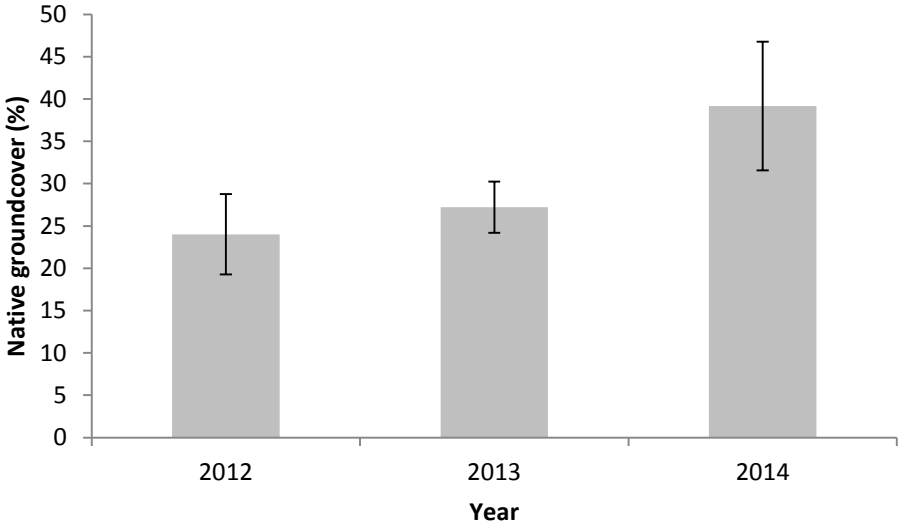

Figure 9: Comparison of mean native groundcover between 2012-14 within disturbed areas (vegetation condition class 1 & 2)

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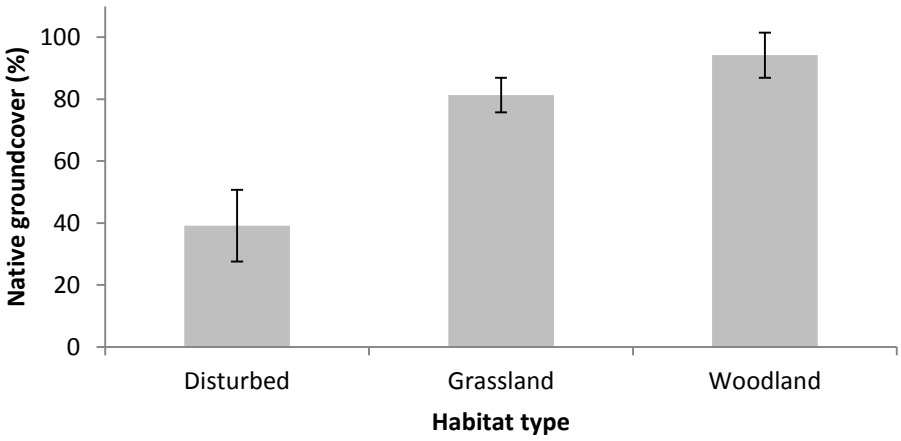

Figure 10: Comparison of native groundcover between habitats in 2014

3.3 Exotic flora species richness, cover and problem species

A substantial increase in exotic flora cover between 2013 and 2014 was recorded with a mean of 28.6% (SE =± 5.3) exotic cover per site recorded in 2013, compared with a mean of 50.3% (SE =± 5.2) cover in 2014 (**Figure 11**). Exotic plant cover at woodland sites appears to have increased since 2012 and 2013 (**Figure 12**), with grassland sites displaying similar exotic cover those recorded in 2012 (**Figure 13**). Exotic cover at disturbed sites appears to have increased dramatically since 2012 but remain similar to those recorded in 2013 (**Figure 14)**

Large increases in the amount of exotic cover from the previous year occurred at sites 6, 10, 13 and 21. A reduced exotic plant cover from the previous year was observed at sites 1, 9 and 16.

Exotic species cover is very high (> 70%) at sites 6 and 26 (mine rehabilitation areas), 7 and 16 (formerly cultivated land with canopy species remaining) 10 (White Cypress Pine – Silver-leaved Ironbark – Tumbledown Red Gum open shrubby forest) and 15 (Cleared formerly cultivated land). These areas have been marked in red to indicate that continued weed management is required.

Large apparent increases in exotic cover at woodland sites 10 and 13 are surprising. Site 13 has a large number of native species (and is exceeding the performance criteria) and also has a very large cover of native groundcover species. Site 10 falls below performance criteria for the number of native species but also displays a large amount of native groundcover. Exotic species with a higher cover/abundance score at these sites were *Bromus hordeaceus* (Soft Brome), *Carthamus lanatus* (Saffron thistle), *Lolium* spp. (Ryegrass)*, Medicago sativa* (Lucerne) and an unidentified *Medicago* sp.

Exotic cover exceeded native cover at all class 1 and 2 vegetation monitoring sites (Mine rehab, cleared and cultivated areas). More than 80% of groundcover at Sites 15, 16 and 26 is exotic vegetation. Exotic groundcover also dominated native ground cover at Sites 20 (Rough-barked Apple riparian forb/grass open forest) and 21 (White Box grassy woodland DNG). These areas should be considered to be underperforming in terms of exotic species cover and will require continued monitoring and weed management.

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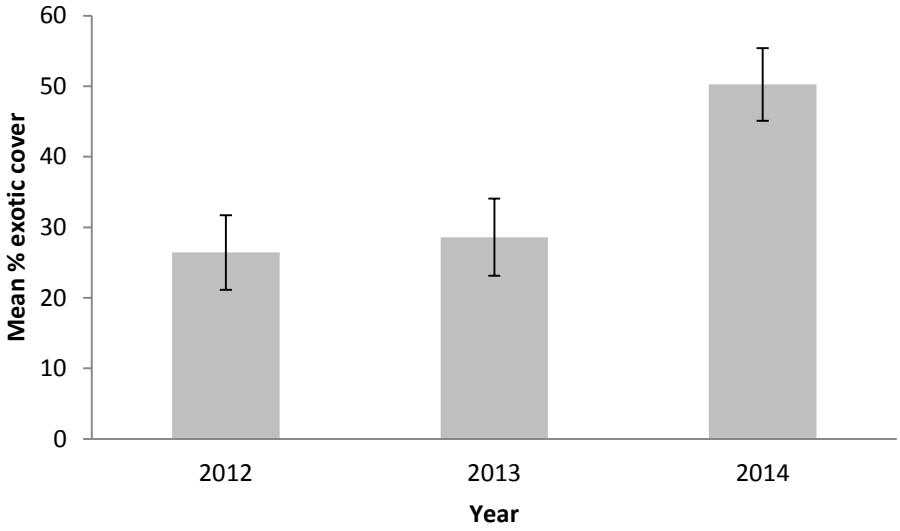

Figure 11: Mean exotic cover per site per year

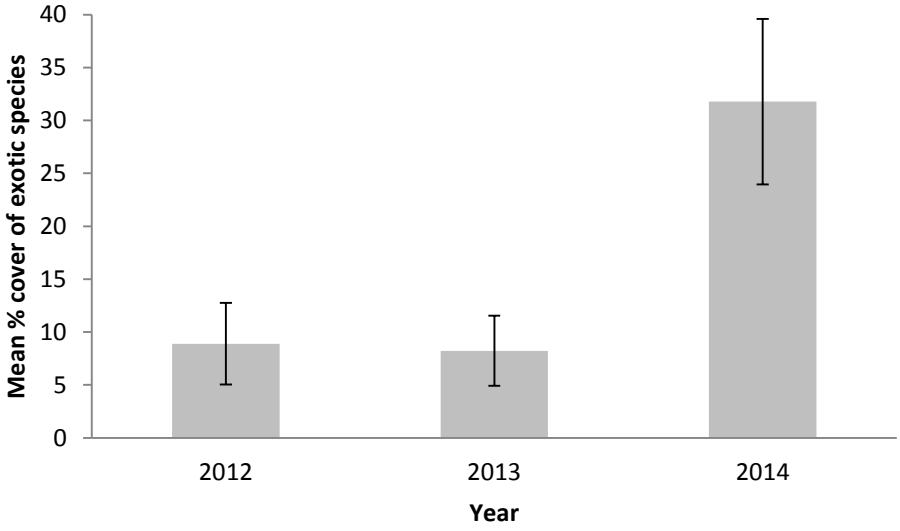

Figure 12: Mean exotic plant cover at woodland sites, 2012 - 2014

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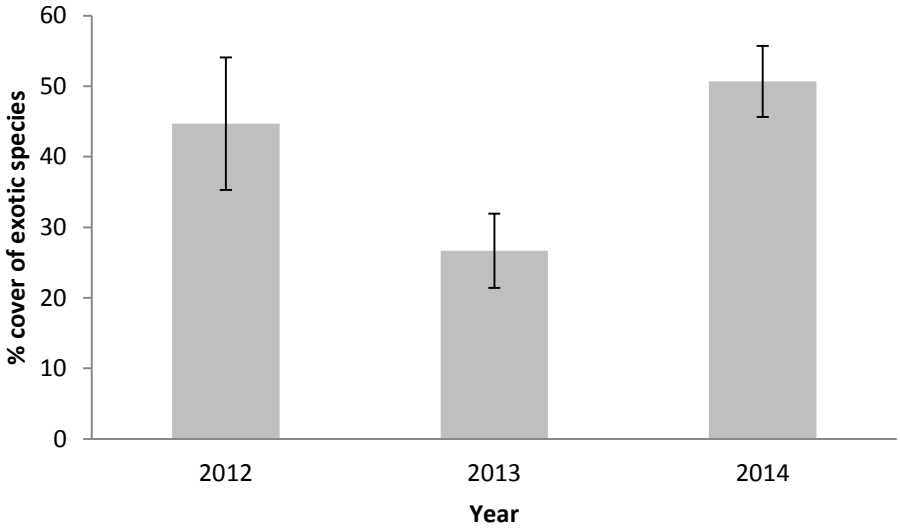

Figure 13: Mean exotic cover at grassland sites, 2010 – 2014

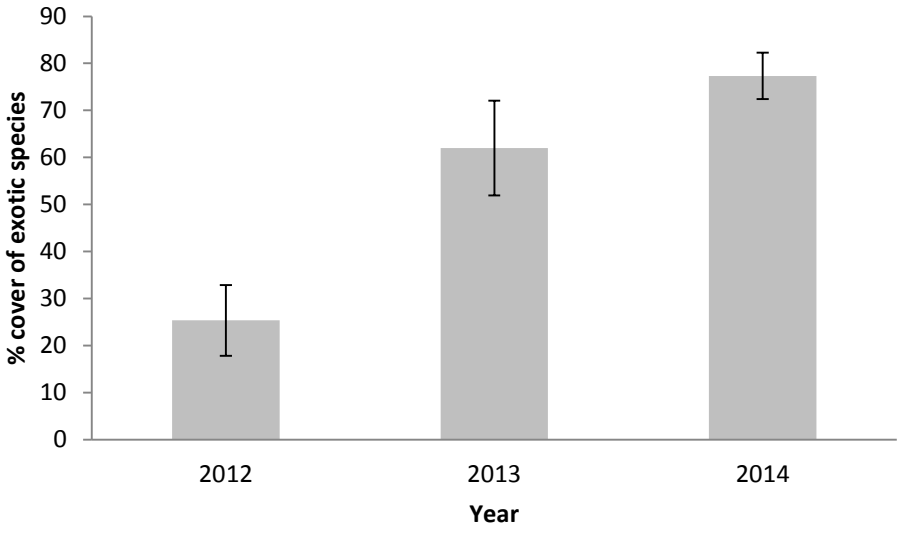

Figure 14: Mean exotic cover at disturbed sites (Condition Class 1 and 2), 2012 – 2014

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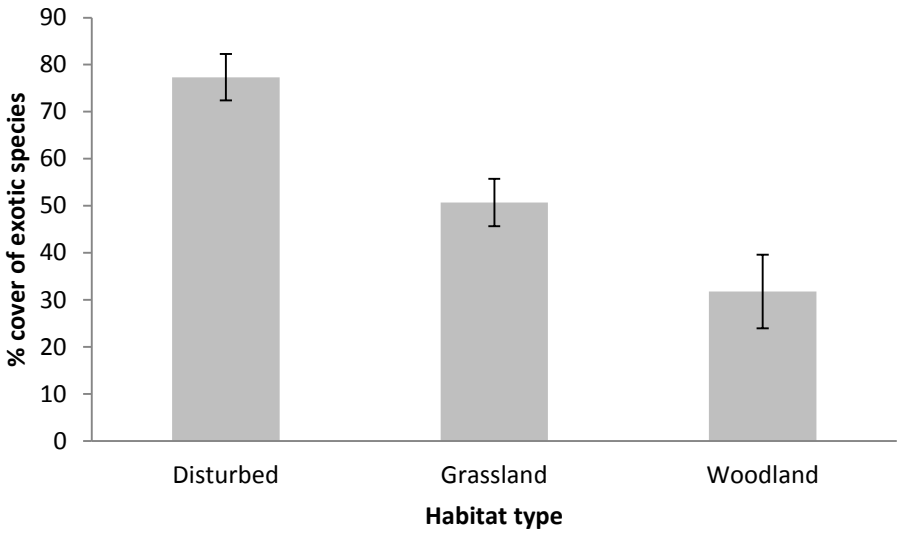

Figure 15: Comparison of mean exotic plant cover between habitats 2014

Exotic plant species

The average number of exotic species per monitoring site has remained relatively stable from 2012 to 2014 with a mean of 10.04 species per site in 2012 (SE = ±1.0) to 11.6 species in 2014 (SE = ± 0.84) (**Figure 16**)

The average number of exotic species per monitoring site in woodland sites appears to have slightly increased since 2012 with a mean of 6.3 species per site in 2012 (SE = ±1.7) to 10.1 species per site in 2014 (SE = ±1.5) (**Figure 17**). The number of exotic species in both grassland and disturbed sites have remained relatively stable since 2012 (**Figure 18** & **Figure** 19).

On average disturbed sites had a substantially larger number of exotic species; (Mean =14.6, SE = ±1.3) than woodland sites (Mean = 10.1, SE = 1.5) (**Figure 20**)

The number of exotic plant species outnumbered native species at all class 1 and 2 vegetation monitoring sites (Mine rehab, cleared and cultivated areas). This was also the case at sites 5 (Yellow Box – Blakely's Red Gum grassy woodland), 8 and 12 (White Box grassy woodland DNG) and 20 (Rough-barked Apple riparian forb/grass open forest).

Changes in the number of exotic species recorded between 2013 and 14 occurred at almost all sites. The number of exotic species recorded decreased at 8 of the 24 sites monitored during 2013 and increased at 14 sites. A substantial reduction in the number of weed species recorded occurred at site 25 (Plains Grass grassland) with 16 fewer exotic species recorded in 2014 than in the previous year.

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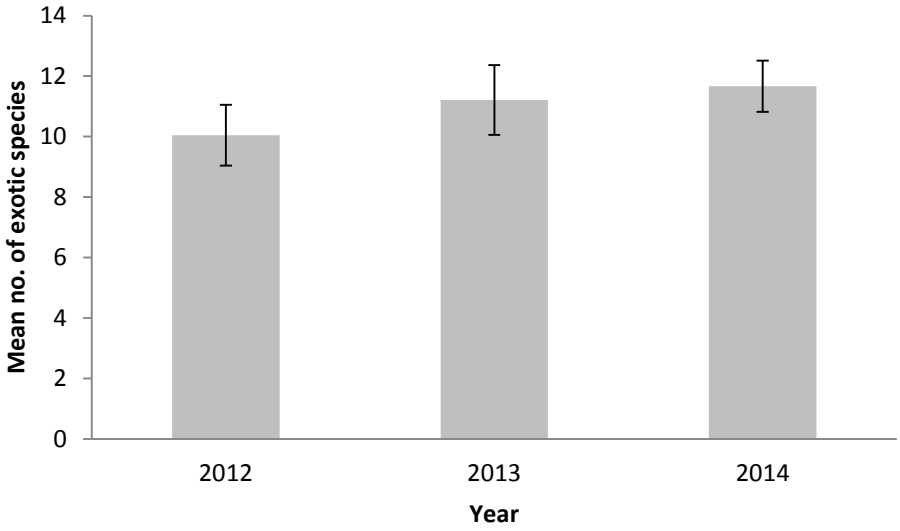

Figure 16: Mean number of exotic species per site per year

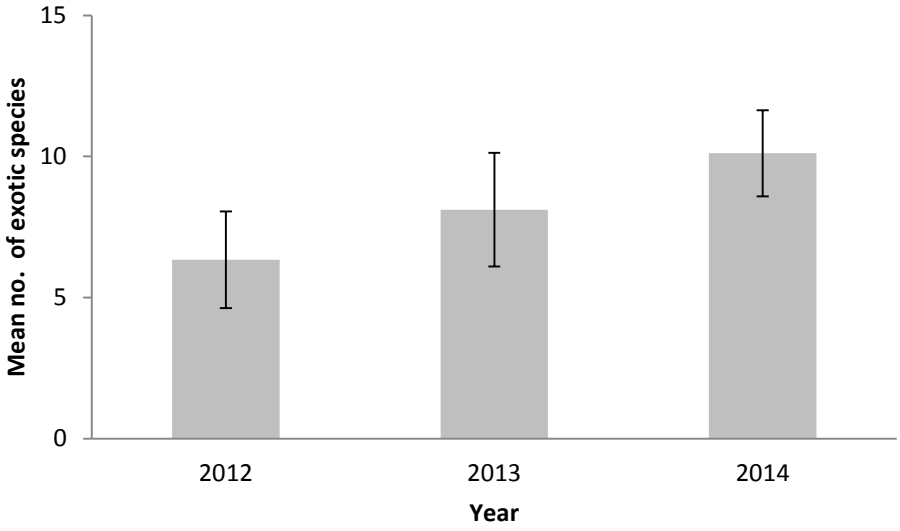

Figure 17: Mean no of exotic species per site per year in woodland sites (condition class 4) 2012 - 14

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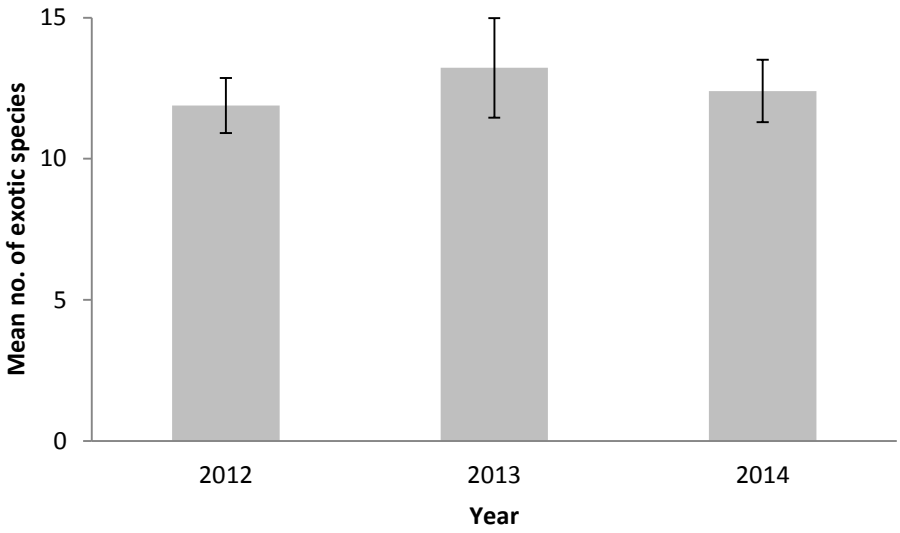

Figure 18: Mean no of exotic species in grassland sites (condition class 3) 2012 - 14

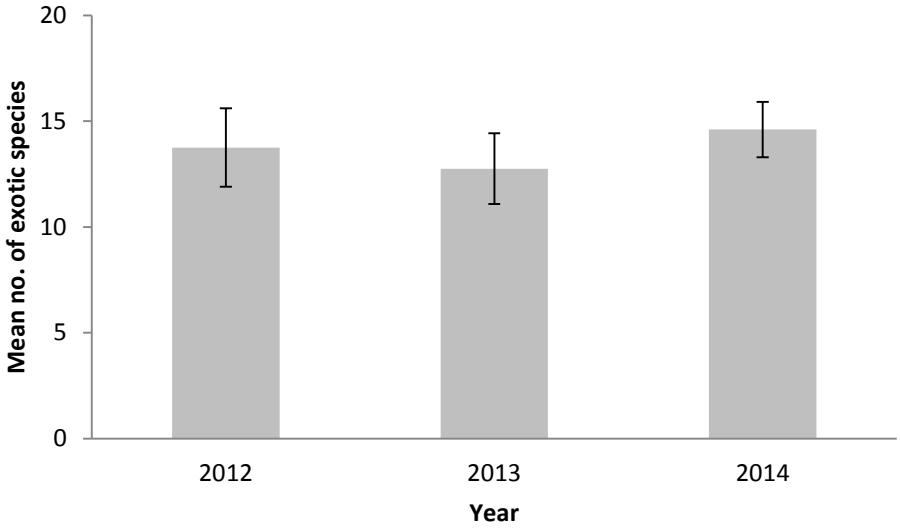

Figure 19: Mean no of exotic species in disturbed sites (condition classes 1 & 2) 2012 -14

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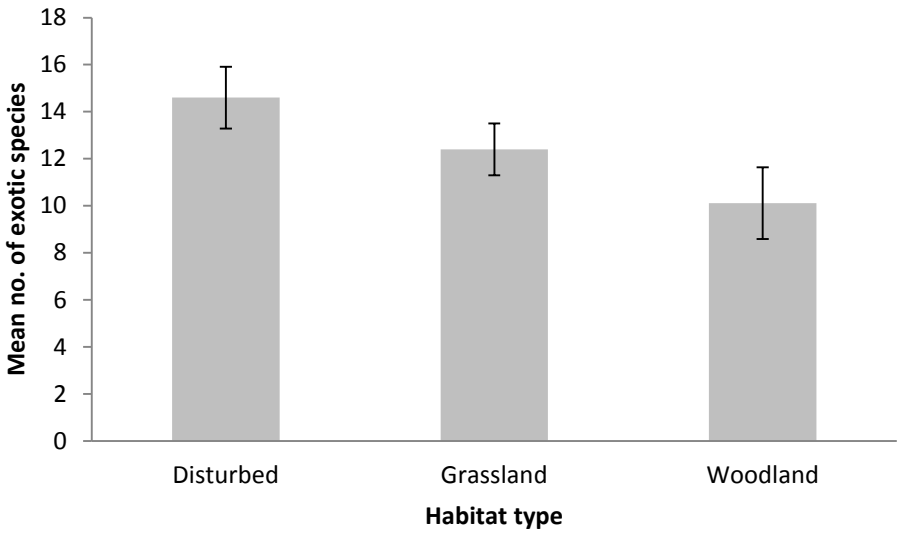

Figure 20: Comparison of the mean number of exotic species between habitat types

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4 Floristic Data

Table 2: Plant species and cover/abundance scores for each site

Family	Scientific name	Common name	Native / Exotic	Site no.																										
				1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Acanthaceae	*Brunoniella australis*	Blue Trumpet	N														1			2									
Adiantaceae	*Cheilanthes distans*	Bristly Cloak Fern	N			1									1														
Adiantaceae	*Cheilanthes sieberi*	Rock Fern	N	1	1							2			2										1		2		
Anthericaceae	*Dichopogon fimbriatus*	Nodding Chocolate Lily	N												2														2
Anthericaceae	*Thysanotus tuberosus*	Common Fringe Lilly	N																							1			
Apiaceae	*Ammi majus*	Bishop's Weed	E				1	1			1	1		2		1		3										1	1
Apiaceae	*Cyclospermum leptophyllum*	Slender Celery	E											1							2				2				
Apiaceae	*Daucus carota*	Wild Carrot	E			1		1					1																
Apiaceae	*Daucus*	Native Carrot	N							1								1			2								2

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Family	Scientific name	Common name	Native / Exotic	Site no.																									
				1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
	glochidiatus																												
Apiaceae	*Hydrocotyle laxiflora*	Stinking Pennywort	N																										1
Apocynaceae	*Gomphocarpus fruticosus*	Narrow-leaved Cotton Bush	E					1								1													
Asphodelaceae	*Bulbine bulbosa*	Bulbine Lily, Native Onion, Native Leek, Golden Lily	N		1										2														
Asteraceae	*Bidens subalternans*	Greater Beggar's Ticks	E				1									1													
Asteraceae	*Calotis cuneifolia*	Purple Burr-Daisy	N												1														
Asteraceae	*Calotis lappulacea*	Yellow Burr-daisy	N										1		2				2		2								
Asteraceae	*Carthamus lanatus*	Saffron Thistle	E									2			1							1							
Asteraceae	*Centaurea solstitialis*	St Barnaby's Thistle	E		2								1												1				
Asteraceae	*Chrysocephalum apiculatum*	Common Everlasting	N	1		1																				1			
Asteraceae	*Cirsium*	Spear Thistle	E	1	1	1	1						1												3				1

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Family	Scientific name	Common name	Native / Exotic	Site no.																										
				1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
	vulgare																												
Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane	E					2																					
Asteraceae	*Conyza* sp.	Fleabane	E							1																			
Asteraceae	*Cymbonotus lawsonianus*	Bear's Ear	E			1						1	1		1														2
Asteraceae	*Euchiton sphaericus*	Star Cudweed	N																										1
Asteraceae	*Hedypnois cretica*	Cretan Weed	E																										2
Asteraceae	*Hedypnois rhagadioloides*	Cretan Weed	E		2				1																				
Asteraceae	*Hedypnois rhagadioloides*	Cretan Weed	E			2											1												
Asteraceae	*Hypochaeris radicata*	Catsear	E	1	2	1				2	2				1		1									3	1	2
Asteraceae	*Lactuca saligna*	Willow-leaved Lettuce	E													1											1	
Asteraceae	*Lactuca serriola*	Prickly Lettuce	E		1	2	1	1	1	1	1	1	1								1							1
Asteraceae	*Leiocarpa*	Woolly	N							1																			

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Family	Scientific name	Common name	Native / Exotic	Site no.																										
				1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
	panaetioides	Buttons																												
Asteraceae	*Olearia* sp. aff. *elliptica*	Sticky Daisy Bush	N																							1			
Asteraceae	*Onopordum acanthium*	Scotch Thistle	E	1	2					1	1																		
Asteraceae	*Senecio quadridentatus*	Cotton Fireweed	N				1	1							1c														1
Asteraceae	*Silybum marianum*	Variegated Thistle	E				1		1			1	1		1		1	1										1	1
Asteraceae	*Sonchus oleraceus*	Common Sowthistle	E		1	2			1				2		1	2	1	3										2	
Boraginaceae	*Echium plantagineum*	Paterson's Curse, Salvation Jane	E												2														
Brassicaceae	*Hirschfeldia incana*	Hairy Brassica	E																									2	
Brassicaceae	*Rapistrum rugosum*	Turnip Weed	E				2	2	2																				1
Cactaceae	*Opuntia stricta*	Common Prickly Pear, Smooth Pest	E																							1			1

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Family	Scientific name	Common name	Native / Exotic	Site no.																										
				1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
		Pear																												
Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell	N									1								1			2		1	1			
Caryophyllaceae	*Paronychia brasiliana*	Brazilian Whitlow	E			1																							
Caryophyllaceae	*Petrorhagia nanteuilii*	Proliferous Pink	E				1												1										1
Caryophyllaceae	*Silene gallica* var *gallica*	French Catchfly	E						2																			1	
Celastraceae	*Denhamia cunninghamii*		N																	1									
Chenopodiaceae	*Einadia hastata*	Berry Saltbush	N									2																	
Chenopodiaceae	*Einadia nutans*	Climbing Saltbush	N						1									1											
Chenopodiaceae	*Einadia polygonoides*	Knotweed Goosefoot	N				1						1						1	1									
Chenopodiaceae	*Einadia trigonos*	Fishweed	N										1		1														
Chenopodiaceae	*Maireana microphylla*	Small-leaf Bluebush	N			2																							

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Family	Scientific name	Common name	Native / Exotic	Site no.																									
				1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Clusiaceae	*Hypericum perforatum*	St. Johns Wort	E		1	1							1												2				
Convolvulaceae	*Convolvulus erubescens*	Blushing Bindweed	N																									1	1
Convolvulaceae	*Dichondra repens*	Kidney Weed	N				2																						
Convolvulaceae	*Dichondra* sp. A	Kidney Weed	N		1	1							2		2				2	2				2		3			2
Cupressaceae	*Callitris glaucophylla*	White Cypress Pine	N																					4					
Cyperaceae	*Carex inversa*	Knob Sedge	N	1								2	1	2											4				
Cyperaceae	*Cyperus gracilis*	Slender Flat-sedge	E	1	2	2	1		2				2		2				2							3			1
Cyperaceae	*Cyperus rotundus*	Nutgrass	E													2													
Cyperaceae	*Scleria mackaviensis*		N																					1					
Dilleniaceae	*Hibbertia obtusifolia*	Hoary guinea flower, Grey Guinea Flower	N																					1					
Euphorbiaceae	*Chamaesyce drummondii*	Caustic Weed	N			1												1											

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Family	Scientific name	Common name	Native / Exotic	Site no.																									
				1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Fabaceae	*Swainsona galegifolia*	Smooth Darling-pea	N																	1			1						
Fabaceae	*Trifolium* spp.	Clover spp.	E																			2	1		2				
Fabaceae - Faboideae	*Glycine clandestina*		N												1														1
Fabaceae - Faboideae	*Medicago minima*	Woolly Burr Medic	E																									1	2
Fabaceae - Faboideae	*Medicago polymorpha*	Burr Medic	E	2	2	2	1	2	3								1											1	2
Fabaceae - Faboideae	*Medicago scutellata*	Snail Medic	E						1																				
Fabaceae (Faboideae)	*Cullen tenax*	Emu-foot	N													1												2	
Fabaceae (Faboideae)	*Desmodium brachypodum*	Large Tick-trefoil	N												1					1				2		3			
Fabaceae (Faboideae)	*Medicago sativa*	Lucerne	E				1	2		1	1				3	1													
Fabaceae (Mimosoideae)	*Acacia implexa*	Hickory Wattle	N																					1					
Geraniaceae	*Geranium solanderi*	Native Geranium	N		2			1				1	1												1				1

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Family	Scientific name	Common name	Native / Exotic	Site no.																										
				1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Goodeniaceae	*Goodenia pinnatifida*		N																				2						
Juncaceae	*Juncus usitatus*		N						1		1																		
Lamiaceae	*Mentha satureioides*	Native Pennyroyal	N				1	2					2	1					2										2
Lomandraceae	*Lomandra filiformis*	Wattle Matt-rush	N																	1				2		2			
Lomandraceae	*Lomandra multiflora* subsp. *multiflora*	Many-flowered Mat-rush	N			1									1														
Loranthaceae	*Amyema miquelii*	Box Mistletoe	N																					1					
Malvaceae	*Modiola caroliniana*	Red-flowered Mallow	E									1	1																
Malvaceae	*Sida corrugata*	Corrugated Sida	N		1	1							1							3									
Malvaceae	*Sida spinosa*		E			1						1	1		2						2			1		1			1
Myrsinaceae	*Anagallis arvensis*	Scarlet Pimpernel	E	3	3	1		1		2																	1		
Myrtaceae	*Angophora*	Rough-barked	N																			1							

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Family	Scientific name	Common name	Native / Exotic	Site no.																									
				1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
	floribunda	Apple																											
Myrtaceae	*Eucalyptus albens*	White Box	N		2	1							4					4	3	4				4					
Myrtaceae	*Eucalyptus blakelyi*	Blakely's Red Gum	N													1												1 ?	
Myrtaceae	*Eucalyptus crebra*	Narrow-leaved Ironbark	N																					1					
Myrtaceae	*Eucalyptus dealbata*	Tumbledown Red Gum	N									4			3					3									
Myrtaceae	*Eucalyptus melliodora*	Yellow Box	N					2																					
Nyctaginaceae	*Boerhavia dominii*	Tarvine	N				2																		1				1
Oleaceae	*Notelaea microcarpa*	Native Olive	N																					2		2			
Oxalidaceae	*Oxalis perennans*		N			1	1	1							1														1
Oxalidaceae	*Oxalis* spp.		N										1																
Phormiaceae	*Dianella longifolia*	A Blue Flax Lily	N												3														1
Phormiaceae	*Dianella* spp.		N																					1					

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Family	Scientific name	Common name	Native / Exotic	Site no.																									
				1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Pittosporaceae	*Bursaria spinosa*	Native Blackthorn	N																					1					
Plantaginaceae	*Plantago debilis*	Shade Plantain	N			1														1									
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues	E			1	1			2	2																		
Poaceae	*Aristida leptopoda*	White Speargrass	N				2																						
Poaceae	*Aristida ramosa* var. *speciosa*	Purple Wiregrass	N	3	4	2	1		2		1	3	2	3		1			3	3	4		3	3		3	3		1
Poaceae	*Austrostipa aristiglumis*	Plains Grass	N		2	1	3	3	2		4		4	4				1	2			2							3
Poaceae	*Austrostipa ramosissima*	Stout Bamboo Grass	N		1																								
Poaceae	*Austrostipa scabra*	Speargrass	N	1		2						2	3		3					3				2	2	3			
Poaceae	*Avena sativa*	Oats	E								3																		
Poaceae	*Avena* spp.	Oats	E				2	3	1	3				3	1	2	3	2				1					1	4	
Poaceae	*Bothriochloa macra*	Red Grass	N	2	3	3	2	2	2	2			3		3				3		4	1					4		

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Family	Scientific name	Common name	Native / Exotic	Site no.																										
				1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Poaceae	*Bothriochloa* spp.	Redgrass, Bluegrass	N																							1			
Poaceae	*Bromus catharticus*	Praire Grass	E				1	2	1	2	2		1	2		1		2				2						1	
Poaceae	*Bromus hordeaceus*	Soft Brome	E	2	3	2	1		2			3		2	1		1				3	2							1
Poaceae	*Chloris truncata*	Windmill Grass	N																							2			
Poaceae	*Chloris ventricosa*	Tall Chloris	N										1		2				3										
Poaceae	*Cymbopogon refractus*	Barbed Wire Grass	N	1	1										2						1			1					
Poaceae	*Cynodon dactylon*	Common Couch	N	3	1						2	2	2			1												1	
Poaceae	*Dichanthium sericeum*	Queensland Bluegrass	N				2	3	2	4	2					2										2		3
Poaceae	*Digitaria diffusa*	Open Summer Grass	N																	1									
Poaceae	*Digitaria divaricatissima*	A Finger Grass	N	1																									
Poaceae	*Eragrostis* sp.		E																										1

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Family	Scientific name	Common name	Native / Exotic	Site no.																										
				1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Poaceae	*Lolium perenne*	Perennial Ryegrass	E										2																
Poaceae	*Lolium rigidum*	Wimmera Ryegrass	E		1		3	2		2						3	4	4				2						3	
Poaceae	*Lolium* spp.	A Ryegrass	E	2					4			2																	
Poaceae	*Panicum decompositum*	Native Millet	N				1	2	1							2													1
Poaceae	*Panicum effusum*	Poison or Hairy Panic	N	1																									
Poaceae	*Paspalidium* spp.		N					1																					
Poaceae	*Paspalum dilatatum*	Paspalum	E				1				2															2			
Poaceae	*Pennisetum clandestinum*	Kikuyu Grass	E																			4							
Poaceae	*Phalaris* spp.		E					2								1													
Poaceae	*Rytidosperma bipartita*	Wallaby Grass	N		1			3																					
Poaceae	*Rytidosperma* spp.	A Wallaby Grass	N		1	2		1								1			1		2					2		2

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Family	Scientific name	Common name	Native / Exotic	Site no.																									
				1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Poaceae	*Sporobolus creber*	Slender Rat's Tail Grass	E																2										
Poaceae	*Vulpia* spp.	Fescue	E																						1				
Polygonaceae	*Polygonum aviculare*	Wireweed	E																									1	
Polygonaceae	*Rumex brownii*	Swamp Dock	N			1						1	1		1														1
Polygonaceae	*Rumex crispus*	Curled Dock	E								1			1								2							
Rubiaceae	*Asperula conferta*	Common Woodruff	N				2																						
Rubiaceae	*Asperula cunninghamii*	Twining Woodruff	N			2													1										2
Rubiaceae	*Galium aparine*	Goosegrass	E						1																				
Rubiaceae	*Galium* spp.		E								1																		
Rutaceae	*Zieria* spp.		N																	2									
Scrophulariaceae	*Misopates orontium*	Lesser Snapdragon	E																	1	1								
Solanaceae	*Solanum prinophyllum*	Forest Nightshade	N																					1		1			

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Family	Scientific name	Common name	Native / Exotic	Site no.																									
				1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Sterculiaceae	*Brachychiton populneus*	Kurrajong	N												1									1					
Thymelaeaceae	*Pimelea neo-anglica*	Poison Pimelea	N																1	1				2		2			
Verbenaceae	*Verbena bonariensis*	Purpletop	E																			1							

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5 Fauna Species List

Table 3: Fauna species recorded during both winter bird and spring fauna monitoring 2014

Class	Family	Species	Common Name
Amphibia	Hylidae	*Litoria caerulea*	Green Tree Frog
	Hylidae	*Litoria peronii*	Peron's Tree Frog
	Hylidae	*Litoria rubella*	Desert Tree Frog
Aves	Acanthizidae	*Acanthiza apicalis*	Inland Thornbill
		Acanthiza chrysorrhoa	Yellow-rumped Thornbill
		Acanthiza reguloides	Buff-rumped Thornbill
		Chthonicola sagittata	**Speckled Warbler**
		Gerygone fusca	Western Gerygone
		Gerygone olivacea	White-throated Gerygone
		Smicrornis brevirostris	Weebill
	Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk
		Aquila audax	Wedge-tailed Eagle
		Elanus axillaris	Black-shouldered Kite
	Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar
	Alaudidae	*Mirafra javanica*	Horsefield's Bushlark
	Anatidae	*Chenonetta jubata*	Australian Wood Duck
	Ardeidae	*Egretta novaehollandiae*	White-faced Heron
	Artamidae	*Artamus cyanopterus*	Dusky Woodswallow
	Artamidae	*Artamus superciliosus*	White-browed Woodswallow
	Artamidae	*Cracticus nigrogularis*	Pied Butcherbird
		Cracticus torquatus	Grey Butcherbird
		Gymnorhina tibicen	Australian Magpie
		Strepera graculina	Pied Currawong
	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo
		Cacatua sanguinea	Little Corella
		Eolophus roseicapillus	Galah
		Nymphicus hollandicus	Cockatiel
	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike

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Class	Family	Species	Common Name
		Lalage tricolor	White-winged Triller
	Columbidae	*Columba livia**	Rock Dove
		Ocyphaps lophotes	Crested Pigeon
	Corvidae	*Corvus coronoides*	Australian Raven
	Cuculidae	*Cacomantis pallidus*	Pallid Cuckoo
		Scythrops novaehollandiae	Channel-billed Cuckoo
	Dicaeidae	*Dicaeum hirundinaceum*	Mistletoe Bird
	Dicruridae	*Grallina cyanoleuca*	Magpie-lark
		Rhipidura albiscapa	Grey Fantail
		Rhipidura leucophrys	Willie Wagtail
	Estrildidae	*Taeniopygia bichenovii*	Double-barred Finch
	Falconidae	*Falco berigora*	Brown Falcon
		Falco cenchroides	Nankeen Kestrel
		Falco longipennis	Australian Hobby
	Halcyonidae	*Dacelo novaeguineae*	Laughing Kookaburra
	Hirundinidae	*Petrochelidon nigricans*	Tree Martin
	Locustellidae	*Cincloramphus cruralis*	Brown Songlark
	Maluridae	*Malurus cyaneus*	Superb Fairy-wren
	Meliphagidae	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater
		Lichenostomus fuscus	Fuscous Honeyeater
		Manorina melanocephala	Noisy Miner
		Philemon corniculatus	Noisy Friarbird
		Plectorhyncha lanceolata	Striped Honeyeater
	Meropidae	*Merops ornatus*	Rainbow Bee-eater
	Monarchidae	*Myiagra cyanoleuca*	Satin Flycatcher
		Myiagra rubecula	Leaden Flycatcher
	Motacillidae	*Anthus australis*	Australian (Richard's) Pipit
	Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush
		Pachycephala rufiventris	Rufous Whistler
	Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote
		Pardalotus striatus	Striated Pardalote
	Petroicidae	*Microeca fascinans*	Jacky Winter

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Class	Family	Species	Common Name
	Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant
	Phasianidae	*Coturnix ypsilophora*	Brown Quail
	Podargidae	*Podargus strigoides*	Tawny Frogmouth
	Pomatostomidae	***Pomatostomus temporalis temporalis***	**Grey-crowned Babbler (eastern subspecies)**
	Psittacidae	*Alisterus scapularis*	Australian King-Parrot
		Glossopsitta concinna	Musk Lorikeet
		Glossopsitta pusilla	Little Lorikeet
		Platycercus adscitus eximius	Eastern Rosella
		Psephotus haematonotus	Red-rumped Parrot
	Strigidae	*Ninox novaeseelandiae*	Southern Boobook
	Sturnidae	*Sturnus vulgaris* *	European Starling
	Sylviidae	*Cincloramphus mathewsi*	Rufous Songlark
		Cisticola exilis	Golden-headed Cisticola
	Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis
	Tytonidae	*Tyto alba*	Barn Owl
	Zosteropidae	*Zosterops lateralis*	Silvereye
Mammalia	Canidae	*Vulpes vulpes* *	European Red Fox
	Emballonuridae	***Saccolaimus flaviventris***	**Yellow-bellied Sheath-tail Bat**
	Felidae	*Felis catus**	Feral Cat
	Leporidae	*Lepus capensis* *	Brown Hare
		Oryctolagus cuniculus *	European Rabbit
	Macropodidae	*Macropus giganteus*	Eastern Grey Kangaroo
		Macropus robustus	Wallaroo
		Macropus rufogriseus	Red-necked Wallaby
	Molossidae	*Austronomus australis*	White-striped Free-tailed Bat
		Mormopterus ridei	**Ride's Free-tailed Bat**
		Mormopterus sp. 3	Inland Free-tailed Bat
		Mormopterus sp. 4	South-eastern Free-tailed Bat
	Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum

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Class	Family	Species	Common Name
	Suidae	*Sus scrofa**	Feral Pig
	Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat
		Chalinolobus morio	Chocolate Wattled Bat
		Falsistrellus tasmaniensis	**Eastern False Pipistrelle**
		Nyctophilus spp.	Long-eared Bats
		Scoteanax rueppellii	**Greater Broad-nosed Bat**
		Scotorepens balstoni	Inland Broad-nosed Bat
		Scotorepens greyii	Little Broad-nosed Bat
		Vespadelus regulus	Southern Forest Bat
		Vespadelus vulturnus	Little Forest Bat
Reptilia	Agamidae	*Pogona barbata*	Eastern Bearded Dragon
	Chelidae	*Chelodina longicollis*	Eastern Snake-necked Turtle
	Elapidae	*Pseudonaja textilis*	Eastern Brown Snake
		Vermicella annulata	Bandy Bandy
	Gekkonidae	*Gehyra dubia*	Dubious Dtella
		Gehyra variegata	Common Dtella
		Nebulifera robusta	Robust Velvet Gecko
		Underwoodisaurus milii	Barking Gecko
	Pygopodidae	*Lialis burtonis*	Burton's Snake-lizard
	Scincidae	*Anomalopus leuckartii*	Two-clawed Worm-skink
		Carlia tetradactyla	Southern Rainbow Skink
		Cryptoblepharus sp.	Fence Skink
		Ctenotus robustus	Eastern Striped Skink
		Ctenotus sp.	Striped Skink
		Egernia striolata	Tree skink
		Lampropholis delicata	Garden Sunskink
		Liopholis modesta	Eastern Ranges Rock-skink
		Morethia boulengeri	Boulenger's Morethia
		Tiliqua scincoides scincoides	Eastern Blue-tongued Lizard
	Typhlopidae	*Ramphotyphlops wiedii.*	Blind Snake

* = introduced species. Species listed as threatened under the TSC or EPBC Acts are presented in bold type

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Werris Creek Coal
Blast Monitoring
2014-2015

WERRIS CREEK COAL BLASTING RESULTS
APRIL 2014

Blast Number	Shot number	Date fired	Time Fired	Location	WC South Predicted Vibration K50 mm/s	Type	Glenara R11		Kyooma R98		Werris Ck Sth R62		Werris Ck Mid R92		COMPLIANCE		ARTC Culvert		COMPLIANCE	TEMPERATURE	WIND		SINGLE FREQUENCY >0.02			FUME	DUST	COMPLAINTS		
							Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	Inversion oC/100m	Direction	m/s	L Hz	V Hz	T Hz	0 to 5		OP/Vib	Dust/Fume	Other
1	2014-21	1/04/2014	15:08	S13_7-10_Gcoal TSB Part 1	0.4	TSB	0.25	101.9	1.71	96.7	0.75	92.7	0.48	71.5	10.00	120.0	Not Monitored		50.00	-2.7	273	2.8	13.7	12.9	13.4	0	Road	3	0	0
2	2014-22	4/04/2014	13:14	Ramp 14	0.3	IB	0.12	98.5	0.37	97.5	0.22	96.9	0.18	101.8	10.00	120.0	Not Monitored		50.00	-3.6	322	6.8	10.0	-	-	0	OK	0	0	0
3	2014-23	8/04/2014	13:08	S15_10-12_350	0.6	IB	0.15	104.7	1.22	105.3	0.38	111.9	0.24	109.3	10.00	120.0	Not Monitored		50.00	-2.8	283	0.5	-	12.9	-	0	OK	2	0	0
4	2014-24	16/04/2014	15:13	S13_7-10_Gcoal TSB Part 2	0.7	TSB	0.21	101.5	1.70	108.8	0.83	109.0	0.45	103.1	10.00	120.0	Not Monitored		50.00	-2.4	152	6.4	9.8	9.8	9.8	0	Road	2	1	0
5	2014-25	17/04/2014	10:13	S15_8-10	0.5	IB	0.10	102.6	0.92	101.6	0.28	98.9	0.20	97.2	10.00	120.0	Not Monitored		50.00	-3.2	229	1.5	10.5	10.5	-	0	OK	0	0	0
	TOTALS	**APRIL 2014**	**# BLAST**	**5**	**TARGET**	**AVERAGE**	**0.17**	**101.8**	**1.18**	**102.0**	**0.49**	**101.9**	**0.31**	**96.6**	**5.00**	**115.0**														
	TOTALS	**APRIL 2014**	**#>0.5mm**	**4**	**<1mm/s**	**HIGHEST**	**0.25**	**104.7**	**1.71**	**108.8**	**0.83**	**111.9**	**0.48**	**109.3**	**10.00**	**120.0**														
	TOTALS	**ANNUAL**	**# BLAST**	**5**	**<115dBL**	**AVERAGE**	**0.17**	**101.8**	**1.18**	**102.0**	**0.49**	**101.9**	**0.31**	**96.6**	**5.00**	**115.0**														
	TOTALS	**MONTHLY LIMIT**	**#>0.5mm**	**15**	**% >115dB(L) or 5mm/s**		**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**5%**	**5%**														

WERRIS CREEK COAL BLASTING RESULTS
MAY 2014

Blast Number	Shot number	Date fired	Time Fired	Location	WC South Predicted Vibration K50 mm/s	Type	Glenara R11		Kyooma R98		Werris Ck Sth R62		Werris Ck Mid R92		COMPLIANCE		ARTC Culvert		COMPLIANCE	TEMPERATURE	WIND		SINGLE FREQUENCY >0.02			FUME	DUST	COMPLAINTS		
							Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	Inversion oC/100m	Direction	m/s	L Hz	V Hz	T Hz	0 to 5		OP/Vib	Dust/Fume	Other
6	2014-26	5/05/2014	9:05	S13_B10-B17_RL264_TSB#1	0.6	IB	0.28	97.4	2.15	100.5	0.71	95.6	0.54	92.3	10.00	120.0	Not Monitored		50.00	-2.7	334	2.5	10.0,11.5	11.7	11.5	1A	OK	0	0	0
7	2014-27	7/05/2014	12:08	S16_B9-B12_RL370	0.6	OB	0.10	99.6	0.82	94.8	0.28	93.8	0.19	90.2	10.00	120.0	Not Monitored		50.00	-3.2	107	3.7	15.9	13.2	14.2	2B	OK	0	0	0
8	2014-28	9/05/2014	12:08	S17_Blackseam	0.7	OB	0.16	97.6	0.70	93.6	0.34	95.5	0.22	92.4	10.00	120.0	Not Monitored		50.00	-2.3	134	1.7	11.5	11.2	11.2	3B	OK	0	0	0
9	2014-29	14/05/2014	15:08	S13_B10-B17_RL264#2	0.3	IB	0.14	97.4	0.96	97.0	0.33	91.3	0.16	91.3	10.00	120.0	Not Monitored		50.00	-2.3	62	2.6	9.5	9.8	9.8	0	OK	0	0	0
10	2014-30	16/05/2014	15:15	S13_B7-B10_Gseam	0.9	IB	0.29	93.1	2.42	96.4	0.85	88.5	0.56	85.1	10.00	120.0	Not Monitored		50.00	-1.7	158	2.6	10.0,16.9	9.5	9.8,16.4	0	OK	1	0	0
11	2014-31	22/05/2014	11:13	S13_B11-B12_Gseam	0.8	IB	0.28	110.5	1.73	109.4	0.68	98.9	0.44	97.4	10.00	120.0	Not Monitored		50.00	-2.3	309	1.9	11.7,16.1	12.7	-	0	Road	1	0	0
12	2014-32	23/05/2014	15:09	S13_B10-B11_Gseam	0.5	IB	0.10	95.7	0.31	96.3	0.13	96.0	0.12	92.8	10.00	120.0	Not Monitored		50.00	-1.8	358	2.9	-	-	-	0	OK	0	0	0
13	2014-33	29/05/2014	15:13	S13_11-16_264 Presplit + S13_B10-B17_RL264#3	0.5	PS/IB	0.29	96.7	1.60	94.1	0.55	93.7	0.31	90.6	10.00	120.0	Not Monitored		50.00	-2.0	221	1.4	15.4	10.0,15.1	15.6	3B	Road	2	0	0
14	2014-34	30/05/2014	13:07	S13_16-21_264 Presplit	NA	PS	0.25	101.4	0.73	97.7	0.25	95.8	0.20	88.9	10.00	120.0	Not Monitored		50.00	-2.8	280	2.5	2.9	2.9	3.2	0	OK	0	0	0
	TOTALS	**MAY 2013**	**# BLAST**	**9**	**TARGET**	**AVERAGE**	**0.21**	**98.8**	**1.27**	**96.6**	**0.46**	**94.3**	**0.30**	**91.2**	**5.00**	**115.0**														
	TOTALS	**MAY 2013**	**#>0.5mm**	**8**	**<1mm/s**	**HIGHEST**	**0.29**	**110.5**	**2.42**	**109.4**	**0.85**	**98.9**	**0.56**	**97.4**	**10.00**	**120.0**														
	TOTALS	**ANNUAL**	**# BLAST**	**14**	**<115dBL**	**AVERAGE**	**0.19**	**100.3**	**1.23**	**99.3**	**0.47**	**98.1**	**0.31**	**93.9**	**5.00**	**115.0**														
	TOTALS	**MONTHLY LIMIT**	**#>0.5mm**	**15**	**% >115dB(L) or 5mm/s**		**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**5%**	**5%**														

WERRIS CREEK COAL BLASTING RESULTS
JUNE 2014

Blast Number	Shot number	Date fired	Time Fired	Location	WC South Predicted Vibration K50 mm/s	Type	Glenara R11		Kyooma R98		Werris Ck Sth R62		Werris Ck Mid R92		COMPLIANCE		ARTC Culvert		COMPLIANCE	TEMPERATURE	WIND		SINGLE FREQUENCY >0.02			FUME	DUST	COMPLAINTS		
							Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	Inversion oC/100m	Direction	m/s	L Hz	V Hz	T Hz	0 to 5		OP/Vib	Dust/Fume	Other
15	2014-35	2/06/2014	15:13	S13_B14-B15_Gseam	0.6	IB	0.24	96.4	1.83	91.9	0.25	86.7	0.20	95.4	10.00	120.0	Not Monitored		50.00	-1.9	296	2.5	16.6	-	-	4C	OK	0	0	0
16	2014-36	6/06/2014	13:07	S13_B17-B23_RL290_TSB#1		TSB	0.26	100.9	0.82	108.2	0.46	103.4	0.27	94.8	10.00	120.0	Not Monitored		50.00	-1.8	143	5.8	11	11	10.7	0	OK	0	0	0
17	2014-37	10/06/2014	16:00	S13_B11-B13_Gseam#1	0.3	IB	0.16	103.8	1.11	104.1	0.39	98.4	0.37	91.7	10.00	120.0	Not Monitored		50.00	-1.3	134	6.2	11.7	13.4	-	0	OK	0	0	0
18	2014-38	11/06/2014	13:08	S16_B18-B20_370 Ramp	0.4	IB	0.09	104.4	0.45	103.0	0.24	98.2	0.17	97.6	10.00	120.0	Not Monitored		50.00	-2.3	139	3.2	-	-	-	0	OK	0	0	0
19	2014-39	16/06/2014	9:10	S13_B17-B23_RL290_TSB#2		TSB	0.10	96.8	0.45	99.8	0.14	91.4	0.12	90.4	10.00	120.0	Not Monitored		50.00	-2.7	335	3.2	-	-	-	0	OK	0	0	0
20	2014-40	17/06/2014	11:03	S15_B9-B12_Boxcut_RL330	0.6	IB	0.15	92.7	1.01	95.9	0.46	92.3	0.22	90.6	10.00	120.0	Not Monitored		50.00	-2.7	323	2.8	10	12.7	-	1A	OK	0	0	1
21	2014-41	19/06/2014	13:08	S13_B14-B15_Gseam#2	0.4	IB	0.17	98.5	0.97	95.5	0.33	91.8	0.24	91.0	10.00	120.0	Not Monitored		50.00	-2.6	311	4.3	-	-	-	0	OK	0	0	0
22	2014-42	20/06/2014	9:03	S15_B7-B8_RL350	0.6	IB	0.11	107.0	0.55	103.2	0.35	94.9	0.15	102.5	10.00	120.0	Not Monitored		50.00	-1.0	337	3.4	13.2	13.2	-	0	OK	0	0	0
23	2014-43	23/06/2014	13:04	S13_Fault_Gseam	0.4	IB	0.09	103.5	0.51	98.9	0.35	95.5	0.25	101.6	10.00	120.0	Not Monitored		50.00	-1.8	327	5.4	-	-	-	0	OK	0	0	0
	TOTALS	**JUNE 2013**	**# BLAST**	**9**	**TARGET**	**AVERAGE**	**0.15**	**100.4**	**0.86**	**100.1**	**0.33**	**94.7**	**0.22**	**95.1**	**5.00**	**115.0**														
	TOTALS	**JUNE 2013**	**#>0.5mm**	**7**	**<1mm/s**	**HIGHEST**	**0.26**	**107.0**	**1.83**	**108.2**	**0.46**	**103.4**	**0.37**	**102.5**	**10.00**	**120.0**														
	TOTALS	**ANNUAL**	**# BLAST**	**23**	**<115dBL**	**AVERAGE**	**0.18**	**100.4**	**1.10**	**99.6**	**0.43**	**97.0**	**0.28**	**94.3**	**5.00**	**115.0**														
	TOTALS	**MONTHLY LIMIT**	**#>0.5mm**	**15**	**% >115dB(L) or 5mm/s**		**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**5%**	**5%**														

WERRIS CREEK COAL BLASTING RESULTS
JULY 2014

Blast Number	Shot number	Date fired	Time Fired	Location	WC South Predicted Vibration K50 mm/s	Type	Glenara R11		Kyooma R98		Werris Ck Sth R62		Werris Ck Mid R92		COMPLIANCE		ARTC Culvert		COMPLIANCE	TEMPERATURE	WIND		SINGLE FREQUENCY >0.02			FUME	DUST	COMPLAINTS		
							Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	Inversion oC/100m	Direction	m/s	L Hz	V Hz	T Hz	0 to 5		OP/Vib	Dust/Fume	Other
24	2014-44	1/07/2014	13:08	S15_B6-B7_UG1	-	UG	0.09	101.2	0.57	110.8	0.23	108.7	0.18	105.1	10.00	120.0	1.95	127.3	50.00	-1.8	8	1.4	-	-	-	1A	OK	0	0	0
25	2014-45	2/07/2014	13:05	S15_B12-B16_330_EXT	0.7	IB	0.27	94.7	1.26	99.9	0.53	95.8	0.48	94.1	10.00	120.0	Not Monitored		50.00	-2.6	220	1.8	18.8,11	18.8,11	9.5,16.4	5C	OK	0	0	0
26	2014-46	4/07/2014	13:12	S15_B6-B7_UG2	-	UG	0.06	106.7	0.30	103.1	0.21	97.3	0.12	104.4	10.00	120.0	2.19	121.2	50.00	-2.7	306	5.5	-	-	-	3B	Road	0	0	0
27	2014-47	9/07/2014	11:03	S14_Ramp_RL350	0.3	IB	0.13	108.3	0.50	98.0	0.18	95.5	0.22	99.4	10.00	120.0	Not Monitored		50.00	-2.9	325	6.2	-	-	10	0	Offsite	0	0	0
28	2014-48	11/07/2014	13:04	S13_B11_B13_Gseam	0.7	IB	0.21	103.7	1.14	96.2	0.68	91.5	0.49	93.0	10.00	120.0	Not Monitored		50.00	-3.8	273	4.1	16.6	-	-	0	OK	0	0	0
29	2014-49	15/07/2014	13:05	S16_B16-B17_370	0.5	IB	0.13	107.4	0.39	103.3	0.2	95.6	0.16	95.3	10.00	120.0	Not Monitored		50.00	-2.1	334	3.1	16.1	3.4	16.8	0	OK	0	0	0
30	2014-50	17/07/2014	10:08	S13_B14-B15_Gseam#3	0.4	IB	0.13	98.1	0.63	99.3	0.26	91.6	0.17	90.6	10.00	120.0	Not Monitored		50.00	-2.9	318	5.2	10.3	11.0	10.7	1A	OK	0	0	0
31	2014-51	21/07/2014	13:23	S13_B16-B20_RL270_TSB	0.3	IB	0.17	93.3	0.36	96	0.27	91.4	0.21	89.3	10.00	120.0	Not Monitored		50.00	-2.8	283	1.6	12.2	12.2	12.2	0	OK	0	0	0
32	2014-52	24/07/2014	13:03	S15_B14-B16_RL330	0.7	IB	0.12	101.6	0.54	96.3	0.27	98.2	0.22	99.4	10.00	120.0	Not Monitored		50.00	-1.9	19	3.9	13.4	12.7	-	0	Onsite	1	0	0
33	2014-53	25/07/2014	13:06	S15_B6-B7_UG3	-	UG	0.06	98.9	0.31	96.3	0.14	93.8	0.09	92.8	10.00	120.0	<1	DNT	50.00	-2.1	22	4.6	-	-	-	2A	OK	0	0	0
34	2014-54	29/07/2014	13:18	S16_B8-B11_RL350	0.9	IB	0.10	102.3	0.51	102.6	0.21	96.0	0.16	97.3	10.00	120.0	Not Monitored		50.00	-2.8	336	4.9	3.2	3.4	2.7	0	OK	0	0	0
	TOTALS	**JULY 2014**	**# BLAST**	**11**	**TARGET**	**AVERAGE**	**0.13**	**101.5**	**0.59**	**100.2**	**0.29**	**95.9**	**0.23**	**96.4**	**5.00**	**115.0**	DNT = Did not trigger													
	TOTALS	**JULY 2014**	**#>0.5mm**	**7**	**<1mm/s**	**HIGHEST**	**0.27**	**108.3**	**1.26**	**110.8**	**0.68**	**108.7**	**0.49**	**105.1**	**10.00**	**120.0**														
	TOTALS	**ANNUAL**	**# BLAST**	**34**	**<115dBL**	**AVERAGE**	**0.17**	**100.6**	**0.98**	**99.7**	**0.39**	**96.7**	**0.27**	**94.8**	**5.00**	**115.0**														
	TOTALS	**MONTHLY LIMIT**	**#>0.5mm**	**15**	**% >115dB(L) or 5mm/s**		**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**5%**	**5%**														

WERRIS CREEK COAL BLASTING RESULTS
AUGUST 2014

Blast Number	Shot number	Date fired	Time Fired	Location	WC South Predicted Vibration K50 mm/s	Type	Glenara R11		Kyooma R98		Werris Ck Sth R62		Werris Ck Mid R92		COMPLIANCE		ARTC Culvert		COMPLIANCE	TEMPERATURE	WIND		SINGLE FREQUENCY >0.02			FUME	DUST	COMPLAINTS		
							Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	Inversion oC/100m	Direction	m/s	L Hz	V Hz	T Hz	0 to 5		OP/Vib	Dust/Fume	Other
35	2014-55	1/08/2014	12:24	S13_B19-B20_Gseam_TSB	0.7	TSB	0.30	103.9	0.99	102.5	0.63	103.3	0.48	109.3	10.00	120.0	Not Monitored		50.00	-2.8	328	6.5	12.2	12.2	12.2	2A	OK	0	0	0
36	2014-56	4/08/2014	13:03	Big Rocks	-	Rocks	0.00	87.3	0.00	91.4	0.00	86.1	0.01	82.5	10.00	120.0	Not Monitored		50.00	-2.8	232	0.9	-	-	-	0	OK	0	0	0
37	2014-57	5/08/2014	13:03	Big Rocks	-	Rocks	0.00	93.6	0.00	86.0	0.01	92.7	0.01	96.3	10.00	120.0	Not Monitored		50.00	-2.1	209	1.8	-	-	-	0	OK	0	0	0
38	2014-58	6/08/2014	13:05	S15_B3-5_RL350_TSB	1.0	TSB	0.32	105.0	1.69	104.6	1.02	95.7	0.48	94.2	10.00	120.0	9.84	122.3	50.00	-3.1	336	3.7	12.9	12.9	12.9	0	Road	1	0	0
39	2014-59	7/08/2014	13:03	S16_B8-B9_RL350	0.7	IB	0.10	94.2	0.60	93.4	0.37	90.4	0.18	88.7	10.00	120.0	2.47	111.2	50.00	-1.2	342	0.6	13.2	-	9.3	0	OK	0	0	0
40	2014-60	8/08/2014	13:04	Big Rocks	-	Rocks	0.00	92.2	0.04	85.7	0.00	87.9	0.01	86.9	10.00	120.0	Not Monitored		50.00	-2.6	358	2.6	-	-	-	0	OK	0	0	0
41	2014-61	11/08/2014	13:08	S16_B12-B13_RL350	1.0	IB	0.19	98.0	0.81	103.1	0.52	98.4	0.36	94.6	10.00	120.0	Not Monitored		50.00	-3.3	294	2.9	9.8	10.3	9.5	0	OK	2	0	0
42	2014-62	12/08/2014	16:08	S13_B16-B18_Gseam	0.4	IB	0.13	96.1	0.41	91.3	0.19	90.8	0.14	89.1	10.00	120.0	Not Monitored		50.00	-1.7	152	5.1	-	-	-	0	OK	0	0	0
43	2014-63	13/08/2014	13:08	S14_B16-B20_Presplit	NA	PS	0.45	98.4	0.89	101.5	0.46	91.6	0.42	89.6	10.00	120.0	Not Monitored		50.00	-3.1	169	3.9	3.2	2.9	2.9	2B	OK	0	0	0
44	2014-64	14/08/2014	16:08	Big Rocks	-	Rocks	0.00	85.5	0.04	98.3	0.01	93.6	0.00	94.4	10.00	120.0	Not Monitored		50.00	-1.9	177	5.4	-	-	-	0	OK	0	0	0
45	2014-65	15/08/2014	13:04	S14_B16-B18_Aseam	0.3	IB	0.05	93.1	0.24	93.9	0.15	90.1	0.09	91.1	10.00	120.0	Not Monitored		50.00	-2.0	106	3.5	-	-	-	0	OK	0	0	0
46	2014-66	22/08/2014	13:08	S13_B16-B18_Gseam	0.5	IB	0.22	95.9	0.50	111.8	0.29	94.5	0.24	104.4	10.00	120.0	Not Monitored		50.00	-2.9	98	4.2	16.1	-	16.6	1A	Onsite	0	0	0
47	2014-67	25/08/2014	16:08	S14_B19-B21_RL330		TSB	0.26	110.1	0.75	104.9	0.47	102.4	0.28	98.8	10.00	120.0	Not Monitored		50.00	-1.7	166	3.8	13.4	13.4	13.4	0	OK	0	0	0
48	2014-68	27/08/2014	9:35	S16_B15-B16_RL370	0.3	IB	0.11	97.9	0.28	97.7	0.23	104.7	0.15	106.0	10.00	120.0	Not Monitored		50.00	-1.4	113	1.1	-	11.0	-	2A	OK	0	0	0
49	2014-69	29/08/2014	16:23	S17_B8-B13_RL370	0.5	IB	0.08	101.5	0.43	105.4	0.35	102.0	0.27	102.4	10.00	120.0	2.74	121.3	50.00	-1.7	165	5.5	16.4	3.4	2.9	2B	OK	0	0	0
	TOTALS	**AUGUST 2014**	**# BLAST**	**15**	**TARGET**	**AVERAGE**	**0.15**	**96.8**	**0.51**	**98.1**	**0.31**	**94.9**	**0.21**	**95.2**	**5.00**	**115.0**														
	TOTALS	**AUGUST 2014**	**#>0.5mm**	**7**	**<1mm/s**	**HIGHEST**	**0.45**	**110.1**	**1.69**	**111.8**	**1.02**	**104.7**	**0.48**	**109.3**	**10.00**	**120.0**														
	TOTALS	**ANNUAL**	**# BLAST**	**49**	**<115dBL**	**AVERAGE**	**0.16**	**99.9**	**0.88**	**99.4**	**0.38**	**96.4**	**0.25**	**94.9**	**5.00**	**115.0**														
	TOTALS	**MONTHLY LIMIT**	**#>0.5mm**	**15**	**% >115dB(L) or 5mm/s**		**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**5%**	**5%**														

WERRIS CREEK COAL BLASTING RESULTS
SEPTEMBER 2014

Blast Number	Shot number	Date fired	Time Fired	Location	WC South Predicted Vibration K50 mm/s	Type	Glenara R11		Kyooma R98		Werris Ck Sth R62		Werris Ck Mid R92		COMPLIANCE		ARTC Culvert		COMPLIANCE	TEMPERATURE	WIND		SINGLE FREQUENCY >0.02			FUME	DUST	COMPLAINTS		
							Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	Inversion oC/100m	Direction	m/s	L Hz	V Hz	T Hz	0 to 5		OP/Vib	Dust/Fume	Other
50	2014-70	2/09/2014	9:48	S14_B16_B18_RL330	0.6	IB	0.11	98	0.31	96.6	0.21	91.9	0.12	86.6	10.00	120.0	Not Monitored		50.00	-1.9	337	2.9	-	-	-	0	OK	0	0	0
51	2014-71	4/09/2014	9:48	S14_B21_B23_RL330_TSB	0.6	TSB	0.22	100.1	0.96	96.9	0.53	99.9	0.41	97.0	10.00	120.0	Not Monitored		50.00	-3.2	179	2.5	17.6	-	-	0	OK	0	0	0
52	2014-72	5/09/2014	13:08	S17_B13_B16_RL350	0.6	IB	0.17	104.5	0.87	118.3	0.47	101.8	0.34	101.0	10.00	120.0	Not Monitored		50.00	-4.3	135	6.9	10.7	10.7	13.9	0	Onsite	1	0	0
53	2014-73	10/09/2014	16:08	S17_B9_B12_RL350	1.0	IB	0.14	105.6	0.84	111.3	0.50	107.7	0.45	113.5	10.00	120.0	Not Monitored		50.00	-2.0	260	5.0	3.7	3.2	2.9	0	Road	0	0	0
54	2014-74	11/09/2014	13:18	S15_B5_B6_Wedge_RL350	0.3	IB	0.07	97.4	0.54	102.3	0.23	94.0	0.12	93.5	10.00	120.0	2.03	114.6	50.00	-3.0	269	1.7	-	-	-	0	Road	0	0	0
	2014-75	11/09/2014	13:18	S14_B18_Trim_RL330	0.3	IB	0.07	97.4	0.54	102.3	0.23	94.0	0.12	93.5	10.00	120.0	2.03	114.6	50.00	-3.0	269	1.7	-	-	-	0	Road	0	0	0
55	2014-76	12/09/2014	13:04	S16_B13_B15_RL350	0.3	TSB	0.13	99.5	0.51	98.5	0.40	99.1	0.27	98.9	10.00	120.0	Not Monitored		50.00	-3.2	104	2.5	11.5	11.0	10.7	0	OK	0	0	0
	2014-77	12/09/2014	13:04	S16_B21_B22_TSB_RL350	0.3	TSB	0.13	99.5	0.51	98.5	0.40	99.1	0.27	98.9	10.00	120.0	Not Monitored		50.00	-3.2	104	2.5	11.5	11.0	10.7	0	OK	0	0	0
56	2014-78	15/09/2014	13:08	S14_B18_Trim_RL330_#2	0.2	IB	0.05	101	0.27	97.5	0.12	91.4	0.06	100.7	10.00	120.0	Not Monitored		50.00	-3.7	321	2.9	-	-	-	0	OK	0	0	0
57	2014-79	17/09/2014	9:43	S15_B5_Wedge_RL350 & Big Rocks	0.1	IB	0.03	95.6	0.19	103.5	0.06	101.4	0.05	101.1	10.00	120.0	1.08	119.8	50.00	-3.1	215	1.5	-	-	-	0	OK	0	0	0
58	2014-80	18/09/2014	13:13	S16_B20-B22_RL370	0.4	TSB	0.13	100.2	0.54	101.3	0.51	104.5	0.30	102.2	10.00	120.0	Not Monitored		50.00	-4.1	278	3.6	-	-	-	0	Road	1	1	0
59	2014-81	22/09/2014	16:13	S17_B16-B17_RL370	0.5	OB	0.17	97.3	0.62	98.7	0.36	95.4	0.31	95.5	10.00	120.0	Not Monitored		50.00	-2.3	122	2.7	-	-	10.7	0	OK	0	0	0
60	2014-82	23/09/2014	16:13	S17_B21-B23_RL370	0.5	OB	0.10	105.7	0.46	103.8	0.44	103.8	0.22	102.6	10.00	120.0	Not Monitored		50.00	-1.8	31	2.0	12.

Werris Creek Coal
Blast Monitoring
2014-2015

Blast Number	Shot number	Date fired	Time Fired	Location	WC South Predicted Vibration K50 mm/s	Type	WERRIS CREEK COAL BLASTING RESULTS FEBRUARY 2015																								
							Glenara R11		Kyooma R98		Werris Ck Sth R62		Werris Ck Mid R92		COMPLIANCE		ARTC Culvert		COMPLIANCE	TEMPERATURE	WIND		FFT SINGLE FREQUENCY			FUME	DUST	COMPLAINTS		
							Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	Inversion oC/100m	Direction	m/s	L Hz	V Hz	T Hz	0 to 5		OP/Vib	Dust/Fume	Other
17	2015-19	3/02/2015	16:04	S15_B21-B23_RL335_TSB	0.8	TSB	0.19	107.3	0.57	109.3	0.40	103.9	0.29	105.5	10.00	120.0	Not Monitored		50.00	-3.7	109	6.7	11.3	12.3	11.4	0	Onsite	0	0	0
18	2015-20	4/02/2015	12:07	S14_B6_Wedge	0.1	IB	0.02	97.1	0.13	104.8	0.04	100.2	0.02	88.3	10.00	120.0	Not Monitored		50.00	-4.1	117	5.0	-	-	-	0	OK	0	0	0
19	2015-21	4/02/2015	16:38	S14_B9-B10_Panel3_UG	0.6	UG	0.04	99.0	0.35	110.9	0.07	104.8	0.04	98.5	10.00	120.0	Not Monitored		50.00	-2.7	143	4.8	-	-	3.0	0	OK	0	0	0
20	2015-22	6/02/2015	12:04	S17_B14-B18_RL350	0.7	IB	0.21	96.6	0.74	95.7	0.46	99.3	0.25	94.4	10.00	120.0	Not Monitored		50.00	-3.4	153	2.3	17.9	12.6	18	0	Onsite	0	0	0
21	2015-23	9/02/2015	13:18	S16_B3-B4_RL370_TSB	0.5	TSB	0.08	112.9	0.40	105.3	0.19	110.4	0.11	107.1	10.00	120.0	0.67	104.2	50.00	-3.5	128	5.3	-	3.5	4.3	0	OK	0	0	0
22	2015-24	10/02/2015	13:08	S18_B11-B12_RL390	0.6	OB	0.12	105.9	0.61	112.3	0.41	107.8	0.28	107.6	10.00	120.0	Not Monitored		50.00	-3.4	105	3.3	3.5	11.2	11.6	2B	Onsite	1	0	0
23	2015-25	11/02/2015	13:39	S14_B8-B9_P3_UG#7	0.3	UG	0.06	106.1	0.31	100.2	0.10	100.5	0.06	106.1	10.00	120.0	Not Monitored		50.00	-4	115	3.3	-	2.8	2.9	2B	OK	0	0	0
24	2015-26	13/02/2015	13:23	S14_B9-B10_P3_UG#8	0.6	UG	0.23	107.1	0.82	106.4	0.40	104.5	0.23	107.1	10.00	120.0	Not Monitored		50.00	-3.2	143	2.0	14.0	13.2	13.5	1A	OK	0	0	0
	2015-27	13/02/2015	13:23	S14_B20_RL275_TSB	0.6	TSB	0.23	107.1	0.82	106.4	0.40	104.5	0.23	107.1	10.00	120.0	Not Monitored		50.00	-3.2	143	2.0	14.0	13.2	13.5	0	OK	0	0	0
25	2015-28	16/02/2015	13:04	S14_B16-B18_RL260_PS	0.5	PS	0.32	100.4	0.76	89.5	0.28	91.3	0.22	90.7	10.00	120.0	Not Monitored		50.00	-2.8	346	1.1	2.1	2.9	3.1	1A	OK	0	0	0
26	2015-29	19/02/2015	12:08	S14_B17-B20_RL275	0.4	TSB	0.17	102.1	0.65	103.5	0.40	100.9	0.25	101.7	10.00	120.0	Not Monitored		50.00	-3.1	26	2.3	3.1	-	29.2	0	Onsite	0	0	0
27	2015-29a	19/02/2015	12:48	S14_B17-B20_RL275 refire misfire	-	Misfire	0.00	104.9	0.03	99.2	0.01	88.8	0.00	104.9	10.00	120.0	Not Monitored		50.00	-4	119	4.0	-	-	-	0	OK	0	0	0
28	2015-30	20/02/2015	12:07	S14_B11-B15_DESeam	0.4	UG	0.08	103.5	0.70	99.6	0.32	99.0	0.14	100.1	10.00	120.0	Not Monitored		50.00	-2.7	140	3.2	3.1	3.0	2.6	0	Onsite	0	0	0
29	2015-31	23/02/2015	13:18	S14_B12-B13_PS	0.3	PS	0.08	97.1	0.43	91.0	0.18	92.0	0.10	90.1	10.00	120.0	Not Monitored		50.00	-3.2	157	3.9	-	2.4	3.1	0	OK	0	0	0
30	2015-32	26/02/2015	13:43	S14+B11-B15_Dseam_UG	0.7	UG	0.12	98.2	1.00	101.2	0.37	98.7	0.21	98.9	10.00	120.0	2.80	117.6	50.00	-3.1	320	4.2	2.3	2.4	2.4	0	OK	0	0	0
	2015-33	26/02/2015	13:43	S17_B6-B8_RL350_UGPS	0.3	PS	0.12	98.2	1.00	101.2	0.37	98.7	0.21	98.9	10.00	120.0	2.80	117.6	50.00	-3.1	320	4.2	2.3	2.4	2.4	2A	OK	0	0	0
	TOTALS	**FEBRUARY 2015**	**# BLAST**	**14**	**TARGET**	**AVERAGE**	**0.13**	**102.7**	**0.58**	**102.3**	**0.28**	**100.3**	**0.17**	**100.4**	**5.00**	**115.0**														
	TOTALS	**FEBRUARY 2015**	**#>0.5mm**	**8**	**<1mm/s**	**HIGHEST**	**0.32**	**112.9**	**1.00**	**112.3**	**0.46**	**110.4**	**0.29**	**107.6**	**10.00**	**120.0**														
	TOTALS	**ANNUAL**	**# BLAST**	**130**	**<115dBL**	**AVERAGE**	**0.15**	**100.2**	**0.73**	**100.5**	**0.34**	**97.8**	**0.22**	**97.4**	**5.00**	**115.0**														
	TOTALS	**MONTHLY LIMIT**	**#>0.5mm**	**15**	**% >115dB(L) or 5mm/s**		**0%**	**0%**	**0%**	**0.8%**	**0%**	**0%**	**0%**	**0%**	**5%**	**5%**														

Blast Number	Shot number	Date fired	Time Fired	Location	WC South Predicted Vibration K50 mm/s	Type	WERRIS CREEK COAL BLASTING RESULTS MARCH 2015																								
							Glenara R11		Kyooma R98		Werris Ck Sth R62		Werris Ck Mid R92		COMPLIANCE		ARTC Culvert		COMPLIANCE	TEMPERATURE	WIND		FFT SINGLE FREQUENCY			FUME	DUST	COMPLAINTS		
							Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	OP (dB)	Vib (mm/s)	Inversion oC/100m	Direction	m/s	L Hz	V Hz	T Hz	0 to 5		OP/Vib	Dust/Fume	Other
31	2015-34	2/03/2015	13:04	S17_B16-B18_RL320	0.3	IB	0.21	108.6	0.47	103.2	0.30	108.3	0.33	106.0	10.00	120.0	Not Monitored		50.00	-3.8	153	6.5	3.1	2.4	3.2	2A	Onsite	0	0	0
32	2015-35	4/03/2015	13:24	S16_B7-B8_Cseam_RL350	0.7	IB	0.16	106.3	1.01	115.3	0.35	98.5	0.27	103.0	10.00	120.0	4.35	118.6	50.00	-4.2	309	7.5	8.4	3.1	3.2	0	Offsite	0	0	0
33	2015-36	6/03/2015	13:28	S18_B15-B17_RL370	0.7	IB	0.15	102.6	0.35	101.6	0.26	103.8	0.12	101.2	10.00	120.0	Not Monitored		50.00	-4.8	250	3.8	11.0	11.0	11.1	0	Onsite	0	0	0
	2015-37	6/03/2015	13:29	S14_B6-B8_RL290_TSB	0.6	TSB	0.17	95.1	1.01	101.1	0.48	92.9	0.22	96.7	10.00	120.0	6.23	119.6	50.00	-4.8	250	3.8	9.5	12.7	10.1	0	Road	0	0	0
34	2015-38	9/03/2015	13:09	S16_B6_Cseam	-	IB	0.01	85.3	0.12	92.8	0.05	99.3	0.04	97.0	10.00	120.0	DNT	DNT	50.00	-2.8	230	3.0	-	-	-	0	Road	0	0	0
35	2015-39	11/03/2015	9:32	S20_B13-B16_Blseam	0.5	OB	0.11	105.2	0.46	104.1	0.31	104.1	0.22	102.4	10.00	120.0	Not Monitored		50.00	-2.8	343	1.8	4.3	2.9	9.8	1A	Onsite	0	0	0
36	2015-40	13/03/2015	13:59	S20_B13-B16_Blseam #2	0.5	OB	0.28	111.3	1.17	99.0	0.47	108.1	0.38	100.4	10.00	120.0	Not Monitored		50.00	-3.8	140	6.9	3.1	3.0	3.1	2B	Onsite	0	0	0
	2015-41	13/03/2015	13:59	S14_B7-B10_RL290_TSB	0.7	TSB	0.30	110.4	1.90	103.7	0.83	107.4	0.47	97.6	10.00	120.0	1.75	114.4	50.00	-3.8	140	6.9	15.9	15.2	14.9	0	OK	2	0	0
	2015-42	13/03/2015	13:59	S14_B7-B10_RL290_PS	0.3	PS	0.30	110.4	1.90	103.7	0.83	107.4	0.47	97.6	10.00	120.0	Not Monitored		50.00	-3.8	140	6.9	15.9	15.2	14.9	0	OK	0	0	0
37	2015-43	17/03/2015	13:08	S14_B8-B10_RL290	0.5	IB	0.14	105.3	0.73	106.4	0.42	98.3	0.15	99.5	10.00	120.0	Not Monitored		50.00	-2.9	6	6.3	13.9	-	10.1	0	OK	0	0	0
38	2015-44	20/03/2015	14:02	S14_B17-B20_RL260_TSB	0.7	TSB	0.27	98.8	1.36	100.8	0.39	98.5	0.27	97.2	10.00	120.0	Not Monitored		50.00	-4.4	285	2.3	10.2	10.3	10.4	0	Road	0	0	0
39	2015-45	23/03/2015	13:07	S14_B8-B13_Gseam_PS	0.5	PS	0.24	84.8	1.85	87.6	0.38	85.9	0.29	80.2	10.00	120.0	Not Monitored		50.00	-3.0	337	1.5	3.6	3.0	3.1	3A	OK	0	0	0
40	2015-46	26/03/2015	16:04	S14_B13-B17_Gseam_PS	0.5	PS	0.25	88.9	0.81	90.8	0.29	98.4	0.28	96.3	10.00	120.0	Not Monitored		50.00	-2.9	312	2.8	2.2	3.0	3.1	3A	OK	0	0	0
41	2015-47	27/03/2015	13:08	S15_B18-B22_RL320	0.6	TSB	0.09	100.2	0.45	98.1	0.23	96.6	0.16	97.4	10.00	120.0	Not Monitored		50.00	-4.3	171	1.7	-	12.0	9.9	0	Onsite	0	0	0
42	2015-48	30/03/2015	13:02	S16_B6_Panel#1_UG	0.3	UG	0.04	100.6	0.51	107.0	0.10	107.7	0.07	106.1	10.00	120.0	1.01	125.3	50.00	-2.5	14	2.2	3.5	-	-	0	OK	0	0	0
	TOTALS	**MARCH 2015**	**# BLAST**	**12**	**TARGET**	**AVERAGE**	**0.18**	**100.9**	**0.94**	**101.0**	**0.38**	**101.0**	**0.25**	**98.6**	**5.00**	**115.0**	DNT = Did not trigger													
	TOTALS	**MARCH 2015**	**#>0.5mm**	**9**	**<1mm/s**	**HIGHEST**	**0.30**	**111.3**	**1.90**	**115.3**	**0.83**	**108.3**	**0.47**	**106.1**	**10.00**	**120.0**														
	TOTALS	**ANNUAL**	**# BLAST**	**142**	**<115dBL**	**AVERAGE**	**0.15**	**100.0**	**0.71**	**100.5**	**0.35**	**97.8**	**0.21**	**98.1**	**5.00**	**115.0**														
	TOTALS	**MONTHLY LIMIT**	**#>0.5mm**	**15**	**% >115dB(L) or 5mm/s**		**0%**	**0%**	**0%**	**1.4%**	**0%**	**0%**	**0%**	**0%**	**5%**	**5%**														

29 April 2014

Ref: 04035/5155

Werris Creek Coal
1435 Werris Creek – Quirindi Road
Werris Creek NSW 2341

RE: APRIL 2014 NOISE MONITORING RESULTS – WERRIS CREEK MINE

This letter report presents the results of noise compliance monitoring conducted for the Werris Creek Coal Mine (WCC) on Wednesday 23rd April, 2014 as required by the draft Noise Management Plan (NMP), Project Approval 10_0059 and the Environmental Protection Licence (EPL) 12290 and must be submitted to the Environment Protection Authority within 30 days of the completion of monitoring.

Attended Noise Monitoring Program

Noise monitoring was undertaken in accordance with the WCC Noise Monitoring Programme as detailed below in **Table 1** (as adapted from the NMP). The monitoring locations and noise criteria for each are detailed in **Appendices I** and **II**.

Table 1
WCC Attended Noise Monitoring Program

Monitoring Point	Duration	ID	Receiver	Relevant Monitoring Requirements
A	15 minutes[1]	R5	Rosehill	PA10_0059 Private Property outside NMZ
B1	60 minutes[2]	R7	83 Wadwells Lane	60 minutes as per EPL 12290
		R8*	Almawillee	Private Agreement
B2	60 minutes[2]	R9	Gedhurst	60 minutes as per EPL 12290
		R22	Mountain View	60 minutes as per EPL 12290
C	15 minutes[1]	R10*	Meadholme	Private Agreement
		R11*	Glenara	
D	60 minutes[2]	R24	Hazeldene	60 minutes as per EPL 12290
E	60 minutes[2]	R12	Quipolly Railway Cottage	60 minutes as per EPL 12290
F	60 minutes[2]	R96	Talavera	60 minutes as per EPL 12290
G	15 minutes[1]	R97		PA10_0059 Private Property outside NMZ
H	15 minutes[1]	R98*	Kyooma	Private Agreement
I	60 minutes[2]	R57	Kurrara Street@	60 minutes as per EPL 12290
J	15 minutes[1]		Coronation Avenue@	PA10_0059 Private Property outside NMZ
K	15 minutes[1]	R21*	Alco Park	Private Agreement
L	15 minutes[1]	R103		PA10_0059 Private Property outside NMZ

Notes accompanying the table are on the following page

* - WCC has a private agreement for noise impacts with these property owners

@ - Kurrara Street is representative of sensitive receptors in southern Werris Creek while Coronation Avenue is representative of sensitive receptors in central Werris Creek.

NMZ - Noise Management Zone of properties with project specific noise criteria between 35dB(A) and 40dB(A);

Note 1: For each monthly monitoring event a total of 15 minutes (per location) during the day period, and 15 (per location) during the evening or night period;

Note 2: For each monthly monitoring event a total of 60 minutes (per location) during the day period, and 60 minutes (per location) during the evening or night period.

Monitoring points B1, B2, and C are considered representative of multiple receivers because they are sufficiently close together that therefore noise monitoring at the monitoring points are acoustically representative of individual receivers in accordance with EPL 12290 Condition L4.6.

EPL 12290 Condition L4.6 indicates that noise monitoring be conducted;

- Approximately on the property boundary, where any dwelling is situated 30m or less from the property boundary closest to the premises; or
- Within 30m of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30m from the property boundary closest to the premises; or, where applicable
- Within 50m of the boundary of a National Park or Nature Reserve.

EPL 12290 Condition L4.3 indicates that the relevant noise limits apply under all meteorological conditions except for the following;

1. Wind speeds greater than 3m/s at 10m above ground level; or
2. Temperature inversion conditions of up to 12°/100m and wind speeds greater than 2m/s at 10m above ground level; or
3. Temperature inversion conditions greater than 12°/100m.

To determine compliance with the Leq (15 min) operational noise criteria the modification factors detailed in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the measured noise levels.

To determine compliance with the L1 (1 min) sleep disturbance noise criterion the noise measurement equipment must be located within 1m of a dwelling façade.

Monitoring Equipment

Attended noise monitoring was conducted with Brüel & Kjær Type 2250 and 2260 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 “Sound Level Meters” and have current NATA calibration. Field calibration is carried out at the start and end of each monitoring period.

A-weighted noise levels were measured over the appropriate monitoring periods (15 or 60 minutes) with data acquired at 1 or 2 second statistical intervals and the meter set to “fast” response. Each 1 or 2 second measurement is accompanied by a third-octave band spectrum from 20 - 20k Hz which is required for analysing INP ‘modifying factors’. Time based field notes allow for determination of the relative contributions to the overall noise level of all significant noise sources.

Measurement Analysis

The operational noise criteria for compliance with Condition L4.1 of EPL 12290 are based on a 15 minute Leq noise level. The procedures detailed in Condition M8.2 of EPL 12290 require noise monitoring for significantly longer periods than that of the compliance criteria. To determine compliance with the EPL conditions the worst case 15 minute period, in relation to mine noise, was extracted from each measurement and compared to the criteria in Condition L4.1.

This worst case 15 minute Leq noise level for each monitoring period is shown in the tables below. Where the noise from WCC was audible Bruel & Kjaer "*Evaluator*" analysis software was used to quantify the contributions of the mine and other significant noise sources to the overall level. Mine noise from WCC is shown in the tables in bold type. Where noise from WCC is listed as faintly audible, this means the noise levels from the mine were at least 10 dB below the ambient level during the measurement and not measurable.

All noise levels shown are in dB(A) Leq (15 min) unless otherwise shown.

When no mine noise was audible at a monitoring location during a one hour survey, a representative 15 minute noise measurement was made with observations carried out for the remainder of the applicable time period. In these instances, the measured noise level for the representative 15 minute period is that shown in the tables below.

Meteorological data used in this report were supplied by the mine from their automatic weather station M2 which is located on top of the overburden emplacement. Temperature inversion strength is extrapolated from gauges with 80m vertical separation.

WCC Operations

WCC operations on Wednesday 23rd April, 2014 had the 5600 excavator and one 1900 excavator in Strip 13 east at RL300m, 3600 excavator in Strip 15 centre at RL370m and one 1900 excavator in Strip 16 west at RL390m. The Strip 13 overburden truck fleets were running to the in pit dump at RL400m on day and night shift with the Strip 15/16 truck fleets running to the Top Dump at RL445m on day shift and to the in pit dump on night shift. There were no production delays either day or night shift. The crushing plant and train load out operated to 3:30am with no trains loaded.

Noise Compliance Assessment

The results of the noise measurements are shown below in **Tables 2** and **3**.

Table 2
WCC Noise Monitoring Results – 23 April 2014 (Day)

Location	Time	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m	Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	1:49 pm	33	35	n/a	5.2,294	Birds (30), traffic (30), WCC inaudible
B1 R7 83 Wadwells Lane/R8 Almawillee	2:09 pm	40	37	n/a	5.5,281	Wind in trees (38), birds (33), traffic (29), WCC (24)
B2 R9Gedhurst/ R22 Mountain View	12:43 pm	41	37/36*	n/a	5.2,286	Birds (40), wind in trees (33), traffic (28), WCC (26)
C R10 Meadholme/ R11 Glenara	3:14 pm	44	39	n/a	4.5,289	Traffic (42), birds (39), WCC (22)
D R24 Hazeldene	3:33 pm	49	37	n/a	4.7,286	Traffic (48), birds (41), WCC (22)
E R12 Railway Cottage	4:19 pm	45	38	n/a	2.7,278	Traffic (45), birds (29), WCC inaudible
F R96 Talavera	3:09 pm	38	38	n/a	5.0,290	Wind in trees (37), birds (29), traffic (25), WCC inaudible
G R97	2:17 pm	39	35	n/a	5.9,280	Wind in trees (39), birds (26), WCC inaudible
H R98 Kyooma	2:46 pm	44	36	n/a	5.4,274	Wind in trees (44), birds (30), WCC inaudible
I R57 Kurrara St	12:40 pm	50	35	n/a	5.2,286	Wind in trees (49), traffic (41), road works (35), birds (33), WCC inaudible
J R57 Coronation Ave	1:46 pm	50	35	n/a	5.2,294	Wind in trees (50), traffic (37), road works (33), birds (29), WCC inaudible
K R21 Alco Park	5:06 pm	38	39	n/a	2.3,283	Birds (36), traffic (34), WCC (23)
L R103	4:47 pm	46	35	n/a	2.2,282	Birds (46), traffic (32), WCC inaudible

* Gedhurst noise criterion is 37dB(A) Leq while Mountain View noise criterion is 36 dB(A) Leq.

Table 3
WCC Noise Monitoring Results – 23 April 2014 (Evening/Night)

Location	Time	dB(A), L1 (1min)[1]	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m, Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	9:14 pm	35	37	35	+8.1,0.3,187	Traffic (34), insects (33), WCC (29)
B1 R7 83 Wadwells Lane/R8 Almawillee	9:34 pm	38	36	37	+7.9,1.5,318	WCC (33), traffic (32), insects (19)
B2 R9Gedhurst/ R22 Mountain View	8:10 pm	39	48	37/36*	+8.8,0.4,90	Traffic (48), WCC (35), insects (32)
C R10 Meadholme/ R11 Glenara	10:38 pm	36	44	39	+7.6,1.4,321	Dog (43), traffic (37), WCC (31), insects (23)
D R24 Hazeldene	10:58 pm	44	38	37	+8.6,1.6,313	Traffic (36), WCC (33), insects (19)
E R12 Railway Cottage	10:47 pm	36	40	38	+8.6,1.6316	Traffic (39), WCC (31)
F R96 Talavera	9:37 pm	35	33	37	+7.9,1.2,286	WCC (31), traffic (27), insects (20)
G R97	9:12 pm	26	26	35	+8.1,0.3,187	WCC (22), traffic (21), insects (19)
H R98 Kyooma	8:48 pm	31	30	36	+9.1,0.1,0	WCC (26), train (26), insects (21)
I R57 Kurrara St	7:15 pm	30	48	35	+9.0,0.6,334	Traffic (48), insects (33), plane (32), WCC (26)
J R57 Coronation Ave	8:22 pm	n/a	52	35	+8.7,0.4,90	Traffic (51), trains (44), WCC inaudible
K R21 Alco Park	7:44 pm	26	51	37	+7.3,0.5,108	Dogs (51), traffic (40), insects (31), WCC (22)
L R103	7:23 pm	28	39	35	+8.8,1.1,344	Traffic (37), insects (33), WCC (25)

1. L1 (1 min) from mine noise only
* Gedhurst noise criterion is 37dB(A) Leq while Mountain View noise criterion is 36 dB(A) Leq.

The results in Tables 2 and 3 indicate that, under the operational and atmospheric conditions at the time, the measured noise levels did not exceed the relevant noise criteria at any location during any monitoring period.

Data from those times where WCC operations were audible were analysed using the *"Evaluator"* software. This analysis showed the noise did not contain any tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

In addition to the operational noise, the noise from WCC must not exceed **45 dB(A) L1 (1 min)** between the hours of 10 pm and 7 am. This is to minimise the potential for sleep disturbance as a result of individual loud noises from the mine. The compliance measurement locations are different for each of the operational and sleep disturbance noise. That is, the sleep disturbance criterion is typically applicable at 1m from the façade of a bedroom window.

To avoid undue disturbance to residents the L1 (1 min) noise level from the operational measurements are used to show general compliance with the sleep disturbance criterion. That is, as the distance between the noise source and the operational noise monitoring location is significantly greater than the distance between the operational noise monitoring location and the sleep disturbance monitoring location (i.e. 1m from the facade of the house) there will be little variation in L1 (1 min) levels between the two monitoring locations. It must be noted, however, that the sleep disturbance criterion is to be measured near a bedroom window. As the internal layout of each residence is not known, to consider a worst case, this is assumed to be facing the operational noise monitoring location.

As shown in Table 3, during the night time measurement circuit the L1 (1 min) noise from WCC did not exceed 45 dB(A) at any monitoring location.

Plant Sound Power Levels

In keeping with the NMP, the sound power levels of the major noise producing plant and equipment operating on the WCC site is to be determined from sound pressure level measurements. The measurement programme is to be undertaken progressively to capture noise levels from all plant over the period of a year.

The results of the sound power level calculations to date are shown in **Appendix III**. The table in Appendix III lists SWL's for plant items as taken from those used in the noise modelling for the latest EA for WCM. The SWL's from the EA, therefore, represent a calculated Leq (15 minute) noise level. For mobile plant this calculation is based on the length of time each noise source representing a plant item(s) is at a particular location on the mine site.

For example the noise model includes a number of noise sources located at intervals along the various haul roads to approximate the haul fleet working throughout a 15 minute operational period. The SWL for the point source is calculated based on the length of time any truck is expected to be passing that location during the assessment period.

For mobile plant, the measured Leq noise levels in the table in Appendix III represent a single passby for each plant item whereas the values adopted in the EA (particularly for haul trucks) are for the 15-

minute calculated sound power level of 350m long sections of haul road. These values are typically 7-10 dB lower than the single pass-by level.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,
SPECTRUM ACOUSTICS PTY LIMITED

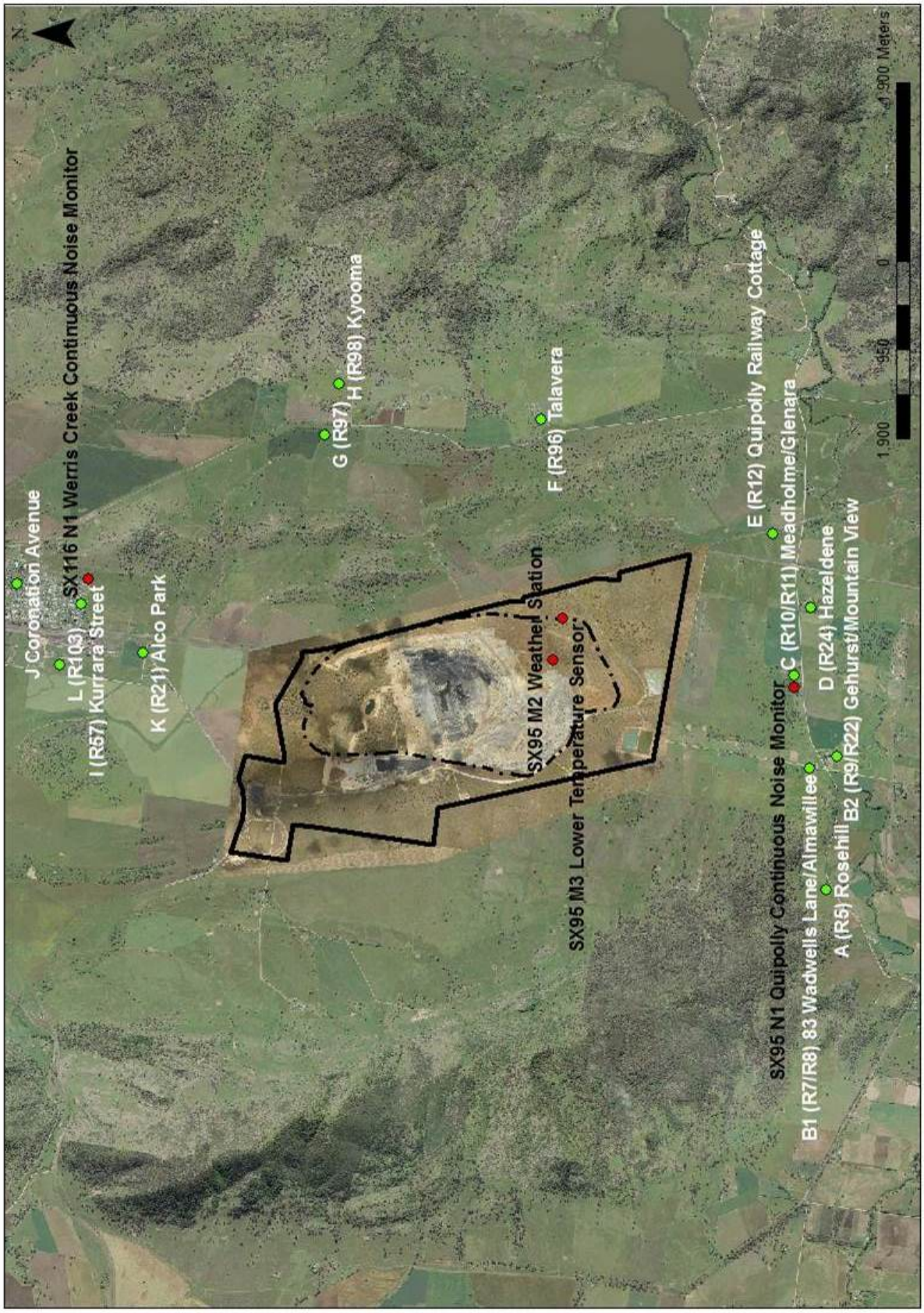
Author:

Ross Hodge
Acoustical Consultant

Review:

Neil Pennington
Acoustical Consultant

Appendix I



Attended Noise Monitoring Locations

Appendix II

Noise Limits

LOM Project Revised Noise Criteria

Location		Day $L_{Aeq,15minute}$	Evening/Night $L_{Aeq,15minute}$	Night $L_{A1(1min)}$	Long Term $L_{Aeq,15minute}$	Acquisition $L_{Aeq,15minute}$
R7	83 Wadwells Lane	37	37	45	35	40
R9	"Gedhurst"	37	37	45	35	40
R12	"Quipolly Railway Cottage"	38	38	45	35	40
R22	"Mountain View"	36	36	45	35	40
R24	"Hazeldene"	37	37	45	35	40
R96	"Talavera"#	38	37	45	35	40
All other privately-owned land		35	35	45	35	40

"Talavera" property was listed in the EA under its previous property name of "Millbank"

Table 21: Properties with Private Agreements Noise Criteria

Location		Noise Works Criteria dB(A) Leq	Noise Acquisition Criteria dB(A) Leq
R8	"Almawillee"	40	45
R10	"Meadholme"	40	45
R11	"Glenara"	40	45
R20	"Tonsley Park"	40	45
R21	"Alco Park"	40	45
R98	"Kyooma"	40	45

Appendix III

Plant Sound Power Levels

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Haul truck CAT 785C (unattenuated)	608	117.7	120	122	17/7/12
Haul truck CAT 785C (attenuated)	608	117.7	116.7	118	24/4/14
Haul truck CAT 785C (unattenuated)	614	117.7	119	121	28/1/14
Haul truck CAT 785C (attenuated)	614	117.7	117.5	119	24/4/14
Haul truck CAT 785C (unattenuated)	609	117.7	120		11/9/12
Haul truck CAT 785C (attenuated)	609	117.7	117.4	119	11/9/12
Haul truck CAT 785C (unattenuated)	610	117.7	121		11/9/12
Haul truck CAT 785C (unattenuated)	611	117.7	120		11/9/12
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Haul truck CAT 785C (attenuated)	612	117.7	117.8	120	24/4/14
Haul truck CAT 785C (unattenuated)	600	117.7	119		11/9/12
Haul truck CAT 785C (unattenuated)	613	117.7	122		8/8/13
Haul truck CAT 785C (attenuated)	613	117.7	117.9		24/4/14
Haul truck CAT 785C (unattenuated)	624	117.7	121		8/8/13
Haul truck CAT 785C (attenuated)	624	117.7	118.1		24/4/14
Haul truck CAT 789 (unattenuated)	875	117.7	119	121	28/1/14
Water Cart	WA897	113	113		11/9/12
Scraper	SC882	118	113		11/9/12
Excavator (PC 3600)	EX551	116	115		11/9/12
Dozer	829	118	115		24/4/14
Dozer (D10T)	832	118	113	118	28/1/14
Crushing Plant	n/a	116	118		11/9/12
Haul truck CAT 785C Horn pre attenuation	608	117.7		129	17/7/12
Haul truck Cat 785C Horn post attenuation	608	117.7		124	11/9/12
Excavator (PC4000)	EX837	116	115		18/12/12
Dozer D10T (1^{st} gear)	505	118	113 109	128 121	18/12/12
Dozer D10T on stockpile (2^{nd} gear) (1^{st} gear)	505	118	118 109	124 113	6/2/13
Dozer D9T on stockpile (2^{nd} gear) (1^{st} gear)	501	118	119 113	122 118	6/2/13

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Excavator (EX 5600)	570	121	116	119	28/1/14
Haul truck CAT 793XQ	660	115	116	119	28/1/14
Haul truck CAT 793XQ	661	115	115	118	28/1/14
Haul truck CAT 793XQ	662	115	116	119	28/1/14
Haul truck CAT 793XQ	663	115	116	119	8/8/13
Haul truck CAT 793XQ	664	115	114	117	8/8/13
Haul truck CAT 793XQ	665	115	115	118	28/1/14
Haul truck CAT 793XQ	666	115	116	118	28/1/14
Haul truck CAT 793XQ	667	115	115	118	28/1/14
Hitachi Excavator 1900	543	116	115	118	28/1/14
Grader	849	n/a	110	113	28/1/14
Warrior 2400 crusher	n/a	116	117	117	8/8/13
Kleeman screen	MCR401	116	111	112	8/8/13
Water Cart (Volvo)	863	113	114	118	28/1/14
Water Cart (Cat 773D)	869	113	119	123	28/1/14
Water Cart (Cat 773D)	869	113	117.5	119	24/4/14
Drill (Bucyrus)	524	116	107	-	28/1/14
Drill (Cat 6420)	526	116	108	-	28/1/14
Water pump (Dam 4)	--	--	106	--	24/4/14
Evaporation fan (Dam 4)	--	--	105	--	24/4/14

*Leq noise level from vehicle pass by only (modelled levels in the EA for LOM are based on an Leq (15 min) for an attenuated haul truck.

13 August 2014

Ref: 04035/5330

Werris Creek Coal
1435 Werris Creek – Quirindi Road
Werris Creek NSW 2341

RE: AUGUST 2014 NOISE MONITORING RESULTS – WERRIS CREEK MINE

This letter report presents the results of noise compliance monitoring conducted for the Werris Creek Coal Mine (WCC) on Thursday 7th August, 2014 as required by the Noise Management Plan (NMP), Project Approval 10_0059 and the Environmental Protection Licence (EPL) 12290 and must be submitted to the Environment Protection Authority within 30 days of the completion of monitoring.

Attended Noise Monitoring Program

Noise monitoring was undertaken in accordance with the WCC Noise Monitoring Programme as detailed below in **Table 1** (as adapted from the NMP). The monitoring locations and noise criteria for each are detailed in **Appendices I** and **II**.

Table 1
WCC Attended Noise Monitoring Program

Monitoring Point	Duration	ID	Receiver	Relevant Monitoring Requirements
A	15 minutes[1]	R5	Rosehill	PA10_0059 Private Property outside NMZ
B	15 minutes[1]	R7*	83 Wadwells Lane	Private Agreement
		R8*	Almawillee	
		R9*	Gedhurst	
		R22*	Mountain View	
C	15 minutes[1]	R10*	Meadholme	Private Agreement
		R11*	Glenara	
D	60 minutes[2]	R24	Hazeldene	60 minutes as per EPL 12290
E	60 minutes[2]	R12	Quipolly Railway Cottage	60 minutes as per EPL 12290
F	60 minutes[2]	R96	Talavera	60 minutes as per EPL 12290
G	15 minutes[1]	R97		PA10_0059 Private Property outside NMZ
H	15 minutes[1]	R98*	Kyooma	Private Agreement
I	60 minutes[2]	R57	Kurrara Street@	60 minutes as per EPL 12290
J	15 minutes[1]		Coronation Avenue@	PA10_0059 Private Property outside NMZ
K	15 minutes[1]	R21*	Alco Park	Private Agreement
L	15 minutes[1]	R103		PA10_0059 Private Property outside NMZ

Notes accompanying the table are on the following page

* - WCC has a private agreement for noise impacts with these property owners

@ - Kurrara Street is representative of sensitive receptors in southern Werris Creek while Coronation Avenue is representative of sensitive receptors in central Werris Creek.

NMZ - Noise Management Zone of properties with project specific noise criteria between 35dB(A) and 40dB(A);

Note 1: For each monthly monitoring event a total of 15 minutes (per location) during the day period, and 15 (per location) during the evening or night period;

Note 2: For each monthly monitoring event a total of 60 minutes (per location) during the day period, and 60 minutes (per location) during the evening or night period.

EPL 12290 Condition L4.6 indicates that noise monitoring be conducted;

- Approximately on the property boundary, where any dwelling is situated 30m or less from the property boundary closest to the premises; or
- Within 30m of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30m from the property boundary closest to the premises; or, where applicable
- Within 50m of the boundary of a National Park or Nature Reserve.

EPL 12290 Condition L4.3 indicates that the relevant noise limits apply under all meteorological conditions except for the following;

1. Wind speeds greater than 3m/s at 10m above ground level; or
2. Temperature inversion conditions of up to 12°/100m and wind speeds greater than 2m/s at 10m above ground level; or
3. Temperature inversion conditions greater than 12°/100m.

To determine compliance with the Leq (15 min) operational noise criteria the modification factors detailed in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the measured noise levels.

To determine compliance with the L1 (1 min) sleep disturbance noise criterion the noise measurement equipment must be located within 1m of a dwelling façade.

Monitoring Equipment

Attended noise monitoring was conducted with Brüel & Kjær Type 2250 and 2260 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 “Sound Level Meters” and have current NATA calibration. Field calibration is carried out at the start and end of each monitoring period.

A-weighted noise levels were measured over the appropriate monitoring periods (15 or 60 minutes) with data acquired at 1 or 2 second statistical intervals and the meter set to “fast” response. Each 1 or 2 second measurement is accompanied by a third-octave band spectrum from 20 - 20k Hz which is required for analysing INP ‘modifying factors’. Time based field notes allow for determination of the relative contributions to the overall noise level of all significant noise sources.

Measurement Analysis

The operational noise criteria for compliance with Condition L4.1 of EPL 12290 are based on a 15 minute Leq noise level. The procedures detailed in Condition M8.2 of EPL 12290 require noise monitoring for significantly longer periods than that of the compliance criteria. To determine compliance with the EPL conditions the worst case 15 minute period, in relation to mine noise, was extracted from each measurement and compared to the criteria in Condition L4.1.

This worst case 15 minute Leq noise level for each monitoring period is shown in the tables below. Where the noise from WCC was audible Bruel & Kjaer "*Evaluator*" analysis software was used to quantify the contributions of the mine and other significant noise sources to the overall level. Mine noise from WCC is shown in the tables in bold type. Where possible the significant audible noise sources from the mine are indicated in notes associated with the tables.

Where noise from WCC is listed as faintly audible, this means the noise levels from the mine were at least 10 dB below the ambient level during the measurement and not measurable.

All noise levels shown are in dB(A) Leq (15 min) unless otherwise shown.

When no mine noise was audible at a monitoring location during a one hour survey, a representative 15 minute noise measurement was made with observations carried out for the remainder of the applicable time period. In these instances, the measured noise level for the representative 15 minute period is that shown in the tables below.

Meteorological data used in this report were supplied by the mine from their automatic weather station M2 which is located on top of the overburden emplacement. Temperature inversion strength is extrapolated from gauges with 80m vertical separation.

WCC Operations

WCC operations on Thursday 7th August 2014 had the 5600 excavator in Strip 15 west at RL350m and the 3600 and 1900 excavators in Strip 13 centre at RL270m. The Strip 13 overburden truck fleet was running to the in pit dump at RL360m while the Strip 15 overburden truck fleet were running to either the out of pit RL430 dumps on day and night shift. There were no production delays either day or night shift. The crushing plant and train load out operated to 2:30am with no trains loaded.

Noise Compliance Assessment

The results of the noise measurements are shown below in **Tables 2** and **3**.

Table 2
WCC Noise Monitoring Results – 7 August 2014 (Day)

Location	Time	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m	Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	1:22 pm	45	35	n/a	1.1,323	Traffic (45), birds (29), WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	1:42 pm	43	40*	n/a	0.9,187	Birds (43), traffic (26), WCC (19)
C R10 Meadholme/ R11 Glenara	2:02 pm	38	40*	n/a	1.3,311	Traffic (35), birds (35), WCC (20)
D R24 Hazeldene	2:23 pm	34	37	n/a	1.3,297	Traffic (33), birds (27), WCC inaudible
E R12 Railway Cottage	4:06 pm	40	38	n/a	1.6,235	Traffic (40), birds (29), WCC inaudible
F R96 Talavera	3:58 pm	37	38	n/a	1.6,235	Birds (36), traffic (29), WCC inaudible
G R97	3:39 pm	37	35	n/a	2.5,233	Birds (37), traffic (25), WCC faintly audible
H R98 Kyooma	3:36 pm	34	40*	n/a	1.7,260	Dogs (31), birds (29), traffic (27), WCC (21)
I R57 Kurrara St	2:08 pm	45	35	n/a	1.4,297	Traffic (44), trains (35), birds (30), WCC faintly audible
J R57 Coronation Ave	3:13 pm	52	35	n/a	1.0,339	Traffic (52), train (27), birds (26), WCC inaudible
K R21 Alco Park	1:45 pm	53	40*	n/a	0.9,187	Traffic (53), WCC (27), birds (26)
L R103	1:26 pm	30	35	n/a	1.0,306	Traffic (29), birds (23), WCC inaudible

* Private Agreement in place – see Appendix II.

Table 3
WCC Noise Monitoring Results – 7 August 2014 (Evening/Night)

Location	Time	dB(A), L1 (1min)[1]	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m, Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	7:24 pm	n/a	35	35	+9.8,1.2,146	Traffic (34), train (27), WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	7:43 pm	n/a	34	40*	+9.7,0.9,106	Traffic (34), WCC inaudible
C R10 Meadholme/ R11 Glenara	8:03 pm	n/a	37	40*	+10.2,0.9,97	Traffic (37), train (26), WCC inaudible
D R24 Hazeldene	8:22 pm	29	44	37	+9.8,1.4,181	Traffic (44), WCC (25)
E R12 Railway Cottage	9:59 pm	n/a	38	38	+10.3,2.3,172	Traffic (38), WCC inaudible
F R96 Talavera	9:58 pm	29	28	37	+10.3,2.3,172	Traffic (26), WCC (24)
G R97	9:34 pm	n/a	21	35	+9.7,1.9,183	Traffic (21), WCC inaudible
H R98 Kyooma	9:37 pm	n/a	25	40*	+9.7,2.1,182	Traffic (25), WCC inaudible
I R57 Kurrara St	8:07 pm	n/a	52	35	+9.9,1.2,161	Traffic (51), trains (46), WCC inaudible
J R57 Coronation Ave	9:12 pm	n/a	39	35	+9.6,1.9,177	Traffic (37), train (33), dog (29), WCC inaudible
K R21 Alco Park	7:44 pm	34	45	40*	+9.7,0.9,106	Traffic (44), train (35), WCC (30)
L R103	7:25 pm	n/a	45	35	+9.8,1.2,142	Train (45), traffic (31), WCC inaudible

1. L1 (1 min) from mine noise only
* Private Agreement in place – see Appendix II.

The results in Tables 2 and 3 indicate that, under the operational and atmospheric conditions at the time, the measured noise levels did not exceed the relevant noise criteria at any location during any monitoring period.

The noise from WCC was inaudible at most locations and times. At Alco Park during the evening/night measurement noise from a dozer was the most significant contributor to the mine noise component.

At other times and locations when mine noise was audible it was as general mine hum with no readily identifiable noise sources.

Data from those times where WCC operations were audible were analysed using the *"Evaluator"* software. This analysis showed the noise did not contain any tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

In addition to the operational noise, the noise from WCC must not exceed **45 dB(A) L1 (1 min)** between the hours of 10 pm and 7 am. This is to minimise the potential for sleep disturbance as a result of individual loud noises from the mine. The compliance measurement locations are different for each of the operational and sleep disturbance noise. That is, the sleep disturbance criterion is typically applicable at 1m from the façade of a bedroom window.

To avoid undue disturbance to residents the L1 (1 min) noise level from the operational measurements are used to show general compliance with the sleep disturbance criterion. That is, as the distance between the noise source and the operational noise monitoring location is significantly greater than the distance between the operational noise monitoring location and the sleep disturbance monitoring location (i.e. 1m from the facade of the house) there will be little variation in L1 (1 min) levels between the two monitoring locations. It must be noted, however, that the sleep disturbance criterion is to be measured near a bedroom window. As the internal layout of each residence is not known, to consider a worst case, this is assumed to be facing the operational noise monitoring location.

As shown in Table 3, during the night time measurement circuit the L1 (1 min) noise from WCC did not exceed 45 dB(A) at any monitoring location.

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In keeping with the NMP, the sound power levels of the major noise producing plant and equipment operating on the WCC site is to be determined from sound pressure level measurements. The measurement programme is to be undertaken progressively to capture noise levels from all plant over the period of a year.

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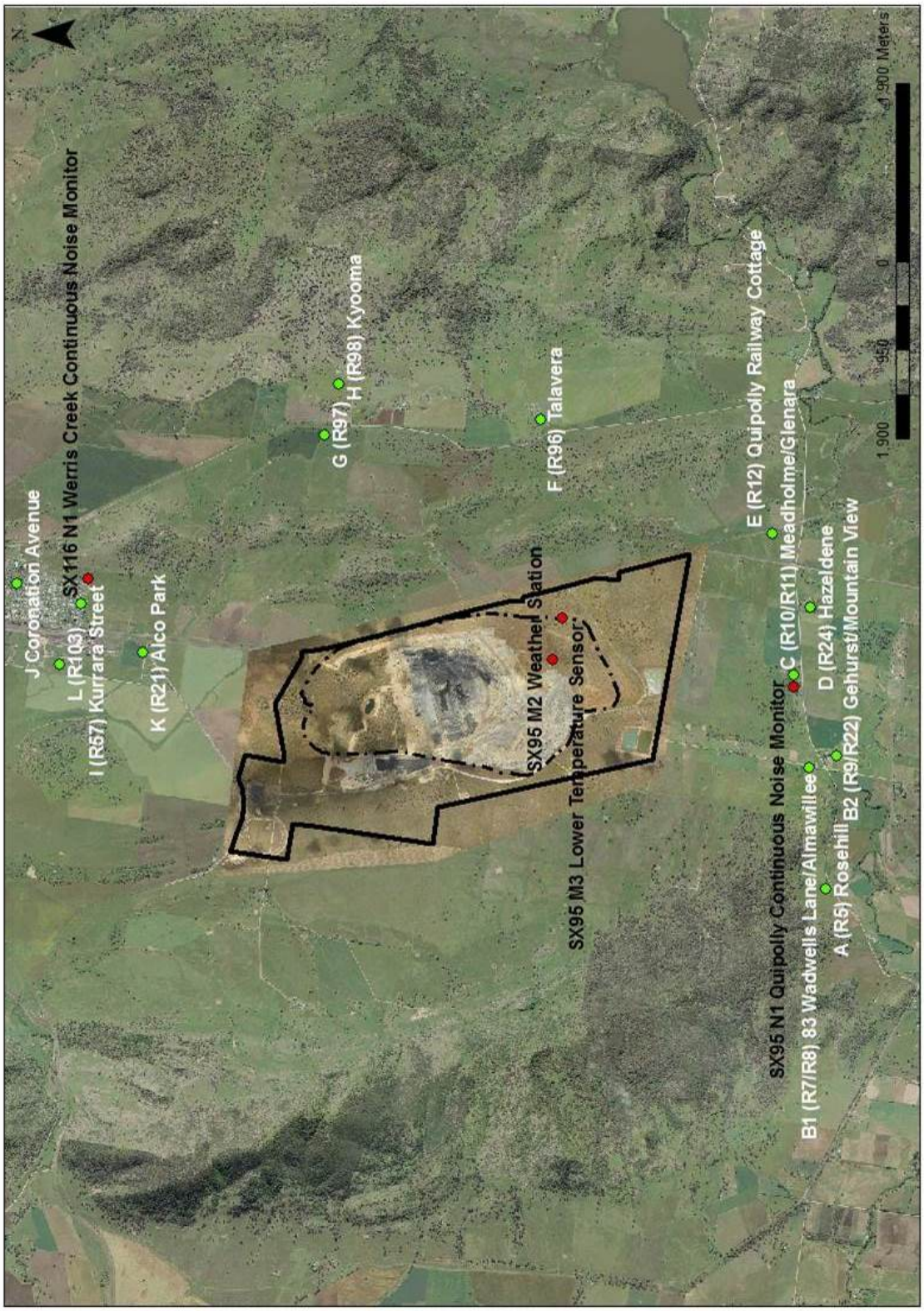
Appendix I



Attended Noise Monitoring Locations

Appendix II

Noise Limits

LOM Project Revised Noise Criteria

Location		Day $L_{Aeq,15minute}$	Evening/Night $L_{Aeq,15minute}$	Night $L_{A1(1min)}$	Long Term $L_{Aeq,15minute}$	Acquisition $L_{Aeq,15minute}$
R12	"Quipolly Railway Cottage"	38	38	45	35	40
R24	"Hazeldene"	37	37	45	35	40
R96	"Talavera"#	38	37	45	35	40
All other privately-owned land		35	35	45	35	40

"Talavera" property was listed in the EA under its previous property name of "Millbank"

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R22	"Mountain View"	40	45
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Appendix III

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Haul truck CAT 785C (attenuated)	608	117.7	116.7	118	24/4/14
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Haul truck CAT 785C (attenuated)	614	117.7	117.5	119	24/4/14
Haul truck CAT 785C (unattenuated)	609	117.7	120		11/9/12
Haul truck CAT 785C (attenuated)	609	117.7	117.4	119	11/9/12
Haul truck CAT 785C (unattenuated)	610	117.7	121		11/9/12
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Scraper	SC882	118	113		11/9/12
Excavator (PC 3600)	EX551	116	115		11/9/12
Dozer	829	118	115		24/4/14
Dozer (D10T)	832	118	113	118	28/1/14
Crushing Plant	n/a	116	118		11/9/12
Haul truck CAT 785C Horn pre attenuation	608	117.7		129	17/7/12
Haul truck Cat 785C Horn post attenuation	608	117.7		124	11/9/12
Excavator (PC4000)	EX837	116	115		18/12/12
Dozer D10T (1^{st} gear)	505	118	113 109	128 121	18/12/12
Dozer D10T on stockpile (2^{nd} gear) (1^{st} gear)	505	118	118 109	124 113	6/2/13
Dozer D9T on stockpile (2^{nd} gear) (1^{st} gear)	501	118	119 113	122 118	6/2/13

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
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Haul truck CAT 793XQ	663	115	116	119	8/8/13
Haul truck CAT 793XQ	664	115	114	117	8/8/13
Haul truck CAT 793XQ	665	115	115	118	28/1/14
Haul truck CAT 793XQ	666	115	116	118	28/1/14
Haul truck CAT 793XQ	667	115	115	118	28/1/14
Hitachi Excavator 1900	543	116	115	118	28/1/14
Grader	849	n/a	110	113	28/1/14
Warrior 2400 crusher	n/a	116	117	117	8/8/13
Kleeman screen	MCR401	116	111	112	8/8/13
Water Cart (Volvo)	863	113	114	118	28/1/14
Water Cart (Cat 773D)	869	113	119	123	28/1/14
Water Cart (Cat 773D)	869	113	117.5	119	24/4/14
Drill (Bucyrus)	524	116	107	-	28/1/14
Drill (Cat 6420)	526	116	108	-	28/1/14
Water pump (Dam 4)	--	--	106	--	24/4/14
Evaporation fan (Dam 4)	--	--	105	--	24/4/14

*Leq noise level from vehicle pass by only (modelled levels in the EA for LOM are based on an Leq (15 min) for an attenuated haul truck.

18 December 2014

Ref: 04035/5546

Werris Creek Coal
1435 Werris Creek – Quirindi Road
Werris Creek NSW 2341

RE: DECEMBER 2014 NOISE MONITORING RESULTS – WERRIS CREEK MINE

This letter report presents the results of noise compliance monitoring conducted for the Werris Creek Coal Mine (WCC) on Thursday 4th and Monday 8th December, 2014 as required by the Noise Management Plan (NMP), Project Approval 10_0059 and the Environmental Protection Licence (EPL) 12290 and must be submitted to the Environment Protection Authority within 30 days of the completion of monitoring.

Attended Noise Monitoring Program

Noise monitoring was undertaken in accordance with the WCC Noise Monitoring Programme as detailed below in **Table 1** (as adapted from the NMP). The monitoring locations and noise criteria for each are detailed in **Appendices I** and **II**.

Table 1
WCC Attended Noise Monitoring Program

Monitoring Point	Duration	ID	Receiver	Relevant Monitoring Requirements
A	15 minutes[1]	R5	Rosehill	PA10_0059 Private Property outside NMZ
B	15 minutes[1]	R7*	83 Wadwells Lane	Private Agreement
		R8*	Almawillee	
		R9*	Gedhurst	
		R22*	Mountain View	
C	15 minutes[1]	R10*	Meadholme	Private Agreement
		R11*	Glenara	
D	60 minutes[2]	R24	Hazeldene	60 minutes as per EPL 12290
E	60 minutes[2]	R12	Quipolly Railway Cottage	60 minutes as per EPL 12290
F	60 minutes[2]	R96	Talavera	60 minutes as per EPL 12290
G	15 minutes[1]	R97		PA10_0059 Private Property outside NMZ
H	15 minutes[1]	R98*	Kyooma	Private Agreement
I	60 minutes[2]	R57	Kurrara Street@	60 minutes as per EPL 12290
J	15 minutes[1]		Coronation Avenue@	PA10_0059 Private Property outside NMZ
K	15 minutes[1]	R21*	Alco Park	Private Agreement
L	15 minutes[1]	R103		PA10_0059 Private Property outside NMZ

Notes accompanying the table are on the following page

* - WCC has a private agreement for noise impacts with these property owners

@ - Kurrara Street is representative of sensitive receptors in southern Werris Creek while Coronation Avenue is representative of sensitive receptors in central Werris Creek.

NMZ - Noise Management Zone of properties with project specific noise criteria between 35dB(A) and 40dB(A);

Note 1: For each monthly monitoring event a total of 15 minutes (per location) during the day period, and 15 (per location) during the evening or night period;

Note 2: For each monthly monitoring event a total of 60 minutes (per location) during the day period, and 60 minutes (per location) during the evening or night period.

EPL 12290 Condition L4.6 indicates that noise monitoring be conducted;

- Approximately on the property boundary, where any dwelling is situated 30m or less from the property boundary closest to the premises; or
- Within 30m of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30m from the property boundary closest to the premises; or, where applicable
- Within 50m of the boundary of a National Park or Nature Reserve.

EPL 12290 Condition L4.3 indicates that the relevant noise limits apply under all meteorological conditions except for the following;

1. Wind speeds greater than 3m/s at 10m above ground level; or
2. Temperature inversion conditions of up to 12°/100m and wind speeds greater than 2m/s at 10m above ground level; or
3. Temperature inversion conditions greater than 12°/100m.

To determine compliance with the Leq (15 min) operational noise criteria the modification factors detailed in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the measured noise levels.

To determine compliance with the L1 (1 min) sleep disturbance noise criterion the noise measurement equipment must be located within 1m of a dwelling façade.

The monitoring commenced during the day time on Thursday, 4th December but inclement weather forced the survey to be abandoned in the late afternoon. The mine did not work for any significant time during the evening and night. The day time monitoring was completed in the morning of Friday, 5th December ((Coronation Avenue).

The evening/night time monitoring was undertaken on Monday, 8th December.

Monitoring Equipment

Attended noise monitoring was conducted with Brüel & Kjær Type 2250 and 2260 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 “Sound Level Meters” and have current NATA calibration. Field calibration is carried out at the start and end of each monitoring period.

A-weighted noise levels were measured over the appropriate monitoring periods (15 or 60 minutes) with data acquired at 1 or 2 second statistical intervals and the meter set to “fast” response. Each 1 or

2 second measurement is accompanied by a third-octave band spectrum from 20 - 20k Hz which is required for analysing INP 'modifying factors'. Time based field notes allow for determination of the relative contributions to the overall noise level of all significant noise sources.

Measurement Analysis

The operational noise criteria for compliance with Condition L4.1 of EPL 12290 are based on a 15 minute Leq noise level. The procedures detailed in Condition M8.2 of EPL 12290 require noise monitoring for significantly longer periods than that of the compliance criteria. To determine compliance with the EPL conditions the worst case 15 minute period, in relation to mine noise, was extracted from each measurement and compared to the criteria in Condition L4.1.

This worst case 15 minute Leq noise level for each monitoring period is shown in the tables below. Where the noise from WCC was audible Bruel & Kjaer "*Evaluator*" analysis software was used to quantify the contributions of the mine and other significant noise sources to the overall level. Mine noise from WCC is shown in the tables in bold type. Where possible the significant audible noise sources from the mine are indicated in notes associated with the tables.

Where noise from WCC is listed as faintly audible, this means the noise levels from the mine were at least 10 dB below the ambient level during the measurement and not measurable.

All noise levels shown are in dB(A) Leq (15 min) unless otherwise shown.

When no mine noise was audible at a monitoring location during a one hour survey, a representative 15 minute noise measurement was made with observations carried out for the remainder of the applicable time period. In these instances, the measured noise level for the representative 15 minute period is that shown in the tables below.

Meteorological data used in this report were supplied by the mine from their automatic weather station M2 which is located on top of the overburden emplacement. Temperature inversion strength is extrapolated from gauges with 80m vertical separation.

WCC Operations

WCC night shift operations on Monday 8th December 2014 had the 5600 excavator in Strip 17 west at RL380m; the 3600 in Strip 15 east at RL310m and one 1900 excavator in Strip 14 west at RL310m and the other 1900 excavator in Strip 16 east at RL370m. The overburden truck fleets were running to the in pit dump at RL360m. To manage operational noise levels, the OCE suspended a 1900 excavator (Strip 14 west) for 5.7 hours and all six CAT785 trucks for a combined 34.2 hours of lost production. In addition, both drills were suspended for a combined 2.5 hours from 1:10am to further manage noise levels. The crushing plant and train load out operated to 11:30pm with no trains loaded.

Noise Compliance Assessment

The results of the noise measurements are shown below in **Tables 2** and **3**.

Table 2
WCC Noise Monitoring Results – 4/5 December 2014 (Day)

Location	Time	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m	Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	2:57 pm	38	35	n/a	3.8,27	Birds (36), wind (30), traffic (28), WCC (23)
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	3:17 pm	44	40*	n/a	3.7,3	Birds (44), wind (28), domestic (26), WCC faintly audible
C R10 Meadholme/ R11 Glenara	3:36 pm	40	40*	n/a	3.2,358	Traffic (37), birds (37), WCC (25)
D R24 Hazeldene	1:49 pm	42	37	n/a	3.6,349	Traffic (40), birds (38), WCC (24)
E R12 Railway Cottage	12:44 pm	45	38	n/a	4.6,24	Traffic (42), wind (39), birds (38), WCC (23)
F R96 Talavera	2:55 pm	50	38	n/a	3.6,19	Birds (50), wind (28), WCC faintly audible
G R97	2:32 pm	34	35	n/a	3.6,22	Wind (33), birds (27), WCC inaudible
H R98 Kyooma	2:07 pm	33	40*	n/a	3.6,349	Birds (30), wind (27), traffic (26), WCC inaudible
I R57 Kurrara St	12:57 pm	44	35	n/a	3.8,21	Birds (42), train yard (39), traffic (35), WCC inaudible
J R57 Coronation Ave**	7:27 am	52	35	n/a	2.2,321	Birds (51), traffic (46), dog (33), WCC inaudible
K R21 Alco Park	12:20 pm	39	40*	n/a	6.5,30	Traffic (34), train (34), birds (34), WCC inaudible
L R103	12:08 pm	48	35	n/a	5.9,31	Dog (48), train yard (30), birds (26), traffic (25), WCC inaudible

* Private Agreement in place – see Appendix II.

**Measurement conducted on the on December 5

Table 3
WCC Noise Monitoring Results – 8 December 2014 (Evening/Night)

Location	Time	dB(A), L1 (1min)[1]	dB(A), Leq	Criterion dB(A) Leq	Inversion °C/100m, Wind speed (m/s),dir°	Identified Noise Sources
A R5 Rosehill	9:25 pm	n/a	47	35	+7.3,1.3,310	Insects (47), traffic (34), WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	9:44 pm	18	38	40*	+7.0,1.0,321	Insects (38), traffic (27), WCC faintly audible
C R10 Meadholme/ R11 Glenara	10:03 pm	n/a	36	40*	+6.9,1.1,275	Traffic (34), insects (31), WCC inaudible
D R24 Hazeldene	8:20 pm	n/a	44	37	+4.3,0.9,328	Birds & insects (42), traffic (40), WCC inaudible
E R12 Railway Cottage	7:15 pm	n/a	44	38	+2.0,1.5,250	Traffic (43), birds & insects (37), WCC inaudible
F R96 Talavera	7:39 pm	33	45	37	+3.6,1.1,288	Birds & insects (45), WCC (29), traffic (28)
G R97	7:19 pm	29	29	35	Lapse,1.8,236	WCC (25), insects (25), traffic (23)
H R98 Kyooma	8:46 pm	35	44	40*	+4.2,0.7,340	Frogs & insects (44), WCC (32), traffic (29)
I R57 Kurrara St	9:35 pm	30	42	35	+7.2,1.0,300	Frogs & insects (40), train yard (35), traffic (33), WCC (25)
J R57 Coronation Ave	9:15 pm	29	35	35	+6.6,1.6,313	Dog (31), frogs & insects (30), traffic (27), WCC (24)
K R21 Alco Park	10:42 pm	n/a	46	40*	+6.5,0.3,8	Frogs & insects (43), traffic (43), dogs (28), WCC inaudible
L R103	10:31 pm	n/a	45	35	+7.8,0.4,314	Train yard (42), insects (40), traffic (38), WCC inaudible

1. L1 (1 min) from mine noise only
* Private Agreement in place – see Appendix II.

The results in Tables 2 and 3 indicate that, under the operational and atmospheric conditions at the time, the measured noise levels did not exceed the relevant noise criteria at any location during any monitoring period.

The audible noise sources from WCC included truck revs, occasional dozer tracks and general mine hum. At other times and locations when mine noise was audible it was coming from the engine/s of the evaporator jets blowing out the excess water from the dams.

Data from those times where WCC operations were audible were analysed using the *"Evaluator"* software. This analysis showed the noise did not contain any tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

In addition to the operational noise, the noise from WCC must not exceed **45 dB(A) L1 (1 min)** between the hours of 10 pm and 7 am. This is to minimise the potential for sleep disturbance as a result of individual loud noises from the mine. The compliance measurement locations are different for each of the operational and sleep disturbance noise. That is, the sleep disturbance criterion is typically applicable at 1m from the façade of a bedroom window.

To avoid undue disturbance to residents the L1 (1 min) noise level from the operational measurements are used to show general compliance with the sleep disturbance criterion. That is, as the distance between the noise source and the operational noise monitoring location is significantly greater than

the distance between the operational noise monitoring location and the sleep disturbance monitoring location (i.e. 1m from the facade of the house) there will be little variation in L1 (1 min) levels between the two monitoring locations. It must be noted, however, that the sleep disturbance criterion is to be measured near a bedroom window. As the internal layout of each residence is not known, to consider a worst case, this is assumed to be facing towards the mine.

As shown in Table 3, during the night time measurement circuit the L1 (1 min) noise from WCC did not exceed 45 dB(A) at any monitoring location.

Plant Sound Power Levels

In keeping with the NMP, the sound power levels of the major noise producing plant and equipment operating on the WCC site is to be determined from sound pressure level measurements. The measurement programme is to be undertaken progressively to capture noise levels from all plant over the period of a year.

The results of the sound power level calculations to date are shown in **Appendix III**. The table in Appendix III lists SWL's for plant items as taken from those used in the noise modelling for the latest EA for WCM. The SWL's from the EA, therefore, represent a calculated Leq (15 minute) noise level. For mobile plant this calculation is based on the length of time each noise source representing a plant item(s) is at a particular location on the mine site.

For example the noise model includes a number of noise sources located at intervals along the various haul roads to approximate the haul fleet working throughout a 15 minute operational period. The SWL for the point source is calculated based on the length of time any truck is expected to be passing that location during the assessment period.

For mobile plant, the measured Leq noise levels in the table in Appendix III represent a single passby for each plant item whereas the values adopted in the EA (particularly for haul trucks) are for the 15-minute calculated sound power level of 350m long sections of haul road. These values are typically 7-10 dB lower than the single pass-by level.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,
SPECTRUM ACOUSTICS PTY LIMITED

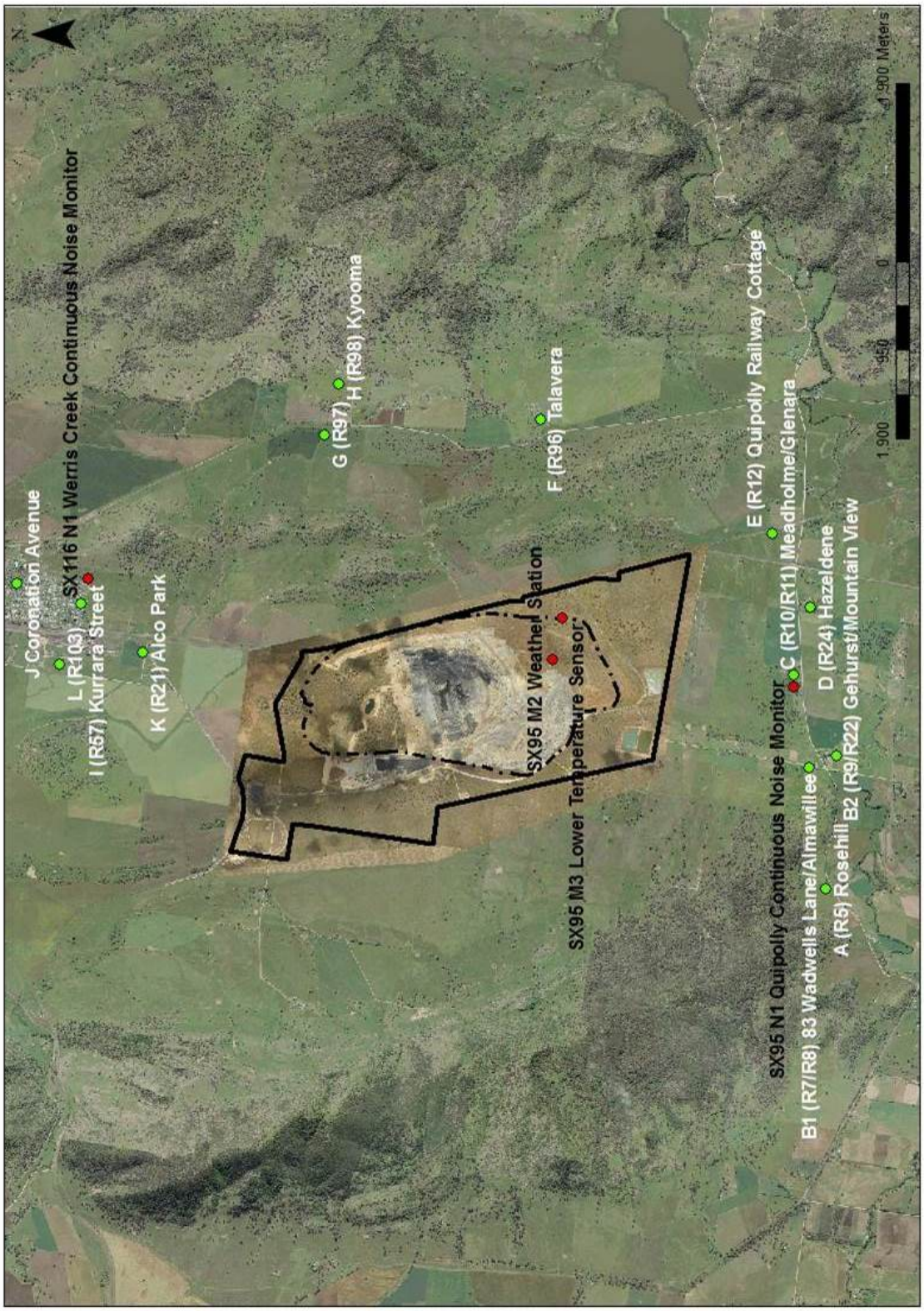
Author:

Ross Hodge
Acoustical Consultant

Review:

Neil Pennington
Acoustical Consultant

Appendix I



Attended Noise Monitoring Locations

Appendix II

Noise Limits

LOM Project Revised Noise Criteria

Location		Day $L_{Aeq,15minute}$	Evening/Night $L_{Aeq,15minute}$	Night $L_{A1(1min)}$	Long Term $L_{Aeq,15minute}$	Acquisition $L_{Aeq,15minute}$
R12	"Quipolly Railway Cottage"	38	38	45	35	40
R24	"Hazeldene"	37	37	45	35	40
R96	"Talavera"#	38	37	45	35	40
All other privately-owned land		35	35	45	35	40

"Talavera" property was listed in the EA under its previous property name of "Millbank"

Table 21: Properties with Private Agreements Noise Criteria

Location		Noise Works Criteria dB(A) Leq	Noise Acquisition Criteria dB(A) Leq
R7	83 Wadwells Lane	40	45
R8	"Almawillee"	40	45
R9	"Gedhurst"	40	45
R10	"Meadholme"	40	45
R11	"Glenara"	40	45
R20	"Tonsley Park"	40	45
R21	"Alco Park"	40	45
R22	"Mountain View"	40	45
R98	"Kyooma"	40	45

Appendix III

Plant Sound Power Levels

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Haul truck CAT 785C (unattenuated)	608	117.7	120	122	17/7/12
Haul truck CAT 785C (attenuated)	608	117.7	116.7	118	24/4/14
Haul truck CAT 785C (unattenuated)	614	117.7	119	121	28/1/14
Haul truck CAT 785C (attenuated)	614	117.7	117.5	119	24/4/14
Haul truck CAT 785C (unattenuated)	609	117.7	120		11/9/12
Haul truck CAT 785C (attenuated)	609	117.7	117.4	119	11/9/12
Haul truck CAT 785C (unattenuated)	610	117.7	121		11/9/12
Haul truck CAT 785C (unattenuated)	611	117.7	120		11/9/12
Haul truck CAT 785C (unattenuated)	612	117.7	120	122	28/1/14
Haul truck CAT 785C (attenuated)	612	117.7	117.8	120	24/4/14
Haul truck CAT 785C (unattenuated)	600	117.7	119		11/9/12
Haul truck CAT 785C (unattenuated)	613	117.7	122		8/8/13
Haul truck CAT 785C (attenuated)	613	117.7	117.9		24/4/14
Haul truck CAT 785C (unattenuated)	624	117.7	121		8/8/13
Haul truck CAT 785C (attenuated)	624	117.7	118.1		24/4/14
Haul truck CAT 789 (unattenuated)	875	117.7	119	121	28/1/14
Water Cart	WA897	113	113		11/9/12
Scraper	SC882	118	113		11/9/12
Excavator (PC 3600)	EX551	116	115		11/9/12
Dozer	829	118	115		24/4/14
Dozer (D10T)	832	118	113	118	28/1/14
Crushing Plant	n/a	116	118		11/9/12
Haul truck CAT 785C Horn pre attenuation	608	117.7		129	17/7/12
Haul truck Cat 785C Horn post attenuation	608	117.7		124	11/9/12
Excavator (PC4000)	EX837	116	115		18/12/12
Dozer D10T (1^{st} gear)	505	118	113 109	128 121	18/12/12
Dozer D10T on stockpile (2^{nd} gear) (1^{st} gear)	505	118	118 109	124 113	6/2/13
Dozer D9T on stockpile (2^{nd} gear) (1^{st} gear)	501	118	119 113	122 118	6/2/13

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Excavator (EX 5600)	570	121	116	119	28/1/14
Haul truck CAT 793XQ	660	115	116	119	28/1/14
Haul truck CAT 793XQ	661	115	115	118	28/1/14
Haul truck CAT 793XQ	662	115	116	119	28/1/14
Haul truck CAT 793XQ	663	115	116	119	8/8/13
Haul truck CAT 793XQ	664	115	114	117	8/8/13
Haul truck CAT 793XQ	665	115	115	118	28/1/14
Haul truck CAT 793XQ	666	115	116	118	28/1/14
Haul truck CAT 793XQ	667	115	115	118	28/1/14
Hitachi Excavator 1900	543	116	115	118	28/1/14
Grader	849	n/a	110	113	28/1/14
Warrior 2400 crusher	n/a	116	117	117	8/8/13
Kleeman screen	MCR401	116	111	112	8/8/13
Water Cart (Volvo)	863	113	114	118	28/1/14
Water Cart (Cat 773D)	869	113	119	123	28/1/14
Water Cart (Cat 773D)	869	113	117.5	119	24/4/14
Drill (Bucyrus)	524	116	107	-	28/1/14
Drill (Cat 6420)	526	116	108	-	28/1/14
Water pump (Dam 4)	--	--	106	--	24/4/14
Evaporation fan (Dam 4)	--	--	105	--	24/4/14

*Leq noise level from vehicle pass by only (modelled levels in the EA for LOM are based on an Leq (15 min) for an attenuated haul truck.

25 February 2015

Ref: 04035/5643

Werris Creek Coal
1435 Werris Creek – Quirindi Road
Werris Creek NSW 2341

RE: FEBRUARY 2015 NOISE MONITORING RESULTS – WERRIS CREEK MINE

This letter report presents the results of noise compliance monitoring conducted for the Werris Creek Coal Mine (WCC) on Tuesday 17th of February, 2015 as required by the Noise Management Plan (NMP), Project Approval 10_0059 and the Environmental Protection Licence (EPL) 12290 and must be submitted to the Environment Protection Authority within 30 days of the completion of monitoring.

Attended Noise Monitoring Program

Noise monitoring was undertaken in accordance with the WCC Noise Monitoring Programme as detailed below in **Table 1** (as adapted from the NMP). The monitoring locations and noise criteria for each are detailed in **Appendices I** and **II**.

Table 1
WCC Attended Noise Monitoring Program

Monitoring Point	Duration	ID	Receiver	Relevant Monitoring Requirements
A	15 minutes[1]	R5	Rosehill	PA10_0059 Private Property outside NMZ
B	15 minutes[1]	R7*	83 Wadwells Lane	Private Agreement
		R8*	Almawillee	
		R9*	Gedhurst	
		R22*	Mountain View	
C	15 minutes[1]	R10*	Meadholme	Private Agreement
		R11*	Glenara	
D	60 minutes[2]	R24	Hazeldene	60 minutes as per EPL 12290
E	60 minutes[2]	R12	Quipolly Railway Cottage	60 minutes as per EPL 12290
F	60 minutes[2]	R96	Talavera	60 minutes as per EPL 12290
G	15 minutes[1]	R97		PA10_0059 Private Property outside NMZ
H	15 minutes[1]	R98*	Kyooma	Private Agreement
I	60 minutes[2]	R57	Kurrara Street@	60 minutes as per EPL 12290
J	15 minutes[1]		Coronation Avenue@	PA10_0059 Private Property outside NMZ
K	15 minutes[1]	R21*	Alco Park	Private Agreement
L	15 minutes[1]	R103		PA10_0059 Private Property outside NMZ

Notes accompanying the table are on the following page

* - WCC has a private agreement for noise impacts with these property owners

@ - Kurrara Street is representative of sensitive receptors in southern Werris Creek while Coronation Avenue is representative of sensitive receptors in central Werris Creek.

NMZ - Noise Management Zone of properties with project specific noise criteria between 35dB(A) and 40dB(A);

Note 1: For each monthly monitoring event a total of 15 minutes (per location) during the day period, and 15 (per location) during the evening or night period;

Note 2: For each monthly monitoring event a total of 60 minutes (per location) during the day period, and 60 minutes (per location) during the evening or night period.

EPL 12290 Condition L4.6 indicates that noise monitoring be conducted;

- Approximately on the property boundary, where any dwelling is situated 30m or less from the property boundary closest to the premises; or
- Within 30m of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30m from the property boundary closest to the premises; or, where applicable
- Within 50m of the boundary of a National Park or Nature Reserve.

EPL 12290 Condition L4.3 indicates that the relevant noise limits apply under all meteorological conditions except for the following;

1. Wind speeds greater than 3m/s at 10m above ground level; or
2. Temperature inversion conditions of up to 12°/100m and wind speeds greater than 2m/s at 10m above ground level; or
3. Temperature inversion conditions greater than 12°/100m.

To determine compliance with the Leq (15 min) operational noise criteria the modification factors detailed in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the measured noise levels.

To determine compliance with the L1 (1 min) sleep disturbance noise criterion the noise measurement equipment must be located within 1m of a dwelling façade.

Monitoring Equipment

Attended noise monitoring was conducted with Brüel & Kjær Type 2250 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 “Sound Level Meters” and have current NATA calibration. Field calibration is carried out at the start and end of each monitoring period.

A-weighted noise levels were measured over the appropriate monitoring periods (15 or 60 minutes) with data acquired at 1 or 2 second statistical intervals and the meter set to “fast” response. Each 1 or 2 second measurement is accompanied by a third-octave band spectrum from 20 - 20k Hz which is required for analysing INP ‘modifying factors’. Time based field notes allow for determination of the relative contributions to the overall noise level of all significant noise sources.

Measurement Analysis

The operational noise criteria for compliance with Condition L4.1 of EPL 12290 are based on a 15 minute Leq noise level. The procedures detailed in Condition M8.2 of EPL 12290 require noise monitoring for significantly longer periods than that of the compliance criteria. To determine compliance with the EPL conditions the worst case 15 minute period, in relation to mine noise, was extracted from each measurement and compared to the criteria in Condition L4.1.

This worst case 15 minute Leq noise level for each monitoring period is shown in the tables below. Where the noise from WCC was audible Bruel & Kjaer "*Evaluator*" analysis software was used to quantify the contributions of the mine and other significant noise sources to the overall level. Mine noise from WCC is shown in the tables in bold type. Where possible the significant audible noise sources from the mine are indicated in notes associated with the tables.

Where noise from WCC is listed as faintly audible, this means the noise levels from the mine were at least 10 dB below the ambient level during the measurement and not measurable.

All noise levels shown are in dB(A) Leq (15 min) unless otherwise shown.

When no mine noise was audible at a monitoring location during a one hour survey, a representative 15 minute noise measurement was made with observations carried out for the remainder of the applicable time period. In these instances, the measured noise level for the representative 15 minute period is that shown in the tables below.

Meteorological data used in this report were supplied by the mine from their automatic weather station M2 which is located on top of the overburden emplacement. Temperature inversion strength is extrapolated from gauges with 80m vertical separation.

WCC Operations

WCC night shift operations on Tuesday 17th February 2015 had the 5600 excavator in Strip 16 west at RL370m; the 3600 in Strip 14 east at RL290m and one 1900 excavator in Strip 16 east at RL370m and the other 1900 excavator in Strip 16 west at RL370m. All overburden truck fleets were running to the in pit dump at RL360m. The coal processing and train load out operated to 10:30pm with no trains loaded.

Noise Compliance Assessment

The results of the noise measurements are shown below in **Tables 2** and **3**.

Table 2
WCC Noise Monitoring Results – 17 February 2015 (Day)

Location	Time	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m	Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	1:26 pm	37	35	n/a	2.1,108	Birds & insects (37), traffic (26), WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	1:46 pm	42	40*	n/a	0.5,209	Birds & insects (42), wind (28), WCC faintly audible
C R10 Meadholme/ R11 Glenara	2:05 pm	42	40*	n/a	3.4,116	Birds & insects (40), wind (37), traffic (25), WCC inaudible
D R24 Hazeldene	2:25 pm	39	37	n/a	2.0,116	Birds & insects (38), traffic (30), wind (27), WCC inaudible
E R12 Railway Cottage	4:01 pm	40	38	n/a	3.8,80	Wind (39), traffic (32), birds & insects (30), WCC faintly audible
F R96 Talavera	1:24 pm	38	38	n/a	2.1,108	Birds (36), wind (33), WCC inaudible
G R97	3:36 pm	36	35	n/a	5.9,46	Birds & insects (34), wind (31), WCC (25)
H R98 Kyooma	3:34 pm	33	40*	n/a	2.4,94	Birds (31), wind (28), WCC faintly audible
I R57 Kurrara St	3:14 pm	37	35	n/a	2.8,126	Birds (35), traffic (30), wind (29), WCC inaudible
J R57 Coronation Ave	2:56 pm	41	35	n/a	1.8,85	Birds & insects (38), wind (37), train yard (28), traffic (28), WCC inaudible
K R21 Alco Park	4:44 pm	42	40*	n/a	5.9,55	Rail track work (42), traffic (29), wind (28), WCC faintly audible
L R103	4:25 pm	43	35	n/a	3.4,59	Wind (42), train yard (34), birds (29), traffic (26), WCC inaudible

* Private Agreement in place – see Appendix II.

Table 3
WCC Noise Monitoring Results – 17 February 2015 (Evening/Night)

Location	Time	dB(A), L1 (1min)[1]	dB(A), Leq	Criterion dB(A) Leq	Inversion °C/100m, Wind speed (m/s),dir°	Identified Noise Sources
A R5 Rosehill	8:51 pm	29	62	35	Lapse,4.9,45	Insects (62), traffic (28), WCC (25)
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	9:09 pm	28	40	40*	Lapse,6.3,56	Insects (39), wind (31), WCC (25), traffic (24)
C R10 Meadholme/ R11 Glenara	9:28 pm	n/a	44	40*	Lapse,7.2,61	Wind (43), insects (36), traffic (27), WCC inaudible
D R24 Hazeldene	9:47 pm	n/a	46	37	Lapse,7.0,62	Traffic (43), wind (43), insects (30), WCC inaudible
E R12 Railway Cottage	7:44 pm	n/a	43	38	Lapse,5.2,45	Wind (41), insects (35), traffic (35), WCC inaudible
F R96 Talavera	7:23 pm	n/a	44	37	Lapse,6.1,48	Insects (44), wind (25), WCC inaudible
G R97	7:19 pm	n/a	45	35	Lapse,6.2,48	Insects (45), wind (31), WCC inaudible
H R98 Kyooma	8:31 pm	n/a	40	40*	Lapse,4.7,50	Insects (40), wind (26), WCC inaudible
I R57 Kurrara St	9:11 pm	n/a	41	35	Lapse,6.3,56	Wind (40), insects (32), traffic (27), WCC inaudible
J R57 Coronation Ave	8:53 pm	n/a	39	35	Lapse,5.0,58	Wind (39), insects (28), WCC inaudible
K R21 Alco Park	10:39 pm	n/a	50	40*	Lapse,7.4,60	Insects (47), wind (47), traffic (24), WCC inaudible
L R103	10:20 pm	n/a	47	35	Lapse,7.4,58	Insects (44), wind (44), train yard (30), WCC inaudible

1. L1 (1 min) from mine noise only
* Private Agreement in place – see Appendix II.

The results in Tables 2 and 3 indicate that, under the operational and atmospheric conditions at the time, the measured noise levels did not exceed the relevant noise criteria at any location during any monitoring period.

The audible noise sources from WCC included truck revs and general mine hum.

Data from those times where WCC operations were audible were analysed using the *"Evaluator"* software. This analysis showed the noise did not contain any tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

In addition to the operational noise, the noise from WCC must not exceed **45 dB(A) L1 (1 min)** between the hours of 10 pm and 7 am. This is to minimise the potential for sleep disturbance as a result of individual loud noises from the mine. The compliance measurement locations are different for each of the operational and sleep disturbance noise. That is, the sleep disturbance criterion is typically applicable at 1m from the façade of a bedroom window.

To avoid undue disturbance to residents the L1 (1 min) noise level from the operational measurements are used to show general compliance with the sleep disturbance criterion. That is, as the distance between the noise source and the operational noise monitoring location is significantly greater than the distance between the operational noise monitoring location and the sleep disturbance monitoring location (i.e. 1m from the facade of the house) there will be little variation in L1 (1 min) levels between the two monitoring locations. It must be noted, however, that the sleep disturbance criterion is to be

measured near a bedroom window. As the internal layout of each residence is not known, to consider a worst case, this is assumed to be facing towards the mine.

As shown in Table 3, during the night time measurement circuit the L1 (1 min) noise from WCC did not exceed 45 dB(A) at any monitoring location.

Plant Sound Power Levels

In keeping with the NMP, the sound power levels of the major noise producing plant and equipment operating on the WCC site is to be determined from sound pressure level measurements. The measurement programme is to be undertaken progressively to capture noise levels from all plant over the period of a year.

The results of the sound power level calculations to date are shown in **Appendix III**. The table in Appendix III lists SWL's for plant items as taken from those used in the noise modelling for the latest EA for WCM. The SWL's from the EA, therefore, represent a calculated Leq (15 minute) noise level. For mobile plant this calculation is based on the length of time each noise source representing a plant item(s) is at a particular location on the mine site.

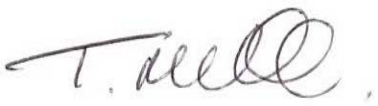
For example the noise model includes a number of noise sources located at intervals along the various haul roads to approximate the haul fleet working throughout a 15 minute operational period. The SWL for the point source is calculated based on the length of time any truck is expected to be passing that location during the assessment period.

For mobile plant, the measured Leq noise levels in the table in Appendix III represent a single passby for each plant item whereas the values adopted in the EA (particularly for haul trucks) are for the 15-minute calculated sound power level of 350m long sections of haul road. These values are typically 7-10 dB lower than the single pass-by level.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,
SPECTRUM ACOUSTICS PTY LIMITED

Author:

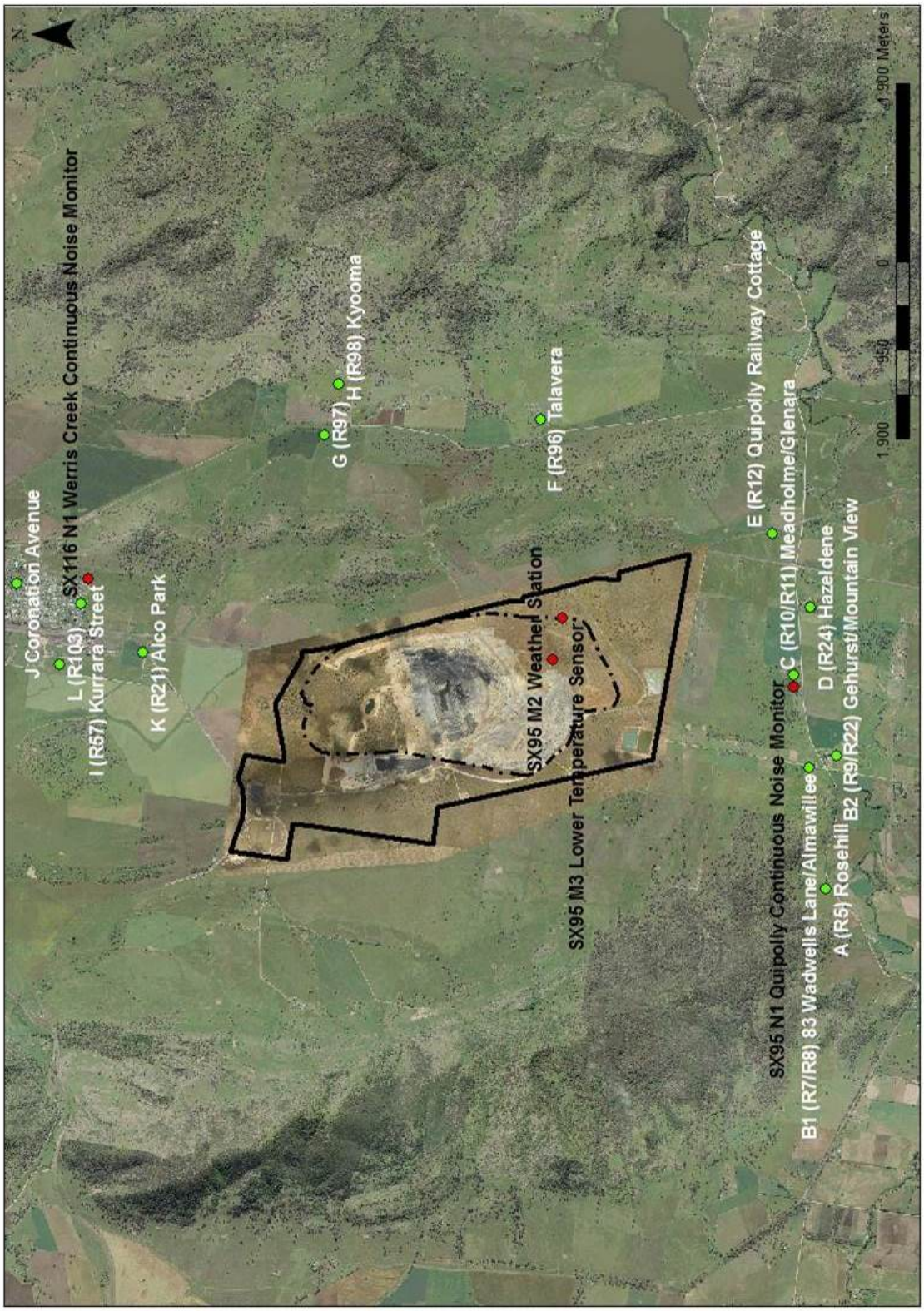


Tristan McCormick
Acoustical Consultant

Review:

Ross Hodge
Acoustical Consultant

Appendix I



Attended Noise Monitoring Locations

Appendix II

Noise Limits

LOM Project Revised Noise Criteria

Location		Day $L_{Aeq,15minute}$	Evening/Night $L_{Aeq,15minute}$	Night $L_{A1(1min)}$	Long Term $L_{Aeq,15minute}$	Acquisition $L_{Aeq,15minute}$
R12	"Quipolly Railway Cottage"	38	38	45	35	40
R24	"Hazeldene"	37	37	45	35	40
R96	"Talavera"#	38	37	45	35	40
All other privately-owned land		35	35	45	35	40

"Talavera" property was listed in the EA under its previous property name of "Millbank"

Table 21: Properties with Private Agreements Noise Criteria

Location		Noise Works Criteria dB(A) Leq	Noise Acquisition Criteria dB(A) Leq
R7	83 Wadwells Lane	40	45
R8	"Almawillee"	40	45
R9	"Gedhurst"	40	45
R10	"Meadholme"	40	45
R11	"Glenara"	40	45
R20	"Tonsley Park"	40	45
R21	"Alco Park"	40	45
R22	"Mountain View"	40	45
R98	"Kyooma"	40	45

Appendix III

Plant Sound Power Levels

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Haul truck CAT 785C (unattenuated)	608	117.7	120	122	17/7/12
Haul truck CAT 785C (attenuated)	608	117.7	116.7	118	24/4/14
Haul truck CAT 785C (unattenuated)	614	117.7	119	121	28/1/14
Haul truck CAT 785C (attenuated)	614	117.7	117.5	119	24/4/14
Haul truck CAT 785C (unattenuated)	609	117.7	120		11/9/12
Haul truck CAT 785C (attenuated)	609	117.7	117.4	119	11/9/12
Haul truck CAT 785C (unattenuated)	610	117.7	121		11/9/12
Haul truck CAT 785C (unattenuated)	611	117.7	120		11/9/12
Haul truck CAT 785C (unattenuated)	612	117.7	120	122	28/1/14
Haul truck CAT 785C (attenuated)	612	117.7	117.8	120	24/4/14
Haul truck CAT 785C (unattenuated)	600	117.7	119		11/9/12
Haul truck CAT 785C (unattenuated)	613	117.7	122		8/8/13
Haul truck CAT 785C (attenuated)	613	117.7	117.9		24/4/14
Haul truck CAT 785C (unattenuated)	624	117.7	121		8/8/13
Haul truck CAT 785C (attenuated)	624	117.7	118.1		24/4/14
Haul truck CAT 789 (unattenuated)	875	117.7	119	121	28/1/14
Water Cart	WA897	113	113		11/9/12
Scraper	SC882	118	113		11/9/12
Excavator (PC 3600)	EX551	116	115		11/9/12
Dozer	829	118	115		24/4/14
Dozer (D10T)	832	118	113	118	28/1/14
Crushing Plant	n/a	116	118		11/9/12
Haul truck CAT 785C Horn pre attenuation	608	117.7		129	17/7/12
Haul truck Cat 785C Horn post attenuation	608	117.7		124	11/9/12
Excavator (PC4000)	EX837	116	115		18/12/12
Dozer D10T (1^{st} gear)	505	118	113 109	128 121	18/12/12
Dozer D10T on stockpile (2^{nd} gear) (1^{st} gear)	505	118	118 109	124 113	6/2/13
Dozer D9T on stockpile (2^{nd} gear) (1^{st} gear)	501	118	119 113	122 118	6/2/13

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Excavator (EX 5600)	570	121	116	119	28/1/14
Haul truck CAT 793XQ	660	115	116	119	28/1/14
Haul truck CAT 793XQ	661	115	115	118	28/1/14
Haul truck CAT 793XQ	662	115	116	119	28/1/14
Haul truck CAT 793XQ	663	115	116	119	8/8/13
Haul truck CAT 793XQ	664	115	114	117	8/8/13
Haul truck CAT 793XQ	665	115	115	118	28/1/14
Haul truck CAT 793XQ	666	115	116	118	28/1/14
Haul truck CAT 793XQ	667	115	115	118	28/1/14
Hitachi Excavator 1900	543	116	115	118	28/1/14
Grader	849	n/a	110	113	28/1/14
Warrior 2400 crusher	n/a	116	117	117	8/8/13
Kleeman screen	MCR401	116	111	112	8/8/13
Water Cart (Volvo)	863	113	114	118	28/1/14
Water Cart (Cat 773D)	869	113	119	123	28/1/14
Water Cart (Cat 773D)	869	113	117.5	119	24/4/14
Drill (Bucyrus)	524	116	107	-	28/1/14
Drill (Cat 6420)	526	116	108	-	28/1/14
Water pump (Dam 4)	--	--	106	--	24/4/14
Evaporation fan (Dam 4)	--	--	105	--	24/4/14

*Leq noise level from vehicle pass by only (modelled levels in the EA for LOM are based on an Leq (15 min) for an attenuated haul truck.

19 January 2015

Ref: 04035/5585

Werris Creek Coal
1435 Werris Creek – Quirindi Road
Werris Creek NSW 2341

RE: JANUARY 2015 NOISE MONITORING RESULTS – WERRIS CREEK MINE

This letter report presents the results of noise compliance monitoring conducted for the Werris Creek Coal Mine (WCC) on Thursday 15th of January, 2015 as required by the Noise Management Plan (NMP), Project Approval 10_0059 and the Environmental Protection Licence (EPL) 12290 and must be submitted to the Environment Protection Authority within 30 days of the completion of monitoring.

Attended Noise Monitoring Program

Noise monitoring was undertaken in accordance with the WCC Noise Monitoring Programme as detailed below in **Table 1** (as adapted from the NMP). The monitoring locations and noise criteria for each are detailed in **Appendices I** and **II**.

Table 1
WCC Attended Noise Monitoring Program

Monitoring Point	Duration	ID	Receiver	Relevant Monitoring Requirements
A	15 minutes[1]	R5	Rosehill	PA10_0059 Private Property outside NMZ
B	15 minutes[1]	R7*	83 Wadwells Lane	Private Agreement
		R8*	Almawillee	
		R9*	Gedhurst	
		R22*	Mountain View	
C	15 minutes[1]	R10*	Meadholme	Private Agreement
		R11*	Glenara	
D	60 minutes[2]	R24	Hazeldene	60 minutes as per EPL 12290
E	60 minutes[2]	R12	Quipolly Railway Cottage	60 minutes as per EPL 12290
F	60 minutes[2]	R96	Talavera	60 minutes as per EPL 12290
G	15 minutes[1]	R97		PA10_0059 Private Property outside NMZ
H	15 minutes[1]	R98*	Kyooma	Private Agreement
I	60 minutes[2]	R57	Kurrara Street@	60 minutes as per EPL 12290
J	15 minutes[1]		Coronation Avenue@	PA10_0059 Private Property outside NMZ
K	15 minutes[1]	R21*	Alco Park	Private Agreement
L	15 minutes[1]	R103		PA10_0059 Private Property outside NMZ

Notes accompanying the table are on the following page

* - WCC has a private agreement for noise impacts with these property owners

@ - Kurrara Street is representative of sensitive receptors in southern Werris Creek while Coronation Avenue is representative of sensitive receptors in central Werris Creek.

NMZ - Noise Management Zone of properties with project specific noise criteria between 35dB(A) and 40dB(A);

Note 1: For each monthly monitoring event a total of 15 minutes (per location) during the day period, and 15 (per location) during the evening or night period;

Note 2: For each monthly monitoring event a total of 60 minutes (per location) during the day period, and 60 minutes (per location) during the evening or night period.

EPL 12290 Condition L4.6 indicates that noise monitoring be conducted;

- Approximately on the property boundary, where any dwelling is situated 30m or less from the property boundary closest to the premises; or
- Within 30m of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30m from the property boundary closest to the premises; or, where applicable
- Within 50m of the boundary of a National Park or Nature Reserve.

EPL 12290 Condition L4.3 indicates that the relevant noise limits apply under all meteorological conditions except for the following;

1. Wind speeds greater than 3m/s at 10m above ground level; or
2. Temperature inversion conditions of up to 12°/100m and wind speeds greater than 2m/s at 10m above ground level; or
3. Temperature inversion conditions greater than 12°/100m.

To determine compliance with the Leq (15 min) operational noise criteria the modification factors detailed in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the measured noise levels.

To determine compliance with the L1 (1 min) sleep disturbance noise criterion the noise measurement equipment must be located within 1m of a dwelling façade.

Monitoring Equipment

Attended noise monitoring was conducted with Brüel & Kjær Type 2250 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 “Sound Level Meters” and have current NATA calibration. Field calibration is carried out at the start and end of each monitoring period.

A-weighted noise levels were measured over the appropriate monitoring periods (15 or 60 minutes) with data acquired at 1 or 2 second statistical intervals and the meter set to “fast” response. Each 1 or 2 second measurement is accompanied by a third-octave band spectrum from 20 - 20k Hz which is required for analysing INP ‘modifying factors’. Time based field notes allow for determination of the relative contributions to the overall noise level of all significant noise sources.

Measurement Analysis

The operational noise criteria for compliance with Condition L4.1 of EPL 12290 are based on a 15 minute Leq noise level. The procedures detailed in Condition M8.2 of EPL 12290 require noise monitoring for significantly longer periods than that of the compliance criteria. To determine compliance with the EPL conditions the worst case 15 minute period, in relation to mine noise, was extracted from each measurement and compared to the criteria in Condition L4.1.

This worst case 15 minute Leq noise level for each monitoring period is shown in the tables below. Where the noise from WCC was audible Bruel & Kjaer "*Evaluator*" analysis software was used to quantify the contributions of the mine and other significant noise sources to the overall level. Mine noise from WCC is shown in the tables in bold type. Where possible the significant audible noise sources from the mine are indicated in notes associated with the tables.

Where noise from WCC is listed as faintly audible, this means the noise levels from the mine were at least 10 dB below the ambient level during the measurement and not measurable.

All noise levels shown are in dB(A) Leq (15 min) unless otherwise shown.

When no mine noise was audible at a monitoring location during a one hour survey, a representative 15 minute noise measurement was made with observations carried out for the remainder of the applicable time period. In these instances, the measured noise level for the representative 15 minute period is that shown in the tables below.

Meteorological data used in this report were supplied by the mine from their automatic weather station M2 which is located on top of the overburden emplacement. Temperature inversion strength is extrapolated from gauges with 80m vertical separation.

WCC Operations

WCC night shift operations on Thursday 15th January 2015 had the 5600 excavator in Strip 15 west at RL370m; the 3600 in Strip 14 centre at RL310m and one 1900 excavator in Strip 14 west at RL310m and the other 1900 excavator in Strip 15 west at RL370m. The Strip 15 overburden truck fleets were running to the eastern RL420m dump while the Strip 14 overburden truck fleets were running to the in pit dump at RL340m. To manage operational noise levels, the OCE suspended a 1900 excavator (Strip 15 west) for 3.5 hours at 22:10; the 5600 excavator for 2.2 hours at 22:20; a 1900 excavator (Strip 14 west) for 1.2 hours at 00:50 and the 3600 excavator for 1.6 hours at 01:05. All six CAT785 trucks were suspended from 22:35. In addition, the Coal Processing Plant and road trucks plus the Train Load Out dozers were suspended for 2 hours from 1:10am to further manage noise levels. The Mining Production, Coal Processing and Train Load Out operated to 2:10am with no trains loaded.

Noise Compliance Assessment

The results of the noise measurements are shown below in **Tables 2** and **3**.

Table 2
WCC Noise Monitoring Results – 15 January 2015 (Day)

Location	Time	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m	Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	1:27 pm	38	35	n/a	1.5,225	Birds & insects (38), traffic (25), WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	1:47 pm	42	40*	n/a	2.1,282	Birds & insects (42), WCC (23)
C R10 Meadholme/ R11 Glenara	2:06 pm	46	40*	n/a	1.1,72	Birds & insects (46), traffic (24), WCC faintly audible
D R24 Hazeldene	2:26 pm	53	37	n/a	1.8,259	Birds & insects (53), wind (29), traffic (26), WCC faintly audible
E R12 Railway Cottage	4:02 pm	46	38	n/a	3.4,257	Birds & insects (45), traffic (40), WCC inaudible
F R96 Talavera	4:09 pm	34	38	n/a	3.3,254	Birds (33), wind (26), WCC inaudible
G R97	3:36 pm	37	35	n/a	1.3,252	Birds & insects (37), WCC (26)
H R98 Kyooma	3:43 pm	36	40*	n/a	1.7,290	Birds (36), wind (24), WCC faintly audible
I R57 Kurrara St	2:12 pm	41	35	n/a	2.2,281	Birds (40), traffic (32), wind (29), WCC inaudible
J R57 Coronation Ave	3:17 pm	48	35	n/a	0.9,210	Birds & insects (47), traffic (39), wind (32), WCC inaudible
K R21 Alco Park	1:51 pm	39	40*	n/a	1.9,263	Birds & insects (35), traffic (34), dogs (31), lawn mower (29), WCC faintly audible
L R103	1:31 pm	41	35	n/a	1.5,225	Train yard (40), birds & insects (31), traffic (26), WCC inaudible

* Private Agreement in place – see Appendix II.

Table 3
WCC Noise Monitoring Results – 15 January 2015 (Evening/Night)

Location	Time	dB(A), L1 (1min)[1]	dB(A), Leq	Criterion dB(A) Leq	Inversion °C/100m, Wind speed (m/s),dir°	Identified Noise Sources
A R5 Rosehill	7:59 pm	n/a	35	35	+1.8,3.1,217	Birds & insects (34), traffic (29), WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	8:20 pm	n/a	51	40*	+3.1,3.0,223	Birds & insects (51), traffic (26), WCC inaudible
C R10 Meadholme/ R11 Glenara	8:40 pm	n/a	42	40*	+4.4,3.5215	Birds & insects (42), traffic (29), WCC inaudible
D R24 Hazeldene	8:59 pm	n/a	47	37	+5.3,2.5,188	Insects (47), traffic (33), domestic (23), WCC inaudible
E R12 Railway Cottage	10:06 pm	n/a	43	38	+5.6,1.7,169	Traffic (41), frogs & insects (38), WCC inaudible
F R96 Talavera	10:14 pm	34	33	37	+5.8,1.6,171	Frogs & insects (31), WCC (28)
G R97	7:30 pm	31	46	35	+0.7,3.0,245	Insects (46), WCC (27)
H R98 Kyooma	9:48 pm	40	39	40*	+5.5,3.1,222	WCC (37), frogs & insects (34)
I R57 Kurrara St	8:19 pm	n/a	41	35	+4.1,3.3,216	Frogs & insects (37), train yard (37), traffic (32), WCC inaudible
J R57 Coronation Ave	9:23 pm	n/a	36	35	+5.3,2.3,189	Traffic (32), train yard (30), dogs (30), insects (26), WCC inaudible
K R21 Alco Park	7:58 pm	n/a	50	40*	+1.8,3.1,217	Trains (48), traffic (42), birds & insects (41), WCC inaudible
L R103	7:38 pm	n/a	43	35	+1.0,3.0,238	Birds (43), train yard (32), WCC inaudible

1. L1 (1 min) from mine noise only
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The results in Tables 2 and 3 indicate that, under the operational and atmospheric conditions at the time, the measured noise levels did not exceed the relevant noise criteria at any location during any monitoring period.

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the distance between the operational noise monitoring location and the sleep disturbance monitoring location (i.e. 1m from the facade of the house) there will be little variation in L1 (1 min) levels between the two monitoring locations. It must be noted, however, that the sleep disturbance criterion is to be measured near a bedroom window. As the internal layout of each residence is not known, to consider a worst case, this is assumed to be facing towards the mine.

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We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,
SPECTRUM ACOUSTICS PTY LIMITED

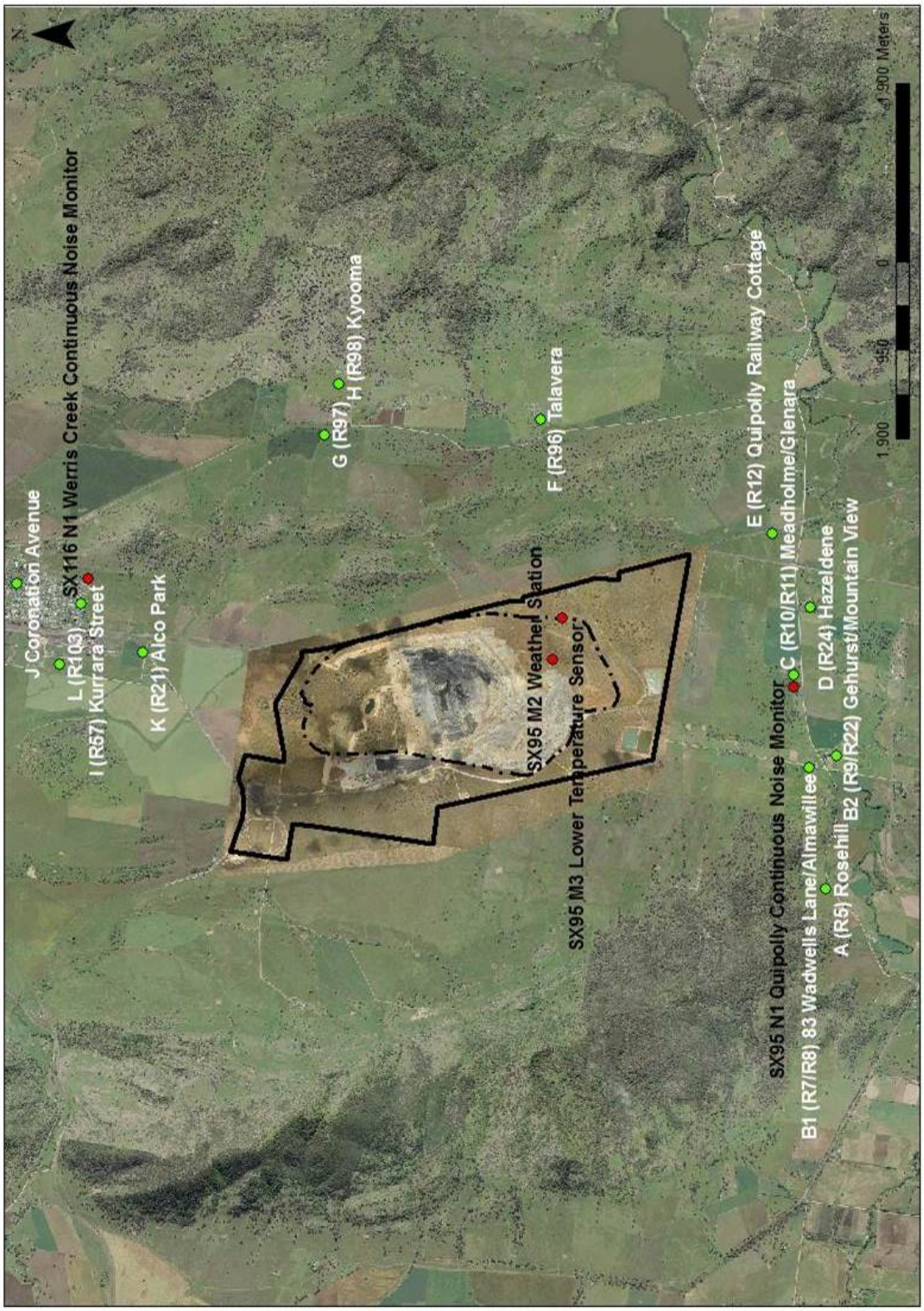
Author:

Ross Hodge
Acoustical Consultant

Review:

Neil Pennington
Acoustical Consultant

Appendix I



Attended Noise Monitoring Locations

Appendix II

Noise Limits

LOM Project Revised Noise Criteria

Location		Day $L_{Aeq,15minute}$	Evening/Night $L_{Aeq,15minute}$	Night $L_{A1(1min)}$	Long Term $L_{Aeq,15minute}$	Acquisition $L_{Aeq,15minute}$
R12	"Quipolly Railway Cottage"	38	38	45	35	40
R24	"Hazeldene"	37	37	45	35	40
R96	"Talavera"#	38	37	45	35	40
All other privately-owned land		35	35	45	35	40

"Talavera" property was listed in the EA under its previous property name of "Millbank"

Table 21: Properties with Private Agreements Noise Criteria

Location		Noise Works Criteria dB(A) Leq	Noise Acquisition Criteria dB(A) Leq
R7	83 Wadwells Lane	40	45
R8	"Almawillee"	40	45
R9	"Gedhurst"	40	45
R10	"Meadholme"	40	45
R11	"Glenara"	40	45
R20	"Tonsley Park"	40	45
R21	"Alco Park"	40	45
R22	"Mountain View"	40	45
R98	"Kyooma"	40	45

Appendix III

Plant Sound Power Levels

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Haul truck CAT 785C (unattenuated)	608	117.7	120	122	17/7/12
Haul truck CAT 785C (attenuated)	608	117.7	116.7	118	24/4/14
Haul truck CAT 785C (unattenuated)	614	117.7	119	121	28/1/14
Haul truck CAT 785C (attenuated)	614	117.7	117.5	119	24/4/14
Haul truck CAT 785C (unattenuated)	609	117.7	120		11/9/12
Haul truck CAT 785C (attenuated)	609	117.7	117.4	119	11/9/12
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Haul truck CAT 785C (unattenuated)	624	117.7	121		8/8/13
Haul truck CAT 785C (attenuated)	624	117.7	118.1		24/4/14
Haul truck CAT 789 (unattenuated)	875	117.7	119	121	28/1/14
Water Cart	WA897	113	113		11/9/12
Scraper	SC882	118	113		11/9/12
Excavator (PC 3600)	EX551	116	115		11/9/12
Dozer	829	118	115		24/4/14
Dozer (D10T)	832	118	113	118	28/1/14
Crushing Plant	n/a	116	118		11/9/12
Haul truck CAT 785C Horn pre attenuation	608	117.7		129	17/7/12
Haul truck Cat 785C Horn post attenuation	608	117.7		124	11/9/12
Excavator (PC4000)	EX837	116	115		18/12/12
Dozer D10T (1^{st} gear)	505	118	113 109	128 121	18/12/12
Dozer D10T on stockpile (2^{nd} gear) (1^{st} gear)	505	118	118 109	124 113	6/2/13
Dozer D9T on stockpile (2^{nd} gear) (1^{st} gear)	501	118	119 113	122 118	6/2/13

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Excavator (EX 5600)	570	121	116	119	28/1/14
Haul truck CAT 793XQ	660	115	116	119	28/1/14
Haul truck CAT 793XQ	661	115	115	118	28/1/14
Haul truck CAT 793XQ	662	115	116	119	28/1/14
Haul truck CAT 793XQ	663	115	116	119	8/8/13
Haul truck CAT 793XQ	664	115	114	117	8/8/13
Haul truck CAT 793XQ	665	115	115	118	28/1/14
Haul truck CAT 793XQ	666	115	116	118	28/1/14
Haul truck CAT 793XQ	667	115	115	118	28/1/14
Hitachi Excavator 1900	543	116	115	118	28/1/14
Grader	849	n/a	110	113	28/1/14
Warrior 2400 crusher	n/a	116	117	117	8/8/13
Kleeman screen	MCR401	116	111	112	8/8/13
Water Cart (Volvo)	863	113	114	118	28/1/14
Water Cart (Cat 773D)	869	113	119	123	28/1/14
Water Cart (Cat 773D)	869	113	117.5	119	24/4/14
Drill (Bucyrus)	524	116	107	-	28/1/14
Drill (Cat 6420)	526	116	108	-	28/1/14
Water pump (Dam 4)	--	--	106	--	24/4/14
Evaporation fan (Dam 4)	--	--	105	--	24/4/14

*Leq noise level from vehicle pass by only (modelled levels in the EA for LOM are based on an Leq (15 min) for an attenuated haul truck.

17 July 2014

Ref: 04035/5272

Werris Creek Coal
1435 Werris Creek – Quirindi Road
Werris Creek NSW 2341

RE: JULY 2014 NOISE MONITORING RESULTS – WERRIS CREEK MINE

This letter report presents the results of noise compliance monitoring conducted for the Werris Creek Coal Mine (WCC) on Tuesday 8th July, 2014 as required by the Noise Management Plan (NMP), Project Approval 10_0059 and the Environmental Protection Licence (EPL) 12290 and must be submitted to the Environment Protection Authority within 30 days of the completion of monitoring.

Attended Noise Monitoring Program

Noise monitoring was undertaken in accordance with the WCC Noise Monitoring Programme as detailed below in **Table 1** (as adapted from the NMP). The monitoring locations and noise criteria for each are detailed in **Appendices I** and **II**.

Table 1
WCC Attended Noise Monitoring Program

Monitoring Point	Duration	ID	Receiver	Relevant Monitoring Requirements
A	15 minutes[1]	R5	Rosehill	PA10_0059 Private Property outside NMZ
B	15 minutes[1]	R7*	83 Wadwells Lane	Private Agreement
		R8*	Almawillee	
		R9*	Gedhurst	
		R22*	Mountain View	
C	15 minutes[1]	R10*	Meadholme	Private Agreement
		R11*	Glenara	
D	60 minutes[2]	R24	Hazeldene	60 minutes as per EPL 12290
E	60 minutes[2]	R12	Quipolly Railway Cottage	60 minutes as per EPL 12290
F	60 minutes[2]	R96	Talavera	60 minutes as per EPL 12290
G	15 minutes[1]	R97		PA10_0059 Private Property outside NMZ
H	15 minutes[1]	R98*	Kyooma	Private Agreement
I	60 minutes[2]	R57	Kurrara Street@	60 minutes as per EPL 12290
J	15 minutes[1]		Coronation Avenue@	PA10_0059 Private Property outside NMZ
K	15 minutes[1]	R21*	Alco Park	Private Agreement
L	15 minutes[1]	R103		PA10_0059 Private Property outside NMZ

Notes accompanying the table are on the following page

* - WCC has a private agreement for noise impacts with these property owners

@ - Kurrara Street is representative of sensitive receptors in southern Werris Creek while Coronation Avenue is representative of sensitive receptors in central Werris Creek.

NMZ - Noise Management Zone of properties with project specific noise criteria between 35dB(A) and 40dB(A);

Note 1: For each monthly monitoring event a total of 15 minutes (per location) during the day period, and 15 (per location) during the evening or night period;

Note 2: For each monthly monitoring event a total of 60 minutes (per location) during the day period, and 60 minutes (per location) during the evening or night period.

EPL 12290 Condition L4.6 indicates that noise monitoring be conducted;

- Approximately on the property boundary, where any dwelling is situated 30m or less from the property boundary closest to the premises; or
- Within 30m of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30m from the property boundary closest to the premises; or, where applicable
- Within 50m of the boundary of a National Park or Nature Reserve.

EPL 12290 Condition L4.3 indicates that the relevant noise limits apply under all meteorological conditions except for the following;

1. Wind speeds greater than 3m/s at 10m above ground level; or
2. Temperature inversion conditions of up to 12°/100m and wind speeds greater than 2m/s at 10m above ground level; or
3. Temperature inversion conditions greater than 12°/100m.

To determine compliance with the Leq (15 min) operational noise criteria the modification factors detailed in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the measured noise levels.

To determine compliance with the L1 (1 min) sleep disturbance noise criterion the noise measurement equipment must be located within 1m of a dwelling façade.

Monitoring Equipment

Attended noise monitoring was conducted with Brüel & Kjær Type 2250 and 2260 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 “Sound Level Meters” and have current NATA calibration. Field calibration is carried out at the start and end of each monitoring period.

A-weighted noise levels were measured over the appropriate monitoring periods (15 or 60 minutes) with data acquired at 1 or 2 second statistical intervals and the meter set to “fast” response. Each 1 or 2 second measurement is accompanied by a third-octave band spectrum from 20 - 20k Hz which is required for analysing INP ‘modifying factors’. Time based field notes allow for determination of the relative contributions to the overall noise level of all significant noise sources.

Measurement Analysis

The operational noise criteria for compliance with Condition L4.1 of EPL 12290 are based on a 15 minute Leq noise level. The procedures detailed in Condition M8.2 of EPL 12290 require noise monitoring for significantly longer periods than that of the compliance criteria. To determine compliance with the EPL conditions the worst case 15 minute period, in relation to mine noise, was extracted from each measurement and compared to the criteria in Condition L4.1.

This worst case 15 minute Leq noise level for each monitoring period is shown in the tables below. Where the noise from WCC was audible Bruel & Kjaer "*Evaluator*" analysis software was used to quantify the contributions of the mine and other significant noise sources to the overall level. Mine noise from WCC is shown in the tables in bold type. Where noise from WCC is listed as faintly audible, this means the noise levels from the mine were at least 10 dB below the ambient level during the measurement and not measurable.

All noise levels shown are in dB(A) Leq (15 min) unless otherwise shown.

When no mine noise was audible at a monitoring location during a one hour survey, a representative 15 minute noise measurement was made with observations carried out for the remainder of the applicable time period. In these instances, the measured noise level for the representative 15 minute period is that shown in the tables below.

Meteorological data used in this report were supplied by the mine from their automatic weather station M2 which is located on top of the overburden emplacement. Temperature inversion strength is extrapolated from gauges with 80m vertical separation.

WCC Operations

WCC operations on Tuesday 8th July 2014 had the 5600 excavator and two 1900 excavators in Strip 15 at RL370m and the 3600 excavator in Strip 13 west at RL290m. The Strip 13 overburden truck fleet was running to the in pit dump at RL360m while the Strip 15 overburden truck fleets were running to either the out of pit RL410 or RL430 dumps on day and night shift. There were no production delays either day or night shift but the OCE modified the night dump location from RL430m to RL410m to manage noise levels to Quipolly after midnight. The crushing plant and train load out operated to 2:30am with no trains loaded.

Noise Compliance Assessment

The results of the noise measurements are shown below in **Tables 2** and **3**.

Table 2
WCC Noise Monitoring Results – 8 July 2014 (Day)

Location	Time	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m	Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	1:08 pm	33	35	n/a	1.7,297	Traffic (30), birds (30), WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	1:30 pm	44	40*	n/a	1.9,313	Birds (44), WCC faintly audible
C R10 Meadholme/ R11 Glenara	1:52 pm	44	40*	n/a	1.5,300	Birds (44), traffic (27), WCC inaudible
D R24 Hazeldene	2:12 pm	36	37	n/a	1.3,317	Birds (35), traffic (29), WCC (23)
E R12 Railway Cottage	3:49 pm	44	38	n/a	2.4,308	Traffic (44), birds (28), WCC inaudible
F R96 Talavera	3:34 pm	31	38	n/a	2.1,319	Birds (29), domestic (25), traffic (24), WCC inaudible
G R97	3:23 pm	27	35	n/a	1.3,329	Planes (25), WCC (22)
H R98 Kyooma	3:11 pm	30	40*	n/a	1.1,342	Birds (27), traffic (24), wind (24), WCC inaudible
I R57 Kurrara St	1:43 pm	44	35	n/a	1.5,297	Traffic (43), trains (34), birds (32), WCC inaudible
J R57 Coronation Ave	2:47 pm	52	35	n/a	1.2,328	Traffic (52), birds (30), domestic (28), WCC inaudible
K R21 Alco Park	1:22 pm	42	40*	n/a	1.8,302	Domestic power tools (41), traffic (35), WCC inaudible
L R103	1:03 pm	35	35	n/a	1.8,305	Trains (34), traffic (28), WCC inaudible

* Private Agreement in place – see Appendix II.

Table 3
WCC Noise Monitoring Results – 8 July 2014 (Evening/Night)

Location	Time	dB(A), L1 (1min)[1]	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m, Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	6:30 pm	n/a	35	35	+8.8,1.3,344	Traffic (35), WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	6:50 pm	31	36	40*	+10.0,1.3,332	Traffic (35), WCC (28)
C R10 Meadholme/ R11 Glenara	7:10 pm	n/a	33	40*	+10.3,0.5,50	Traffic (31), WCC (28)
D R24 Hazeldene	7:33 pm	34	51	37	+10.2,0.5,311	Traffic (51), WCC (27)
E R12 Railway Cottage	9:12 pm	28	45	38	+10.4,1.4,328	Traffic (45), WCC (33)
F R96 Talavera	9:07 pm	30	33	37	+10.5,1.4,324	Traffic (31), WCC (28)
G R97	8:46 pm	26	25	35	+10.7,1.7,302	Trains (25), WCC inaudible
H R98 Kyooma	8:40 pm	34	25	40*	+10.5,1.3,293	Traffic (23), WCC (21)
I R57 Kurrara St	7:11 pm	n/a	44	35	+10.4,0.5,40	Traffic (42), trains (40), WCC inaudible
J R57 Coronation Ave	8:15 pm	n/a	48	35	+10.0,0.5,303	Traffic (48), dogs (31), trains (30), WCC inaudible
K R21 Alco Park	6:50 pm	n/a	51	40*	+10.0,1.3,332	Traffic (51), trains (38), WCC inaudible
L R103	6:29 pm	n/a	42	35	+8.8,1.3,344	Traffic (41), trains (36), WCC inaudible

1. L1 (1 min) from mine noise only
* Private Agreement in place – see Appendix II.

The results in Tables 2 and 3 indicate that, under the operational and atmospheric conditions at the time, the measured noise levels did not exceed the relevant noise criteria at any location during any monitoring period.

Data from those times where WCC operations were audible were analysed using the *"Evaluator"* software. This analysis showed the noise did not contain any tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

In addition to the operational noise, the noise from WCC must not exceed **45 dB(A) L1 (1 min)** between the hours of 10 pm and 7 am. This is to minimise the potential for sleep disturbance as a result of individual loud noises from the mine. The compliance measurement locations are different for each of the operational and sleep disturbance noise. That is, the sleep disturbance criterion is typically applicable at 1m from the façade of a bedroom window.

To avoid undue disturbance to residents the L1 (1 min) noise level from the operational measurements are used to show general compliance with the sleep disturbance criterion. That is, as the distance between the noise source and the operational noise monitoring location is significantly greater than the distance between the operational noise monitoring location and the sleep disturbance monitoring location (i.e. 1m from the facade of the house) there will be little variation in L1 (1 min) levels between the two monitoring locations. It must be noted, however, that the sleep disturbance criterion is to be measured near a bedroom window. As the internal layout of each residence is not known, to consider a worst case, this is assumed to be facing the operational noise monitoring location.

As shown in Table 3, during the night time measurement circuit the L1 (1 min) noise from WCC did not exceed 45 dB(A) at any monitoring location.

Plant Sound Power Levels

In keeping with the NMP, the sound power levels of the major noise producing plant and equipment operating on the WCC site is to be determined from sound pressure level measurements. The measurement programme is to be undertaken progressively to capture noise levels from all plant over the period of a year.

The results of the sound power level calculations to date are shown in **Appendix III**. The table in Appendix III lists SWL's for plant items as taken from those used in the noise modelling for the latest EA for WCM. The SWL's from the EA, therefore, represent a calculated Leq (15 minute) noise level. For mobile plant this calculation is based on the length of time each noise source representing a plant item(s) is at a particular location on the mine site.

For example the noise model includes a number of noise sources located at intervals along the various haul roads to approximate the haul fleet working throughout a 15 minute operational period. The SWL for the point source is calculated based on the length of time any truck is expected to be passing that location during the assessment period.

For mobile plant, the measured Leq noise levels in the table in Appendix III represent a single passby for each plant item whereas the values adopted in the EA (particularly for haul trucks) are for the 15-

minute calculated sound power level of 350m long sections of haul road. These values are typically 7-10 dB lower than the single pass-by level.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,
SPECTRUM ACOUSTICS PTY LIMITED

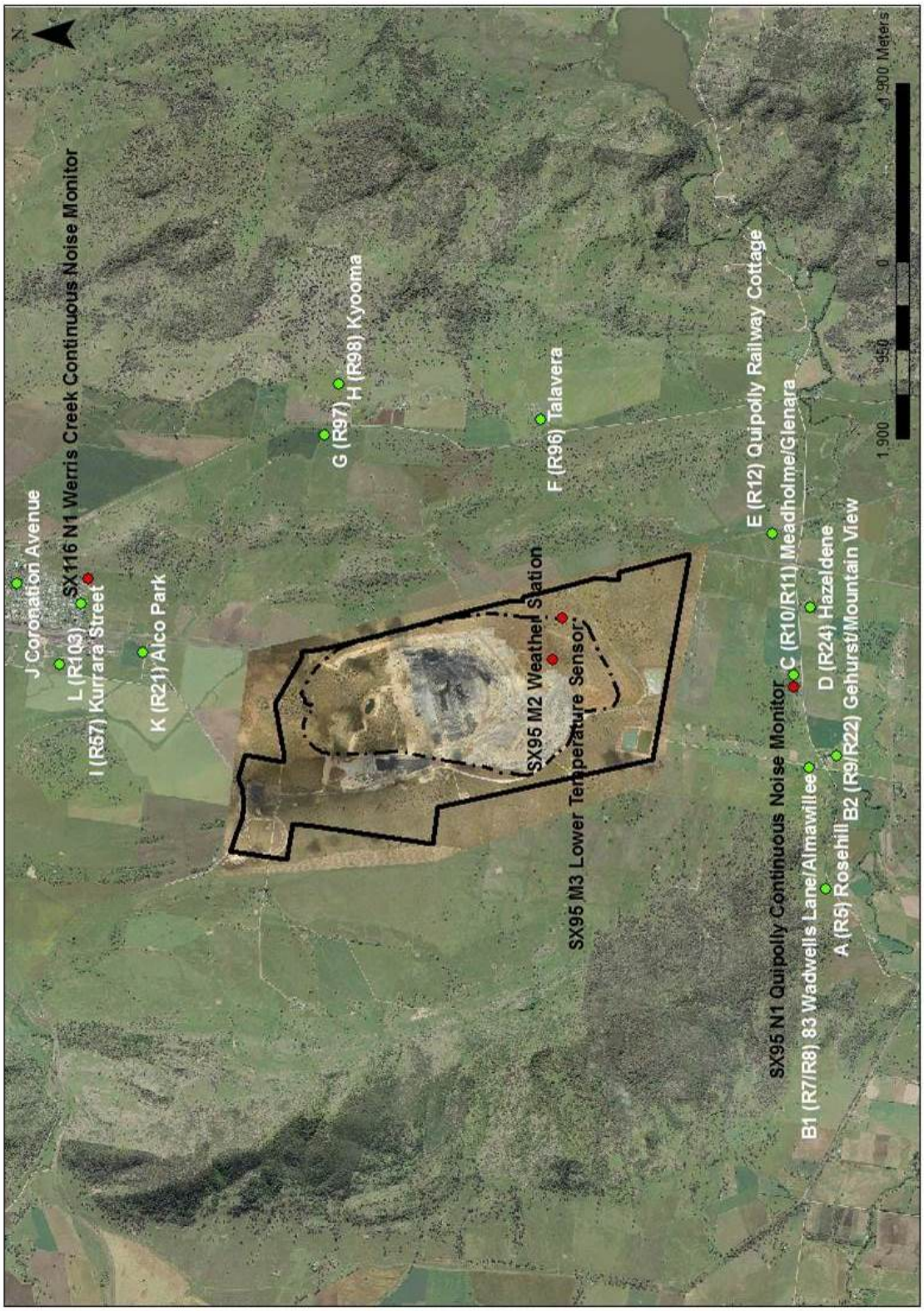
Author:

Ross Hodge
Acoustical Consultant

Review:

Neil Pennington
Acoustical Consultant

Appendix I



Attended Noise Monitoring Locations

Appendix II

Noise Limits

LOM Project Revised Noise Criteria

Location		Day $L_{Aeq,15minute}$	Evening/Night $L_{Aeq,15minute}$	Night $L_{A1(1min)}$	Long Term $L_{Aeq,15minute}$	Acquisition $L_{Aeq,15minute}$
R12	"Quipolly Railway Cottage"	38	38	45	35	40
R24	"Hazeldene"	37	37	45	35	40
R96	"Talavera"#	38	37	45	35	40
All other privately-owned land		35	35	45	35	40

"Talavera" property was listed in the EA under its previous property name of "Millbank"

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R11	"Glenara"	40	45
R20	"Tonsley Park"	40	45
R21	"Alco Park"	40	45
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R98	"Kyooma"	40	45

Appendix III

Plant Sound Power Levels

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
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Haul truck CAT 785C (attenuated)	614	117.7	117.5	119	24/4/14
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Excavator (PC4000)	EX837	116	115		18/12/12
Dozer D10T (1^{st} gear)	505	118	113 109	128 121	18/12/12
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1 July 2014

Ref: 04035/5261

Werris Creek Coal
1435 Werris Creek – Quirindi Road
Werris Creek NSW 2341

RE: JUNE 2014 NOISE MONITORING RESULTS – WERRIS CREEK MINE

This letter report presents the results of noise compliance monitoring conducted for the Werris Creek Coal Mine (WCC) on Tuesday 17th June, 2014 as required by the Noise Management Plan (NMP), Project Approval 10_0059 and the Environmental Protection Licence (EPL) 12290 and must be submitted to the Environment Protection Authority within 30 days of the completion of monitoring.

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		R22*	Mountain View	
C	15 minutes[1]	R10*	Meadholme	Private Agreement
		R11*	Glenara	
D	60 minutes[2]	R24	Hazeldene	60 minutes as per EPL 12290
E	60 minutes[2]	R12	Quipolly Railway Cottage	60 minutes as per EPL 12290
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H	15 minutes[1]	R98*	Kyooma	Private Agreement
I	60 minutes[2]	R57	Kurrara Street@	60 minutes as per EPL 12290
J	15 minutes[1]		Coronation Avenue@	PA10_0059 Private Property outside NMZ
K	15 minutes[1]	R21*	Alco Park	Private Agreement
L	15 minutes[1]	R103		PA10_0059 Private Property outside NMZ

Notes accompanying the table are on the following page

* - WCC has a private agreement for noise impacts with these property owners

@ - Kurrara Street is representative of sensitive receptors in southern Werris Creek while Coronation Avenue is representative of sensitive receptors in central Werris Creek.

NMZ - Noise Management Zone of properties with project specific noise criteria between 35dB(A) and 40dB(A);

Note 1: For each monthly monitoring event a total of 15 minutes (per location) during the day period, and 15 (per location) during the evening or night period;

Note 2: For each monthly monitoring event a total of 60 minutes (per location) during the day period, and 60 minutes (per location) during the evening or night period.

EPL 12290 Condition L4.6 indicates that noise monitoring be conducted;

- Approximately on the property boundary, where any dwelling is situated 30m or less from the property boundary closest to the premises; or
- Within 30m of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30m from the property boundary closest to the premises; or, where applicable
- Within 50m of the boundary of a National Park or Nature Reserve.

EPL 12290 Condition L4.3 indicates that the relevant noise limits apply under all meteorological conditions except for the following;

1. Wind speeds greater than 3m/s at 10m above ground level; or
2. Temperature inversion conditions of up to 12°/100m and wind speeds greater than 2m/s at 10m above ground level; or
3. Temperature inversion conditions greater than 12°/100m.

To determine compliance with the Leq (15 min) operational noise criteria the modification factors detailed in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the measured noise levels.

To determine compliance with the L1 (1 min) sleep disturbance noise criterion the noise measurement equipment must be located within 1m of a dwelling façade.

Monitoring Equipment

Attended noise monitoring was conducted with Brüel & Kjær Type 2250 and 2260 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 “Sound Level Meters” and have current NATA calibration. Field calibration is carried out at the start and end of each monitoring period.

A-weighted noise levels were measured over the appropriate monitoring periods (15 or 60 minutes) with data acquired at 1 or 2 second statistical intervals and the meter set to “fast” response. Each 1 or 2 second measurement is accompanied by a third-octave band spectrum from 20 - 20k Hz which is required for analysing INP ‘modifying factors’. Time based field notes allow for determination of the relative contributions to the overall noise level of all significant noise sources.

Measurement Analysis

The operational noise criteria for compliance with Condition L4.1 of EPL 12290 are based on a 15 minute Leq noise level. The procedures detailed in Condition M8.2 of EPL 12290 require noise monitoring for significantly longer periods than that of the compliance criteria. To determine compliance with the EPL conditions the worst case 15 minute period, in relation to mine noise, was extracted from each measurement and compared to the criteria in Condition L4.1.

This worst case 15 minute Leq noise level for each monitoring period is shown in the tables below. Where the noise from WCC was audible Bruel & Kjaer "*Evaluator*" analysis software was used to quantify the contributions of the mine and other significant noise sources to the overall level. Mine noise from WCC is shown in the tables in bold type. Where noise from WCC is listed as faintly audible, this means the noise levels from the mine were at least 10 dB below the ambient level during the measurement and not measurable.

All noise levels shown are in dB(A) Leq (15 min) unless otherwise shown.

When no mine noise was audible at a monitoring location during a one hour survey, a representative 15 minute noise measurement was made with observations carried out for the remainder of the applicable time period. In these instances, the measured noise level for the representative 15 minute period is that shown in the tables below.

Meteorological data used in this report were supplied by the mine from their automatic weather station M2 which is located on top of the overburden emplacement. Temperature inversion strength is extrapolated from gauges with 80m vertical separation.

WCC Operations

WCC operations on Tuesday 17th June 2014 had the 5600 excavator and one 1900 excavator in Strip 13 west at RL270m; 3600 excavator and one 1900 excavator in Strip 13 centre at RL260m. The Strip 13 overburden truck fleets were either running to the in pit dump at RL360m or out of pit RL410 dump on day and night shift. There were no production delays either day or night shift. The crushing plant and train load out operated to 3:30am with no trains loaded.

Noise Compliance Assessment

The results of the noise measurements are shown below in **Tables 2** and **3**.

Table 2
WCC Noise Monitoring Results – 17 June 2014 (Day)

Location	Time	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m	Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	1:43 pm	33	35	n/a	3.4,139	Traffic (31), birds (27), WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	2:04 pm	42	40*	n/a	2.4,151	Birds (42), traffic (29), WCC inaudible
C R10 Meadholme/ R11 Glenara	2:28 pm	35	40*	n/a	2.8,164	Birds (35), traffic (23), WCC inaudible
D R24 Hazeldene	2:50 pm	38	37	n/a	2.7,169	Birds (37), traffic (31), WCC inaudible
E R12 Railway Cottage	4:26 pm	40	38	n/a	0.4,164	Birds (38), traffic (36), WCC inaudible
F R96 Talavera	4:18 pm	41	38	n/a	0.6,167	Birds (41), traffic (30), WCC inaudible
G R97	4:00 pm	30	35	n/a	1.7,163	Birds (29), traffic (22), WCC faintly audible
H R98 Kyooma	3:56 pm	30	40*	n/a	1.7,163	Birds (29), traffic (23), WCC faintly audible
I R57 Kurrara St	2:24 pm	50	35	n/a	2.7,168	Traffic (50), trains (28), birds (25), WCC inaudible
J R57 Coronation Ave	3:30 pm	50	35	n/a	2.9,167	Traffic (50), trains (31), birds (28), WCC inaudible
K R21 Alco Park	2:03 pm	33	40*	n/a	2.4,151	Traffic (31), WCC (29)
L R103	1:43 pm	36	35	n/a	3.4,139	Trains (35), birds (28), WCC (25)

* Private Agreement in place – see Appendix II.

Table 3
WCC Noise Monitoring Results – 17 June 2014 (Evening/Night)

Location	Time	dB(A), L1 (1min)[1]	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m, Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	6:45 pm	n/a	33	35	+8.8,1.6,344	Traffic (33), WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	7:06 pm	31	35	40*	+7.4,0.9,341	Traffic (34), WCC (27)
C R10 Meadholme/ R11 Glenara	7:26 pm	n/a	35	40*	+8.6,0.9,337	Traffic (35), WCC inaudible
D R24 Hazeldene	7:46 pm	34	47	37	+8.4,0.9,330	Traffic (47), WCC (30)
E R12 Railway Cottage	9:31 pm	28	37	38	+9.8,0.9,336	Traffic (37), WCC (25)
F R96 Talavera	9:17 pm	30	32	37	+9.6,1.0,334	Traffic (31), WCC (26)
G R97	8:57 pm	26	27	35	+8.4,0.8,328	Traffic (25), WCC (22)
H R98 Kyooma	8:53 pm	34	31	40*	+8.4,0.8,328	WCC (29), traffic (26)
I R57 Kurrara St	7:27 pm	n/a	52	35	+8.6,0.9,333	Trains (52), traffic (36), WCC inaudible
J R57 Coronation Ave	8:32 pm	n/a	52	35	+7.6,0.9,333	Trains (52), traffic (34), WCC inaudible
K R21 Alco Park	7:06 pm	n/a	45	40*	+7.4,0.9,341	Trains (43), traffic (40), WCC inaudible
L R103	6:46 pm	n/a	39	35	+8.8,1.6,344	Trains (37), traffic (34), WCC inaudible

1. L1 (1 min) from mine noise only
* Private Agreement in place – see Appendix II.

The results in Tables 2 and 3 indicate that, under the operational and atmospheric conditions at the time, the measured noise levels did not exceed the relevant noise criteria at any location during any monitoring period.

Data from those times where WCC operations were audible were analysed using the *"Evaluator"* software. This analysis showed the noise did not contain any tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

In addition to the operational noise, the noise from WCC must not exceed **45 dB(A) L1 (1 min)** between the hours of 10 pm and 7 am. This is to minimise the potential for sleep disturbance as a result of individual loud noises from the mine. The compliance measurement locations are different for each of the operational and sleep disturbance noise. That is, the sleep disturbance criterion is typically applicable at 1m from the façade of a bedroom window.

To avoid undue disturbance to residents the L1 (1 min) noise level from the operational measurements are used to show general compliance with the sleep disturbance criterion. That is, as the distance between the noise source and the operational noise monitoring location is significantly greater than the distance between the operational noise monitoring location and the sleep disturbance monitoring location (i.e. 1m from the facade of the house) there will be little variation in L1 (1 min) levels between the two monitoring locations. It must be noted, however, that the sleep disturbance criterion is to be measured near a bedroom window. As the internal layout of each residence is not known, to consider a worst case, this is assumed to be facing the operational noise monitoring location.

As shown in Table 3, during the night time measurement circuit the L1 (1 min) noise from WCC did not exceed 45 dB(A) at any monitoring location.

Plant Sound Power Levels

In keeping with the NMP, the sound power levels of the major noise producing plant and equipment operating on the WCC site is to be determined from sound pressure level measurements. The measurement programme is to be undertaken progressively to capture noise levels from all plant over the period of a year.

The results of the sound power level calculations to date are shown in **Appendix III**. The table in Appendix III lists SWL's for plant items as taken from those used in the noise modelling for the latest EA for WCM. The SWL's from the EA, therefore, represent a calculated Leq (15 minute) noise level. For mobile plant this calculation is based on the length of time each noise source representing a plant item(s) is at a particular location on the mine site.

For example the noise model includes a number of noise sources located at intervals along the various haul roads to approximate the haul fleet working throughout a 15 minute operational period. The SWL for the point source is calculated based on the length of time any truck is expected to be passing that location during the assessment period.

For mobile plant, the measured Leq noise levels in the table in Appendix III represent a single passby for each plant item whereas the values adopted in the EA (particularly for haul trucks) are for the 15-

minute calculated sound power level of 350m long sections of haul road. These values are typically 7-10 dB lower than the single pass-by level.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,
SPECTRUM ACOUSTICS PTY LIMITED

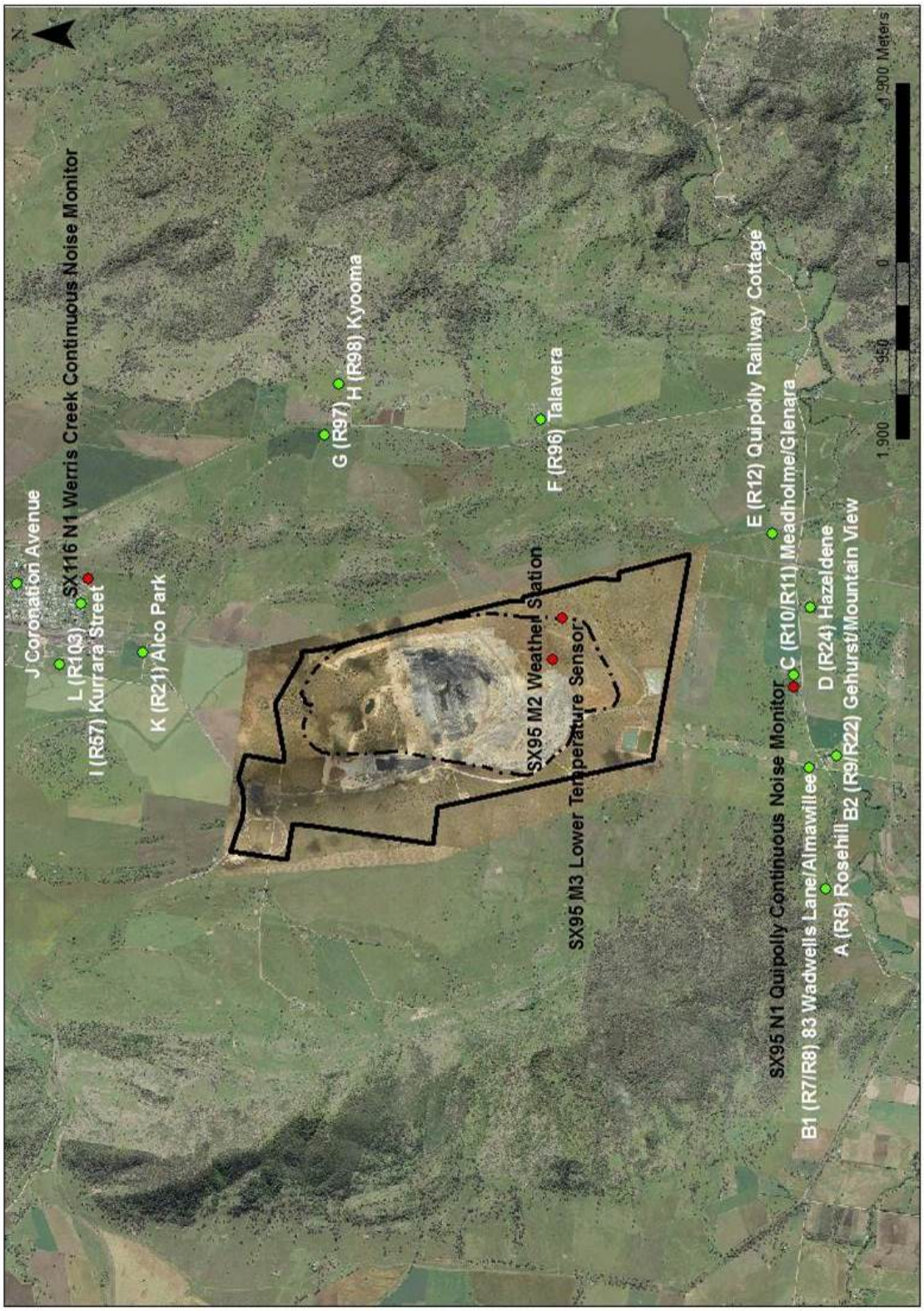
Author:

Ross Hodge
Acoustical Consultant

Review:

Neil Pennington
Acoustical Consultant

Appendix I



Attended Noise Monitoring Locations

Appendix II

Noise Limits

LOM Project Revised Noise Criteria

Location		Day $L_{Aeq,15minute}$	Evening/Night $L_{Aeq,15minute}$	Night $L_{A1(1min)}$	Long Term $L_{Aeq,15minute}$	Acquisition $L_{Aeq,15minute}$
R12	"Quipolly Railway Cottage"	38	38	45	35	40
R24	"Hazeldene"	37	37	45	35	40
R96	"Talavera"#	38	37	45	35	40
All other privately-owned land		35	35	45	35	40

"Talavera" property was listed in the EA under its previous property name of "Millbank"

Table 21: Properties with Private Agreements Noise Criteria

Location		Noise Works Criteria dB(A) Leq	Noise Acquisition Criteria dB(A) Leq
R7	83 Wadwells Lane	40	45
R8	"Almawillee"	40	45
R9	"Gedhurst"	40	45
R10	"Meadholme"	40	45
R11	"Glenara"	40	45
R20	"Tonsley Park"	40	45
R21	"Alco Park"	40	45
R22	"Mountain View"	40	45
R98	"Kyooma"	40	45

Appendix III

Plant Sound Power Levels

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Haul truck CAT 785C (unattenuated)	608	117.7	120	122	17/7/12
Haul truck CAT 785C (attenuated)	608	117.7	116.7	118	24/4/14
Haul truck CAT 785C (unattenuated)	614	117.7	119	121	28/1/14
Haul truck CAT 785C (attenuated)	614	117.7	117.5	119	24/4/14
Haul truck CAT 785C (unattenuated)	609	117.7	120		11/9/12
Haul truck CAT 785C (attenuated)	609	117.7	117.4	119	11/9/12
Haul truck CAT 785C (unattenuated)	610	117.7	121		11/9/12
Haul truck CAT 785C (unattenuated)	611	117.7	120		11/9/12
Haul truck CAT 785C (unattenuated)	612	117.7	120	122	28/1/14
Haul truck CAT 785C (attenuated)	612	117.7	117.8	120	24/4/14
Haul truck CAT 785C (unattenuated)	600	117.7	119		11/9/12
Haul truck CAT 785C (unattenuated)	613	117.7	122		8/8/13
Haul truck CAT 785C (attenuated)	613	117.7	117.9		24/4/14
Haul truck CAT 785C (unattenuated)	624	117.7	121		8/8/13
Haul truck CAT 785C (attenuated)	624	117.7	118.1		24/4/14
Haul truck CAT 789 (unattenuated)	875	117.7	119	121	28/1/14
Water Cart	WA897	113	113		11/9/12
Scraper	SC882	118	113		11/9/12
Excavator (PC 3600)	EX551	116	115		11/9/12
Dozer	829	118	115		24/4/14
Dozer (D10T)	832	118	113	118	28/1/14
Crushing Plant	n/a	116	118		11/9/12
Haul truck CAT 785C Horn pre attenuation	608	117.7		129	17/7/12
Haul truck Cat 785C Horn post attenuation	608	117.7		124	11/9/12
Excavator (PC4000)	EX837	116	115		18/12/12
Dozer D10T (1^{st} gear)	505	118	113 109	128 121	18/12/12
Dozer D10T on stockpile (2^{nd} gear) (1^{st} gear)	505	118	118 109	124 113	6/2/13
Dozer D9T on stockpile (2^{nd} gear) (1^{st} gear)	501	118	119 113	122 118	6/2/13

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Excavator (EX 5600)	570	121	116	119	28/1/14
Haul truck CAT 793XQ	660	115	116	119	28/1/14
Haul truck CAT 793XQ	661	115	115	118	28/1/14
Haul truck CAT 793XQ	662	115	116	119	28/1/14
Haul truck CAT 793XQ	663	115	116	119	8/8/13
Haul truck CAT 793XQ	664	115	114	117	8/8/13
Haul truck CAT 793XQ	665	115	115	118	28/1/14
Haul truck CAT 793XQ	666	115	116	118	28/1/14
Haul truck CAT 793XQ	667	115	115	118	28/1/14
Hitachi Excavator 1900	543	116	115	118	28/1/14
Grader	849	n/a	110	113	28/1/14
Warrior 2400 crusher	n/a	116	117	117	8/8/13
Kleeman screen	MCR401	116	111	112	8/8/13
Water Cart (Volvo)	863	113	114	118	28/1/14
Water Cart (Cat 773D)	869	113	119	123	28/1/14
Water Cart (Cat 773D)	869	113	117.5	119	24/4/14
Drill (Bucyrus)	524	116	107	-	28/1/14
Drill (Cat 6420)	526	116	108	-	28/1/14
Water pump (Dam 4)	--	--	106	--	24/4/14
Evaporation fan (Dam 4)	--	--	105	--	24/4/14

*Leq noise level from vehicle pass by only (modelled levels in the EA for LOM are based on an Leq (15 min) for an attenuated haul truck.

13 March 2015

Ref: 04035/5672

Werris Creek Coal
1435 Werris Creek – Quirindi Road
Werris Creek NSW 2341

RE: MARCH 2015 NOISE MONITORING RESULTS – WERRIS CREEK MINE

This letter report presents the results of noise compliance monitoring conducted for the Werris Creek Coal Mine (WCC) on Thursday 5th of March, 2015 as required by the Noise Management Plan (NMP), Project Approval 10_0059 and the Environmental Protection Licence (EPL) 12290 and must be submitted to the Environment Protection Authority within 30 days of the completion of monitoring.

Attended Noise Monitoring Program

Noise monitoring was undertaken in accordance with the WCC Noise Monitoring Programme as detailed below in **Table 1** (as adapted from the NMP). The monitoring locations and noise criteria for each are detailed in **Appendices I** and **II**.

Table 1
WCC Attended Noise Monitoring Program

Monitoring Point	Duration	ID	Receiver	Relevant Monitoring Requirements
A	15 minutes[1]	R5	Rosehill	PA10_0059 Private Property outside NMZ
B	15 minutes[1]	R7*	83 Wadwells Lane	Private Agreement
		R8*	Almawillee	
		R9*	Gedhurst	
		R22*	Mountain View	
C	15 minutes[1]	R10*	Meadholme	Private Agreement
		R11*	Glenara	
D	60 minutes[2]	R24	Hazeldene	60 minutes as per EPL 12290
E	60 minutes[2]	R12	Quipolly Railway Cottage	60 minutes as per EPL 12290
F	60 minutes[2]	R96	Talavera	60 minutes as per EPL 12290
G	15 minutes[1]	R97		PA10_0059 Private Property outside NMZ
H	15 minutes[1]	R98*	Kyooma	Private Agreement
I	60 minutes[2]	R57	Kurrara Street@	60 minutes as per EPL 12290
J	15 minutes[1]		Coronation Avenue@	PA10_0059 Private Property outside NMZ
K	15 minutes[1]	R21*	Alco Park	Private Agreement
L	15 minutes[1]	R103		PA10_0059 Private Property outside NMZ

Notes accompanying the table are on the following page

* - WCC has a private agreement for noise impacts with these property owners

@ - Kurrara Street is representative of sensitive receptors in southern Werris Creek while Coronation Avenue is representative of sensitive receptors in central Werris Creek.

NMZ - Noise Management Zone of properties with project specific noise criteria between 35dB(A) and 40dB(A);

Note 1: For each monthly monitoring event a total of 15 minutes (per location) during the day period, and 15 (per location) during the evening or night period;

Note 2: For each monthly monitoring event a total of 60 minutes (per location) during the day period, and 60 minutes (per location) during the evening or night period.

EPL 12290 Condition L4.6 indicates that noise monitoring be conducted;

- Approximately on the property boundary, where any dwelling is situated 30m or less from the property boundary closest to the premises; or
- Within 30m of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30m from the property boundary closest to the premises; or, where applicable
- Within 50m of the boundary of a National Park or Nature Reserve.

EPL 12290 Condition L4.3 indicates that the relevant noise limits apply under all meteorological conditions except for the following;

1. Wind speeds greater than 3m/s at 10m above ground level; or
2. Temperature inversion conditions of up to 12°/100m and wind speeds greater than 2m/s at 10m above ground level; or
3. Temperature inversion conditions greater than 12°/100m.

To determine compliance with the Leq (15 min) operational noise criteria the modification factors detailed in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the measured noise levels.

To determine compliance with the L1 (1 min) sleep disturbance noise criterion the noise measurement equipment must be located within 1m of a dwelling façade.

Monitoring Equipment

Attended noise monitoring was conducted with Brüel & Kjær Type 2250 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 “Sound Level Meters” and have current NATA calibration. Field calibration is carried out at the start and end of each monitoring period.

A-weighted noise levels were measured over the appropriate monitoring periods (15 or 60 minutes) with data acquired at 1 or 2 second statistical intervals and the meter set to “fast” response. Each 1 or 2 second measurement is accompanied by a third-octave band spectrum from 20 - 20k Hz which is required for analysing INP ‘modifying factors’. Time based field notes allow for determination of the relative contributions to the overall noise level of all significant noise sources.

Measurement Analysis

The operational noise criteria for compliance with Condition L4.1 of EPL 12290 are based on a 15 minute Leq noise level. The procedures detailed in Condition M8.2 of EPL 12290 require noise monitoring for significantly longer periods than that of the compliance criteria. To determine compliance with the EPL conditions the worst case 15 minute period, in relation to mine noise, was extracted from each measurement and compared to the criteria in Condition L4.1.

This worst case 15 minute Leq noise level for each monitoring period is shown in the tables below. Where the noise from WCC was audible Bruel & Kjaer "*Evaluator*" analysis software was used to quantify the contributions of the mine and other significant noise sources to the overall level. Mine noise from WCC is shown in the tables in bold type. Where possible the significant audible noise sources from the mine are indicated in notes associated with the tables.

Where noise from WCC is listed as faintly audible, this means the noise levels from the mine were at least 10 dB below the ambient level during the measurement and not measurable.

All noise levels shown are in dB(A) Leq (15 min) unless otherwise shown.

When no mine noise was audible at a monitoring location during a one hour survey, a representative 15 minute noise measurement was made with observations carried out for the remainder of the applicable time period. In these instances, the measured noise level for the representative 15 minute period is that shown in the tables below.

Meteorological data used in this report were supplied by the mine from their automatic weather station M2 which is located on top of the overburden emplacement. Temperature inversion strength is extrapolated from gauges with 80m vertical separation.

WCC Operations

WCC night shift operations on Thursday 5th March 2015 had the 5600 excavator in Strip 14 centre at RL295m; the 3600 in Strip 14 centre at RL295m and both 1900 excavators in Strip 14 west until 2:30am. All overburden truck fleets were running to the in pit dump at RL360m. The coal processing and train load out operated to 11:40pm with no trains loaded.

Noise Compliance Assessment

The results of the noise measurements are shown below in **Tables 2** and **3**.

Table 2
WCC Noise Monitoring Results – 5 March 2015 (Day)

Location	Time	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m	Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	1:10 pm	43	35	n/a	5.2,262	Wind (42), birds & insects (35), traffic (26), WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	1:30 pm	48	40*	n/a	5.4,270	Wind (48), birds & insects (32), traffic (24), WCC inaudible
C R10 Meadholme/ R11 Glenara	1:49 pm	48	40*	n/a	6.3,266	Wind (48), birds & insects (34), WCC inaudible
D R24 Hazeldene	2:09 pm	48	37	n/a	6.0,254	Wind (48), birds & insects (31), traffic (27), WCC faintly audible
E R12 Railway Cottage	3:43 pm	48	38	n/a	5.7,252	Wind (45), traffic (45), birds & insects (27), WCC inaudible
F R96 Talavera	1:13 pm	43	38	n/a	5.8,263	Wind (42), birds & insects (36), traffic (24), WCC faintly audible
G R97	3:20 pm	47	35	n/a	6.0,259	Wind (47), WCC (26), birds & insects (26)
H R98 Kyooma	2:18 pm	49	40*	n/a	6.2,265	Wind (49), birds (29), WCC inaudible
I R57 Kurrara St	3:03 pm	50	35	n/a	5.9,253	Wind (50), train yard (37), traffic (28), birds (27), WCC inaudible
J R57 Coronation Ave	2:42 pm	48	35	n/a	5.7,248	Wind (48), birds (36), traffic (25), WCC inaudible
K R21 Alco Park	4:30 pm	46	40*	n/a	5.8,258	Train yard (45), traffic (37), birds (32), wind (27), WCC inaudible
L R103	4:10 pm	37	35	n/a	6.0,250	Wind (33), traffic (32), train yard (30), birds (27), WCC inaudible

* Private Agreement in place – see Appendix II.

Table 3
WCC Noise Monitoring Results – 5 March 2015 (Evening/Night)

Location	Time	dB(A), L1 (1min)[1]	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m, Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	8:45 pm	n/a	40	35	+4.5,3.6,201	Insects (40), traffic (25), WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	9:04 pm	n/a	32	40*	+5.4,3.3,202	Traffic (30), insects (27), WCC inaudible
C R10 Meadholme/ R11 Glenara	9:23 pm	n/a	33	40*	+5.2,3.2,200	Insects (30), traffic (30), WCC inaudible
D R24 Hazeldene	9:42 pm	n/a	35	37	+4.9,3.7,195	Traffic (35), insects (24), WCC inaudible
E R12 Railway Cottage	7:39 pm	n/a	45	38	+2.8,3.1,209	Traffic (45), insects (31), WCC inaudible
F R96 Talavera	7:15 pm	28	47	37	+1.6,3.9,231	Birds & insects (47), traffic (31), WCC (24)
G R97	7:16 pm	30	43	35	+1.6,4.2,242	Insects (43), WCC (27), traffic (24)
H R98 Kyooma	8:21 pm	34	37	40*	+3.5,2.6,197	Insects (35), traffic (29), WCC (29)
I R57 Kurrara St	9:04 pm	n/a	46	35	+5.3,3.3,200	Train yard (46), insects (32), traffic (28), WCC inaudible
J R57 Coronation Ave	8:45 pm	19	37	35	+4.5,3.6,201	Traffic (36), train yard (29), insects (24), WCC faintly audible
K R21 Alco Park	10:29 pm	35	43	40*	+4.3,3.7,184	Insects (40), traffic (38), train yard (32), WCC (30)
L R103	10:09 pm	n/a	39	35	+4.8,3.8,197	Train yard (37), insects (33), mine (25), WCC inaudible

1. L1 (1 min) from mine noise only
* Private Agreement in place – see Appendix II.

The results in Tables 2 and 3 indicate that, under the operational and atmospheric conditions at the time, the measured noise levels did not exceed the relevant noise criteria at any location during any monitoring period.

The audible noise sources from WCC included truck revs, dozer tracks and general mine hum.

Data from those times where WCC operations were audible were analysed using the *"Evaluator"* software. This analysis showed the noise did not contain any tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

In addition to the operational noise, the noise from WCC must not exceed **45 dB(A) L1 (1 min)** between the hours of 10 pm and 7 am. This is to minimise the potential for sleep disturbance as a result of individual loud noises from the mine. The compliance measurement locations are different for each of the operational and sleep disturbance noise. That is, the sleep disturbance criterion is typically applicable at 1m from the façade of a bedroom window.

To avoid undue disturbance to residents the L1 (1 min) noise level from the operational measurements are used to show general compliance with the sleep disturbance criterion. That is, as the distance between the noise source and the operational noise monitoring location is significantly greater than the distance between the operational noise monitoring location and the sleep disturbance monitoring location (i.e. 1m from the facade of the house) there will be little variation in L1 (1 min) levels between

the two monitoring locations. It must be noted, however, that the sleep disturbance criterion is to be measured near a bedroom window. As the internal layout of each residence is not known, to consider a worst case, this is assumed to be facing towards the mine.

As shown in Table 3, during the night time measurement circuit the L1 (1 min) noise from WCC did not exceed 45 dB(A) at any monitoring location.

Plant Sound Power Levels

In keeping with the NMP, the sound power levels of the major noise producing plant and equipment operating on the WCC site is to be determined from sound pressure level measurements. The measurement programme is to be undertaken progressively to capture noise levels from all plant over the period of a year.

The results of the sound power level calculations to date are shown in **Appendix III**. The table in Appendix III lists SWL's for plant items as taken from those used in the noise modelling for the latest EA for WCM. The SWL's from the EA, therefore, represent a calculated Leq (15 minute) noise level. For mobile plant this calculation is based on the length of time each noise source representing a plant item(s) is at a particular location on the mine site.

For example the noise model includes a number of noise sources located at intervals along the various haul roads to approximate the haul fleet working throughout a 15 minute operational period. The SWL for the point source is calculated based on the length of time any truck is expected to be passing that location during the assessment period.

For mobile plant, the measured Leq noise levels in the table in Appendix III represent a single passby for each plant item whereas the values adopted in the EA (particularly for haul trucks) are for the 15-minute calculated sound power level of 350m long sections of haul road. These values are typically 7-10 dB lower than the single pass-by level.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,
SPECTRUM ACOUSTICS PTY LIMITED

Author:

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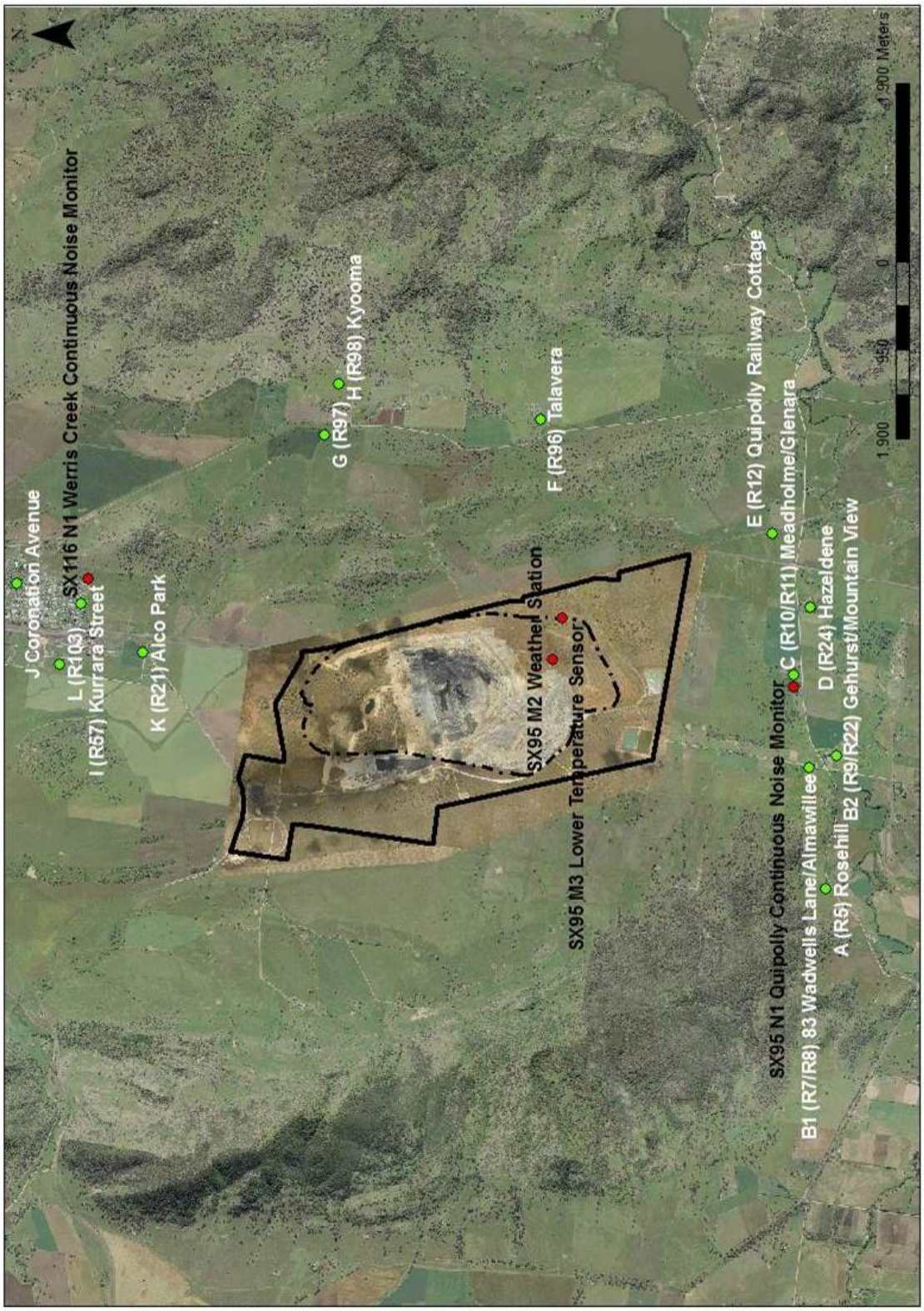
Acoustical Consultant

Review:

Ross Hodge
Acoustical Consultant

Appendix I



Attended Noise Monitoring Locations

Appendix II

Noise Limits

LOM Project Revised Noise Criteria

Location		Day $L_{Aeq,15minute}$	Evening/Night $L_{Aeq,15minute}$	Night $L_{A1(1min)}$	Long Term $L_{Aeq,15minute}$	Acquisition $L_{Aeq,15minute}$
R12	"Quipolly Railway Cottage"	38	38	45	35	40
R24	"Hazeldene"	37	37	45	35	40
R96	"Talavera"#	38	37	45	35	40
All other privately-owned land		35	35	45	35	40

"Talavera" property was listed in the EA under its previous property name of "Millbank"

Table 21: Properties with Private Agreements Noise Criteria

Location		Noise Works Criteria dB(A) Leq	Noise Acquisition Criteria dB(A) Leq
R7	83 Wadwells Lane	40	45
R8	"Almawillee"	40	45
R9	"Gedhurst"	40	45
R10	"Meadholme"	40	45
R11	"Glenara"	40	45
R20	"Tonsley Park"	40	45
R21	"Alco Park"	40	45
R22	"Mountain View"	40	45
R98	"Kyooma"	40	45

Appendix III

Plant Sound Power Levels

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Haul truck CAT 785C (unattenuated)	608	117.7	120	122	17/7/12
Haul truck CAT 785C (attenuated)	608	117.7	116.7	118	24/4/14
Haul truck CAT 785C (unattenuated)	614	117.7	119	121	28/1/14
Haul truck CAT 785C (attenuated)	614	117.7	117.5	119	24/4/14
Haul truck CAT 785C (unattenuated)	609	117.7	120		11/9/12
Haul truck CAT 785C (attenuated)	609	117.7	117.4	119	11/9/12
Haul truck CAT 785C (unattenuated)	610	117.7	121		11/9/12
Haul truck CAT 785C (unattenuated)	611	117.7	120		11/9/12
Haul truck CAT 785C (unattenuated)	612	117.7	120	122	28/1/14
Haul truck CAT 785C (attenuated)	612	117.7	117.8	120	24/4/14
Haul truck CAT 785C (unattenuated)	600	117.7	119		11/9/12
Haul truck CAT 785C (unattenuated)	613	117.7	122		8/8/13
Haul truck CAT 785C (attenuated)	613	117.7	117.9		24/4/14
Haul truck CAT 785C (unattenuated)	624	117.7	121		8/8/13
Haul truck CAT 785C (attenuated)	624	117.7	118.1		24/4/14
Haul truck CAT 789 (unattenuated)	875	117.7	119	121	28/1/14
Water Cart	WA897	113	113		11/9/12
Scraper	SC882	118	113		11/9/12
Excavator (PC 3600)	EX551	116	115		11/9/12
Dozer	829	118	115		24/4/14
Dozer (D10T)	832	118	113	118	28/1/14
Crushing Plant	n/a	116	118		11/9/12
Haul truck CAT 785C Horn pre attenuation	608	117.7		129	17/7/12
Haul truck Cat 785C Horn post attenuation	608	117.7		124	11/9/12
Excavator (PC4000)	EX837	116	115		18/12/12
Dozer D10T (1^{st} gear)	505	118	113 109	128 121	18/12/12
Dozer D10T on stockpile (2^{nd} gear) (1^{st} gear)	505	118	118 109	124 113	6/2/13
Dozer D9T on stockpile (2^{nd} gear) (1^{st} gear)	501	118	119 113	122 118	6/2/13

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Excavator (EX 5600)	570	121	116	119	28/1/14
Haul truck CAT 793XQ	660	115	116	119	28/1/14
Haul truck CAT 793XQ	661	115	115	118	28/1/14
Haul truck CAT 793XQ	662	115	116	119	28/1/14
Haul truck CAT 793XQ	663	115	116	119	8/8/13
Haul truck CAT 793XQ	664	115	114	117	8/8/13
Haul truck CAT 793XQ	665	115	115	118	28/1/14
Haul truck CAT 793XQ	666	115	116	118	28/1/14
Haul truck CAT 793XQ	667	115	115	118	28/1/14
Hitachi Excavator 1900	543	116	115	118	28/1/14
Grader	849	n/a	110	113	28/1/14
Warrior 2400 crusher	n/a	116	117	117	8/8/13
Kleeman screen	MCR401	116	111	112	8/8/13
Water Cart (Volvo)	863	113	114	118	28/1/14
Water Cart (Cat 773D)	869	113	119	123	28/1/14
Water Cart (Cat 773D)	869	113	117.5	119	24/4/14
Drill (Bucyrus)	524	116	107	-	28/1/14
Drill (Cat 6420)	526	116	108	-	28/1/14
Water pump (Dam 4)	--	--	106	--	24/4/14
Evaporation fan (Dam 4)	--	--	105	--	24/4/14

*Leq noise level from vehicle pass by only (modelled levels in the EA for LOM are based on an Leq (15 min) for an attenuated haul truck.

3 June 2014

Ref: 04035/5202

Werris Creek Coal
1435 Werris Creek – Quirindi Road
Werris Creek NSW 2341

RE: MAY 2014 NOISE MONITORING RESULTS – WERRIS CREEK MINE

This letter report presents the results of noise compliance monitoring conducted for the Werris Creek Coal Mine (WCC) on Wednesday 21st May, 2014 as required by the Noise Management Plan (NMP), Project Approval 10_0059 and the Environmental Protection Licence (EPL) 12290 and must be submitted to the Environment Protection Authority within 30 days of the completion of monitoring.

Attended Noise Monitoring Program

Noise monitoring was undertaken in accordance with the WCC Noise Monitoring Programme as detailed below in **Table 1** (as adapted from the NMP). The monitoring locations and noise criteria for each are detailed in **Appendices I** and **II**.

Table 1
WCC Attended Noise Monitoring Program

Monitoring Point	Duration	ID	Receiver	Relevant Monitoring Requirements
A	15 minutes[1]	R5	Rosehill	PA10_0059 Private Property outside NMZ
B	15 minutes[1]	R7	83 Wadwells Lane	Private Agreement
		R8*	Almawillee	
		R9	Gedhurst	
		R22	Mountain View	
C	15 minutes[1]	R10*	Meadholme	Private Agreement
		R11*	Glenara	
D	60 minutes[2]	R24	Hazeldene	60 minutes as per EPL 12290
E	60 minutes[2]	R12	Quipolly Railway Cottage	60 minutes as per EPL 12290
F	60 minutes[2]	R96	Talavera	60 minutes as per EPL 12290
G	15 minutes[1]	R97		PA10_0059 Private Property outside NMZ
H	15 minutes[1]	R98*	Kyooma	Private Agreement
I	60 minutes[2]	R57	Kurrara Street@	60 minutes as per EPL 12290
J	15 minutes[1]		Coronation Avenue@	PA10_0059 Private Property outside NMZ
K	15 minutes[1]	R21*	Alco Park	Private Agreement
L	15 minutes[1]	R103		PA10_0059 Private Property outside NMZ

Notes accompanying the table are on the following page

* - WCC has a private agreement for noise impacts with these property owners

@ - Kurrara Street is representative of sensitive receptors in southern Werris Creek while Coronation Avenue is representative of sensitive receptors in central Werris Creek.

NMZ - Noise Management Zone of properties with project specific noise criteria between 35dB(A) and 40dB(A);

Note 1: For each monthly monitoring event a total of 15 minutes (per location) during the day period, and 15 (per location) during the evening or night period;

Note 2: For each monthly monitoring event a total of 60 minutes (per location) during the day period, and 60 minutes (per location) during the evening or night period.

EPL 12290 Condition L4.6 indicates that noise monitoring be conducted;

- Approximately on the property boundary, where any dwelling is situated 30m or less from the property boundary closest to the premises; or
- Within 30m of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30m from the property boundary closest to the premises; or, where applicable
- Within 50m of the boundary of a National Park or Nature Reserve.

EPL 12290 Condition L4.3 indicates that the relevant noise limits apply under all meteorological conditions except for the following;

1. Wind speeds greater than 3m/s at 10m above ground level; or
2. Temperature inversion conditions of up to 12°/100m and wind speeds greater than 2m/s at 10m above ground level; or
3. Temperature inversion conditions greater than 12°/100m.

To determine compliance with the Leq (15 min) operational noise criteria the modification factors detailed in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the measured noise levels.

To determine compliance with the L1 (1 min) sleep disturbance noise criterion the noise measurement equipment must be located within 1m of a dwelling façade.

Monitoring Equipment

Attended noise monitoring was conducted with Brüel & Kjær Type 2250 and 2260 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 “Sound Level Meters” and have current NATA calibration. Field calibration is carried out at the start and end of each monitoring period.

A-weighted noise levels were measured over the appropriate monitoring periods (15 or 60 minutes) with data acquired at 1 or 2 second statistical intervals and the meter set to “fast” response. Each 1 or 2 second measurement is accompanied by a third-octave band spectrum from 20 - 20k Hz which is required for analysing INP ‘modifying factors’. Time based field notes allow for determination of the relative contributions to the overall noise level of all significant noise sources.

Measurement Analysis

The operational noise criteria for compliance with Condition L4.1 of EPL 12290 are based on a 15 minute Leq noise level. The procedures detailed in Condition M8.2 of EPL 12290 require noise monitoring for significantly longer periods than that of the compliance criteria. To determine compliance with the EPL conditions the worst case 15 minute period, in relation to mine noise, was extracted from each measurement and compared to the criteria in Condition L4.1.

This worst case 15 minute Leq noise level for each monitoring period is shown in the tables below. Where the noise from WCC was audible Bruel & Kjaer "*Evaluator*" analysis software was used to quantify the contributions of the mine and other significant noise sources to the overall level. Mine noise from WCC is shown in the tables in bold type. Where noise from WCC is listed as faintly audible, this means the noise levels from the mine were at least 10 dB below the ambient level during the measurement and not measurable.

All noise levels shown are in dB(A) Leq (15 min) unless otherwise shown.

When no mine noise was audible at a monitoring location during a one hour survey, a representative 15 minute noise measurement was made with observations carried out for the remainder of the applicable time period. In these instances, the measured noise level for the representative 15 minute period is that shown in the tables below.

Meteorological data used in this report were supplied by the mine from their automatic weather station M2 which is located on top of the overburden emplacement. Temperature inversion strength is extrapolated from gauges with 80m vertical separation.

WCC Operations

WCC operations on Wednesday 21st May 2014 had the 5600 excavator and one 1900 excavator in Strip 13 centre at RL270m, 3600 excavator in Strip 17 west at RL370m and one 1900 excavator in Strip 16 west at RL370m. The Strip 13 overburden truck fleets were running to the in pit dump at RL390m on day and night shift with the Strip 16/17 truck fleets running to the Top Dump at RL445m on day shift and to the in pit dump on night shift. There were no production delays either day or night shift. The crushing plant and train load out operated to 3:30am with no trains loaded.

Noise Compliance Assessment

The results of the noise measurements are shown below in **Tables 2** and **3**.

Table 2
WCC Noise Monitoring Results – 21 May 2014 (Day)

Location	Time	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m	Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	8:57 am	38	35	n/a	0.6,172	Traffic (35), birds (35), WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	9:18 am	40	40*	n/a	1.0,170	Birds (39), traffic (30), WCC inaudible
C R10 Meadholme/ R11 Glenara	9:39 am	34	40*	n/a	0.6,168	Traffic (31), birds (31), WCC inaudible
D R24 Hazeldene	10:01 am	34	37	n/a	1.7,199	Traffic (32), birds (30), WCC inaudible
E R12 Railway Cottage	11:43 am	36	38	n/a	1.0,207	Traffic (36), birds (26), WCC inaudible
F R96 Talavera	4:32 pm	42	38	n/a	3.5,160	Birds (41), traffic (34), WCC inaudible
G R97	11:15 am	27	35	n/a	3.4,202	Traffic (25), birds (21), faintly audible
H R98 Kyooma	4:07 pm	40	40*	n/a	3.8,167	Traffic (37), birds (36), WCC inaudible
I R57 Kurrara St	2:33 pm	49	35	n/a	3.6,163	Traffic (49), birds (37), WCC faintly audible
J R57 Coronation Ave	3:39 pm	54	35	n/a	4.1,167	Traffic (54), birds (32), WCC inaudible
K R21 Alco Park	2:12 pm	35	40*	n/a	2.4,159	Traffic (34), bulldozer (28), WCC faintly audible
L R103	1:50 pm	41	35	n/a	2.9,130	Bulldozer (38), traffic (38), WCC faintly audible

* Private Agreement in place – see Appendix II.

Table 3
WCC Noise Monitoring Results – 21 May 2014 (Evening/Night)

Location	Time	dB(A), L1 (1min)[1]	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m, Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	9:11 pm	n/a	23	35	1.6,135,+8.7	Traffic (23), WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	9:30 pm	n/a	28	40*	1.4,164,+8.5	Traffic (28), WCC faintly audible
C R10 Meadholme/ R11 Glenara	9:50 pm	n/a	38	40*	1.4,167,+8.5	Traffic (38), WCC faintly audible
D R24 Hazeldene	10:10 pm	32	35	37	0.8,,106,+9.4	Traffic (34), WCC (26)
E R12 Railway Cottage	8:04 pm	n/a	37	38	1.9,148,+9.0	Traffic (37), WCC inaudible
F R96 Talavera	10:20 pm	23	26	37	0.5,124,+9.5	Traffic (24), WCC (20)
G R97	7:38 pm	n/a	26	35	2.0,154,+8.1	Traffic (26), WCC inaudible
H R98 Kyooma	9:54 pm	31	30	40*	1.4,155,+8.1	WCC (27), traffic (27)
I R57 Kurrara St	8:20 pm	27	40	35	2.0,147,+9.1	Traffic (40), WCC (24)
J R57 Coronation Ave	9:25 pm	n/a	42	35	1.4,164,+8.5	Trains (40), traffic (37), WCC inaudible
K R21 Alco Park	7:58 pm	30	36	40*	1.8,138,+8.7	Traffic (34), trains (29), WCC (26)
L R103	7:34 pm	27	34	35	2.1,148,+7.9	Traffic (34), WCC (24)

1. L1 (1 min) from mine noise only
* Private Agreement in place – see Appendix II.

The results in Tables 2 and 3 indicate that, under the operational and atmospheric conditions at the time, the measured noise levels did not exceed the relevant noise criteria at any location during any monitoring period.

Data from those times where WCC operations were audible were analysed using the *"Evaluator"* software. This analysis showed the noise did not contain any tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

In addition to the operational noise, the noise from WCC must not exceed **45 dB(A) L1 (1 min)** between the hours of 10 pm and 7 am. This is to minimise the potential for sleep disturbance as a result of individual loud noises from the mine. The compliance measurement locations are different for each of the operational and sleep disturbance noise. That is, the sleep disturbance criterion is typically applicable at 1m from the façade of a bedroom window.

To avoid undue disturbance to residents the L1 (1 min) noise level from the operational measurements are used to show general compliance with the sleep disturbance criterion. That is, as the distance between the noise source and the operational noise monitoring location is significantly greater than the distance between the operational noise monitoring location and the sleep disturbance monitoring location (i.e. 1m from the facade of the house) there will be little variation in L1 (1 min) levels between the two monitoring locations. It must be noted, however, that the sleep disturbance criterion is to be measured near a bedroom window. As the internal layout of each residence is not known, to consider a worst case, this is assumed to be facing the operational noise monitoring location.

As shown in Table 3, during the night time measurement circuit the L1 (1 min) noise from WCC did not exceed 45 dB(A) at any monitoring location.

Plant Sound Power Levels

In keeping with the NMP, the sound power levels of the major noise producing plant and equipment operating on the WCC site is to be determined from sound pressure level measurements. The measurement programme is to be undertaken progressively to capture noise levels from all plant over the period of a year.

The results of the sound power level calculations to date are shown in **Appendix III**. The table in Appendix III lists SWL's for plant items as taken from those used in the noise modelling for the latest EA for WCM. The SWL's from the EA, therefore, represent a calculated Leq (15 minute) noise level. For mobile plant this calculation is based on the length of time each noise source representing a plant item(s) is at a particular location on the mine site.

For example the noise model includes a number of noise sources located at intervals along the various haul roads to approximate the haul fleet working throughout a 15 minute operational period. The SWL for the point source is calculated based on the length of time any truck is expected to be passing that location during the assessment period.

For mobile plant, the measured Leq noise levels in the table in Appendix III represent a single passby for each plant item whereas the values adopted in the EA (particularly for haul trucks) are for the 15-minute calculated sound power level of 350m long sections of haul road. These values are typically 7-10 dB lower than the single pass-by level.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,
SPECTRUM ACOUSTICS PTY LIMITED

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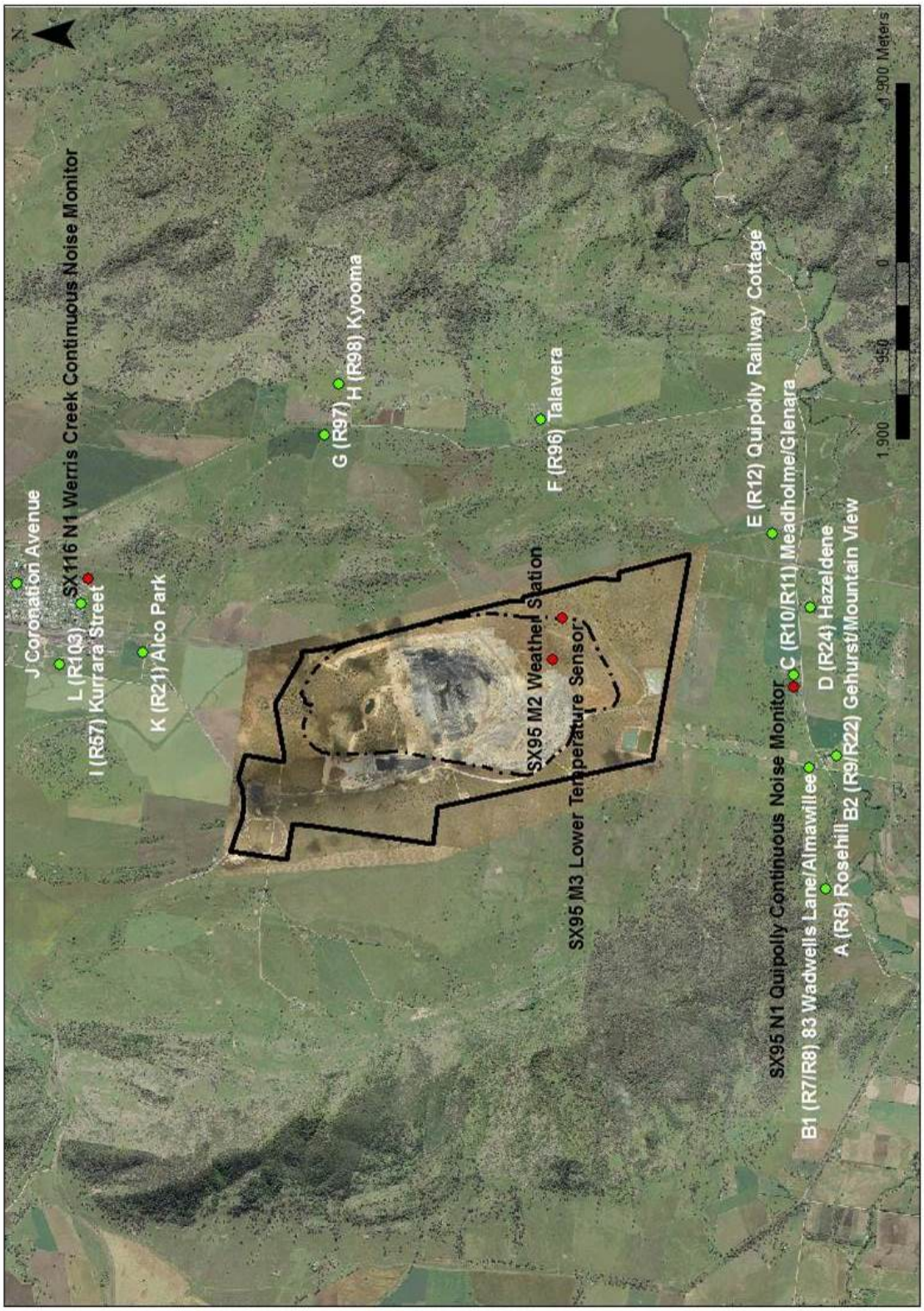
Acoustical Consultant

Appendix I



Attended Noise Monitoring Locations

Appendix II

Noise Limits

LOM Project Revised Noise Criteria

Location		Day $L_{Aeq,15minute}$	Evening/Night $L_{Aeq,15minute}$	Night $L_{A1(1min)}$	Long Term $L_{Aeq,15minute}$	Acquisition $L_{Aeq,15minute}$
R12	"Quipolly Railway Cottage"	38	38	45	35	40
R24	"Hazeldene"	37	37	45	35	40
R96	"Talavera"#	38	37	45	35	40
All other privately-owned land		35	35	45	35	40

"Talavera" property was listed in the EA under its previous property name of "Millbank"

Table 21: Properties with Private Agreements Noise Criteria

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R20	"Tonsley Park"	40	45
R21	"Alco Park"	40	45
R22	"Mountain View"	40	45
R98	"Kyooma"	40	45

Appendix III

Plant Sound Power Levels

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
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Haul truck CAT 785C (unattenuated)	614	117.7	119	121	28/1/14
Haul truck CAT 785C (attenuated)	614	117.7	117.5	119	24/4/14
Haul truck CAT 785C (unattenuated)	609	117.7	120		11/9/12
Haul truck CAT 785C (attenuated)	609	117.7	117.4	119	11/9/12
Haul truck CAT 785C (unattenuated)	610	117.7	121		11/9/12
Haul truck CAT 785C (unattenuated)	611	117.7	120		11/9/12
Haul truck CAT 785C (unattenuated)	612	117.7	120	122	28/1/14
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Haul truck CAT 785C (unattenuated)	613	117.7	122		8/8/13
Haul truck CAT 785C (attenuated)	613	117.7	117.9		24/4/14
Haul truck CAT 785C (unattenuated)	624	117.7	121		8/8/13
Haul truck CAT 785C (attenuated)	624	117.7	118.1		24/4/14
Haul truck CAT 789 (unattenuated)	875	117.7	119	121	28/1/14
Water Cart	WA897	113	113		11/9/12
Scraper	SC882	118	113		11/9/12
Excavator (PC 3600)	EX551	116	115		11/9/12
Dozer	829	118	115		24/4/14
Dozer (D10T)	832	118	113	118	28/1/14
Crushing Plant	n/a	116	118		11/9/12
Haul truck CAT 785C Horn pre attenuation	608	117.7		129	17/7/12
Haul truck Cat 785C Horn post attenuation	608	117.7		124	11/9/12
Excavator (PC4000)	EX837	116	115		18/12/12
Dozer D10T (1^{st} gear)	505	118	113 109	128 121	18/12/12
Dozer D10T on stockpile (2^{nd} gear) (1^{st} gear)	505	118	118 109	124 113	6/2/13
Dozer D9T on stockpile (2^{nd} gear) (1^{st} gear)	501	118	119 113	122 118	6/2/13

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Excavator (EX 5600)	570	121	116	119	28/1/14
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Haul truck CAT 793XQ	661	115	115	118	28/1/14
Haul truck CAT 793XQ	662	115	116	119	28/1/14
Haul truck CAT 793XQ	663	115	116	119	8/8/13
Haul truck CAT 793XQ	664	115	114	117	8/8/13
Haul truck CAT 793XQ	665	115	115	118	28/1/14
Haul truck CAT 793XQ	666	115	116	118	28/1/14
Haul truck CAT 793XQ	667	115	115	118	28/1/14
Hitachi Excavator 1900	543	116	115	118	28/1/14
Grader	849	n/a	110	113	28/1/14
Warrior 2400 crusher	n/a	116	117	117	8/8/13
Kleeman screen	MCR401	116	111	112	8/8/13
Water Cart (Volvo)	863	113	114	118	28/1/14
Water Cart (Cat 773D)	869	113	119	123	28/1/14
Water Cart (Cat 773D)	869	113	117.5	119	24/4/14
Drill (Bucyrus)	524	116	107	-	28/1/14
Drill (Cat 6420)	526	116	108	-	28/1/14
Water pump (Dam 4)	--	--	106	--	24/4/14
Evaporation fan (Dam 4)	--	--	105	--	24/4/14

*Leq noise level from vehicle pass by only (modelled levels in the EA for LOM are based on an Leq (15 min) for an attenuated haul truck.

28 November 2014

Ref: 04035/5495

Werris Creek Coal
1435 Werris Creek – Quirindi Road
Werris Creek NSW 2341

RE: NOVEMBER 2014 NOISE MONITORING RESULTS – WERRIS CREEK MINE

This letter report presents the results of noise compliance monitoring conducted for the Werris Creek Coal Mine (WCC) on Wednesday 26th November, 2014 as required by the Noise Management Plan (NMP), Project Approval 10_0059 and the Environmental Protection Licence (EPL) 12290 and must be submitted to the Environment Protection Authority within 30 days of the completion of monitoring.

Attended Noise Monitoring Program

Noise monitoring was undertaken in accordance with the WCC Noise Monitoring Programme as detailed below in **Table 1** (as adapted from the NMP). The monitoring locations and noise criteria for each are detailed in **Appendices I** and **II**.

Table 1
WCC Attended Noise Monitoring Program

Monitoring Point	Duration	ID	Receiver	Relevant Monitoring Requirements
A	15 minutes[1]	R5	Rosehill	PA10_0059 Private Property outside NMZ
B	15 minutes[1]	R7*	83 Wadwells Lane	Private Agreement
		R8*	Almawillee	
		R9*	Gedhurst	
		R22*	Mountain View	
C	15 minutes[1]	R10*	Meadholme	Private Agreement
		R11*	Glenara	
D	60 minutes[2]	R24	Hazeldene	60 minutes as per EPL 12290
E	60 minutes[2]	R12	Quipolly Railway Cottage	60 minutes as per EPL 12290
F	60 minutes[2]	R96	Talavera	60 minutes as per EPL 12290
G	15 minutes[1]	R97		PA10_0059 Private Property outside NMZ
H	15 minutes[1]	R98*	Kyooma	Private Agreement
I	60 minutes[2]	R57	Kurrara Street@	60 minutes as per EPL 12290
J	15 minutes[1]		Coronation Avenue@	PA10_0059 Private Property outside NMZ
K	15 minutes[1]	R21*	Alco Park	Private Agreement
L	15 minutes[1]	R103		PA10_0059 Private Property outside NMZ

Notes accompanying the table are on the following page

* - WCC has a private agreement for noise impacts with these property owners

@ - Kurrara Street is representative of sensitive receptors in southern Werris Creek while Coronation Avenue is representative of sensitive receptors in central Werris Creek.

NMZ - Noise Management Zone of properties with project specific noise criteria between 35dB(A) and 40dB(A);

Note 1: For each monthly monitoring event a total of 15 minutes (per location) during the day period, and 15 (per location) during the evening or night period;

Note 2: For each monthly monitoring event a total of 60 minutes (per location) during the day period, and 60 minutes (per location) during the evening or night period.

EPL 12290 Condition L4.6 indicates that noise monitoring be conducted;

- Approximately on the property boundary, where any dwelling is situated 30m or less from the property boundary closest to the premises; or
- Within 30m of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30m from the property boundary closest to the premises; or, where applicable
- Within 50m of the boundary of a National Park or Nature Reserve.

EPL 12290 Condition L4.3 indicates that the relevant noise limits apply under all meteorological conditions except for the following;

1. Wind speeds greater than 3m/s at 10m above ground level; or
2. Temperature inversion conditions of up to 12°/100m and wind speeds greater than 2m/s at 10m above ground level; or
3. Temperature inversion conditions greater than 12°/100m.

To determine compliance with the Leq (15 min) operational noise criteria the modification factors detailed in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the measured noise levels.

To determine compliance with the L1 (1 min) sleep disturbance noise criterion the noise measurement equipment must be located within 1m of a dwelling façade.

Monitoring Equipment

Attended noise monitoring was conducted with Brüel & Kjær Type 2250 and 2260 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 “Sound Level Meters” and have current NATA calibration. Field calibration is carried out at the start and end of each monitoring period.

A-weighted noise levels were measured over the appropriate monitoring periods (15 or 60 minutes) with data acquired at 1 or 2 second statistical intervals and the meter set to “fast” response. Each 1 or 2 second measurement is accompanied by a third-octave band spectrum from 20 - 20k Hz which is required for analysing INP ‘modifying factors’. Time based field notes allow for determination of the relative contributions to the overall noise level of all significant noise sources.

Measurement Analysis

The operational noise criteria for compliance with Condition L4.1 of EPL 12290 are based on a 15 minute Leq noise level. The procedures detailed in Condition M8.2 of EPL 12290 require noise monitoring for significantly longer periods than that of the compliance criteria. To determine compliance with the EPL conditions the worst case 15 minute period, in relation to mine noise, was extracted from each measurement and compared to the criteria in Condition L4.1.

This worst case 15 minute Leq noise level for each monitoring period is shown in the tables below. Where the noise from WCC was audible Bruel & Kjaer "*Evaluator*" analysis software was used to quantify the contributions of the mine and other significant noise sources to the overall level. Mine noise from WCC is shown in the tables in bold type. Where possible the significant audible noise sources from the mine are indicated in notes associated with the tables.

Where noise from WCC is listed as faintly audible, this means the noise levels from the mine were at least 10 dB below the ambient level during the measurement and not measurable.

All noise levels shown are in dB(A) Leq (15 min) unless otherwise shown.

When no mine noise was audible at a monitoring location during a one hour survey, a representative 15 minute noise measurement was made with observations carried out for the remainder of the applicable time period. In these instances, the measured noise level for the representative 15 minute period is that shown in the tables below.

Meteorological data used in this report were supplied by the mine from their automatic weather station M2 which is located on top of the overburden emplacement. Temperature inversion strength is extrapolated from gauges with 80m vertical separation.

WCC Operations

WCC operations on Thursday 26th November 2014 had the 5600 excavator and two 1900 excavators in Strip 14 west at RL310m and the 3600 in Strip 15 west at RL370m although the 3600 did have a 0.3 hour noise delay at 9:25pm. The overburden truck fleets were running to the in pit dump at RL360m while the coal truck fleets were running to the ROM Stockpile at RL390m via Ramp 6 but was changed to Ramp 17 at 9:45pm to minimise noise from hauling along the main western haul road. All dozers were instructed to use 1st gear reverse at 8:55pm. The crushing plant and train load out operated to 11:30pm with no trains loaded.

Noise Compliance Assessment

The results of the noise measurements are shown below in **Tables 2** and **3**.

Table 2
WCC Noise Monitoring Results – 26 November 2014 (Day)

Location	Time	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m	Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	1:15 pm	39	35	n/a	3.8,302	Birds (37), wind (33), tractor (25), traffic (24), WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	1:35 pm	46	40*	n/a	4.3,285	Birds (44), wind (42), WCC (25)
C R10 Meadholme/ R11 Glenara	1:54 pm	36	40*	n/a	4.0,281	Birds (32), wind (32), WCC (27), traffic (24)
D R24 Hazeldene	2:13 pm	47	37	n/a	5.2,289	Birds (45), wind (43), WCC (28), traffic (28)
E R12 Railway Cottage	3:47 pm	45	38	n/a	4.8,289	Traffic (43), wind (39), birds (35), WCC inaudible
F R96 Talavera	4:00 pm	50	38	n/a	4.8,282	Birds (49), wind (42), traffic (25), WCC inaudible
G R97	3:23 pm	44	35	n/a	5.9,299	Wind (44), WCC (23)
H R98 Kyooma	3:38 pm	46	40*	n/a	5.2,295	Wind (46), birds (26), WCC (24)
I R57 Kurrara St	2:07 pm	51	35	n/a	3.9,294	Traffic (50), birds (40), train (37), wind (29), WCC inaudible
J R57 Coronation Ave	3:12 pm	53	35	n/a	5.8,296	Traffic (53), lawn mower (41), birds (35), train yard (28), wind (28), WCC inaudible
K R21 Alco Park	1:45 pm	50	40*	n/a	4.3,266	Traffic (50), wind (35), train (32), WCC (25), birds (24)
L R103	1:24 pm	35	35	n/a	4.0,303	Wind (31), train yard (29), birds (28), traffic (26), WCC inaudible

* Private Agreement in place – see Appendix II.

Table 3
WCC Noise Monitoring Results – 26 November 2014 (Evening/Night)

Location	Time	dB(A), L1 (1min)[1]	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m, Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	7:21 pm	n/a	36	35	Lapse,4.4,305	Birds (34), traffic (30), tractor (26), WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	7:46 pm	36	46	40*	Lapse,3.9,316	Birds & insects (46), WCC (32), plane (26), traffic (25)
C R10 Meadholme/ R11 Glenara	8:05 pm	39	45	40*	Lapse,3.5,319	Birds & insects (45), WCC (33), traffic (28)
D R24 Hazeldene	8:23 pm	27	39	37	Lapse,3.0,323	Traffic (39), insects (25), WCC (25)
E R12 Railway Cottage	9:57 pm	27	44	38	Lapse,2.7,332	Traffic (44), frogs & insects (28), WCC (25)
F R96 Talavera	10:04 pm	36	34	37	Lapse,1.8,241	WCC (32), frogs & insects (27), traffic (27)
G R97	9:32 pm	40	38	35	+2.3,3.8,317	WCC (35), frogs & insects (33), traffic (28)
H R98 Kyooma	9:39 pm	36	35	40*	+1.9,4.0,307	WCC (33), frogs & insects (29), traffic (26)
I R57 Kurrara St	8:05 pm	n/a	44	35	Lapse,3.5,319	Traffic (43), dog (33), train yard (28), frogs & insects (27), WCC inaudible
J R57 Coronation Ave	9:10 pm	30	54	35	+2.8,3.2,326	Traffic (54), insects (29), train yard (26), dog (26), WCC (25)
K R21 Alco Park	7:45 pm	29	52	40*	Lapse,3.9,316	Traffic (52), birds (31), train (28), WCC (23)
L R103	7:26 pm	n/a	38	35	Lapse,4.4,305	Birds (38), traffic (25), train yard (23), WCC inaudible

1. L1 (1 min) from mine noise only
* Private Agreement in place – see Appendix II.

The results in Tables 2 and 3 indicate that, under the operational and atmospheric conditions at the time, the measured noise levels did not exceed the relevant noise criteria at any location during any monitoring period.

The audible noise sources from WCC included truck revs, dozer tracks and loads being dumped. At other times and locations when mine noise was audible it was coming from the engine/s of the evaporator jets blowing out the excess water from the dams.

Data from those times where WCC operations were audible were analysed using the *"Evaluator"* software. This analysis showed the noise did not contain any tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

In addition to the operational noise, the noise from WCC must not exceed **45 dB(A) L1 (1 min)** between the hours of 10 pm and 7 am. This is to minimise the potential for sleep disturbance as a result of individual loud noises from the mine. The compliance measurement locations are different for each of the operational and sleep disturbance noise. That is, the sleep disturbance criterion is typically applicable at 1m from the façade of a bedroom window.

To avoid undue disturbance to residents the L1 (1 min) noise level from the operational measurements are used to show general compliance with the sleep disturbance criterion. That is, as the distance between the noise source and the operational noise monitoring location is significantly greater than

the distance between the operational noise monitoring location and the sleep disturbance monitoring location (i.e. 1m from the facade of the house) there will be little variation in L1 (1 min) levels between the two monitoring locations. It must be noted, however, that the sleep disturbance criterion is to be measured near a bedroom window. As the internal layout of each residence is not known, to consider a worst case, this is assumed to be facing the operational noise monitoring location.

As shown in Table 3, during the night time measurement circuit the L1 (1 min) noise from WCC did not exceed 45 dB(A) at any monitoring location.

Plant Sound Power Levels

In keeping with the NMP, the sound power levels of the major noise producing plant and equipment operating on the WCC site is to be determined from sound pressure level measurements. The measurement programme is to be undertaken progressively to capture noise levels from all plant over the period of a year.

The results of the sound power level calculations to date are shown in **Appendix III**. The table in Appendix III lists SWL's for plant items as taken from those used in the noise modelling for the latest EA for WCM. The SWL's from the EA, therefore, represent a calculated Leq (15 minute) noise level. For mobile plant this calculation is based on the length of time each noise source representing a plant item(s) is at a particular location on the mine site.

For example the noise model includes a number of noise sources located at intervals along the various haul roads to approximate the haul fleet working throughout a 15 minute operational period. The SWL for the point source is calculated based on the length of time any truck is expected to be passing that location during the assessment period.

For mobile plant, the measured Leq noise levels in the table in Appendix III represent a single passby for each plant item whereas the values adopted in the EA (particularly for haul trucks) are for the 15-minute calculated sound power level of 350m long sections of haul road. These values are typically 7-10 dB lower than the single pass-by level.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,
SPECTRUM ACOUSTICS PTY LIMITED

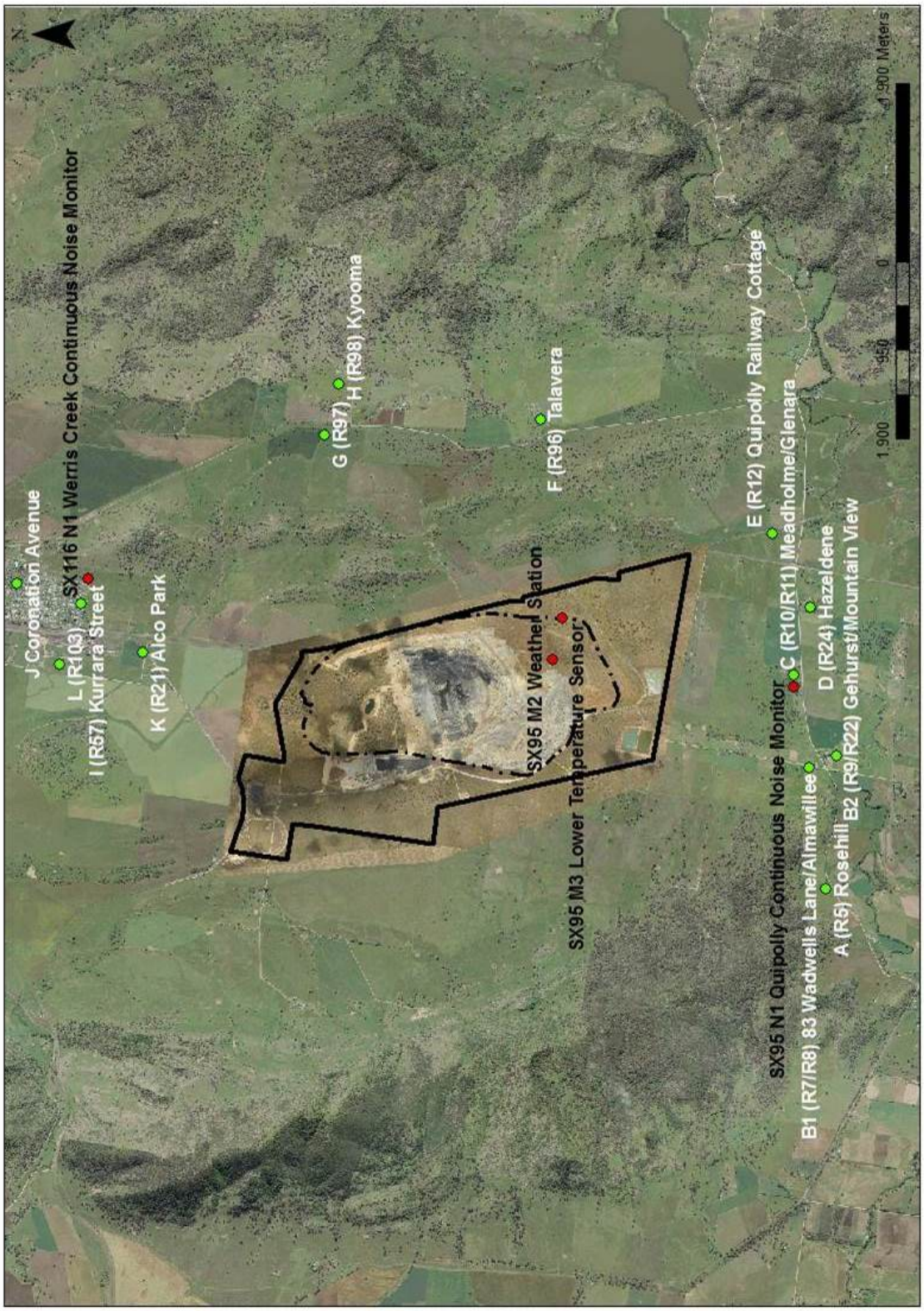
Author:

Ross Hodge
Acoustical Consultant

Review:

Neil Pennington
Acoustical Consultant

Appendix I



Attended Noise Monitoring Locations

Appendix II

Noise Limits

LOM Project Revised Noise Criteria

Location		Day $L_{Aeq,15minute}$	Evening/Night $L_{Aeq,15minute}$	Night $L_{A1(1min)}$	Long Term $L_{Aeq,15minute}$	Acquisition $L_{Aeq,15minute}$
R12	"Quipolly Railway Cottage"	38	38	45	35	40
R24	"Hazeldene"	37	37	45	35	40
R96	"Talavera"#	38	37	45	35	40
All other privately-owned land		35	35	45	35	40

"Talavera" property was listed in the EA under its previous property name of "Millbank"

Table 21: Properties with Private Agreements Noise Criteria

Location		Noise Works Criteria dB(A) Leq	Noise Acquisition Criteria dB(A) Leq
R7	83 Wadwells Lane	40	45
R8	"Almawillee"	40	45
R9	"Gedhurst"	40	45
R10	"Meadholme"	40	45
R11	"Glenara"	40	45
R20	"Tonsley Park"	40	45
R21	"Alco Park"	40	45
R22	"Mountain View"	40	45
R98	"Kyooma"	40	45

Appendix III

Plant Sound Power Levels

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Haul truck CAT 785C (unattenuated)	608	117.7	120	122	17/7/12
Haul truck CAT 785C (attenuated)	608	117.7	116.7	118	24/4/14
Haul truck CAT 785C (unattenuated)	614	117.7	119	121	28/1/14
Haul truck CAT 785C (attenuated)	614	117.7	117.5	119	24/4/14
Haul truck CAT 785C (unattenuated)	609	117.7	120		11/9/12
Haul truck CAT 785C (attenuated)	609	117.7	117.4	119	11/9/12
Haul truck CAT 785C (unattenuated)	610	117.7	121		11/9/12
Haul truck CAT 785C (unattenuated)	611	117.7	120		11/9/12
Haul truck CAT 785C (unattenuated)	612	117.7	120	122	28/1/14
Haul truck CAT 785C (attenuated)	612	117.7	117.8	120	24/4/14
Haul truck CAT 785C (unattenuated)	600	117.7	119		11/9/12
Haul truck CAT 785C (unattenuated)	613	117.7	122		8/8/13
Haul truck CAT 785C (attenuated)	613	117.7	117.9		24/4/14
Haul truck CAT 785C (unattenuated)	624	117.7	121		8/8/13
Haul truck CAT 785C (attenuated)	624	117.7	118.1		24/4/14
Haul truck CAT 789 (unattenuated)	875	117.7	119	121	28/1/14
Water Cart	WA897	113	113		11/9/12
Scraper	SC882	118	113		11/9/12
Excavator (PC 3600)	EX551	116	115		11/9/12
Dozer	829	118	115		24/4/14
Dozer (D10T)	832	118	113	118	28/1/14
Crushing Plant	n/a	116	118		11/9/12
Haul truck CAT 785C Horn pre attenuation	608	117.7		129	17/7/12
Haul truck Cat 785C Horn post attenuation	608	117.7		124	11/9/12
Excavator (PC4000)	EX837	116	115		18/12/12
Dozer D10T (1^{st} gear)	505	118	113 109	128 121	18/12/12
Dozer D10T on stockpile (2^{nd} gear) (1^{st} gear)	505	118	118 109	124 113	6/2/13
Dozer D9T on stockpile (2^{nd} gear) (1^{st} gear)	501	118	119 113	122 118	6/2/13

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Excavator (EX 5600)	570	121	116	119	28/1/14
Haul truck CAT 793XQ	660	115	116	119	28/1/14
Haul truck CAT 793XQ	661	115	115	118	28/1/14
Haul truck CAT 793XQ	662	115	116	119	28/1/14
Haul truck CAT 793XQ	663	115	116	119	8/8/13
Haul truck CAT 793XQ	664	115	114	117	8/8/13
Haul truck CAT 793XQ	665	115	115	118	28/1/14
Haul truck CAT 793XQ	666	115	116	118	28/1/14
Haul truck CAT 793XQ	667	115	115	118	28/1/14
Hitachi Excavator 1900	543	116	115	118	28/1/14
Grader	849	n/a	110	113	28/1/14
Warrior 2400 crusher	n/a	116	117	117	8/8/13
Kleeman screen	MCR401	116	111	112	8/8/13
Water Cart (Volvo)	863	113	114	118	28/1/14
Water Cart (Cat 773D)	869	113	119	123	28/1/14
Water Cart (Cat 773D)	869	113	117.5	119	24/4/14
Drill (Bucyrus)	524	116	107	-	28/1/14
Drill (Cat 6420)	526	116	108	-	28/1/14
Water pump (Dam 4)	--	--	106	--	24/4/14
Evaporation fan (Dam 4)	--	--	105	--	24/4/14

*Leq noise level from vehicle pass by only (modelled levels in the EA for LOM are based on an Leq (15 min) for an attenuated haul truck.

22 October 2014

Ref: 04035/5431

Werris Creek Coal
1435 Werris Creek – Quirindi Road
Werris Creek NSW 2341

RE: OCTOBER 2014 NOISE MONITORING RESULTS – WERRIS CREEK MINE

This letter report presents the results of noise compliance monitoring conducted for the Werris Creek Coal Mine (WCC) on Thursday 16th October, 2014 as required by the Noise Management Plan (NMP), Project Approval 10_0059 and the Environmental Protection Licence (EPL) 12290 and must be submitted to the Environment Protection Authority within 30 days of the completion of monitoring.

Attended Noise Monitoring Program

Noise monitoring was undertaken in accordance with the WCC Noise Monitoring Programme as detailed below in **Table 1** (as adapted from the NMP). The monitoring locations and noise criteria for each are detailed in **Appendices I** and **II**.

Table 1
WCC Attended Noise Monitoring Program

Monitoring Point	Duration	ID	Receiver	Relevant Monitoring Requirements
A	15 minutes[1]	R5	Rosehill	PA10_0059 Private Property outside NMZ
B	15 minutes[1]	R7*	83 Wadwells Lane	Private Agreement
		R8*	Almawillee	
		R9*	Gedhurst	
		R22*	Mountain View	
C	15 minutes[1]	R10*	Meadholme	Private Agreement
		R11*	Glenara	
D	60 minutes[2]	R24	Hazeldene	60 minutes as per EPL 12290
E	60 minutes[2]	R12	Quipolly Railway Cottage	60 minutes as per EPL 12290
F	60 minutes[2]	R96	Talavera	60 minutes as per EPL 12290
G	15 minutes[1]	R97		PA10_0059 Private Property outside NMZ
H	15 minutes[1]	R98*	Kyooma	Private Agreement
I	60 minutes[2]	R57	Kurrara Street@	60 minutes as per EPL 12290
J	15 minutes[1]		Coronation Avenue@	PA10_0059 Private Property outside NMZ
K	15 minutes[1]	R21*	Alco Park	Private Agreement
L	15 minutes[1]	R103		PA10_0059 Private Property outside NMZ

Notes accompanying the table are on the following page

* - WCC has a private agreement for noise impacts with these property owners

@ - Kurrara Street is representative of sensitive receptors in southern Werris Creek while Coronation Avenue is representative of sensitive receptors in central Werris Creek.

NMZ - Noise Management Zone of properties with project specific noise criteria between 35dB(A) and 40dB(A);

Note 1: For each monthly monitoring event a total of 15 minutes (per location) during the day period, and 15 (per location) during the evening or night period;

Note 2: For each monthly monitoring event a total of 60 minutes (per location) during the day period, and 60 minutes (per location) during the evening or night period.

EPL 12290 Condition L4.6 indicates that noise monitoring be conducted;

- Approximately on the property boundary, where any dwelling is situated 30m or less from the property boundary closest to the premises; or
- Within 30m of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30m from the property boundary closest to the premises; or, where applicable
- Within 50m of the boundary of a National Park or Nature Reserve.

EPL 12290 Condition L4.3 indicates that the relevant noise limits apply under all meteorological conditions except for the following;

1. Wind speeds greater than 3m/s at 10m above ground level; or
2. Temperature inversion conditions of up to 12°/100m and wind speeds greater than 2m/s at 10m above ground level; or
3. Temperature inversion conditions greater than 12°/100m.

To determine compliance with the Leq (15 min) operational noise criteria the modification factors detailed in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the measured noise levels.

To determine compliance with the L1 (1 min) sleep disturbance noise criterion the noise measurement equipment must be located within 1m of a dwelling façade.

Monitoring Equipment

Attended noise monitoring was conducted with Brüel & Kjær Type 2250 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 “Sound Level Meters” and have current NATA calibration. Field calibration is carried out at the start and end of each monitoring period.

A-weighted noise levels were measured over the appropriate monitoring periods (15 or 60 minutes) with data acquired at 1 or 2 second statistical intervals and the meter set to “fast” response. Each 1 or 2 second measurement is accompanied by a third-octave band spectrum from 20 - 20k Hz which is required for analysing INP ‘modifying factors’. Time based field notes allow for determination of the relative contributions to the overall noise level of all significant noise sources.

Measurement Analysis

The operational noise criteria for compliance with Condition L4.1 of EPL 12290 are based on a 15 minute Leq noise level. The procedures detailed in Condition M8.2 of EPL 12290 require noise monitoring for significantly longer periods than that of the compliance criteria. To determine compliance with the EPL conditions the worst case 15 minute period, in relation to mine noise, was extracted from each measurement and compared to the criteria in Condition L4.1.

This worst case 15 minute Leq noise level for each monitoring period is shown in the tables below. Where the noise from WCC was audible Bruel & Kjaer "*Evaluator*" analysis software was used to quantify the contributions of the mine and other significant noise sources to the overall level. Mine noise from WCC is shown in the tables in bold type. Where possible the significant audible noise sources from the mine are indicated in notes associated with the tables.

Where noise from WCC is listed as faintly audible, this means the noise levels from the mine were at least 10 dB below the ambient level during the measurement and not measurable.

All noise levels shown are in dB(A) Leq (15 min) unless otherwise shown.

When no mine noise was audible at a monitoring location during a one hour survey, a representative 15 minute noise measurement was made with observations carried out for the remainder of the applicable time period. In these instances, the measured noise level for the representative 15 minute period is that shown in the tables below.

Meteorological data used in this report were supplied by the mine from their automatic weather station M2 which is located on top of the overburden emplacement. Temperature inversion strength is extrapolated from gauges with 80m vertical separation. The wind speed and inversion strength shown in the tables is the average over the one hour monitoring period.

WCC Operations

WCC operations on Thursday 16th October 2014 had the 5600 excavator in Strip 16 centre at RL350m; the 3600 excavator in Strip 14 centre at RL330m; a 1900 excavator in Strip 16 west at RL350m and a 1900 excavator in Strip 16 centre at RL350m. The 3600 and 1900 overburden truck fleets were running to the MIA dump at RL390m on day and to the Ramp 6 in pit dump at RL370m on night shift. The 5600 and the other 1900 overburden truck fleets were running to the in pit eastern ramp dump at RL290m on both day and night shift. There were no production delays either day or night shift. The crushing plant and train load out operated to 11:30pm with two trains loaded; first arriving at 18:23 and leaving at 20:20 and second arriving at 23:44 and leaving at 01:57.

Noise Compliance Assessment

The results of the noise measurements are shown below in **Tables 2** and **3**.

Table 2
WCC Noise Monitoring Results – 16 October 2014 (Day)

Location	Time	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m	Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	10:10 am	35	35	n/a	2.6,268	Birds (34), traffic (27), WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	10:30 am	47	40*	n/a	3.3,278	Birds (47), lawn mower (32), wind in trees (29), WCC inaudible
C R10 Meadholme/ R11 Glenara	10:56 am	40	40*	n/a	3.4,294	Wind in trees (40), birds (28), traffic (23), WCC faintly audible
D R24 Hazeldene	11:16 am	43	37	n/a	3.8,290	Birds (43), traffic (30), wind (25), WCC (24)
E R12 Railway Cottage	12:57 pm	38	38	n/a	4.8,282	Traffic (37), birds (31), WCC inaudible
F R96 Talavera	1:30 pm	40	38	n/a	4.1,270	Wind (38), birds (35), WCC (26)
G R97	12:28 pm	35	35	n/a	4.2,265	Wind (34), WCC (28)
H R98 Kyooma	2:37 pm	42	40*	n/a	3.7,280	Wind in trees (41), birds (36), WCC inaudible
I R57 Kurrara St	3:20 pm	47	35	n/a	4.1,282	Traffic (44), birds (43), train yard (34), wind (32), WCC inaudible
J R57 Coronation Ave	3:01 pm	44	35	n/a	3.6,284	Traffic (42), birds (37), train yard (35), WCC inaudible
K R21 Alco Park	4:49 pm	41	40*	n/a	4.7,260	Train yard (35), traffic (35), wind (34), birds (33), WCC (28), domestic (27)
L R103	4:27 pm	41	35	n/a	4.9,256	Train yard (39), birds (34), traffic (28), wind (28), WCC (24)

* Private Agreement in place – see Appendix II.

Table 3
WCC Noise Monitoring Results – 16 October 2014 (Evening/Night)

Location	Time	dB(A), L1 (1min)[1]	dB(A), Leq	Criterion dB(A) Leq	Inversion °C/100m, Wind speed (m/s),dir°	Identified Noise Sources
A R5 Rosehill	7:16 pm	n/a	38	35	+2.1,3.6,255	Cattle (35), traffic (34), birds (30), WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	7:36 pm	n/a	35	40*	+1.8,4.8,248	Domestic noise (34), traffic (27), insects (23), WCC inaudible
C R10 Meadholme/ R11 Glenara	7:55 pm	n/a	29	40*	+0.8,4.4,229	Traffic (28), insects (21), WCC inaudible
D R24 Hazeldene	8:15 pm	n/a	35	37	+4.8,3.3,188	Traffic (35), insects (20), WCC inaudible
E R12 Railway Cottage	9:52 pm	n/a	47	38	+9.5,2.3,152	Traffic (47), WCC inaudible
F R96 Talavera	7:14 pm	33	48	37	+1.6,4.4,245	Birds (48), traffic (33), WCC (29)
G R97	9:25 pm	44	39	35	+7.9,2.0,153	WCC (38), traffic (29), insects (20)
H R98 Kyooma	8:21 pm	42	36	40*	+3.5,4.3,211	WCC (35), wind in trees (28), insects (24)
I R57 Kurrara St	9:13 pm	36	42	35	+8.2,2.0,148	Traffic (41), train yard (34), WCC (27)
J R57 Coronation Ave	8:52 pm	30	37	35	+6.2,2.4,166	Traffic (36), train yard (28), WCC (27)
K R21 Alco Park	10:48 pm	35	45	40*	+10.2,2.5,147	Train yard (43), traffic (40), WCC (31)
L R103	10:24 pm	22	45	35	+9.5,2.3,155	Train yard (44), traffic (38), WCC (26)

1. L1 (1 min) from mine noise only
* Private Agreement in place – see Appendix II.

The results in Tables 2 and 3 show that, under the operational and atmospheric conditions at the time, the mine noise exceeded the operational noise criterion during the night at the R97 monitoring location. Noise emissions from WCC were measured at 38 dB(A) Leq (15 min) which is 3 dB(A) over the operational noise criterion at this location.

Receiver R97 is unoccupied land and, as there is no residence, no noise levels were predicted in the noise modelling undertaken for the environmental assessments for the operation of WCC. As a result of this R97 is considered a "private property outside of the noise management zone" as defined in Project Approval 10_0059 with an adopted noise criterion of 35 dB(A) Leq (15 min). Had this location been assessed in the LOM EA, then a criterion of 38 dB(A) would have resulted based on a review of worst case predicted noise levels over 25% of this vacant land and no criterion exceedance would have occurred.

Condition L4.3 of EPL 12290 L4.3 indicates that noise limits for WCC do not apply under temperature inversion conditions of up to 12°/100m and wind speeds greater than 2m/s at 10m above ground level. The night time measurement at R97 was made at a time when there was a strong temperature inversion (+8.2°C/100m) and a 2m/s wind. This would represent highly noise enhancing atmospheric conditions for this receiver.

The noise from WCC was audible at most locations that are situated to the north and to the east of the mine site, particularly during the evening/night survey. General mine hum was the most significant contributor to the mine noise component, with distinguishable truck revs and dozer tracks also audible on occasions.

Data from those times where WCC operations were audible were analysed using the *"Evaluator"* software. This analysis showed the noise did not contain any tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

In addition to the operational noise, the noise from WCC must not exceed **45 dB(A) L1 (1 min)** between the hours of 10 pm and 7 am. This is to minimise the potential for sleep disturbance as a result of individual loud noises from the mine.

The compliance measurement locations are different for each of the operational and sleep disturbance noise. That is, the sleep disturbance criterion is typically applicable at 1m from the façade of a bedroom window.

To avoid undue disturbance to residents the L1 (1 min) noise level from the operational measurements are used to show general compliance with the sleep disturbance criterion. That is, as the distance between the noise source and the operational noise monitoring location is significantly greater than the distance between the operational noise monitoring location and the sleep disturbance monitoring location (i.e. 1m from the facade of the house) there will be little variation in L1 (1 min) levels between the two monitoring locations. It must be noted, however, that the sleep disturbance criterion is to be measured near a bedroom window. As the internal layout of each residence is not known, to consider a worst case, this is assumed to be facing the operational noise monitoring location.

As shown in Table 3, during the evening/night time measurement circuit the L1 (1 min) noise from WCC did not exceed 45 dB(A) at any monitoring location.

Plant Sound Power Levels

In keeping with the NMP, the sound power levels of the major noise producing plant and equipment operating on the WCC site is to be determined from sound pressure level measurements. The measurement programme is to be undertaken progressively to capture noise levels from all plant over the period of a year.

The results of the sound power level calculations to date are shown in **Appendix III**. The table in Appendix III lists SWL's for plant items as taken from those used in the noise modelling for the latest EA for WCM. The SWL's from the EA, therefore, represent a calculated Leq (15 minute) noise level. For mobile plant this calculation is based on the length of time each noise source representing a plant item(s) is at a particular location on the mine site.

For example the noise model includes a number of noise sources located at intervals along the various haul roads to approximate the haul fleet working throughout a 15 minute operational period. The SWL for the point source is calculated based on the length of time any truck is expected to be passing that location during the assessment period.

For mobile plant, the measured Leq noise levels in the table in Appendix III represent a single passby for each plant item whereas the values adopted in the EA (particularly for haul trucks) are for the 15-minute calculated sound power level of 350m long sections of haul road. These values are typically 7-10 dB lower than the single pass-by level.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,
SPECTRUM ACOUSTICS PTY LIMITED

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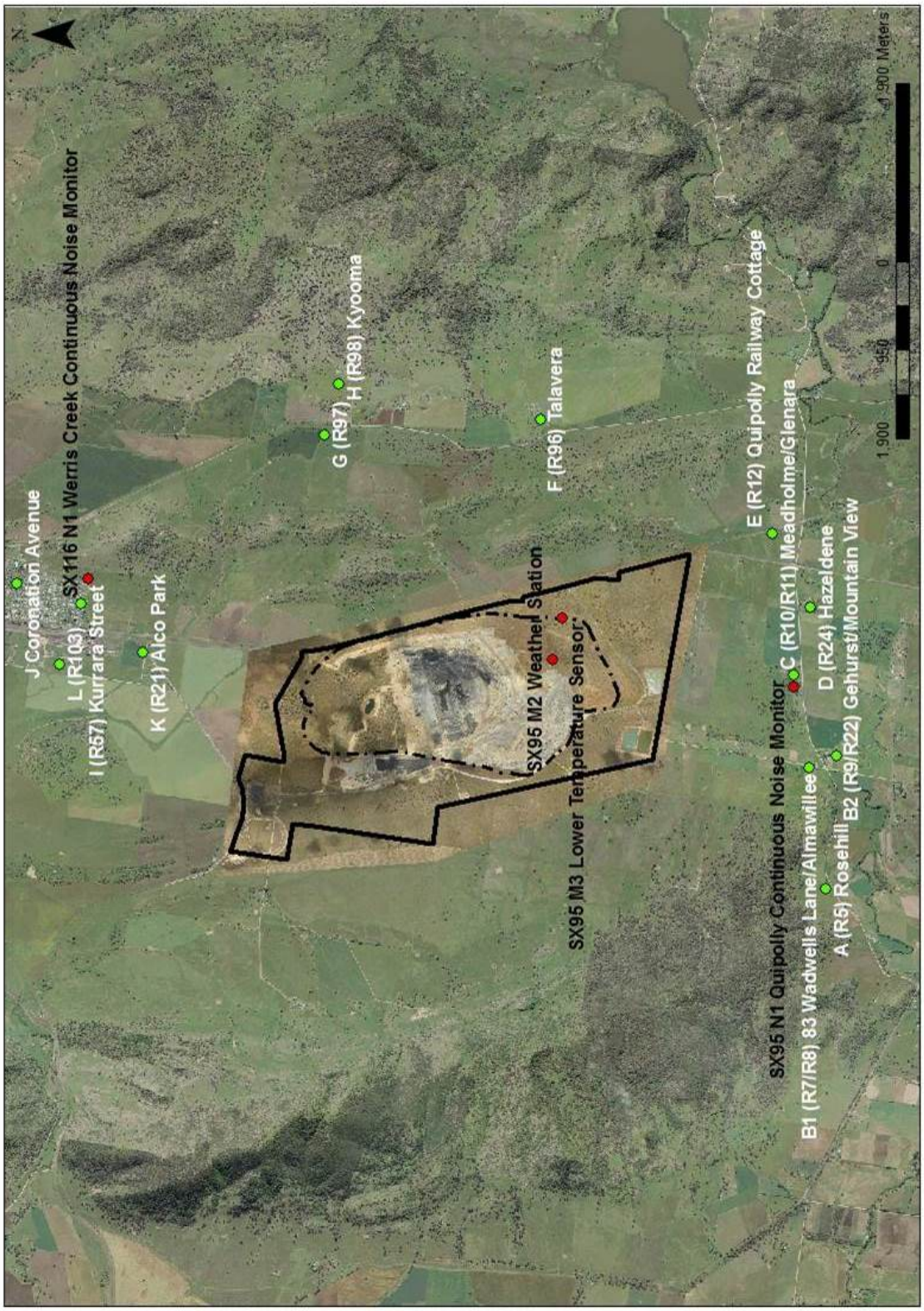
Appendix I



Attended Noise Monitoring Locations

Appendix II

Noise Limits

LOM Project Revised Noise Criteria

Location		Day $L_{Aeq,15minute}$	Evening/Night $L_{Aeq,15minute}$	Night $L_{A1(1min)}$	Long Term $L_{Aeq,15minute}$	Acquisition $L_{Aeq,15minute}$
R12	"Quipolly Railway Cottage"	38	38	45	35	40
R24	"Hazeldene"	37	37	45	35	40
R96	"Talavera"#	38	37	45	35	40
All other privately-owned land		35	35	45	35	40

"Talavera" property was listed in the EA under its previous property name of "Millbank"

Table 21: Properties with Private Agreements Noise Criteria

Location		Noise Works Criteria dB(A) Leq	Noise Acquisition Criteria dB(A) Leq
R7	83 Wadwells Lane	40	45
R8	"Almawillee"	40	45
R9	"Gedhurst"	40	45
R10	"Meadholme"	40	45
R11	"Glenara"	40	45
R20	"Tonsley Park"	40	45
R21	"Alco Park"	40	45
R22	"Mountain View"	40	45
R98	"Kyooma"	40	45

Appendix III

Plant Sound Power Levels

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Haul truck CAT 785C (unattenuated)	608	117.7	120	122	17/7/12
Haul truck CAT 785C (attenuated)	608	117.7	116.7	118	24/4/14
Haul truck CAT 785C (unattenuated)	614	117.7	119	121	28/1/14
Haul truck CAT 785C (attenuated)	614	117.7	117.5	119	24/4/14
Haul truck CAT 785C (unattenuated)	609	117.7	120		11/9/12
Haul truck CAT 785C (attenuated)	609	117.7	117.4	119	11/9/12
Haul truck CAT 785C (unattenuated)	610	117.7	121		11/9/12
Haul truck CAT 785C (unattenuated)	611	117.7	120		11/9/12
Haul truck CAT 785C (unattenuated)	612	117.7	120	122	28/1/14
Haul truck CAT 785C (attenuated)	612	117.7	117.8	120	24/4/14
Haul truck CAT 785C (unattenuated)	600	117.7	119		11/9/12
Haul truck CAT 785C (unattenuated)	613	117.7	122		8/8/13
Haul truck CAT 785C (attenuated)	613	117.7	117.9		24/4/14
Haul truck CAT 785C (unattenuated)	624	117.7	121		8/8/13
Haul truck CAT 785C (attenuated)	624	117.7	118.1		24/4/14
Haul truck CAT 789 (unattenuated)	875	117.7	119	121	28/1/14
Water Cart	WA897	113	113		11/9/12
Scraper	SC882	118	113		11/9/12
Excavator (PC 3600)	EX551	116	115		11/9/12
Dozer	829	118	115		24/4/14
Dozer (D10T)	832	118	113	118	28/1/14
Crushing Plant	n/a	116	118		11/9/12
Haul truck CAT 785C Horn pre attenuation	608	117.7		129	17/7/12
Haul truck Cat 785C Horn post attenuation	608	117.7		124	11/9/12
Excavator (PC4000)	EX837	116	115		18/12/12
Dozer D10T (1^{st} gear)	505	118	113 109	128 121	18/12/12
Dozer D10T on stockpile (2^{nd} gear) (1^{st} gear)	505	118	118 109	124 113	6/2/13
Dozer D9T on stockpile (2^{nd} gear) (1^{st} gear)	501	118	119 113	122 118	6/2/13

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Excavator (EX 5600)	570	121	116	119	28/1/14
Haul truck CAT 793XQ	660	115	116	119	28/1/14
Haul truck CAT 793XQ	661	115	115	118	28/1/14
Haul truck CAT 793XQ	662	115	116	119	28/1/14
Haul truck CAT 793XQ	663	115	116	119	8/8/13
Haul truck CAT 793XQ	664	115	114	117	8/8/13
Haul truck CAT 793XQ	665	115	115	118	28/1/14
Haul truck CAT 793XQ	666	115	116	118	28/1/14
Haul truck CAT 793XQ	667	115	115	118	28/1/14
Hitachi Excavator 1900	543	116	115	118	28/1/14
Grader	849	n/a	110	113	28/1/14
Warrior 2400 crusher	n/a	116	117	117	8/8/13
Kleeman screen	MCR401	116	111	112	8/8/13
Water Cart (Volvo)	863	113	114	118	28/1/14
Water Cart (Cat 773D)	869	113	119	123	28/1/14
Water Cart (Cat 773D)	869	113	117.5	119	24/4/14
Drill (Bucyrus)	524	116	107	-	28/1/14
Drill (Cat 6420)	526	116	108	-	28/1/14
Water pump (Dam 4)	--	--	106	--	24/4/14
Evaporation fan (Dam 4)	--	--	105	--	24/4/14

*Leq noise level from vehicle pass by only (modelled levels in the EA for LOM are based on an Leq (15 min) for an attenuated haul truck.

1 October 2014

Ref: 04035/5415

Werris Creek Coal
1435 Werris Creek – Quirindi Road
Werris Creek NSW 2341

RE: SEPTEMBER 2014 NOISE MONITORING RESULTS – WERRIS CREEK MINE

This letter report presents the results of noise compliance monitoring conducted for the Werris Creek Coal Mine (WCC) on Monday 29th September, 2014 as required by the Noise Management Plan (NMP), Project Approval 10_0059 and the Environmental Protection Licence (EPL) 12290 and must be submitted to the Environment Protection Authority within 30 days of the completion of monitoring.

Attended Noise Monitoring Program

Noise monitoring was undertaken in accordance with the WCC Noise Monitoring Programme as detailed below in **Table 1** (as adapted from the NMP). The monitoring locations and noise criteria for each are detailed in **Appendices I** and **II**.

Table 1
WCC Attended Noise Monitoring Program

Monitoring Point	Duration	ID	Receiver	Relevant Monitoring Requirements
A	15 minutes[1]	R5	Rosehill	PA10_0059 Private Property outside NMZ
B	15 minutes[1]	R7*	83 Wadwells Lane	Private Agreement
		R8*	Almawillee	
		R9*	Gedhurst	
		R22*	Mountain View	
C	15 minutes[1]	R10*	Meadholme	Private Agreement
		R11*	Glenara	
D	60 minutes[2]	R24	Hazeldene	60 minutes as per EPL 12290
E	60 minutes[2]	R12	Quipolly Railway Cottage	60 minutes as per EPL 12290
F	60 minutes[2]	R96	Talavera	60 minutes as per EPL 12290
G	15 minutes[1]	R97		PA10_0059 Private Property outside NMZ
H	15 minutes[1]	R98*	Kyooma	Private Agreement
I	60 minutes[2]	R57	Kurrara Street@	60 minutes as per EPL 12290
J	15 minutes[1]		Coronation Avenue@	PA10_0059 Private Property outside NMZ
K	15 minutes[1]	R21*	Alco Park	Private Agreement
L	15 minutes[1]	R103		PA10_0059 Private Property outside NMZ

Notes accompanying the table are on the following page

* - WCC has a private agreement for noise impacts with these property owners

@ - Kurrara Street is representative of sensitive receptors in southern Werris Creek while Coronation Avenue is representative of sensitive receptors in central Werris Creek.

NMZ - Noise Management Zone of properties with project specific noise criteria between 35dB(A) and 40dB(A);

Note 1: For each monthly monitoring event a total of 15 minutes (per location) during the day period, and 15 (per location) during the evening or night period;

Note 2: For each monthly monitoring event a total of 60 minutes (per location) during the day period, and 60 minutes (per location) during the evening or night period.

EPL 12290 Condition L4.6 indicates that noise monitoring be conducted;

- Approximately on the property boundary, where any dwelling is situated 30m or less from the property boundary closest to the premises; or
- Within 30m of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30m from the property boundary closest to the premises; or, where applicable
- Within 50m of the boundary of a National Park or Nature Reserve.

EPL 12290 Condition L4.3 indicates that the relevant noise limits apply under all meteorological conditions except for the following;

1. Wind speeds greater than 3m/s at 10m above ground level; or
2. Temperature inversion conditions of up to 12°/100m and wind speeds greater than 2m/s at 10m above ground level; or
3. Temperature inversion conditions greater than 12°/100m.

To determine compliance with the Leq (15 min) operational noise criteria the modification factors detailed in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the measured noise levels.

To determine compliance with the L1 (1 min) sleep disturbance noise criterion the noise measurement equipment must be located within 1m of a dwelling façade.

Monitoring Equipment

Attended noise monitoring was conducted with Brüel & Kjær Type 2250 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 “Sound Level Meters” and have current NATA calibration. Field calibration is carried out at the start and end of each monitoring period.

A-weighted noise levels were measured over the appropriate monitoring periods (15 or 60 minutes) with data acquired at 1 or 2 second statistical intervals and the meter set to “fast” response. Each 1 or 2 second measurement is accompanied by a third-octave band spectrum from 20 - 20k Hz which is required for analysing INP ‘modifying factors’. Time based field notes allow for determination of the relative contributions to the overall noise level of all significant noise sources.

Measurement Analysis

The operational noise criteria for compliance with Condition L4.1 of EPL 12290 are based on a 15 minute Leq noise level. The procedures detailed in Condition M8.2 of EPL 12290 require noise monitoring for significantly longer periods than that of the compliance criteria. To determine compliance with the EPL conditions the worst case 15 minute period, in relation to mine noise, was extracted from each measurement and compared to the criteria in Condition L4.1.

This worst case 15 minute Leq noise level for each monitoring period is shown in the tables below. Where the noise from WCC was audible Bruel & Kjaer "*Evaluator*" analysis software was used to quantify the contributions of the mine and other significant noise sources to the overall level. Mine noise from WCC is shown in the tables in bold type. Where possible the significant audible noise sources from the mine are indicated in notes associated with the tables.

Where noise from WCC is listed as faintly audible, this means the noise levels from the mine were at least 10 dB below the ambient level during the measurement and not measurable.

All noise levels shown are in dB(A) Leq (15 min) unless otherwise shown.

When no mine noise was audible at a monitoring location during a one hour survey, a representative 15 minute noise measurement was made with observations carried out for the remainder of the applicable time period. In these instances, the measured noise level for the representative 15 minute period is that shown in the tables below.

Meteorological data used in this report were supplied by the mine from their automatic weather station M2 which is located on top of the overburden emplacement. Temperature inversion strength is extrapolated from gauges with 80m vertical separation. The wind speed and inversion strength shown in the tables is the average over the one hour monitoring period.

WCC Operations

WCC operations on Monday 29th September 2014 had the 5600 excavator in Strip 17 west at RL390m; the 3600 excavator in Strip 16 centre at RL330m and a 1900 excavator in Strip 16 west at RL330m. All overburden truck fleets were running to the in pit dump at RL350m on day and night shift. There were no production delays either day or night shift. The crushing plant and train load out operated to 2:30am with no trains loaded.

Noise Compliance Assessment

The results of the noise measurements are shown below in **Tables 2** and **3**.

Table 2
WCC Noise Monitoring Results – 29 September 2014 (Day)

Location	Time	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m	Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	1:27 pm	39	35	n/a	2.1,7	Birds (39), traffic (25) WCC inaudible
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	1:47 pm	56	40*	n/a	1.9,306	Birds (56), traffic (27), WCC faintly audible
C R10 Meadholme/ R11 Glenara	2:53 pm	41	40*	n/a	1.9,300	Wind in trees (39), birds (37), WCC (25), traffic (24)
D R24 Hazeldene	3:12 pm	48	37	n/a	1.8,290	Birds (47), traffic (42), WCC (27)
E R12 Railway Cottage	4:47 pm	42	38	n/a	1.6,301	Traffic (42), birds (28), WCC inaudible
F R96 Talavera	4:07 pm	38	38	n/a	1.8,289	Birds & insects (38), traffic (25), WCC faintly audible
G R97	4:22 pm	29	35	n/a	2.1,289	Birds & insects (28), traffic (21), WCC inaudible
H R98 Kyooma	3:45 pm	43	40*	n/a	2.0,286	Birds (43), train yard (25), traffic (23), WCC inaudible
I R57 Kurrara St	2:16 pm	50	35	n/a	2.2,310	Traffic (48), birds & insects (45), train yard (36), WCC inaudible
J R57 Coronation Ave	3:22 pm	38	35	n/a	2.0,291	Traffic (35), birds (32), dog (32), WCC inaudible
K R21 Alco Park	1:53 pm	49	40*	n/a	1.9,306	Traffic (49), train yard (30), construction noise (28), birds (26), WCC inaudible
L R103	1:29 pm	39	35	n/a	2.1,7	Birds & insects (35), construction noise (34), train yard (30), wind (29), WCC inaudible

* Private Agreement in place – see Appendix II.

Table 3
WCC Noise Monitoring Results – 29 September 2014 (Evening/Night)

Location	Time	dB(A), L1 (1min)[1]	dB(A), Leq	Criterion dB(A) Leq	Inversion ^{O}C/100m, Wind speed (m/s),dir^{O}	Identified Noise Sources
A R5 Rosehill	7:00 pm	28	37	35	+6.5,1.5,327	Tractor (34), traffic (31), frogs & insects (30), WCC (24)
B R7 83 Wadwells Lane, R8 Almawillee, R9Gedhurst, R22 Mountain View	7:20 pm	33	41	40*	+7.4,1.8,335	Birds & insects (41), traffic (28), WCC (28)
C R10 Meadholme/ R11 Glenara	8:25 pm	37	36	40*	+10.5,2.1,340	Traffic (34), WCC (31), frogs & insects (25)
D R24 Hazeldene	8:45 pm	40	43	37	+10.1,0.9,335	Traffic (42), WCC (34), frogs & insects (27)
E R12 Railway Cottage	10:18 pm	36	40	38	+10.1,1.6,330	Traffic (39), WCC (33), frogs & insects (24)
F R96 Talavera	9:57 pm	42	39	37	+10.5,1.8,328	WCC (38), traffic (29), birds & insects (26)
G R97	9:54 pm	26	37	35	+10.6,1.7,337	Frogs & insects (37), traffic (22), WCC faintly audible
H R98 Kyooma	9:33 pm	40	37	40*	+9.5,0.4,314	WCC (36), traffic (29), insects (25)
I R57 Kurrara St	8:00 pm	n/a	38	35	+9.9,2.1,344	Traffic (36), frogs & insects (35), train yard (29), WCC inaudible
J R57 Coronation Ave	9:05 pm	n/a	35	35	+9.8,1.2,357	Traffic (33), dog (31), WCC inaudible
K R21 Alco Park	7:38 pm	n/a	42	40*	+8,2.0,356	Traffic (41), train yard (32), insects (27), WCC inaudible
L R103	7:15 pm	n/a	48	35	+6.8,1.8,328	Traffic (47), train yard (40), insects (35), WCC inaudible

1. L1 (1 min) from mine noise only
* Private Agreement in place – see Appendix II.

The results in Tables 2 and 3 indicate that, under the operational and atmospheric conditions at the time, the mine noise was greater than the applicable operational noise criterion at night at the Talavera monitoring location. At all other receiver locations the measured noise levels did not exceed the relevant noise criteria.

Section 11.1.3 of the EPA's *NSW Industrial Noise Policy* (INP) defines non-compliance as follows:

> *"A development will be deemed to be in non-compliance with a noise consent or license condition if the monitored noise level is more than 2 dB above the statutory noise level specified in the consent or license condition."*

The 2 dB 'tolerance' is given because this represents the theoretical minimum noise level difference discernible by the human ear. Section 11.1.3 of the INP goes on to define a breach as:

"A development will be in breach of a noise consent or license condition if sustained non-compliances are not addressed and rectified."

These statements mean that a breach only occurs when noise emissions are repeatedly measured at a level more than 2 dB above the limit given in the consent, and the proponent does not endeavour to manage or mitigate the exceedance.

The measured mine noise level at Talavera on the evening/night of 29 September was 1 dB above the relevant criterion for this location and, based on the discussion above, is not considered to be a non-compliance.

The night time measurement at Talavera was made at a time when there was a strong temperature inversion (+10.5 ^{O}C/100m) and a light source to receiver wind. This would represent highly noise enhancing atmospheric conditions for this receiver.

The noise from WCC was audible at most locations that are situated to the south and to the east of the mine site, particularly during the evening/night survey. General mine hum was the most significant contributor to the mine noise component, with distinguishable truck revs and dozer tracks also audible on occasions.

Data from those times where WCC operations were audible were analysed using the *"Evaluator"* software. This analysis showed the noise did not contain any tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

In addition to the operational noise, the noise from WCC must not exceed **45 dB(A) L1 (1 min)** between the hours of 10 pm and 7 am. This is to minimise the potential for sleep disturbance as a result of individual loud noises from the mine.

The compliance measurement locations are different for each of the operational and sleep disturbance noise. That is, the sleep disturbance criterion is typically applicable at 1m from the façade of a bedroom window.

To avoid undue disturbance to residents the L1 (1 min) noise level from the operational measurements are used to show general compliance with the sleep disturbance criterion. That is, as the distance between the noise source and the operational noise monitoring location is significantly greater than the distance between the operational noise monitoring location and the sleep disturbance monitoring location (i.e. 1m from the facade of the house) there will be little variation in L1 (1 min) levels between the two monitoring locations. It must be noted, however, that the sleep disturbance criterion is to be measured near a bedroom window. As the internal layout of each residence is not known, to consider a worst case, this is assumed to be facing the operational noise monitoring location.

As shown in Table 3, during the evening/night time measurement circuit the L1 (1 min) noise from WCC did not exceed 45 dB(A) at any monitoring location.

Plant Sound Power Levels

In keeping with the NMP, the sound power levels of the major noise producing plant and equipment operating on the WCC site is to be determined from sound pressure level measurements. The measurement programme is to be undertaken progressively to capture noise levels from all plant over the period of a year.

The results of the sound power level calculations to date are shown in **Appendix III**. The table in Appendix III lists SWL's for plant items as taken from those used in the noise modelling for the latest

EA for WCM. The SWL's from the EA, therefore, represent a calculated Leq (15 minute) noise level. For mobile plant this calculation is based on the length of time each noise source representing a plant item(s) is at a particular location on the mine site.

For example the noise model includes a number of noise sources located at intervals along the various haul roads to approximate the haul fleet working throughout a 15 minute operational period. The SWL for the point source is calculated based on the length of time any truck is expected to be passing that location during the assessment period.

For mobile plant, the measured Leq noise levels in the table in Appendix III represent a single passby for each plant item whereas the values adopted in the EA (particularly for haul trucks) are for the 15-minute calculated sound power level of 350m long sections of haul road. These values are typically 7-10 dB lower than the single pass-by level.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,
SPECTRUM ACOUSTICS PTY LIMITED

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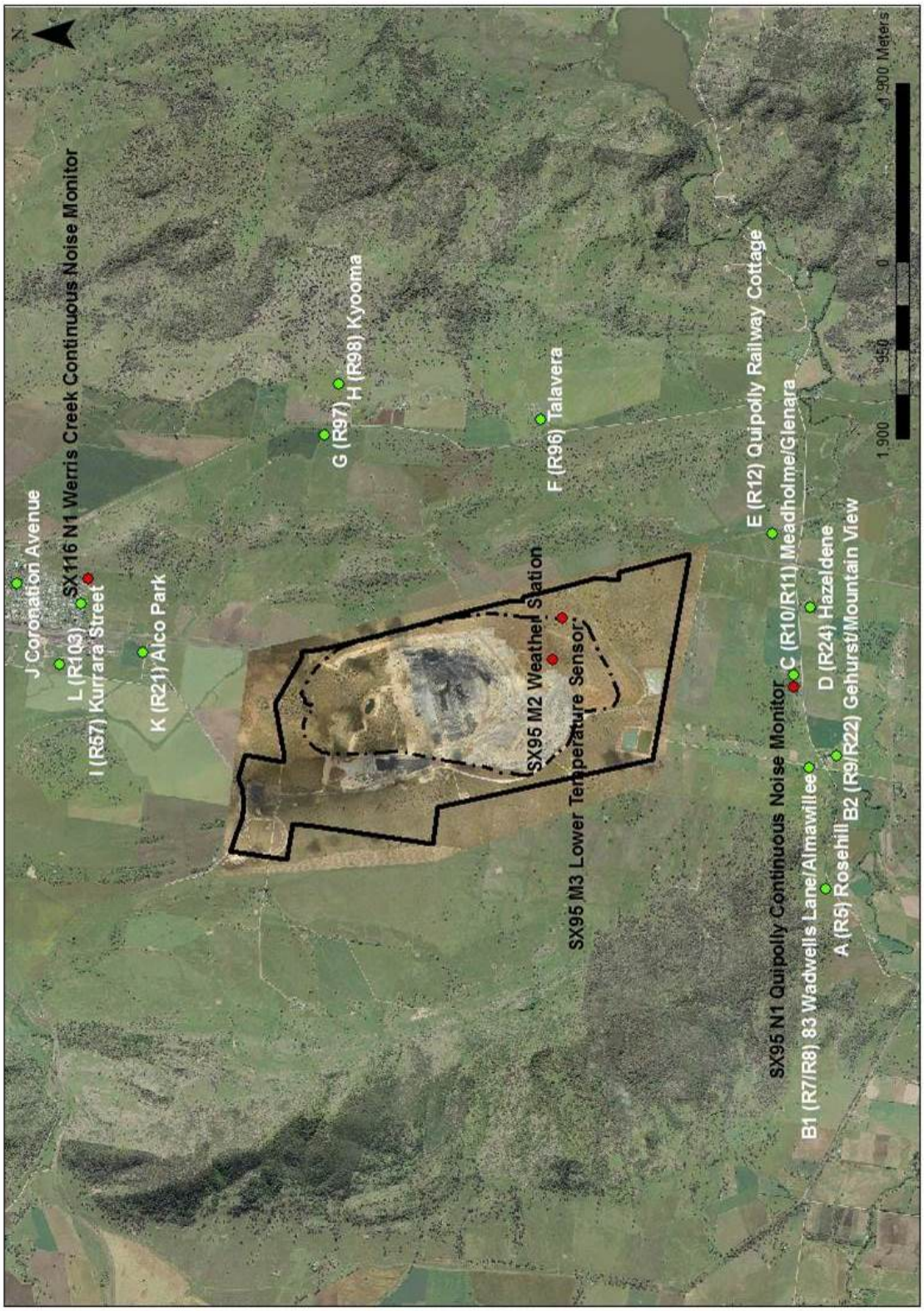
Appendix I



Attended Noise Monitoring Locations

Appendix II

Noise Limits

LOM Project Revised Noise Criteria

Location		Day $L_{Aeq,15minute}$	Evening/Night $L_{Aeq,15minute}$	Night $L_{A1(1min)}$	Long Term $L_{Aeq,15minute}$	Acquisition $L_{Aeq,15minute}$
R12	"Quipolly Railway Cottage"	38	38	45	35	40
R24	"Hazeldene"	37	37	45	35	40
R96	"Talavera"#	38	37	45	35	40
All other privately-owned land		35	35	45	35	40

"Talavera" property was listed in the EA under its previous property name of "Millbank"

Table 21: Properties with Private Agreements Noise Criteria

Location		Noise Works Criteria dB(A) Leq	Noise Acquisition Criteria dB(A) Leq
R7	83 Wadwells Lane	40	45
R8	"Almawillee"	40	45
R9	"Gedhurst"	40	45
R10	"Meadholme"	40	45
R11	"Glenara"	40	45
R20	"Tonsley Park"	40	45
R21	"Alco Park"	40	45
R22	"Mountain View"	40	45
R98	"Kyooma"	40	45

Appendix III

Plant Sound Power Levels

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Haul truck CAT 785C (unattenuated)	608	117.7	120	122	17/7/12
Haul truck CAT 785C (attenuated)	608	117.7	116.7	118	24/4/14
Haul truck CAT 785C (unattenuated)	614	117.7	119	121	28/1/14
Haul truck CAT 785C (attenuated)	614	117.7	117.5	119	24/4/14
Haul truck CAT 785C (unattenuated)	609	117.7	120		11/9/12
Haul truck CAT 785C (attenuated)	609	117.7	117.4	119	11/9/12
Haul truck CAT 785C (unattenuated)	610	117.7	121		11/9/12
Haul truck CAT 785C (unattenuated)	611	117.7	120		11/9/12
Haul truck CAT 785C (unattenuated)	612	117.7	120	122	28/1/14
Haul truck CAT 785C (attenuated)	612	117.7	117.8	120	24/4/14
Haul truck CAT 785C (unattenuated)	600	117.7	119		11/9/12
Haul truck CAT 785C (unattenuated)	613	117.7	122		8/8/13
Haul truck CAT 785C (attenuated)	613	117.7	117.9		24/4/14
Haul truck CAT 785C (unattenuated)	624	117.7	121		8/8/13
Haul truck CAT 785C (attenuated)	624	117.7	118.1		24/4/14
Haul truck CAT 789 (unattenuated)	875	117.7	119	121	28/1/14
Water Cart	WA897	113	113		11/9/12
Scraper	SC882	118	113		11/9/12
Excavator (PC 3600)	EX551	116	115		11/9/12
Dozer	829	118	115		24/4/14
Dozer (D10T)	832	118	113	118	28/1/14
Crushing Plant	n/a	116	118		11/9/12
Haul truck CAT 785C Horn pre attenuation	608	117.7		129	17/7/12
Haul truck Cat 785C Horn post attenuation	608	117.7		124	11/9/12
Excavator (PC4000)	EX837	116	115		18/12/12
Dozer D10T (1^{st} gear)	505	118	113 109	128 121	18/12/12
Dozer D10T on stockpile (2^{nd} gear) (1^{st} gear)	505	118	118 109	124 113	6/2/13
Dozer D9T on stockpile (2^{nd} gear) (1^{st} gear)	501	118	119 113	122 118	6/2/13

Plant Item		NMP SWL dB(A) Leq	Actual dB(A) Leq	Actual dB(A) Lmax	Date Measured
Type	No.				
Excavator (EX 5600)	570	121	116	119	28/1/14
Haul truck CAT 793XQ	660	115	116	119	28/1/14
Haul truck CAT 793XQ	661	115	115	118	28/1/14
Haul truck CAT 793XQ	662	115	116	119	28/1/14
Haul truck CAT 793XQ	663	115	116	119	8/8/13
Haul truck CAT 793XQ	664	115	114	117	8/8/13
Haul truck CAT 793XQ	665	115	115	118	28/1/14
Haul truck CAT 793XQ	666	115	116	118	28/1/14
Haul truck CAT 793XQ	667	115	115	118	28/1/14
Hitachi Excavator 1900	543	116	115	118	28/1/14
Grader	849	n/a	110	113	28/1/14
Warrior 2400 crusher	n/a	116	117	117	8/8/13
Kleeman screen	MCR401	116	111	112	8/8/13
Water Cart (Volvo)	863	113	114	118	28/1/14
Water Cart (Cat 773D)	869	113	119	123	28/1/14
Water Cart (Cat 773D)	869	113	117.5	119	24/4/14
Drill (Bucyrus)	524	116	107	-	28/1/14
Drill (Cat 6420)	526	116	108	-	28/1/14
Water pump (Dam 4)	--	--	106	--	24/4/14
Evaporation fan (Dam 4)	--	--	105	--	24/4/14

*Leq noise level from vehicle pass by only (modelled levels in the EA for LOM are based on an Leq (15 min) for an attenuated haul truck.

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Report

Continuous Environmental Noise Monitoring

Werris Creek Coal

Whitehaven Coal

4 May, 2015
Rev 0 (Final)

www.advitech.com.au

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Report Details

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Endorsements

Function	Signature	Name and Title	Date
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Checked and Authorised for Release by		Dr Rod Bennison Lead Environmental Scientist	4 May, 2015

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1. INTRODUCTION

Advitech Pty Limited (Advitech) was engaged by Werris Creek Coal (Whitehaven Coal Limited) to prepare annual assessment of noise monitoring results from continuous monitoring systems located in the receiving environment adjacent to the Werris Creek Coal (WCC) mine.

It should be noted that this report was prepared by Advitech Pty Limited for Whitehaven Coal ("the customer") in accordance with the scope of work and specific requirements agreed between Advitech and the customer. This report was prepared with background information, terms of reference and assumptions agreed with the customer. The report is not intended for use by any other individual or organisation and as such, Advitech will not accept liability for use of the information contained in this report, other than that which was intended at the time of writing.

2. ENVIRONMENTAL MONITORING PROGRAM

Werris Creek Coal operates a network of SentineX continuous noise and meteorological monitoring systems in the receiving environment adjacent to the WCC mine. During the 2014-2015 AEMR period, the monitoring network included:

- two permanent trailer mounted (mobile) off-site noise monitoring systems, including:
  - SentineX95 (Quipolly (south of WCC));
  - SentineX116 (Werris Creek (north of WCC)); and
- one temporary off-site noise monitoring system at Werris East (Marengo property (east of WCC));
- on-site meteorological monitoring (10m wind speed and direction, and direct measurement of temperate lapse).

2.1 Noise Monitoring and Reporting Objectives

The objective of continuous environmental noise assessment is to monitor potential mining noise impacts in the receiving environment adjacent to the WCC mine, and determine if these impacts are consistent with the objectives of the NMP.

2.2 Noise Monitoring and Assessment Methodology

SentineX is a remote noise monitoring system which provides near real time data access via a dedicated website. The noise monitoring system records the following parameters:

- measured noise levels (L_{Aeq}, $L_{AeqLF(20\ to\ 630Hz)}$, and statistical levels L_{A1} to L_{A90}); and
- wind direction, wind speed, temperature, humidity and rainfall.

For the purposes of this assessment, analysis of monitoring results is undertaken to evaluate changes in day shift (6:00 to 16:00) and night shift (16:00 to 2:00) noise levels over time, and describes long term trends in terms of the following indicators:

- maximum $L_{A1,15minute}$ result during the day and night periods;
- $L_{Aeq,day}$ and $L_{Aeq,night}$ results;
- $L_{AeqLF,day}$ and $L_{AeqLF,night}$ results; and
- assessment background level (L_{A90}) results for the day and night assessment period.

Results for each calendar month are summarised to present the minimum, median and maximum observations for each of these descriptors, and reported on an annual basis. A summary of monitoring results for the period April 2014 to March 2015 is presented below.

3. RESULTS

3.1 April 2014 Results Summary

The continuous noise monitoring results summary for April 2014 is presented in **Table 1**. These results are calculated on the basis of available 15 minute monitoring data, following exclusion of results obtained under conditions to which the noise criteria do not apply (as defined in Condition L4.3 of EPL12290). It is noted that these results present analysis of raw monitoring data, and no evaluation of source contributions has been undertaken to validate whether the reported noise levels are representative of mining, or cumulative environmental noise impacts.

Table 1: Continuous monitoring results for April, 2014

Descriptor		SentineX95 (Quipolly)		SentineX116 (Werris Creek)		SentineX2 (Werris East)	
		Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)
$L_{A1,15minute}$	Minimum	52	41	54	48	n/a	n/a
	Median	72	51	63	58	n/a	n/a
	Maximum	89	77	86	64	n/a	n/a
$L_{Aeq,period}$	Minimum	43	32	42	29	n/a	n/a
	Median	50	36	46	43	n/a	n/a
	Maximum	70	59	61	46	n/a	n/a
$L_{AeqLF,period}$	Minimum	31	28	36	27	n/a	n/a
	Median	36	34	40	40	n/a	n/a
	Maximum	60	37	46	45	n/a	n/a
$L_{A90,period}$	Minimum	28	19	35	20	n/a	n/a
	Median	34	28	38	34	n/a	n/a
	Maximum	53	52	43	39	n/a	n/a

Note: n/a denotes that monitoring was not undertaken at this location at this time.

3.2 May 2014 Results Summary

The continuous noise monitoring results summary for May 2014 is presented in **Table 2**. These results are calculated on the basis of available 15 minute monitoring data, following exclusion of results obtained under conditions to which the noise criteria do not apply (as defined in Condition L4.3 of EPL12290). It is noted that these results present analysis of raw monitoring data, and no evaluation of source contributions has been undertaken to validate whether the reported noise levels are representative of mining, or cumulative environmental noise impacts.

Table 2: Continuous monitoring results for May, 2014

Descriptor		SentineX95 (Quipolly)		SentineX116 (Werris Creek)		SentineX2 (Werris East)	
		Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)
$L_{A1,15minute}$	Minimum	62	36	57	45	n/a	n/a
	Median	73	51	61	57	n/a	n/a
	Maximum	83	54	71	66	n/a	n/a
$L_{Aeq,period}$	Minimum	43	29	42	35	n/a	n/a
	Median	50	36	45	42	n/a	n/a
	Maximum	55	42	53	47	n/a	n/a
$L_{AeqLF,period}$	Minimum	34	28	35	32	n/a	n/a
	Median	36	34	40	40	n/a	n/a
	Maximum	43	35	43	45	n/a	n/a
$L_{A90,period}$	Minimum	30	22	32	26	n/a	n/a
	Median	34	27	37	34	n/a	n/a
	Maximum	38	38	41	39	n/a	n/a

Note: n/a denotes that monitoring was not undertaken at this location at this time.

3.3 June 2014 Results Summary

The continuous noise monitoring results summary for June 2014 is presented in **Table 3**. These results are calculated on the basis of available 15 minute monitoring data, following exclusion of results obtained under conditions to which the noise criteria do not apply (as defined in Condition L4.3 of EPL12290). It is noted that these results present analysis of raw monitoring data, and no evaluation of source contributions has been undertaken to validate whether the reported noise levels are representative of mining, or cumulative environmental noise impacts.

Table 3: Continuous monitoring results for June, 2014

Descriptor		SentineX95 (Quipolly)		SentineX116 (Werris Creek)		SentineX2 (Werris East)	
		Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)
$L_{A1,15minute}$	Minimum	47	38	48	46	n/a	n/a
	Median	72	52	60	59	n/a	n/a
	Maximum	79	57	86	64	n/a	n/a
$L_{Aeq,period}$	Minimum	35	32	41	39	n/a	n/a
	Median	49	37	46	44	n/a	n/a
	Maximum	57	42	59	47	n/a	n/a
$L_{AeqLF,period}$	Minimum	30	30	36	37	n/a	n/a
	Median	36	35	42	42	n/a	n/a
	Maximum	41	37	45	46	n/a	n/a
$L_{A90,period}$	Minimum	29	19	34	31	n/a	n/a
	Median	36	28	38	36	n/a	n/a
	Maximum	46	37	41	42	n/a	n/a

Note: n/a denotes that monitoring was not undertaken at this location at this time.

3.4 July 2014 Results Summary

The continuous noise monitoring results summary for July 2014 is presented in **Table 4**. These results are calculated on the basis of available 15 minute monitoring data, following exclusion of results obtained under conditions to which the noise criteria do not apply (as defined in Condition L4.3 of EPL12290). It is noted that these results present analysis of raw monitoring data, and no evaluation of source contributions has been undertaken to validate whether the reported noise levels are representative of mining, or cumulative environmental noise impacts.

Table 4: Continuous monitoring results for July, 2014

Descriptor		SentineX95 (Quipolly)		SentineX116 (Werris Creek)		SentineX2 (Werris East)	
		Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)
$L_{A1,15minute}$	Minimum	55	40	56	43	n/a	n/a
	Median	72	52	62	58	n/a	n/a
	Maximum	85	56	87	65	n/a	n/a
$L_{Aeq,period}$	Minimum	46	31	42	33	n/a	n/a
	Median	50	37	46	44	n/a	n/a
	Maximum	60	41	56	47	n/a	n/a
$L_{AeqLF,period}$	Minimum	34	29	35	31	n/a	n/a
	Median	37	35	42	42	n/a	n/a
	Maximum	44	40	48	46	n/a	n/a
$L_{A90,period}$	Minimum	34	20	34	27	n/a	n/a
	Median	37	29	38	34	n/a	n/a
	Maximum	43	34	43	40	n/a	n/a

Note: n/a denotes that monitoring was not undertaken at this location at this time.

3.5 August 2014 Results Summary

The continuous noise monitoring results summary for August 2014 is presented in **Table 5**. These results are calculated on the basis of available 15 minute monitoring data, following exclusion of results obtained under conditions to which the noise criteria do not apply (as defined in Condition L4.3 of EPL12290). It is noted that these results present analysis of raw monitoring data, and no evaluation of source contributions has been undertaken to validate whether the reported noise levels are representative of mining, or cumulative environmental noise impacts.

Table 5: Continuous monitoring results for August, 2014

Descriptor		SentineX95 (Quipolly)		SentineX116 (Werris Creek)		SentineX2 (Werris East)	
		Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)
$L_{A1,15minute}$	Minimum	57	29	55	40	n/a	n/a
	Median	65	50	68	58	n/a	n/a
	Maximum	75	56	84	67	n/a	n/a
$L_{Aeq,period}$	Minimum	44	22	43	30	n/a	n/a
	Median	48	36	49	44	n/a	n/a
	Maximum	50	46	72	47	n/a	n/a
$L_{AeqLF,period}$	Minimum	32	21	36	29	n/a	n/a
	Median	36	34	41	42	n/a	n/a
	Maximum	41	38	45	45	n/a	n/a
$L_{A90,period}$	Minimum	30	19	33	24	n/a	n/a
	Median	37	26	38	34	n/a	n/a
	Maximum	43	42	41	40	n/a	n/a

Note: n/a denotes that monitoring was not undertaken at this location at this time.

3.6 September 2014 Results Summary

The continuous noise monitoring results summary for September 2014 is presented in **Table 6**. These results are calculated on the basis of available 15 minute monitoring data, following exclusion of results obtained under conditions to which the noise criteria do not apply (as defined in Condition L4.3 of EPL12290). It is noted that these results present analysis of raw monitoring data, and no evaluation of source contributions has been undertaken to validate whether the reported noise levels are representative of mining, or cumulative environmental noise impacts.

Table 6: Continuous monitoring results for September, 2014

Descriptor		SentineX95 (Quipolly)		SentineX116 (Werris Creek)		SentineX2 (Werris East)	
		Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)
$L_{A1,15minute}$	Minimum	55	35	54	48	n/a	n/a
	Median	62	53	59	58	n/a	n/a
	Maximum	74	72	68	67	n/a	n/a
$L_{Aeq,period}$	Minimum	43	28	42	36	n/a	n/a
	Median	47	37	45	43	n/a	n/a
	Maximum	59	48	56	49	n/a	n/a
$L_{AeqLF,period}$	Minimum	32	23	34	33	n/a	n/a
	Median	36	34	41	41	n/a	n/a
	Maximum	53	38	48	48	n/a	n/a
$L_{A90,period}$	Minimum	35	19	31	17	n/a	n/a
	Median	38	27	37	34	n/a	n/a
	Maximum	51	34	46	45	n/a	n/a

Note: n/a denotes that monitoring was not undertaken at this location at this time.

3.7 October 2014 Results Summary

The continuous noise monitoring results summary for October 2014 is presented in **Table 7**. These results are calculated on the basis of available 15 minute monitoring data, following exclusion of results obtained under conditions to which the noise criteria do not apply (as defined in Condition L4.3 of EPL12290). It is noted that these results present analysis of raw monitoring data, and no evaluation of source contributions has been undertaken to validate whether the reported noise levels are representative of mining, or cumulative environmental noise impacts.

Table 7: Continuous monitoring results for October, 2014

Descriptor		SentineX95 (Quipolly)		SentineX116 (Werris Creek)		SentineX2 (Werris East)	
		Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)
$L_{A1,15minute}$	Minimum	58	33	55	44	n/a	n/a
	Median	62	53	63	57	n/a	n/a
	Maximum	78	71	84	72	n/a	n/a
$L_{Aeq,period}$	Minimum	43	29	43	34	n/a	n/a
	Median	47	38	46	43	n/a	n/a
	Maximum	53	46	59	48	n/a	n/a
$L_{AeqLF,period}$	Minimum	32	25	34	28	n/a	n/a
	Median	37	34	40	40	n/a	n/a
	Maximum	41	38	45	45	n/a	n/a
$L_{A90,period}$	Minimum	35	20	33	28	n/a	n/a
	Median	38	30	37	36	n/a	n/a
	Maximum	45	38	40	43	n/a	n/a

Note: n/a denotes that monitoring was not undertaken at this location at this time.

3.8 November 2014 Results Summary

The continuous noise monitoring results summary for November 2014 is presented in **Table 8**. These results are calculated on the basis of available 15 minute monitoring data, following exclusion of results obtained under conditions to which the noise criteria do not apply (as defined in Condition L4.3 of EPL12290). It is noted that these results present analysis of raw monitoring data, and no evaluation of source contributions has been undertaken to validate whether the reported noise levels are representative of mining, or cumulative environmental noise impacts.

Table 8: Continuous monitoring results for November, 2014

Descriptor		SentineX95 (Quipolly)		SentineX116 (Werris Creek)		SentineX2 (Werris East)	
		Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)
$L_{A1,15minute}$	Minimum	50	43	52	48	46	32
	Median	61	53	63	58	53	48
	Maximum	87	71	77	67	61	57
$L_{Aeq,period}$	Minimum	37	34	41	38	33	20
	Median	41	40	46	45	37	36
	Maximum	64	61	65	50	42	42
$L_{AeqLF,period}$	Minimum	30	30	31	29	25	17
	Median	36	35	38	38	30	28
	Maximum	55	40	42	43	33	39
$L_{A90,period}$	Minimum	30	26	31	32	23	13
	Median	33	32	36	38	26	28
	Maximum	39	59	41	44	28	36

3.9 December 2014 Results Summary

The continuous noise monitoring results summary for December 2014 is presented in **Table 9**. These results are calculated on the basis of available 15 minute monitoring data, following exclusion of results obtained under conditions to which the noise criteria do not apply (as defined in Condition L4.3 of EPL12290). It is noted that these results present analysis of raw monitoring data, and no evaluation of source contributions has been undertaken to validate whether the reported noise levels are representative of mining, or cumulative environmental noise impacts.

Table 9: Continuous monitoring results for December, 2014

Descriptor		SentineX95 (Quipolly)		SentineX116 (Werris Creek)		SentineX2 (Werris East)	
		Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)
$L_{A1,15minute}$	Minimum	49	41	49	45	51	41
	Median	56	55	64	58	61	51
	Maximum	68	61	80	65	75	63
$L_{Aeq,period}$	Minimum	36	33	42	37	35	33
	Median	40	42	46	44	41	39
	Maximum	47	57	68	49	55	48
$L_{AeqLF,period}$	Minimum	30	29	34	30	24	18
	Median	35	37	39	40	30	25
	Maximum	46	41	49	44	37	37
$L_{A90,period}$	Minimum	28	27	30	30	24	20
	Median	33	37	37	37	27	33
	Maximum	42	56	47	43	33	40

3.10 January 2015 Results Summary

The continuous noise monitoring results summary for January 2015 is presented in **Table 10**. These results are calculated on the basis of available 15 minute monitoring data, following exclusion of results obtained under conditions to which the noise criteria do not apply (as defined in Condition L4.3 of EPL12290). It is noted that these results present analysis of raw monitoring data, and no evaluation of source contributions has been undertaken to validate whether the reported noise levels are representative of mining, or cumulative environmental noise impacts.

Table 10: Continuous monitoring results for January, 2015

Descriptor		SentineX95 (Quipolly)		SentineX116 (Werris Creek)		SentineX2 (Werris East)	
		Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)
$L_{A1,15minute}$	Minimum	53	46	55	46	53	43
	Median	58	54	62	55	63	49
	Maximum	70	60	77	76	79	62
$L_{Aeq,period}$	Minimum	37	36	40	37	39	37
	Median	41	40	45	42	46	41
	Maximum	52	47	58	55	55	45
$L_{AeqLF,period}$	Minimum	31	27	34	32	26	19
	Median	36	36	38	39	31	28
	Maximum	45	38	48	45	51	37
$L_{A90,period}$	Minimum	30	29	33	28	29	33
	Median	33	34	37	36	34	37
	Maximum	43	45	45	42	46	40

3.11 February 2015 Results Summary

The continuous noise monitoring results summary for February 2015 is presented in **Table 11**. These results are calculated on the basis of available 15 minute monitoring data, following exclusion of results obtained under conditions to which the noise criteria do not apply (as defined in Condition L4.3 of EPL12290). It is noted that these results present analysis of raw monitoring data, and no evaluation of source contributions has been undertaken to validate whether the reported noise levels are representative of mining, or cumulative environmental noise impacts.

Table 11: Continuous monitoring results for February, 2015

Descriptor		SentineX95 (Quipolly)		SentineX116 (Werris Creek)		SentineX2 (Werris East)	
		Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)
$L_{A1,15minute}$	Minimum	55	43	57	42	58	40
	Median	60	51	62	55	63	52
	Maximum	68	67	84	75	75	66
$L_{Aeq,period}$	Minimum	39	33	40	36	42	31
	Median	43	39	44	41	45	43
	Maximum	45	47	57	50	51	51
$L_{AeqLF,period}$	Minimum	34	28	35	27	29	19
	Median	36	34	38	37	39	28
	Maximum	42	45	48	47	45	45
$L_{A90,period}$	Minimum	32	26	31	30	28	27
	Median	34	34	34	36	32	40
	Maximum	39	40	45	45	39	48

3.12 March 2015 Results Summary

The continuous noise monitoring results summary for March 2015 is presented in **Table 12**. These results are calculated on the basis of available 15 minute monitoring data, following exclusion of results obtained under conditions to which the noise criteria do not apply (as defined in Condition L4.3 of EPL12290). It is noted that these results present analysis of raw monitoring data, and no evaluation of source contributions has been undertaken to validate whether the reported noise levels are representative of mining, or cumulative environmental noise impacts.

Table 12: Continuous monitoring results for March, 2015

Descriptor		SentineX95 (Quipolly)		SentineX116 (Werris Creek)		SentineX2 (Werris East)	
		Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)	Day (6:00 to 16:00)	Night (16:00 to 2:00)
$L_{A1,15minute}$	Minimum	49	43	50	47	47	37
	Median	58	52	61	57	62	47
	Maximum	65	65	80	70	70	61
$L_{Aeq,period}$	Minimum	41	34	42	32	40	29
	Median	44	39	45	42	44	36
	Maximum	54	46	55	47	54	48
$L_{AeqLF,period}$	Minimum	33	29	32	28	23	23
	Median	37	36	40	38	38	29
	Maximum	43	40	43	43	47	43
$L_{A90,period}$	Minimum	32	25	33	24	30	26
	Median	35	33	36	34	32	33
	Maximum	41	39	41	38	35	39

4. CONCLUSIONS

The assessment in this report seeks to provide a summary level analysis of results observed by continuous noise monitoring systems in the receiving environment adjacent to the WCC Mine. While the data has been filtered to exclude impacts associated with extraneous meteorological conditions, the report presents only the 'as measured' data, and does not attempt to validate mining noise contributions, or provide assessment of these impacts.

Meteorological Daily Statistics Summary

Unit Id	:	Werris Ck Mine (Sentinex95)
Module Id	:	M2 (10M Weather Station)
Requested Report Date	:	2014/05/01
Requested Report Hour	:	00
Chart Available	:	no

Main Data Summary

Record Time	Temperature									Humidity			Prevailing Wind			Gust	Dir	Rain	Bar	Solar Rad	
	2m			10m			60m						Speed								
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg	Max
					(°C)						(%)			(m/s)		(m/s)	(°)	(mm)	(hPa)	(W/m²)	
2014/04/01 00:00:00	22.0	17.0	28.4	21.6	16.9	27.2	-99.0	-99.0	-99.0	65.4	43.7	80.4	0.9	0.0	4.8	6.1	201	0.0	1019.9	139.4	717.4
2014/04/02 00:00:00	22.3	18.3	29.4	22.2	18.8	28.4	-99.0	-99.0	-99.0	66.5	46.5	80.4	0.9	0.0	11.4	16.2	293	1.6	1018.5	142.5	746.6
2014/04/03 00:00:00	24.0	18.2	30.3	23.9	18.4	29.3	-99.0	-99.0	-99.0	64.9	43.1	82.3	0.4	0.0	3.9	5.7	245	0.0	1018.4	151.8	723.8
2014/04/04 00:00:00	23.1	19.8	27.9	22.8	19.4	26.9	-99.0	-99.0	-99.0	71.1	53.7	88.0	1.4	0.0	7.0	10.0	331	6.0	1018.9	110.4	681.1
2014/04/05 00:00:00	20.8	17.7	25.2	20.6	17.2	24.5	-99.0	-99.0	-99.0	82.6	66.7	90.2	0.6	0.0	11.6	15.1	316	4.8	1019.8	98.0	691.3
2014/04/06 00:00:00	19.5	15.7	24.3	19.2	15.7	23.4	-99.0	-99.0	-99.0	74.5	52.4	89.5	4.4	0.0	9.4	11.9	157	0.0	1020.8	161.6	728.0
2014/04/07 00:00:00	18.4	14.5	23.5	18.1	14.5	22.5	-99.0	-99.0	-99.0	63.3	46.1	81.2	4.2	1.4	9.2	12.0	137	0.0	1023.7	170.5	638.5
2014/04/08 00:00:00	18.5	13.0	25.0	18.3	13.6	24.2	-99.0	-99.0	-99.0	62.7	39.3	79.0	1.7	0.5	5.2	6.6	166	0.0	1022.5	166.0	615.7
2014/04/09 00:00:00	19.8	14.8	26.2	19.6	14.9	25.2	-99.0	-99.0	-99.0	65.3	43.4	79.3	0.9	0.0	3.5	6.0	180	0.0	1020.4	143.8	709.3
2014/04/10 00:00:00	20.6	17.1	24.1	20.4	17.4	23.2	-99.0	-99.0	-99.0	65.8	53.8	78.5	1.6	0.0	5.0	6.6	325	0.8	1016.5	108.5	553.2
2014/04/11 00:00:00	20.7	17.0	25.1	20.4	16.4	24.1	-99.0	-99.0	-99.0	73.3	59.0	88.2	2.4	0.0	7.0	9.3	306	7.6	1010.6	106.8	606.6
2014/04/12 00:00:00	18.7	14.7	23.5	18.3	15.3	22.6	-99.0	-99.0	-99.0	74.3	55.2	88.6	1.3	0.0	6.6	8.2	160	0.2	1013.7	114.7	674.7
2014/04/13 00:00:00	17.7	12.7	23.6	17.5	12.9	22.3	-99.0	-99.0	-99.0	68.5	52.1	82.2	3.7	0.0	8.9	11.1	152	0.0	1017.3	155.2	582.2
2014/04/14 00:00:00	17.4	13.6	23.4	17.2	13.9	22.6	-99.0	-99.0	-99.0	67.9	48.8	81.2	4.1	1.4	7.6	10.5	151	0.0	1019.0	143.6	704.9
2014/04/15 00:00:00	16.9	12.1	23.6	16.7	12.1	22.4	-99.0	-99.0	-99.0	67.2	42.5	85.8	3.0	0.6	7.0	9.2	148	0.0	1020.0	133.0	606.3
2014/04/16 00:00:00	17.0	13.3	22.5	16.7	13.5	21.1	-99.0	-99.0	-99.0	67.6	49.1	82.5	3.2	0.8	7.1	9.8	152	0.0	1019.8	128.2	642.6
2014/04/17 00:00:00	16.6	11.1	22.7	16.4	11.5	21.4	-99.0	-99.0	-99.0	62.7	40.4	82.6	1.4	0.0	6.5	8.1	171	0.0	1020.6	132.7	613.5
2014/04/18 00:00:00	16.6	9.4	23.6	16.4	9.5	22.7	-99.0	-99.0	-99.0	58.5	35.6	82.4	1.3	0.0	6.0	7.6	251	0.0	1019.0	137.4	522.2
2014/04/19 00:00:00	17.1	11.7	23.6	17.0	11.9	22.2	-99.0	-99.0	-99.0	58.1	39.7	75.3	1.2	0.0	5.7	8.2	251	0.0	1018.4	122.5	659.2
2014/04/20 00:00:00	16.6	9.9	23.6	16.4	9.8	22.6	-99.0	-99.0	-99.0	51.4	28.7	80.5	2.7	0.0	7.0	10.1	316	0.0	1019.3	148.6	559.1
2014/04/21 00:00:00	15.8	7.7	23.5	15.7	8.0	22.3	-99.0	-99.0	-99.0	46.9	29.7	67.6	1.2	0.0	4.3	6.9	310	0.0	1021.8	147.2	549.1
2014/04/22 00:00:00	18.7	10.6	25.5	18.8	11.7	24.9	-99.0	-99.0	-99.0	51.1	37.9	64.5	2.4	0.0	7.3	10.6	316	0.0	1020.7	128.5	540.8
2014/04/23 00:00:00	21.0	14.7	27.7	21.0	15.4	26.4	-99.0	-99.0	-99.0	52.1	32.4	73.6	2.5	0.0	8.6	11.9	307	0.0	1018.8	136.2	599.0
2014/04/24 00:00:00	20.8	15.5	28.2	20.8	16.2	27.3	-99.0	-99.0	-99.0	49.9	29.9	63.7	1.3	0.0	6.9	11.3	314	0.0	1017.8	131.6	522.7

Continued on next page

Record Time	Temperature									Humidity			Prevailing Wind							
	2m			10m			60m						Speed			Gust	Dir	Rain	Bar	Solar Rad
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg	Max
					($°C$)						(%)			(m/s)		(m/s)	($°$)	(mm)	(hPa)	(W/m^2)	
2014/04/25 00:00:00	18.8	14.3	23.7	18.8	14.1	23.2	-99.0	-99.0	-99.0	62.6	46.7	84.0	0.8	0.0	8.4	14.6	119	7.8	1020.5	107.0	734.4
2014/04/26 00:00:00	19.1	14.2	23.6	19.1	15.1	22.8	-99.0	-99.0	-99.0	60.1	46.7	70.6	1.8	0.0	6.5	9.3	316	0.0	1019.2	88.1	563.2
2014/04/27 00:00:00	18.9	15.4	24.5	18.8	15.3	23.4	-99.0	-99.0	-99.0	68.5	51.1	81.2	2.1	0.0	5.8	7.4	162	0.0	1021.7	78.4	531.5
2014/04/28 00:00:00	18.4	13.5	24.9	18.1	13.8	23.8	-99.0	-99.0	-99.0	67.4	45.6	83.5	2.1	0.0	5.4	6.8	163	0.0	1023.8	136.3	513.9
2014/04/29 00:00:00	21.4	17.0	24.6	21.0	15.8	23.4	-99.0	-99.0	-99.0	55.9	46.5	68.0	2.2	0.0	5.0	6.8	313	0.0	1018.3	182.3	526.9
2014/04/30 00:00:00	16.1	11.6	18.1	15.9	11.8	18.3	-99.0	-99.0	-99.0	78.9	66.2	87.6	1.6	0.5	5.1	6.9	330	3.6	1017.1	37.3	447.0

Meteorological Daily Statistics Summary

Unit Id	:	Werris Ck Mine (Sentinex95)
Module Id	:	M2 (10M Weather Station)
Requested Report Date	:	2014/06/01
Requested Report Hour	:	00
Chart Available	:	no

Main Data Summary

Record Time	Temperature									Humidity			Prevailing Wind							
	2m			10m			60m						Speed			Gust	Dir	Rain	Bar	Solar Rad	
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg	Max
					($°C$)						(%)			(m/s)		(m/s)	($°$)	(mm)	(hPa)	(W/m^2)	
2014/05/01 00:00:00	15.5	9.3	21.7	15.2	9.5	20.4	-99.0	-99.0	-99.0	67.8	47.8	83.3	0.5	0.1	5.0	6.6	302	0.0	1016.6	122.5	693.9
2014/05/02 00:00:00	14.8	9.9	20.2	14.4	10.8	19.0	-99.0	-99.0	-99.0	57.3	43.2	72.7	4.2	0.7	7.5	11.4	322	0.0	1009.0	100.3	525.5
2014/05/03 00:00:00	9.2	7.6	12.1	8.7	6.9	11.9	-99.0	-99.0	-99.0	74.6	56.8	85.2	3.9	2.0	12.0	15.4	290	11.2	1004.8	60.1	531.4
2014/05/04 00:00:00	9.2	7.4	12.5	8.7	6.7	12.1	-99.0	-99.0	-99.0	80.5	68.1	88.0	5.9	3.4	8.0	11.4	160	4.0	1012.9	33.8	270.4
2014/05/05 00:00:00	9.8	5.3	15.6	9.3	5.4	15.4	-99.0	-99.0	-99.0	67.4	49.6	80.4	0.9	0.0	5.7	7.4	203	0.2	1021.9	108.4	707.1
2014/05/06 00:00:00	13.1	8.4	17.1	12.8	8.6	16.3	-99.0	-99.0	-99.0	59.5	47.8	77.6	0.7	0.0	2.9	4.4	201	0.0	1022.7	143.1	486.8
2014/05/07 00:00:00	12.5	6.5	18.9	12.5	6.5	18.3	-99.0	-99.0	-99.0	71.1	52.5	82.7	2.3	0.0	5.1	6.1	144	0.0	1023.9	103.1	734.6
2014/05/08 00:00:00	14.0	9.5	20.7	13.9	10.2	19.8	-99.0	-99.0	-99.0	65.9	46.2	80.7	3.3	0.3	5.9	7.6	140	0.0	1025.6	107.3	555.0
2014/05/09 00:00:00	14.5	7.9	21.6	14.5	8.5	20.2	-99.0	-99.0	-99.0	64.6	41.7	83.9	1.0	0.0	3.5	4.1	159	0.0	1026.1	114.8	536.9
2014/05/10 00:00:00	15.5	11.1	19.4	15.4	11.2	18.6	-99.0	-99.0	-99.0	62.9	49.8	75.3	1.0	0.0	4.2	5.5	331	0.0	1025.4	62.8	324.7
2014/05/11 00:00:00	14.8	11.3	18.7	14.5	11.5	17.9	-99.0	-99.0	-99.0	78.7	68.2	87.0	0.7	0.0	5.2	6.9	318	3.4	1025.7	77.6	512.8
2014/05/12 00:00:00	15.0	10.0	21.1	15.1	10.5	20.3	-99.0	-99.0	-99.0	70.1	47.0	87.8	2.3	0.0	7.4	9.0	126	0.2	1029.3	94.3	485.8
2014/05/13 00:00:00	15.0	8.7	21.8	14.8	8.9	20.8	-99.0	-99.0	-99.0	70.9	47.0	84.5	2.0	0.0	5.7	6.9	170	0.0	1029.7	111.9	472.9
2014/05/14 00:00:00	15.5	10.2	22.4	15.6	11.2	21.5	-99.0	-99.0	-99.0	64.7	37.3	82.5	0.8	0.0	3.6	5.2	131	0.0	1028.6	109.2	468.1
2014/05/15 00:00:00	16.2	10.8	22.3	16.3	11.3	21.4	-99.0	-99.0	-99.0	54.9	37.7	72.7	0.8	0.1	4.2	5.7	148	0.0	1028.9	111.5	450.4
2014/05/16 00:00:00	16.6	10.3	22.8	16.7	11.2	22.5	-99.0	-99.0	-99.0	52.7	31.2	72.8	0.8	0.0	4.7	7.2	138	0.0	1030.5	109.9	448.9
2014/05/17 00:00:00	16.8	11.1	23.0	16.7	11.8	22.0	-99.0	-99.0	-99.0	53.3	36.8	70.7	0.1	0.0	3.6	4.7	341	0.0	1031.3	108.7	441.1
2014/05/18 00:00:00	16.7	11.6	22.8	16.6	12.3	21.7	-99.0	-99.0	-99.0	56.1	40.0	70.1	0.4	0.0	3.3	4.9	336	0.0	1029.9	98.7	484.5
2014/05/19 00:00:00	17.1	12.8	22.7	17.0	13.3	21.4	-99.0	-99.0	-99.0	57.1	39.5	68.0	0.9	0.0	3.6	5.2	302	0.0	1028.4	100.0	581.2
2014/05/20 00:00:00	15.7	11.2	20.5	15.6	11.9	19.5	-99.0	-99.0	-99.0	64.3	51.1	77.7	1.1	0.0	4.7	6.0	318	0.0	1026.2	80.2	387.8
2014/05/21 00:00:00	16.6	10.9	23.5	16.6	11.1	22.4	-99.0	-99.0	-99.0	61.4	38.2	81.2	1.1	0.0	5.0	6.9	160	0.0	1025.7	100.9	414.2
2014/05/22 00:00:00	16.8	10.3	24.0	16.9	11.3	22.7	-99.0	-99.0	-99.0	58.7	39.4	77.4	0.7	0.0	3.7	6.0	305	0.0	1024.7	101.6	419.3
2014/05/23 00:00:00	15.4	11.8	20.3	15.4	12.3	19.4	-99.0	-99.0	-99.0	75.7	64.5	87.2	1.8	0.0	4.1	5.2	345	1.8	1021.1	60.3	595.9
2014/05/24 00:00:00	16.1	11.8	21.4	15.9	12.2	20.4	-99.0	-99.0	-99.0	77.1	56.2	90.0	0.9	0.0	3.0	5.2	326	0.2	1020.3	87.5	553.7

Continued on next page

Record Time	Temperature									Humidity			Prevailing Wind							
	2m			10m			60m						Speed			Gust	Dir	Rain	Bar	Solar Rad
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg Max
					($°C$)						($\%$)			(m/s)		(m/s)	($°$)	(mm)	(hPa)	(W/m^2)	
2014/05/25 00:00:00	17.6	12.1	23.6	17.6	12.3	22.8	-99.0	-99.0	-99.0	67.3	47.3	84.0	1.6	0.0	4.9	7.6	331	0.0	1022.6	96.0 407.1
2014/05/26 00:00:00	18.5	12.4	25.5	18.7	12.8	24.5	-99.0	-99.0	-99.0	59.1	37.4	80.3	1.1	0.0	3.6	5.5	331	0.0	1025.0	83.9 365.4
2014/05/27 00:00:00	19.4	15.7	23.2	19.2	16.4	22.3	-99.0	-99.0	-99.0	54.3	41.6	62.2	6.7	2.1	10.9	15.4	349	0.0	1019.9	79.0 389.5
2014/05/28 00:00:00	17.9	12.6	22.1	17.6	13.5	20.8	-99.0	-99.0	-99.0	59.5	44.5	76.9	3.8	0.0	9.0	12.4	304	0.0	1019.3	65.7 339.9
2014/05/29 00:00:00	14.2	8.1	20.8	14.4	8.7	20.0	-99.0	-99.0	-99.0	58.7	35.1	80.0	1.0	0.0	4.0	4.7	172	0.0	1024.4	87.3 366.6
2014/05/30 00:00:00	14.8	9.6	21.8	14.7	9.6	21.0	-99.0	-99.0	-99.0	60.8	41.3	78.2	1.1	0.0	2.6	4.5	175	0.0	1025.6	78.6 346.9
2014/05/31 00:00:00	16.4	11.9	22.6	16.2	12.0	21.2	-99.0	-99.0	-99.0	69.7	51.6	84.8	1.6	0.2	9.0	11.6	53	3.4	1024.2	74.6 391.9

Meteorological Daily Statistics Summary

Unit Id	:	Werris Ck Mine (Sentinex95)
Module Id	:	M2 (10M Weather Station)
Requested Report Date	:	2014/07/01
Requested Report Hour	:	00
Chart Available	:	no

Main Data Summary

Record Time	Temperature									Humidity			Prevailing Wind							
	2m			10m			60m						Speed			Gust	Dir	Rain	Bar	Solar Rad
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg	Max
					($°C$)						(%)			(m/s)		(m/s)	($°$)	(mm)	(hPa)	(W/m^2)	
2014/06/01 00:00:00	14.8	12.8	18.4	14.7	13.0	17.8	-99.0	-99.0	-99.0	79.4	65.0	86.8	1.9	0.0	7.2	8.4	358	13.2	1020.8	35.8	272.3
2014/06/02 00:00:00	14.1	11.1	17.7	13.8	11.1	16.7	-99.0	-99.0	-99.0	80.2	63.4	89.8	2.2	0.6	4.4	5.8	323	5.0	1020.1	58.1	480.7
2014/06/03 00:00:00	11.2	5.3	16.1	11.0	6.5	14.8	-99.0	-99.0	-99.0	77.0	58.3	89.7	1.4	0.0	4.1	5.3	315	0.0	1022.7	78.3	374.8
2014/06/04 00:00:00	10.9	5.5	16.2	10.9	6.0	15.3	-99.0	-99.0	-99.0	72.5	53.8	87.8	0.3	0.0	3.2	3.6	215	0.0	1025.9	82.9	369.5
2014/06/05 00:00:00	12.7	7.0	19.7	12.6	6.7	19.2	-99.0	-99.0	-99.0	71.6	47.7	85.9	0.6	0.0	3.3	3.9	182	0.0	1025.8	84.6	373.0
2014/06/06 00:00:00	12.7	8.4	17.9	12.6	8.8	16.7	-99.0	-99.0	-99.0	78.2	64.0	86.5	4.4	1.3	8.4	10.6	148	0.0	1026.0	78.8	468.2
2014/06/07 00:00:00	12.4	8.4	17.4	12.4	8.7	16.7	-99.0	-99.0	-99.0	73.8	56.2	86.1	3.2	0.0	6.2	8.7	150	0.0	1026.9	86.1	450.2
2014/06/08 00:00:00	11.8	7.9	17.3	11.8	8.3	16.4	-99.0	-99.0	-99.0	71.9	54.3	84.7	3.1	0.1	6.9	8.7	143	0.0	1026.6	86.1	385.4
2014/06/09 00:00:00	11.6	6.7	17.0	11.5	7.1	16.0	-99.0	-99.0	-99.0	66.1	40.4	82.1	3.9	0.0	8.1	10.3	148	0.0	1028.0	80.6	346.7
2014/06/10 00:00:00	12.8	9.2	18.2	12.8	9.6	17.2	-99.0	-99.0	-99.0	69.3	50.9	84.1	3.8	0.2	6.9	9.5	140	0.0	1028.4	73.5	400.9
2014/06/11 00:00:00	11.6	5.4	18.4	11.7	5.1	17.8	-99.0	-99.0	-99.0	64.6	45.4	81.1	1.7	0.0	4.0	5.5	131	0.0	1025.5	78.5	343.7
2014/06/12 00:00:00	13.1	8.2	19.5	13.1	8.4	18.3	-99.0	-99.0	-99.0	60.4	42.5	75.3	0.5	0.0	3.6	5.3	331	0.0	1022.6	79.6	342.9
2014/06/13 00:00:00	14.0	9.5	19.7	14.0	10.5	18.2	-99.0	-99.0	-99.0	65.4	50.4	84.0	1.5	0.0	6.9	9.5	340	2.6	1019.4	54.3	446.9
2014/06/14 00:00:00	12.3	9.3	14.0	11.9	8.9	13.5	-99.0	-99.0	-99.0	86.5	78.3	89.5	2.9	0.0	6.7	8.2	321	17.2	1015.8	37.2	242.1
2014/06/15 00:00:00	9.6	7.0	12.9	9.1	6.5	11.9	-99.0	-99.0	-99.0	81.1	69.5	87.2	4.2	1.8	8.5	11.7	303	0.0	1018.3	52.2	315.6
2014/06/16 00:00:00	9.9	5.4	14.2	9.6	6.0	13.4	-99.0	-99.0	-99.0	75.7	60.1	86.7	2.6	0.8	4.5	6.0	327	0.0	1025.0	78.3	484.4
2014/06/17 00:00:00	8.6	3.4	14.0	8.4	3.6	13.5	-99.0	-99.0	-99.0	76.9	60.1	88.4	0.5	0.0	5.3	6.5	328	0.0	1028.8	71.3	380.4
2014/06/18 00:00:00	11.4	4.4	19.2	11.4	5.5	17.9	-99.0	-99.0	-99.0	76.0	57.5	86.3	0.8	0.0	3.8	5.0	194	0.0	1030.6	79.8	336.9
2014/06/19 00:00:00	13.0	7.9	18.7	13.0	8.2	17.8	-99.0	-99.0	-99.0	71.6	53.0	85.7	0.9	0.0	4.3	5.3	315	0.0	1028.0	79.1	339.3
2014/06/20 00:00:00	13.7	10.9	16.7	13.6	11.5	16.4	-99.0	-99.0	-99.0	76.6	67.2	86.7	3.2	0.2	7.9	11.1	329	4.0	1022.6	36.3	378.4
2014/06/21 00:00:00	13.4	9.9	17.9	13.2	10.5	16.8	-99.0	-99.0	-99.0	80.5	63.1	89.7	0.9	0.0	4.9	6.3	310	0.2	1022.2	72.3	390.3
2014/06/22 00:00:00	12.2	7.3	17.2	12.3	8.1	16.6	-99.0	-99.0	-99.0	76.8	54.8	89.5	0.2	0.0	2.8	4.4	311	0.2	1022.5	65.4	449.2
2014/06/23 00:00:00	12.1	8.6	14.7	12.1	8.8	14.4	-99.0	-99.0	-99.0	69.3	50.8	82.8	3.8	0.1	7.1	9.3	332	0.0	1017.6	51.5	349.1
2014/06/24 00:00:00	11.0	8.2	14.5	10.5	7.9	14.2	-99.0	-99.0	-99.0	58.1	47.0	68.9	6.2	3.3	10.0	14.6	295	0.0	1016.2	75.8	398.2

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Record Time	Temperature									Humidity			Prevailing Wind							
	2m			10m			60m						Speed			Gust	Dir	Rain	Bar	Solar Rad
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg Max
					($^\circ C$)						(%)			(m/s)		(m/s)	($^\circ$)	(mm)	(hPa)	(W/m^2)
2014/06/25 00:00:00	10.7	7.2	15.0	10.3	7.0	14.0	-99.0	-99.0	-99.0	63.7	48.9	76.4	4.7	2.5	8.3	11.4	301	0.0	1021.6	74.4 416.8
2014/06/26 00:00:00	10.4	5.2	15.6	10.3	5.5	14.6	-99.0	-99.0	-99.0	67.9	51.3	80.5	3.4	0.4	6.0	8.7	328	0.0	1026.5	83.2 387.8
2014/06/27 00:00:00	10.4	3.9	16.9	10.3	4.7	15.9	-99.0	-99.0	-99.0	65.3	39.6	85.5	1.7	0.0	3.7	5.8	319	0.0	1022.9	86.0 360.2
2014/06/28 00:00:00	11.9	8.7	17.2	11.9	9.1	16.0	-99.0	-99.0	-99.0	64.3	44.0	82.8	5.9	1.5	16.1	21.9	330	4.8	1012.0	41.5 406.3
2014/06/29 00:00:00	8.6	5.1	11.1	8.1	4.9	9.7	-99.0	-99.0	-99.0	64.3	57.4	75.6	5.2	2.1	9.8	13.9	300	0.2	1014.8	64.7 446.0
2014/06/30 00:00:00	7.7	4.5	12.3	7.2	4.5	10.6	-99.0	-99.0	-99.0	66.6	52.1	78.7	4.1	0.8	7.7	11.1	281	0.0	1021.9	66.2 511.4

Meteorological Daily Statistics Summary

Unit Id	:	Werris Ck Mine (Sentinex95)
Module Id	:	M2 (10M Weather Station)
Requested Report Date	:	2014/08/01
Requested Report Hour	:	00
Chart Available	:	no

Main Data Summary

Record Time	Temperature									Humidity			Prevailing Wind							
	2m			10m			60m						Speed			Gust	Dir	Rain	Bar	Solar Rad	
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg	Max
					($°C$)						($\%$)			(m/s)		(m/s)	($°$)	(mm)	(hPa)	(W/m^2)	
2014/07/01 00:00:00	6.9	1.5	13.1	6.6	1.5	11.7	-99.0	-99.0	-99.0	73.0	55.5	84.1	2.3	0.0	5.6	7.6	334	0.0	1028.7	78.2	437.5
2014/07/02 00:00:00	8.3	2.1	15.8	8.3	1.8	14.6	-99.0	-99.0	-99.0	71.3	50.2	88.9	0.8	0.0	3.5	4.1	179	0.0	1029.0	82.4	350.6
2014/07/03 00:00:00	10.3	3.7	17.2	10.4	4.4	16.1	-99.0	-99.0	-99.0	64.6	41.9	83.3	1.1	0.0	3.8	5.5	325	0.0	1028.0	84.1	357.6
2014/07/04 00:00:00	11.3	4.2	17.6	11.5	5.4	16.4	-99.0	-99.0	-99.0	57.0	36.6	78.1	2.5	0.0	7.1	10.3	322	0.0	1024.2	84.7	356.8
2014/07/05 00:00:00	11.0	6.1	16.9	10.7	6.4	15.5	-99.0	-99.0	-99.0	53.8	36.0	67.6	3.1	0.0	8.0	10.6	271	0.0	1019.9	82.7	360.2
2014/07/06 00:00:00	9.2	6.4	12.5	8.5	6.1	11.1	-99.0	-99.0	-99.0	60.2	46.9	77.8	4.0	2.3	6.8	9.8	272	0.0	1018.9	55.1	325.1
2014/07/07 00:00:00	8.5	4.3	13.7	8.0	4.3	12.9	-99.0	-99.0	-99.0	69.5	50.7	86.4	2.2	0.0	5.6	6.9	305	0.0	1019.0	82.0	432.8
2014/07/08 00:00:00	8.0	2.0	15.0	7.8	2.3	13.7	-99.0	-99.0	-99.0	67.9	46.6	85.6	1.2	0.0	2.9	4.2	322	0.0	1018.3	86.0	362.1
2014/07/09 00:00:00	11.9	4.4	18.4	11.8	5.5	17.6	-99.0	-99.0	-99.0	45.4	25.7	73.7	5.3	1.8	12.1	16.0	314	0.0	1010.5	87.3	370.0
2014/07/10 00:00:00	8.4	4.8	11.1	7.9	4.8	10.2	-99.0	-99.0	-99.0	53.8	36.7	63.2	4.8	2.5	9.0	12.2	289	0.0	1015.1	56.5	468.1
2014/07/11 00:00:00	8.7	4.3	13.2	8.3	4.7	11.9	-99.0	-99.0	-99.0	62.7	49.8	74.5	2.8	0.7	5.3	7.3	308	0.0	1023.3	87.7	429.6
2014/07/12 00:00:00	8.3	0.2	14.6	8.2	1.0	13.3	-99.0	-99.0	-99.0	63.2	41.2	85.6	1.9	0.0	6.9	9.5	282	0.0	1024.6	86.2	409.2
2014/07/13 00:00:00	8.3	2.9	13.4	8.1	2.9	12.7	-99.0	-99.0	-99.0	61.5	42.3	79.9	3.6	0.1	7.3	10.0	152	0.0	1028.1	89.8	378.2
2014/07/14 00:00:00	10.7	3.2	17.4	10.5	3.7	16.2	-99.0	-99.0	-99.0	62.2	46.5	78.4	1.2	0.0	4.4	6.5	155	0.0	1030.5	87.4	381.3
2014/07/15 00:00:00	13.4	10.4	16.3	13.3	10.7	15.2	-99.0	-99.0	-99.0	63.1	54.2	73.5	0.9	0.0	4.8	6.0	355	0.0	1024.7	39.4	239.9
2014/07/17 00:00:00	11.8	7.4	15.3	11.1	6.7	14.1	-99.0	-99.0	-99.0	64.2	46.4	83.4	5.2	3.0	9.0	12.5	293	0.2	1017.9	103.1	451.1
2014/07/18 00:00:00	6.9	3.6	10.0	6.4	4.3	8.6	-99.0	-99.0	-99.0	68.1	54.6	86.0	3.4	0.0	10.4	16.5	263	0.0	1018.8	58.7	353.9
2014/07/19 00:00:00	6.9	0.4	13.5	6.9	0.6	11.9	-99.0	-99.0	-99.0	64.7	46.8	83.3	1.6	0.0	7.4	9.5	185	0.0	1024.4	93.8	418.5
2014/07/20 00:00:00	10.3	5.7	14.7	9.9	6.0	13.2	-99.0	-99.0	-99.0	67.9	61.4	77.9	3.6	0.1	8.7	11.3	155	0.0	1026.0	85.7	452.7
2014/07/21 00:00:00	12.0	7.0	18.8	11.8	7.0	17.2	-99.0	-99.0	-99.0	70.1	48.6	86.6	1.6	0.2	3.3	4.5	161	0.0	1025.1	96.8	551.0
2014/07/22 00:00:00	11.9	6.9	18.2	11.7	7.1	16.4	-99.0	-99.0	-99.0	69.6	52.7	84.1	1.8	0.0	6.6	8.1	177	0.0	1023.9	88.8	520.8
2014/07/23 00:00:00	11.6	5.4	17.7	11.6	6.0	16.9	-99.0	-99.0	-99.0	60.4	33.3	83.4	0.4	0.0	3.2	4.7	105	0.0	1024.3	96.6	405.0
2014/07/24 00:00:00	14.0	10.8	18.0	13.9	11.1	16.6	-99.0	-99.0	-99.0	60.0	51.0	68.5	2.9	0.6	5.1	7.1	24	0.0	1022.9	50.1	328.1
2014/07/25 00:00:00	16.2	13.0	21.4	16.0	13.5	19.7	-99.0	-99.0	-99.0	61.5	49.2	75.3	3.9	0.1	8.2	10.1	10	0.0	1025.3	65.4	509.8

Continued on next page

Record Time	Temperature									Humidity			Prevailing Wind			Gust	Dir	Rain	Bar	Solar Rad	
	2m			10m			60m						Speed								
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg	Max
					($°C$)						($\%$)			(m/s)		(m/s)	($°$)	(mm)	(hPa)	(W/m^2)	
2014/07/26 00:00:00	12.4	7.7	16.4	12.2	9.0	15.6	-99.0	-99.0	-99.0	82.8	69.5	88.9	0.5	0.0	8.4	14.6	333	22.0	1026.2	40.5	379.5
2014/07/27 00:00:00	10.0	4.1	16.3	10.2	5.1	16.1	-99.0	-99.0	-99.0	75.0	49.0	90.6	0.7	0.0	3.8	4.5	340	0.2	1027.0	104.1	421.5
2014/07/28 00:00:00	9.7	-85.2	15.8	9.7	-88.8	14.7	-99.0	-99.0	-99.0	71.3	51.2	86.8	1.8	0.0	4.5	5.3	353	0.0	1025.0	106.2	430.3
2014/07/29 00:00:00	11.1	4.7	17.5	11.3	5.0	16.6	-99.0	-99.0	-99.0	64.5	45.6	83.5	2.5	0.0	6.6	8.7	348	0.0	1023.8	106.4	429.2
2014/07/30 00:00:00	12.8	5.9	19.0	13.0	7.4	18.2	-99.0	-99.0	-99.0	55.3	40.7	73.8	2.4	0.0	5.8	7.9	359	0.0	1023.4	106.0	425.6
2014/07/31 00:00:00	14.6	8.3	20.8	14.9	9.5	20.0	-99.0	-99.0	-99.0	45.3	27.5	66.6	4.3	0.8	8.2	11.5	349	0.0	1018.7	109.2	437.6

Meteorological Daily Statistics Summary

Unit Id	:	Werris Ck Mine (Sentinex95)
Module Id	:	M2 (10M Weather Station)
Requested Report Date	:	2014/09/01
Requested Report Hour	:	00
Chart Available	:	no

Main Data Summary

Record Time	Temperature									Humidity			Prevailing Wind							
	2m			10m			60m						Speed			Gust	Dir	Rain	Bar	Solar Rad	
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg	Max
					($°C$)						(%)			(m/s)		(m/s)	($°$)	(mm)	(hPa)	(W/m^2)	
2014/08/01 00:00:00	12.7	6.6	17.1	12.3	6.8	16.0	-99.0	-99.0	-99.0	45.2	36.5	54.5	4.9	2.0	11.0	14.2	312	0.0	1015.7	98.9	432.2
2014/08/02 00:00:00	7.5	1.5	13.2	7.2	1.7	12.4	-99.0	-99.0	-99.0	55.2	39.0	73.6	1.2	0.3	4.9	7.4	213	0.0	1027.6	113.8	449.3
2014/08/03 00:00:00	9.7	3.7	16.7	9.6	3.9	15.4	-99.0	-99.0	-99.0	59.3	46.3	69.6	2.2	0.0	5.9	7.4	158	0.0	1032.5	91.4	557.7
2014/08/04 00:00:00	12.4	7.4	18.1	12.4	8.0	17.0	-99.0	-99.0	-99.0	58.3	42.7	70.6	1.0	0.2	3.5	4.4	208	0.0	1033.0	96.7	505.6
2014/08/05 00:00:00	13.2	8.8	18.5	13.2	9.1	17.5	-99.0	-99.0	-99.0	56.8	41.6	73.9	0.7	0.0	4.4	5.6	205	0.0	1033.3	94.7	478.7
2014/08/06 00:00:00	11.9	4.8	18.8	11.9	5.4	17.3	-99.0	-99.0	-99.0	54.8	33.3	77.7	1.5	0.0	4.5	6.6	339	0.0	1032.7	117.3	461.2
2014/08/07 00:00:00	9.8	2.0	17.6	9.8	3.0	16.7	-99.0	-99.0	-99.0	54.5	33.5	73.4	0.4	0.0	4.2	5.0	343	0.0	1030.7	119.3	467.8
2014/08/08 00:00:00	12.3	6.4	19.7	12.1	6.7	18.5	-99.0	-99.0	-99.0	50.2	28.0	74.3	0.2	0.0	3.5	6.8	323	0.0	1031.2	122.1	477.6
2014/08/09 00:00:00	13.2	6.3	19.6	13.2	7.3	18.6	-99.0	-99.0	-99.0	51.4	33.4	73.8	2.0	0.0	5.5	8.2	345	0.0	1030.6	120.1	472.6
2014/08/10 00:00:00	12.3	5.7	19.2	12.7	7.5	18.0	-99.0	-99.0	-99.0	47.7	28.1	69.1	2.2	0.0	6.9	9.3	327	0.0	1026.2	115.5	544.9
2014/08/11 00:00:00	9.8	4.4	16.3	9.6	5.5	14.9	-99.0	-99.0	-99.0	51.4	30.4	72.6	1.3	0.0	4.4	7.9	201	0.0	1025.4	126.8	488.6
2014/08/12 00:00:00	10.1	3.6	17.7	9.7	3.9	16.4	-99.0	-99.0	-99.0	59.1	35.0	78.5	3.3	0.2	7.9	9.6	169	0.0	1027.6	141.3	643.7
2014/08/13 00:00:00	10.6	5.6	17.2	10.3	6.2	16.0	-99.0	-99.0	-99.0	63.6	42.0	77.1	3.4	0.2	7.6	9.8	176	0.0	1031.5	117.9	521.0
2014/08/14 00:00:00	11.2	4.0	18.4	11.0	4.2	17.4	-99.0	-99.0	-99.0	59.7	35.5	81.3	2.5	0.5	6.9	8.2	176	0.0	1033.1	117.9	496.9
2014/08/15 00:00:00	13.7	7.4	20.1	13.3	7.2	19.2	-99.0	-99.0	-99.0	52.6	30.5	72.0	1.3	0.1	5.4	7.2	141	0.0	1028.4	127.2	506.3
2014/08/16 00:00:00	13.3	11.8	17.2	13.1	11.6	16.0	-99.0	-99.0	-99.0	66.6	47.5	83.6	2.6	0.0	9.6	14.6	88	14.6	1020.0	50.6	456.0
2014/08/17 00:00:00	11.5	9.2	15.8	10.8	8.5	14.3	-99.0	-99.0	-99.0	75.0	48.6	87.4	3.4	0.6	9.6	13.3	356	9.0	1011.5	120.4	608.3
2014/08/18 00:00:00	10.3	8.2	13.0	9.8	7.5	12.6	-99.0	-99.0	-99.0	84.2	71.3	88.9	5.5	1.0	9.9	12.7	322	7.8	1010.3	39.0	352.1
2014/08/19 00:00:00	11.4	9.2	15.2	11.0	9.1	14.7	-99.0	-99.0	-99.0	78.3	64.3	87.5	2.8	1.0	8.9	12.7	203	2.0	1017.9	66.6	451.4
2014/08/20 00:00:00	11.4	7.5	16.5	11.1	7.9	15.6	-99.0	-99.0	-99.0	65.9	46.4	79.3	4.6	0.8	7.8	10.1	169	0.0	1024.6	133.1	539.7
2014/08/21 00:00:00	12.0	7.1	18.2	11.7	7.5	17.2	-99.0	-99.0	-99.0	69.5	45.2	83.2	3.6	0.5	8.2	10.0	173	0.0	1027.4	132.8	589.2
2014/08/22 00:00:00	13.1	7.8	19.4	12.8	8.1	18.1	-99.0	-99.0	-99.0	64.9	42.6	84.3	3.1	1.1	7.1	9.3	145	0.0	1029.3	132.0	574.1
2014/08/23 00:00:00	13.0	8.0	18.5	12.7	7.8	17.4	-99.0	-99.0	-99.0	69.7	51.5	83.0	2.4	0.4	6.3	8.5	164	0.0	1029.5	100.6	588.2
2014/08/24 00:00:00	13.5	8.0	19.6	13.2	7.9	18.5	-99.0	-99.0	-99.0	69.1	47.2	85.0	2.2	0.2	5.2	7.3	192	0.0	1028.3	138.4	552.9

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Record Time	Temperature									Humidity			Prevailing Wind							
	2m			10m			60m						Speed			Gust	Dir	Rain	Bar	Solar Rad
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg Max
					($^\circ C$)						(%)			(m/s)		(m/s)	($^\circ$)	(mm)	(hPa)	(W/m^2)
2014/08/25 00:00:00	13.4	7.3	20.4	13.3	7.3	19.1	-99.0	-99.0	-99.0	64.5	39.6	85.5	1.6	0.0	5.3	10.8	189	0.0	1024.7	138.3 551.4
2014/08/26 00:00:00	12.1	7.1	18.7	11.9	7.2	17.3	-99.0	-99.0	-99.0	74.7	55.2	84.5	3.3	0.8	12.4	17.6	165	1.0	1021.6	95.7 559.7
2014/08/27 00:00:00	12.5	9.9	17.6	12.1	9.5	16.8	-99.0	-99.0	-99.0	75.6	47.7	88.8	5.3	0.1	10.6	13.8	177	5.8	1022.6	83.0 430.0
2014/08/28 00:00:00	12.9	9.5	17.7	12.4	9.4	16.5	-99.0	-99.0	-99.0	69.1	50.2	83.7	6.3	2.3	10.0	13.2	180	0.0	1025.3	130.6 634.1
2014/08/29 00:00:00	11.4	7.4	16.7	11.1	7.2	15.2	-99.0	-99.0	-99.0	66.1	48.0	78.1	3.5	0.0	9.3	12.7	178	0.0	1026.5	129.8 595.4
2014/08/30 00:00:00	12.0	8.1	17.5	11.7	8.1	16.2	-99.0	-99.0	-99.0	71.8	59.0	83.9	4.2	0.9	8.7	12.2	179	0.0	1024.1	115.2 714.6
2014/08/31 00:00:00	14.0	9.4	20.3	13.9	9.7	19.2	-99.0	-99.0	-99.0	69.4	47.4	86.1	1.4	0.0	4.0	6.3	189	0.0	1021.1	139.7 773.1

Meteorological Daily Statistics Summary

Unit Id	:	Werris Ck Mine (Sentinex95)
Module Id	:	M2 (10M Weather Station)
Requested Report Date	:	2014/10/01
Requested Report Hour	:	00
Chart Available	:	no

Main Data Summary

Record Time	Temperature									Humidity			Prevailing Wind							
	2m			10m			60m						Speed			Gust	Dir	Rain	Bar	Solar Rad
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg	Max
					(°C)						(%)			(m/s)		(m/s)	(°)	(mm)	(hPa)	(W/m^2)	
2014/09/01 00:00:00	14.8	7.9	20.9	14.6	8.3	19.7	-99.0	-99.0	-99.0	60.5	39.8	84.5	2.4	0.0	7.4	9.8	348	0.0	1018.1	147.0	604.8
2014/09/02 00:00:00	9.2	7.1	14.5	9.5	7.5	14.5	-99.0	-99.0	-99.0	45.3	-99.0	78.4	4.7	2.7	15.7	23.3	248	0.4	982.1	-99.0	43.5
2014/09/03 00:00:00	9.5	4.2	15.7	9.4	5.0	14.5	-99.0	-99.0	-99.0	60.8	35.3	89.7	3.8	0.0	9.5	13.3	210	2.6	1016.4	153.1	617.4
2014/09/04 00:00:00	9.9	4.2	15.8	10.1	5.2	15.0	-99.0	-99.0	-99.0	58.7	40.2	76.8	2.1	0.0	5.9	8.4	167	0.0	1018.0	155.8	714.7
2014/09/05 00:00:00	10.1	6.2	15.3	10.3	7.1	14.3	-99.0	-99.0	-99.0	66.6	46.6	79.2	4.4	1.4	9.3	11.7	153	0.0	1022.3	120.0	691.9
2014/09/06 00:00:00	12.1	6.2	18.5	12.2	7.2	17.4	-99.0	-99.0	-99.0	63.2	34.8	88.5	3.5	0.5	7.3	9.0	129	0.0	1027.9	150.9	765.7
2014/09/07 00:00:00	13.1	5.2	19.4	13.1	6.0	18.2	-99.0	-99.0	-99.0	57.4	33.6	84.9	2.4	0.1	6.6	10.0	114	0.0	1029.1	152.2	679.1
2014/09/08 00:00:00	15.1	8.7	21.2	15.1	9.1	19.9	-99.0	-99.0	-99.0	56.7	34.3	75.6	2.4	0.2	9.1	11.3	43	0.0	1026.3	173.8	689.1
2014/09/09 00:00:00	16.9	10.3	23.1	16.9	11.4	21.9	-99.0	-99.0	-99.0	55.7	37.3	78.1	4.7	2.1	9.0	12.4	355	0.0	1019.6	171.2	687.2
2014/09/10 00:00:00	16.8	11.4	21.1	16.7	12.2	19.8	-99.0	-99.0	-99.0	54.7	33.6	86.1	4.3	0.0	13.2	17.2	310	5.4	1014.9	151.8	692.6
2014/09/11 00:00:00	13.9	1.8	22.1	15.0	8.5	21.3	-99.0	-99.0	-99.0	52.1	29.2	84.0	0.7	0.0	5.3	7.1	278	0.0	1020.7	181.8	630.0
2014/09/12 00:00:00	12.5	-15.6	22.3	15.2	9.7	21.5	-99.0	-99.0	-99.0	56.9	27.4	83.7	2.2	0.2	6.5	8.4	169	0.0	1024.0	183.7	643.4
2014/09/13 00:00:00	6.7	-20.0	22.7	15.7	9.9	21.5	-99.0	-99.0	-99.0	61.6	33.9	88.1	0.8	0.0	4.2	7.4	267	0.0	1024.5	161.6	788.5
2014/09/14 00:00:00	-16.4	-20.0	8.9	17.3	11.7	22.9	-99.0	-99.0	-99.0	49.0	25.1	78.3	2.7	0.0	6.7	9.9	309	0.0	1021.6	183.4	648.0
2014/09/15 00:00:00	-20.0	-20.0	-20.0	17.5	9.8	23.4	-99.0	-99.0	-99.0	41.1	21.2	67.0	0.7	0.0	5.1	7.7	300	0.0	1017.7	187.8	658.0
2014/09/16 00:00:00	-20.0	-20.0	-20.0	18.2	13.1	22.7	-99.0	-99.0	-99.0	39.2	19.0	57.6	4.8	0.3	11.6	15.8	303	0.0	1013.5	187.0	657.3
2014/09/17 00:00:00	-20.0	-20.0	-15.7	13.7	-17.7	19.2	-99.0	-99.0	-99.0	-99.0	-99.0	79.9	2.9	0.2	7.8	12.4	260	0.0	1017.1	157.0	820.1
2014/09/18 00:00:00	-20.0	-20.0	-20.0	13.2	8.3	19.2	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.0	0.1	6.9	9.8	233	0.0	1021.5	191.8	657.4
2014/09/19 00:00:00	-20.0	-20.0	-20.0	11.6	6.0	16.9	-99.0	-99.0	-99.0	9.9	-99.0	69.1	1.4	0.0	5.3	8.1	179	0.0	1022.8	163.4	762.5
2014/09/20 00:00:00	-20.0	-20.0	-20.0	13.5	6.0	20.0	-99.0	-99.0	-99.0	39.4	15.4	62.8	2.0	0.0	7.0	9.7	157	0.0	1024.1	195.7	669.4
2014/09/21 00:00:00	-20.0	-20.0	-20.0	13.9	8.1	19.2	-99.0	-99.0	-99.0	53.1	25.4	77.9	2.4	0.1	7.2	9.5	132	0.0	1028.6	149.3	699.9
2014/09/22 00:00:00	-20.0	-20.0	-20.0	15.2	8.7	21.5	-99.0	-99.0	-99.0	51.9	23.1	78.8	2.0	0.0	6.2	8.7	148	0.0	1030.0	199.3	696.2
2014/09/23 00:00:00	-20.0	-20.0	-20.0	16.9	9.6	23.8	-99.0	-99.0	-99.0	45.7	12.0	76.5	0.4	0.0	4.1	7.3	160	0.0	1028.0	203.0	693.1
2014/09/24 00:00:00	-20.0	-20.0	-20.0	18.3	12.8	23.3	-99.0	-99.0	-99.0	42.9	24.7	64.0	2.4	0.2	6.2	9.5	352	0.0	1022.5	196.3	704.5

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Record Time	Temperature									Humidity			Prevailing Wind			Gust	Dir	Rain	Bar	Solar Rad	
	2m			10m			60m						Speed								
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg	Max
					($°C$)						(%)			(m/s)		(m/s)	(°)	(mm)	(hPa)	(W/m^2)	
2014/09/25 00:00:00	-20.0	-20.0	-20.0	15.3	13.0	18.1	-99.0	-99.0	-99.0	80.0	45.8	94.5	2.8	0.2	10.1	14.6	315	28.2	1015.8	75.2	642.8
2014/09/26 00:00:00	-20.0	-20.0	-20.0	15.5	11.7	19.9	-99.0	-99.0	-99.0	64.4	39.0	92.8	2.6	0.1	6.1	8.3	173	0.0	1018.4	185.9	827.3
2014/09/27 00:00:00	-20.0	-20.0	-20.0	14.9	8.9	19.6	-99.0	-99.0	-99.0	59.2	37.5	86.3	2.1	0.0	6.6	8.2	180	0.0	1021.2	187.5	876.9
2014/09/28 00:00:00	-20.0	-20.0	-20.0	16.7	10.9	22.3	-99.0	-99.0	-99.0	51.9	26.0	79.8	1.1	0.0	3.7	6.9	308	0.0	1022.2	218.1	732.5
2014/09/29 00:00:00	-20.0	-20.0	-20.0	19.7	11.9	25.6	-99.0	-99.0	-99.0	47.4	27.7	72.4	2.0	0.0	5.4	7.7	322	0.0	1019.9	214.5	719.8
2014/09/30 00:00:00	-20.0	-20.0	-20.0	22.3	16.6	28.3	-99.0	-99.0	-99.0	43.4	26.8	63.8	3.5	0.2	7.8	10.6	327	0.0	1018.0	175.1	842.7

Meteorological Daily Statistics Summary

Unit Id	:	Werris Ck Mine (Sentinex95)
Module Id	:	M2 (10M Weather Station)
Requested Report Date	:	2014/11/01
Requested Report Hour	:	00
Chart Available	:	no

Main Data Summary

Record Time	Temperature									Humidity			Prevailing Wind			Gust	Dir	Rain	Bar	Solar Rad	
	2m			10m			60m						Speed								
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg	Max
					($°C$)						(%)			(m/s)		(m/s)	($°$)	(mm)	(hPa)	(W/m^2)	
2014/10/01 00:00:00	-15.4	-20.0	21.8	17.6	-10.5	21.9	-99.0	-99.0	-99.0	31.2	16.6	52.5	2.7	0.2	8.1	10.3	216	0.0	1018.4	227.1	754.7
2014/10/02 00:00:00	-17.2	-20.0	23.3	13.6	-20.0	22.5	-99.0	-99.0	-99.0	42.8	14.6	70.2	0.5	0.2	3.6	6.0	252	0.0	1022.0	215.1	731.2
2014/10/03 00:00:00	-20.0	-20.0	-20.0	18.2	10.2	25.0	-99.0	-99.0	-99.0	36.9	15.7	64.7	0.2	0.0	3.6	6.1	258	0.0	1019.6	233.5	771.6
2014/10/04 00:00:00	-20.0	-20.0	-20.0	20.4	12.5	26.7	-99.0	-99.0	-99.0	47.8	25.2	79.4	2.1	0.0	7.4	10.5	312	0.0	1019.2	222.5	757.7
2014/10/05 00:00:00	-20.0	-20.0	-20.0	22.1	14.7	28.7	-99.0	-99.0	-99.0	38.2	15.7	67.1	2.0	0.0	5.8	8.5	318	0.0	1019.7	242.3	769.6
2014/10/06 00:00:00	-20.0	-20.0	-20.0	23.6	15.3	30.5	-99.0	-99.0	-99.0	29.3	15.3	44.8	2.2	0.0	6.3	9.2	332	0.0	1017.2	233.9	766.9
2014/10/07 00:00:00	-20.0	-20.0	-20.0	23.5	18.3	29.4	-99.0	-99.0	-99.0	34.9	23.5	50.7	3.2	1.1	10.3	23.5	315	0.0	1012.5	199.1	771.0
2014/10/08 00:00:00	-20.0	-20.0	-20.0	17.6	10.4	22.8	-99.0	-99.0	-99.0	51.8	30.7	81.9	3.0	0.2	7.3	10.6	175	0.0	1017.5	227.3	927.3
2014/10/09 00:00:00	-20.0	-20.0	-20.0	17.1	9.9	24.3	-99.0	-99.0	-99.0	57.8	26.1	92.5	2.1	0.1	5.5	8.8	172	0.0	1021.0	242.5	805.0
2014/10/10 00:00:00	-20.0	-20.0	-20.0	19.9	13.1	26.4	-99.0	-99.0	-99.0	47.0	22.5	74.3	1.1	0.1	4.2	8.4	349	0.0	1018.6	239.6	822.3
2014/10/11 00:00:00	-20.0	-20.0	-20.0	21.6	15.6	28.0	-99.0	-99.0	-99.0	40.3	22.0	63.3	0.9	0.0	7.8	10.6	305	0.0	1017.2	201.8	874.9
2014/10/12 00:00:00	-20.0	-20.0	-20.0	23.4	17.2	29.5	-99.0	-99.0	-99.0	37.2	20.9	54.6	1.9	0.1	7.9	10.3	354	0.0	1016.4	238.2	899.9
2014/10/13 00:00:00	-20.0	-20.0	-20.0	19.9	14.1	24.1	-99.0	-99.0	-99.0	60.4	38.9	92.6	5.0	0.3	12.2	18.4	358	6.4	1011.2	107.2	698.3
2014/10/14 00:00:00	-4.3	-20.0	16.1	11.7	5.9	15.0	-99.0	-99.0	-99.0	58.9	31.4	92.5	4.2	0.1	12.7	15.6	278	0.6	1012.7	175.5	929.7
2014/10/15 00:00:00	11.9	5.5	18.6	11.5	5.6	17.9	-99.0	-99.0	-99.0	60.4	30.4	85.8	1.6	0.4	5.9	7.7	264	0.0	1016.9	148.1	1099.3
2014/10/16 00:00:00	15.2	6.1	22.3	15.0	7.1	21.0	-99.0	-99.0	-99.0	42.3	18.7	76.3	1.9	0.0	6.8	10.4	276	0.0	1020.4	259.0	810.0
2014/10/17 00:00:00	15.7	9.4	22.9	15.5	9.8	21.0	-99.0	-99.0	-99.0	46.3	26.4	72.6	3.2	0.0	9.6	13.5	162	0.0	1023.8	261.6	880.3
2014/10/18 00:00:00	16.0	8.1	23.8	15.9	8.8	23.0	-99.0	-99.0	-99.0	53.6	22.9	82.3	2.4	0.2	5.9	7.6	153	0.0	1027.8	262.7	833.7
2014/10/19 00:00:00	19.6	11.0	27.1	19.4	11.6	26.3	-99.0	-99.0	-99.0	43.1	19.4	76.9	0.4	0.0	3.8	7.7	244	0.0	1027.0	260.5	819.7
2014/10/20 00:00:00	20.6	13.4	28.7	20.3	14.8	27.0	-99.0	-99.0	-99.0	43.0	22.4	70.8	3.3	0.0	10.3	13.2	159	0.0	1026.4	252.8	822.9
2014/10/21 00:00:00	17.3	10.9	25.1	16.8	11.1	23.5	-99.0	-99.0	-99.0	60.6	35.0	86.8	3.7	1.3	8.0	9.8	155	0.0	1029.0	259.5	815.7
2014/10/22 00:00:00	18.9	9.1	27.0	18.7	9.6	26.3	-99.0	-99.0	-99.0	51.5	31.4	81.8	0.7	0.0	4.3	6.8	190	0.0	1025.1	245.1	830.8
2014/10/23 00:00:00	23.1	15.9	30.9	22.9	16.9	28.7	-99.0	-99.0	-99.0	39.7	22.8	54.8	1.1	0.0	8.1	12.1	318	0.0	1020.6	180.5	820.7
2014/10/24 00:00:00	24.3	15.1	32.1	24.2	15.3	31.1	-99.0	-99.0	-99.0	39.2	20.4	65.1	2.2	0.3	7.0	9.2	351	0.4	1019.7	200.7	777.0

Continued on next page

Record Time	Temperature									Humidity			Prevailing Wind			Gust	Dir	Rain	Bar	Solar Rad	
	2m			10m			60m						Speed								
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg	Max
					($^\circ C$)						(%)			(m/s)		(m/s)	($^\circ$)	(mm)	(hPa)	(W/m^2)	
2014/10/25 00:00:00	27.6	21.3	34.8	27.4	21.8	33.2	-99.0	-99.0	-99.0	26.9	13.0	42.3	0.6	0.1	10.1	15.1	334	0.0	1017.1	237.0	810.1
2014/10/26 00:00:00	28.9	21.2	37.0	28.7	21.6	35.7	-99.0	-99.0	-99.0	24.0	10.8	39.7	2.2	0.1	10.5	17.2	262	0.0	1013.3	229.1	820.7
2014/10/27 00:00:00	26.7	18.5	34.7	26.6	19.4	33.0	-99.0	-99.0	-99.0	27.1	13.9	50.0	3.1	0.0	10.5	15.9	268	0.0	1010.9	155.5	1020.8
2014/10/28 00:00:00	21.5	13.9	29.0	21.1	14.9	27.0	-99.0	-99.0	-99.0	25.7	9.3	45.4	2.6	0.5	8.2	12.2	235	0.0	1014.7	273.8	849.5
2014/10/29 00:00:00	22.0	14.9	29.0	21.8	16.1	28.8	-99.0	-99.0	-99.0	26.6	16.3	36.6	1.7	0.0	5.7	9.5	184	0.0	1017.2	271.2	837.9
2014/10/30 00:00:00	24.1	15.7	31.7	24.1	16.6	30.3	-99.0	-99.0	-99.0	-99.0	-99.0	61.5	1.7	0.0	6.1	12.4	296	0.0	1016.2	254.2	916.8
2014/10/31 00:00:00	25.9	16.5	34.6	25.7	18.3	33.0	-99.0	-99.0	-99.0	27.3	11.4	70.3	3.0	0.0	19.4	26.2	332	0.0	1013.7	259.1	842.5

Meteorological Daily Statistics Summary

Unit Id	:	Werris Ck Mine (Sentinex95)
Module Id	:	M2 (10M Weather Station)
Requested Report Date	:	2014/12/01
Requested Report Hour	:	00
Chart Available	:	no

Main Data Summary

Record Time	Temperature									Humidity			Prevailing Wind							
	2m			10m			60m						Speed			Gust	Dir	Rain	Bar	Solar Rad	
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg	Max
					($°C$)						(%)			(m/s)		(m/s)	($°$)	(mm)	(hPa)	(W/m^2)	
2014/11/01 00:00:00	24.6	17.5	32.2	24.2	17.8	30.2	-99.0	-99.0	-99.0	52.0	28.8	78.5	5.4	0.6	14.2	19.0	326	5.4	1010.0	224.9	965.1
2014/11/02 00:00:00	17.8	11.3	24.7	17.5	11.8	23.8	-99.0	-99.0	-99.0	28.3	8.9	62.0	3.4	0.8	9.1	11.7	199	0.0	1019.6	317.7	968.0
2014/11/03 00:00:00	18.8	9.8	26.5	18.4	10.4	25.9	-99.0	-99.0	-99.0	37.5	16.7	64.0	1.3	0.2	6.9	9.0	144	0.0	1022.7	305.0	940.7
2014/11/04 00:00:00	21.2	13.8	27.0	20.9	14.2	25.8	-99.0	-99.0	-99.0	46.6	30.6	69.9	1.3	0.0	5.6	8.4	326	0.0	1021.9	226.6	944.4
2014/11/05 00:00:00	20.4	14.1	29.9	20.3	14.3	28.3	-99.0	-99.0	-99.0	56.4	27.7	88.3	1.9	0.0	14.1	18.0	2	20.0	1017.9	201.1	1092.5
2014/11/06 00:00:00	19.5	11.7	27.3	19.4	12.1	26.2	-99.0	-99.0	-99.0	61.0	29.0	92.1	0.7	0.0	5.0	7.7	268	0.0	1015.6	278.0	1042.3
2014/11/07 00:00:00	24.1	13.9	28.7	23.5	13.3	27.3	-99.0	-99.0	-99.0	37.9	16.7	88.7	3.2	1.0	7.0	9.7	166	0.0	1019.1	436.0	1011.5
2014/11/08 00:00:00	23.1	13.6	30.8	22.9	14.0	30.6	-99.0	-99.0	-99.0	41.1	12.1	81.7	0.6	0.0	3.7	9.6	183	0.0	1020.7	325.1	977.8
2014/11/09 00:00:00	26.3	17.3	34.0	26.3	18.7	33.3	-99.0	-99.0	-99.0	34.3	14.6	63.1	1.0	0.0	7.4	9.9	353	0.0	1018.5	317.5	957.6
2014/11/10 00:00:00	26.6	18.2	80.4	26.4	18.4	81.6	-99.0	-99.0	-99.0	43.6	17.7	81.9	1.5	0.0	9.5	451.9	301	1.0	1016.4	263.8	1028.6
2014/11/11 00:00:00	21.5	14.8	30.0	21.0	15.4	28.4	-99.0	-99.0	-99.0	62.8	31.6	91.6	4.1	1.1	10.2	12.4	166	0.0	1016.8	317.8	947.1
2014/11/12 00:00:00	22.3	12.6	30.7	21.9	12.8	29.5	-99.0	-99.0	-99.0	48.6	20.0	82.1	2.4	0.0	6.9	8.9	162	0.0	1016.5	323.8	1010.1
2014/11/13 00:00:00	25.0	15.9	32.8	24.8	16.2	32.1	-99.0	-99.0	-99.0	42.1	20.4	67.5	0.4	0.1	4.4	7.4	107	0.0	1016.0	290.6	1007.8
2014/11/14 00:00:00	29.0	22.0	36.1	28.6	22.2	35.0	-99.0	-99.0	-99.0	37.9	17.8	63.3	3.3	0.0	7.4	11.5	339	0.0	1014.5	307.8	935.6
2014/11/17 00:00:00	26.4	20.2	31.0	26.4	22.0	29.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.8	0.7	5.0	6.8	245	0.0	1013.7	203.8	801.3
2014/11/18 00:00:00	23.2	13.6	31.1	22.9	14.7	28.9	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.2	0.4	5.9	8.9	183	0.0	1017.0	334.1	990.0
2014/11/19 00:00:00	24.2	14.9	32.9	23.4	15.2	31.4	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.3	0.3	10.6	13.3	129	0.0	1017.8	295.6	1179.8
2014/11/20 00:00:00	27.9	16.8	36.7	27.0	19.1	33.4	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.1	0.0	10.4	14.1	328	0.0	1014.5	305.9	1060.2
2014/11/21 00:00:00	30.7	25.5	37.9	29.9	25.5	35.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.9	0.6	10.9	16.3	329	0.0	1011.1	277.5	1110.7
2014/11/22 00:00:00	30.9	19.8	39.8	30.5	21.4	37.8	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	0.9	0.0	6.8	13.2	241	0.0	1012.7	338.9	994.1
2014/11/23 00:00:00	32.3	23.3	42.1	31.9	25.1	39.8	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	4.1	0.1	19.6	24.2	360	0.0	1013.5	272.8	1051.9
2014/11/24 00:00:00	29.4	21.1	39.3	28.7	21.3	36.6	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.3	0.3	15.2	21.4	327	3.2	1013.5	229.2	1020.0
2014/11/25 00:00:00	23.2	19.6	28.4	22.9	20.3	26.4	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	0.9	0.2	5.2	7.9	245	1.4	1016.6	144.1	951.1
2014/11/26 00:00:00	25.0	18.4	32.9	24.1	18.5	29.7	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.0	0.0	6.9	10.4	299	0.0	1017.2	214.8	904.9

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Record Time	Temperature												Prevailing Wind							
	2m			10m			60m			Humidity			Speed			Gust	Dir	Rain	Bar	Solar Rad	
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg	Max
					($°C$)						(%)			(m/s)		(m/s)	($°$)	(mm)	(hPa)	(W/m^2)	
2014/11/27 00:00:00	23.1	16.5	31.3	22.0	17.1	27.6	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	5.3	0.4	11.8	14.9	152	0.0	1018.4	306.9	1035.8
2014/11/28 00:00:00	22.5	14.3	31.8	21.5	14.7	28.9	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.4	0.3	9.5	14.4	138	0.0	1020.1	304.3	1098.3
2014/11/29 00:00:00	22.4	14.7	30.1	21.7	16.2	27.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	0.3	0.1	11.3	14.5	76	0.2	1018.4	212.8	1099.3
2014/11/30 00:00:00	24.6	16.7	32.0	23.7	18.2	30.7	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.2	0.1	8.9	10.9	344	0.0	1015.5	230.6	1116.9

Meteorological Daily Statistics Summary

Unit Id	:	Werris Ck Mine (Sentinex95)
Module Id	:	M2 (10M Weather Station)
Requested Report Date	:	2015/01/01
Requested Report Hour	:	00
Chart Available	:	no

Main Data Summary

Record Time	Temperature									Humidity			Prevailing Wind			Gust	Dir	Rain	Bar	Solar Rad	
	2m			10m			60m						Speed								
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg	Max
					(°C)						(%)			(m/s)		(m/s)	(°)	(mm)	(hPa)	(W/m²)	
2014/12/01 00:00:00	23.8	18.0	33.5	22.7	18.4	29.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.1	0.0	10.3	15.4	329	0.2	1013.3	201.3	1215.6
2014/12/02 00:00:00	27.1	18.8	35.5	25.9	19.2	32.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.7	0.1	8.5	10.5	327	0.2	1013.7	295.6	1086.8
2014/12/03 00:00:00	28.8	20.6	37.0	27.5	21.1	33.2	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.9	0.6	10.7	14.1	336	0.4	1014.9	254.5	1110.4
2014/12/04 00:00:00	22.3	17.5	29.4	22.2	17.3	27.4	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.1	0.0	7.4	9.1	6	12.4	1015.1	105.6	788.9
2014/12/05 00:00:00	22.2	16.5	31.8	21.9	17.2	29.7	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.9	0.0	12.2	18.4	346	13.8	1010.6	249.6	1076.5
2014/12/06 00:00:00	20.6	16.1	28.3	20.5	15.9	26.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.8	0.0	14.5	19.3	18	21.6	1008.3	163.9	1061.5
2014/12/07 00:00:00	21.3	15.4	31.1	21.3	16.4	29.8	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.2	0.0	10.2	13.7	355	18.0	1007.9	252.0	1064.3
2014/12/08 00:00:00	24.7	18.2	33.5	25.2	18.8	30.7	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.3	0.0	10.1	12.8	327	0.0	1009.9	213.3	1045.7
2014/12/09 00:00:00	26.0	19.1	34.9	25.5	20.6	31.6	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	0.7	0.0	9.7	12.5	342	0.0	1013.9	255.9	1185.9
2014/12/10 00:00:00	24.9	17.8	35.2	24.5	18.7	32.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.1	0.1	10.4	16.1	317	7.4	1013.1	268.0	953.4
2014/12/11 00:00:00	21.7	16.0	30.3	21.5	16.2	28.4	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.7	0.0	12.2	15.7	163	10.6	1009.2	185.7	1049.7
2014/12/12 00:00:00	17.8	14.2	22.8	17.0	14.5	20.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	9.3	4.6	14.8	19.6	149	0.0	1014.5	272.5	1031.6
2014/12/13 00:00:00	19.1	12.2	26.9	18.2	12.7	24.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	5.5	2.4	10.3	12.5	136	0.0	1015.3	292.6	1222.3
2014/12/14 00:00:00	21.0	12.1	28.4	20.3	13.0	27.1	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.7	0.1	5.0	7.9	157	0.0	1013.2	341.6	977.6
2014/12/15 00:00:00	24.5	14.5	32.9	24.1	16.2	30.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.0	0.0	9.2	12.7	162	0.0	1011.1	341.8	1074.9
2014/12/16 00:00:00	25.0	15.8	35.3	25.1	19.1	32.8	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.5	0.0	15.7	23.3	337	0.0	1007.4	189.0	1030.5
2014/12/17 00:00:00	27.6	18.2	38.7	27.3	19.7	35.8	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.7	0.0	10.8	14.2	285	0.0	1005.8	290.4	1049.7
2014/12/18 00:00:00	25.2	17.9	32.9	25.2	18.5	31.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.9	0.1	10.6	15.4	294	0.0	1008.6	153.9	599.2
2014/12/19 00:00:00	23.7	16.3	31.6	23.3	17.2	28.6	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.8	0.7	6.9	10.4	261	0.0	1013.0	343.0	974.6
2014/12/20 00:00:00	22.9	14.1	30.9	21.8	14.6	28.9	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.1	0.1	7.9	10.6	155	0.0	1016.0	325.9	1044.9
2014/12/21 00:00:00	25.6	16.7	32.9	24.7	18.0	31.2	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.3	0.1	8.9	11.7	73	0.0	1016.5	315.7	1105.1
2014/12/22 00:00:00	26.8	19.4	35.2	25.8	20.3	32.6	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.9	0.2	7.6	11.9	25	0.8	1016.2	297.0	1008.9
2014/12/23 00:00:00	23.2	18.5	28.1	22.9	18.6	26.2	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.1	0.9	9.4	11.4	342	3.4	1016.1	163.7	990.6
2014/12/24 00:00:00	25.4	18.3	33.9	24.6	19.3	31.3	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	0.5	0.0	9.4	13.7	325	0.0	1014.3	283.7	1065.8

Continued on next page

Record Time	Temperature									Humidity			Prevailing Wind							
	2m			10m			60m						Speed			Gust	Dir	Rain	Bar	Solar Rad	
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg	Max
					($°C$)						(%)			(m/s)		(m/s)	($°$)	(mm)	(hPa)	(W/m^2)	
2014/12/25 00:00:00	24.9	18.6	33.9	24.3	19.7	30.7	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.2	0.0	11.8	15.7	327	7.0	1012.1	227.0	1042.8
2014/12/26 00:00:00	22.4	18.5	28.5	22.9	18.8	28.6	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.0	0.0	9.6	12.5	280	26.8	1012.3	189.8	1116.8
2014/12/27 00:00:00	20.0	16.2	25.2	19.7	16.4	23.8	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.0	1.6	6.2	7.9	148	0.0	1018.6	132.2	805.6
2014/12/28 00:00:00	17.7	15.8	19.4	17.6	15.2	19.6	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.2	0.2	4.6	6.0	161	22.8	1017.5	82.3	457.7
2014/12/29 00:00:00	21.7	17.4	27.7	21.6	17.3	27.1	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.3	0.0	6.4	8.2	353	0.0	1010.6	242.0	1157.7
2014/12/30 00:00:00	25.8	18.5	33.4	25.8	20.7	31.9	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.0	0.2	9.3	15.1	275	0.0	1010.0	334.1	967.5
2014/12/31 00:00:00	24.5	15.2	32.0	24.3	18.0	30.4	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.5	0.4	7.5	9.3	159	0.0	1013.4	339.9	963.7

Meteorological Daily Statistics Summary

Unit Id	:	Werris Ck Mine (Sentinex95)
Module Id	:	M2 (10M Weather Station)
Requested Report Date	:	2015/02/01
Requested Report Hour	:	00
Chart Available	:	no

Main Data Summary

Record Time	Temperature									Humidity			Prevailing Wind								
	2m			10m			60m						Speed			Gust	Dir	Rain	Bar	Solar Rad	
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg	Max
					($°C$)						(%)			(m/s)		(m/s)	(°)	(mm)	(hPa)		(W/m^2)
2015/01/01 00:00:00	27.2	18.8	34.2	26.7	21.1	32.8	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.5	0.1	10.4	13.7	6	0.4	1014.4	318.1	1054.7
2015/01/02 00:00:00	21.6	17.6	27.5	22.0	17.5	25.9	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.9	0.1	13.3	16.7	36	7.6	1019.9	159.7	970.6
2015/01/03 00:00:00	26.0	18.1	32.0	25.8	20.6	30.8	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.1	0.0	9.6	11.7	24	0.0	1019.6	331.3	956.1
2015/01/04 00:00:00	26.1	19.8	32.3	25.4	21.5	31.1	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.8	0.1	11.1	14.1	9	0.0	1017.8	286.2	1093.4
2015/01/05 00:00:00	24.5	20.1	30.0	24.2	20.5	28.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.4	0.0	5.8	8.4	144	0.0	1017.8	178.0	1064.6
2015/01/06 00:00:00	25.3	17.8	32.2	24.7	19.1	30.4	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.3	0.2	9.9	11.7	123	0.0	1019.5	306.7	1135.8
2015/01/07 00:00:00	26.0	19.1	32.2	25.5	19.4	30.2	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.0	0.0	6.0	9.3	88	0.0	1018.7	328.0	1034.8
2015/01/08 00:00:00	25.9	18.4	32.5	25.2	19.9	30.2	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.5	0.1	5.4	7.3	14	0.0	1015.4	306.0	1076.7
2015/01/09 00:00:00	27.7	21.3	33.8	26.6	21.8	31.2	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.2	1.0	8.5	10.6	10	0.0	1011.9	288.7	1066.0
2015/01/10 00:00:00	26.6	21.3	33.3	25.8	21.5	30.8	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.9	0.2	8.8	12.7	22	0.8	1012.0	217.3	1166.3
2015/01/11 00:00:00	22.0	19.5	24.5	21.9	19.3	24.4	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	0.8	0.0	4.8	5.8	88	4.8	1013.2	78.1	434.1
2015/01/12 00:00:00	22.5	18.4	-99.0	22.1	18.4	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	4.1	1.0	17.0	910.9	154	2.2	1012.9	152.1	964.9
2015/01/13 00:00:00	24.2	16.7	31.3	23.5	17.3	28.3	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.1	0.3	6.2	7.9	336	0.0	1009.4	184.3	761.4
2015/01/14 00:00:00	25.0	20.0	30.9	24.9	20.8	30.8	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.2	1.7	8.7	13.2	301	26.8	1004.6	243.4	1070.9
2015/01/15 00:00:00	23.3	15.3	30.8	23.1	16.9	28.7	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.3	0.0	5.1	7.3	238	0.0	1007.2	306.9	1168.2
2015/01/16 00:00:00	23.7	14.0	32.0	24.2	17.0	30.6	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.6	0.0	8.1	10.5	272	0.0	1010.0	333.4	958.5
2015/01/17 00:00:00	24.1	11.3	33.2	24.8	16.2	31.6	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.5	0.0	6.9	9.0	233	0.0	1011.3	332.8	957.1
2015/01/18 00:00:00	25.0	11.8	33.6	25.7	17.7	31.4	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.3	0.0	6.3	8.9	204	0.0	1011.7	335.4	968.5
2015/01/19 00:00:00	23.7	16.9	32.5	23.0	17.4	29.9	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	4.3	1.7	11.5	14.7	133	0.0	1011.4	247.7	1078.1
2015/01/20 00:00:00	23.1	17.6	32.7	22.6	17.8	30.3	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.0	0.1	13.3	16.6	75	6.8	1011.1	223.1	1103.8
2015/01/21 00:00:00	23.4	17.9	30.9	22.8	19.1	28.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.8	0.0	9.2	12.8	51	0.4	1010.8	225.7	1021.5
2015/01/22 00:00:00	24.8	17.3	31.8	24.4	18.3	29.9	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.4	0.1	8.3	10.0	103	0.0	1012.2	243.7	1149.4
2015/01/23 00:00:00	23.8	20.4	30.0	23.7	19.6	27.7	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.4	0.0	7.1	9.7	56	1.4	1010.7	163.2	1111.0
2015/01/24 00:00:00	25.9	17.0	33.3	25.9	18.8	31.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	0.6	0.0	7.3	10.8	225	0.0	1008.0	253.0	1034.3

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Record Time	Temperature									Humidity			Prevailing Wind							
	2m			10m			60m						Speed			Gust	Dir	Rain	Bar	Solar Rad
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg Max
					($°C$)						(%)			(m/s)		(m/s)	(°)	(mm)	(hPa)	(W/m^2)
2015/01/25 00:00:00	27.9	18.7	35.6	26.9	19.4	33.4	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.9	0.0	8.0	11.9	218	0.0	1006.7	265.8 1030.5
2015/01/26 00:00:00	24.5	19.1	33.7	24.2	19.6	31.3	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	4.1	2.0	9.9	12.9	156	11.0	1009.5	211.2 1017.0
2015/01/28 00:00:00	17.4	-20.0	20.3	17.9	15.7	20.1	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	5.3	0.9	10.4	13.1	149	5.6	1012.8	126.3 549.9
2015/01/29 00:00:00	18.4	12.8	24.2	18.4	13.2	23.7	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.2	0.6	8.4	12.2	177	0.0	1012.6	286.3 1140.6
2015/01/30 00:00:00	20.1	11.3	27.6	20.0	11.8	26.6	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.2	0.0	8.6	11.7	234	0.0	1009.8	322.5 1014.4
2015/01/31 00:00:00	21.5	12.8	28.5	21.6	14.4	27.1	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.6	0.0	7.2	10.5	253	0.0	1008.7	321.9 964.0

Meteorological Daily Statistics Summary

Unit Id	:	Werris Ck Mine (Sentinex95)
Module Id	:	M2 (10M Weather Station)
Requested Report Date	:	2015/03/01
Requested Report Hour	:	00
Chart Available	:	no

Main Data Summary

Record Time	Temperature									Humidity			Prevailing Wind				Rain	Bar	Solar Rad	
	2m			10m			60m						Speed			Gust	Dir				
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max				Avg	Max
					($°C$)						(%)			(m/s)		(m/s)	($°$)	(mm)	(hPa)	(W/m^2)	
2015/02/01 00:00:00	22.4	14.4	30.1	22.6	15.6	28.9	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.4	0.0	6.1	8.2	150	0.0	1009.3	291.0	1074.6
2015/02/02 00:00:00	21.1	17.3	26.8	21.0	17.8	25.1	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.5	0.1	9.5	11.9	134	8.0	1013.5	187.5	1081.0
2015/02/03 00:00:00	19.9	14.9	25.0	19.6	15.5	23.6	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	5.1	0.0	10.2	14.0	134	0.0	1017.9	267.2	1130.2
2015/02/04 00:00:00	20.2	11.8	27.5	19.9	12.4	26.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.2	0.0	8.2	11.2	128	0.0	1016.4	291.2	958.9
2015/02/05 00:00:00	21.1	13.6	28.3	20.6	14.2	26.7	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	4.0	1.1	7.6	11.4	124	0.0	1022.1	308.3	945.4
2015/02/06 00:00:00	20.7	13.4	28.0	20.4	14.2	26.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.0	0.2	7.9	10.1	124	0.0	1025.8	301.3	917.4
2015/02/07 00:00:00	22.4	14.2	30.8	22.2	14.8	29.7	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.4	0.0	5.6	7.1	179	0.0	1024.1	295.8	896.6
2015/02/08 00:00:00	26.2	17.0	34.6	26.2	17.8	33.4	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	0.4	0.0	6.5	9.5	152	0.0	1021.0	294.4	904.8
2015/02/09 00:00:00	27.3	19.5	34.0	27.1	20.9	32.3	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.9	0.0	7.1	10.6	121	0.0	1021.3	277.8	885.9
2015/02/10 00:00:00	25.2	18.7	32.0	24.8	19.1	30.2	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.7	0.1	8.1	11.1	115	0.0	1023.0	263.5	964.3
2015/02/11 00:00:00	23.8	17.2	31.5	23.6	18.1	30.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.5	0.1	10.5	13.3	95	0.0	1022.3	232.8	1155.4
2015/02/12 00:00:00	24.6	18.2	32.2	24.3	18.8	31.3	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.8	0.0	11.7	15.2	109	0.0	1021.0	267.5	1009.8
2015/02/13 00:00:00	24.0	18.1	31.2	23.7	18.8	30.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.3	0.0	8.6	11.4	108	0.0	1022.5	259.9	1078.2
2015/02/14 00:00:00	24.6	17.2	30.9	24.3	17.9	29.9	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	0.8	0.0	5.0	7.6	109	0.0	1022.0	239.3	965.9
2015/02/15 00:00:00	23.1	18.4	31.1	22.9	18.9	29.1	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.3	0.1	8.4	11.3	348	1.6	1018.5	214.6	1037.9
2015/02/16 00:00:00	23.9	16.7	31.2	23.8	17.8	30.9	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	0.7	0.0	6.0	8.2	107	0.0	1017.3	241.6	1069.9
2015/02/17 00:00:00	24.9	19.0	32.2	24.5	19.8	30.2	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.2	0.1	8.7	11.7	54	0.0	1017.9	269.5	918.5
2015/02/18 00:00:00	24.7	18.1	32.3	24.3	18.8	30.3	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.8	0.0	7.5	11.7	72	0.0	1018.8	253.5	1056.4
2015/02/19 00:00:00	24.5	18.7	32.2	24.2	19.3	30.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.5	0.0	10.0	13.5	96	0.0	1019.1	208.8	1086.6
2015/02/20 00:00:00	21.8	18.3	27.0	21.9	18.8	26.2	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.2	0.0	5.7	7.3	146	3.6	1017.1	90.7	482.5
2015/02/21 00:00:00	3.7	-99.0	26.6	0.1	-99.0	25.7	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	4.5	2.1	8.0	9.8	142	0.0	1015.1	144.7	541.2
2015/02/22 00:00:00	24.3	18.9	31.8	24.0	19.2	30.1	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	4.1	0.7	9.5	12.3	152	0.0	1015.7	212.2	1162.8
2015/02/23 00:00:00	24.9	17.3	33.1	24.7	18.0	31.5	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.8	0.6	8.4	11.4	154	0.0	1015.2	230.2	1025.7
2015/02/24 00:00:00	24.8	18.3	33.7	24.6	18.5	31.8	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.0	0.0	11.1	13.8	160	0.0	1014.1	252.1	893.6

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Record Time	Temperature									Humidity			Prevailing Wind							
	2m			10m			60m						Speed			Gust	Dir	Rain	Bar	Solar Rad	
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg	Max
					($°C$)						(%)			(m/s)		(m/s)	(°)	(mm)	(hPa)	(W/m^2)	
2015/02/25 00:00:00	23.2	16.6	31.4	22.9	17.1	29.9	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	3.4	0.1	10.5	13.2	162	2.2	1014.2	257.9	858.5
2015/02/26 00:00:00	22.5	17.5	29.6	22.4	17.9	28.1	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	0.8	0.0	9.0	13.2	323	1.6	1010.4	172.7	855.9
2015/02/27 00:00:00	23.4	15.0	31.3	23.3	15.7	29.6	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	2.2	0.0	7.3	9.4	165	0.2	1010.2	258.7	1040.9
2015/02/28 00:00:00	25.4	17.8	32.0	25.3	18.4	32.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	0.4	0.0	4.0	5.5	50	0.0	1010.9	201.8	1075.3

Meteorological Daily Statistics Summary

Unit Id	:	Werris Ck Mine (Sentinex95)
Module Id	:	M2 (10M Weather Station)
Requested Report Date	:	2015/04/01
Requested Report Hour	:	00
Chart Available	:	no

Main Data Summary

Record Time	Temperature									Humidity			Prevailing Wind						Solar Rad	
	2m			10m			60m						Speed			Gust	Dir	Rain	Bar	
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max				Avg	Max
					($^\circ C$)						(%)			(m/s)		(m/s)	($^\circ$)	(mm)	(hPa)	(W/m^2)	
2015/03/01 00:00:00	25.0	19.1	33.2	24.7	19.7	31.9	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	1.9	0.1	14.7	20.6	358	13.6	1010.8	198.1	958.9
2015/03/02 00:00:00	22.4	16.3	29.2	22.1	16.8	28.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	4.4	2.0	8.6	11.1	150	0.0	1016.0	261.8	848.1
2015/03/03 00:00:00	24.8	15.9	32.9	24.7	16.7	32.5	-99.0	-99.0	-99.0	12.1	-99.0	51.9	1.1	0.0	5.3	8.0	357	0.4	1015.7	254.3	830.4
2015/03/04 00:00:00	29.2	23.3	35.4	29.0	24.2	34.5	-99.0	-99.0	-99.0	45.5	29.4	70.2	3.2	0.4	10.2	14.9	308	0.0	1011.9	219.0	904.1
2015/03/05 00:00:00	25.3	16.3	30.4	25.1	16.9	28.6	-99.0	-99.0	-99.0	30.6	15.6	72.8	3.1	0.0	8.2	11.1	229	0.0	1010.4	256.1	864.5
2015/03/06 00:00:00	20.2	12.8	28.0	20.0	13.0	26.7	-99.0	-99.0	-99.0	47.6	15.4	85.5	2.1	0.1	6.2	8.2	234	0.0	1011.3	259.4	843.2
2015/03/07 00:00:00	23.2	13.0	31.7	23.5	14.2	30.6	-99.0	-99.0	-99.0	27.1	14.7	46.1	0.5	0.2	5.3	8.7	311	0.0	1011.4	262.2	854.4
2015/03/08 00:00:00	23.7	18.4	29.7	23.9	19.2	28.7	-99.0	-99.0	-99.0	43.7	26.4	60.2	2.4	0.0	7.0	10.1	322	0.0	1012.5	148.2	809.7
2015/03/09 00:00:00	29.5	25.1	33.9	29.7	25.5	33.0	-99.0	-99.0	-99.0	28.9	15.0	54.2	2.1	0.2	8.4	11.4	94	0.0	1011.9	138.2	657.1
2015/03/10 00:00:00	24.4	19.5	32.5	24.5	20.0	32.0	-99.0	-99.0	-99.0	54.2	32.0	80.6	0.7	0.0	11.9	17.5	93	6.6	1016.1	158.2	916.3
2015/03/11 00:00:00	24.5	18.2	32.3	24.5	18.9	31.6	-99.0	-99.0	-99.0	59.3	30.5	82.9	1.0	0.0	8.5	10.1	23	1.0	1016.6	237.9	883.1
2015/03/12 00:00:00	21.2	17.5	28.0	21.5	18.2	27.1	-99.0	-99.0	-99.0	71.7	48.5	83.7	0.2	0.0	9.6	13.0	109	6.2	1016.4	119.4	866.8
2015/03/13 00:00:00	20.3	15.9	26.7	20.3	16.7	25.2	-99.0	-99.0	-99.0	69.7	50.0	86.3	4.9	1.3	10.7	15.8	144	0.0	1017.9	205.4	896.8
2015/03/14 00:00:00	19.3	13.2	26.3	19.3	13.9	25.1	-99.0	-99.0	-99.0	59.0	27.9	85.6	2.3	0.0	6.9	9.5	172	0.0	1017.3	245.2	866.1
2015/03/15 00:00:00	20.4	13.7	29.2	20.5	14.8	27.7	-99.0	-99.0	-99.0	53.6	27.3	74.8	2.6	0.0	10.6	13.8	150	0.0	1012.3	209.5	935.0
2015/03/16 00:00:00	19.5	13.3	27.4	19.5	13.9	26.2	-99.0	-99.0	-99.0	53.7	25.6	81.9	3.0	0.3	6.2	9.3	163	0.0	1016.1	242.0	805.0
2015/03/17 00:00:00	21.3	14.7	27.4	21.3	15.4	26.3	-99.0	-99.0	-99.0	56.7	41.9	74.4	1.1	0.0	5.6	7.6	352	0.0	1014.9	157.7	885.7
2015/03/18 00:00:00	25.3	19.9	31.2	25.0	20.3	30.3	-99.0	-99.0	-99.0	56.4	40.2	72.7	5.1	1.5	11.2	15.4	348	0.0	1010.3	198.5	820.8
2015/03/19 00:00:00	26.6	17.8	34.1	26.7	19.8	32.7	-99.0	-99.0	-99.0	45.3	16.9	81.3	1.4	0.0	5.4	7.3	303	0.0	1012.6	230.5	783.9
2015/03/20 00:00:00	28.0	19.7	37.9	28.2	21.3	36.3	-99.0	-99.0	-99.0	34.1	14.9	74.0	1.2	0.2	192.9	11679.0	270	0.0	1014.4	210.4	775.3
2015/03/21 00:00:00	22.3	17.9	28.4	21.8	18.1	26.2	-99.0	-99.0	-99.0	61.1	42.3	75.1	6.6	4.0	10.1	14.8	139	0.0	1020.6	183.0	975.0
2015/03/22 00:00:00	22.5	16.3	29.9	22.2	16.6	28.8	-99.0	-99.0	-99.0	57.3	26.7	84.0	3.0	0.1	8.7	12.9	123	0.0	1020.9	172.9	902.0
2015/03/23 00:00:00	23.2	16.5	29.9	23.2	17.1	28.9	-99.0	-99.0	-99.0	53.1	33.7	75.2	1.2	0.0	5.5	8.0	4	0.0	1017.8	193.2	990.5
2015/03/24 00:00:00	24.0	19.5	32.6	23.9	20.1	31.0	-99.0	-99.0	-99.0	60.5	32.3	84.5	2.7	0.3	11.3	16.2	342	6.0	1014.3	157.5	832.9

Continued on next page

Record Time	Temperature									Humidity			Prevailing Wind			Gust	Dir	Rain	Bar	Solar Rad	
	2m			10m			60m						Speed								
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max					Avg	Max
					($^\circ C$)						(%)			(m/s)		(m/s)	($^\circ$)	(mm)	(hPa)	(W/m^2)	
2015/03/25 00:00:00	21.5	14.8	28.5	21.6	15.3	27.3	-99.0	-99.0	-99.0	52.8	21.6	86.6	1.4	0.0	6.1	8.7	262	0.0	1016.6	224.0	766.8
2015/03/26 00:00:00	20.2	12.6	27.8	20.4	14.0	26.7	-99.0	-99.0	-99.0	32.5	15.8	54.8	2.1	0.2	6.5	9.8	290	0.0	1020.0	222.0	782.4
2015/03/27 00:00:00	17.9	9.5	26.0	18.1	10.4	25.0	-99.0	-99.0	-99.0	33.3	16.8	61.8	1.7	0.0	5.9	7.7	203	0.0	1022.7	223.7	773.7
2015/03/28 00:00:00	18.9	10.1	27.5	19.3	11.9	26.4	-99.0	-99.0	-99.0	33.2	15.3	56.2	1.2	0.0	3.7	6.0	194	0.0	1022.8	218.3	757.6
2015/03/29 00:00:00	21.4	14.4	28.5	21.4	15.6	27.2	-99.0	-99.0	-99.0	45.2	24.4	71.2	1.4	0.0	6.1	10.0	313	0.0	1023.2	202.8	769.8
2015/03/30 00:00:00	20.3	16.4	24.5	20.6	17.3	23.6	-99.0	-99.0	-99.0	57.5	40.9	83.9	1.2	0.0	6.2	8.0	358	0.4	1024.3	81.2	682.2
2015/03/31 00:00:00	19.4	14.3	26.7	19.3	14.4	25.1	-99.0	-99.0	-99.0	70.8	41.7	86.5	1.7	0.0	8.9	12.3	159	0.6	1024.9	167.4	804.5

2014-2015 Complaints Register

YTD	#	Complaint Date/Time	Issue	Complainant	Method	Nature of Complaint	Investigation	Action Taken / Follow-up
1-3	372-374	01/04/2014 3:10pm	Blast (Overpressure or Vibration)	AL, U, S Werris Creek	Phone to EO	Blast caused significant ground movement and shaking of houses.	WCC shot #21-2014 (S13_7-10_Gcoal TSB) fired at 3:08pm on Tuesday 1st April 2014 was in compliance. Blast in bottom of pit has previously caused complaints.	Written response provided to complainant.
4-5	375-376	08/04/2014 1:10pm	Blast (Overpressure or Vibration)	AL, I Werris Creek	Phone to EO	Blast caused significant ground movement and shaking of houses.	WCC shot #23-2014 (S15_10-12_350) fired at 1:08pm on Tuesday 8th April 2014 was in compliance. Blast performed as expected and both Werris Creek blast monitor results below 0.5mm/s.	Written response provided to complainant.
6-8	377-379	16/04/2014 3:15pm	Blast (Overpressure or Vibration)	U, I, AT Werris Creek	Phone to EO	Blast caused significant ground movement and shaking of houses.	WCC shot #24-2014 (S13_7-10_GCoal TSB Part2) fired at 3:13pm on Wednesday 16th April 2014 was in compliance. Blast in bottom of pit has previously caused complaints.	Written response provided to complainant.
9	380	23/04/2014 3:24pm	Road Transport	LPSC	Email to EO	Council received complaints from public and councillors regarding the speed that some trucks are travelling when exiting the site.	The supervisors responsible for managing delivery and coal transport heavy vehicles have been made aware of the issue to address with their contractors. WCC campaign hauling coal over to Gunnedah by road ceased.	Written response provided to complainant.
10	381	30/04/2014 10:01am	Groundwater (Level)	M Quipolly	Phone to EO	Groundwater level in bore been dropping rapidly recently.	The previous measurement on 26th March 2014 was 8.38m while the 30th April 2014 measurement was 9.32m. This is a larger decrease (-10%) in groundwater compared to the recent trend since May 2013 of between -3% to -6% fall which was believed to be reflecting the lack of rainfall recharge to the Quipolly alluvial aquifer.	EO met with complainant and referred to expert Hydrogeologist for analysis. Written response provided to complainant.
11	382	16/05/2014 3:15pm	Blast (Overpressure or Vibration)	AZ Werris Creek	Phone to EO	Blast caused significant ground movement and shaking of house.	WCC shot #30-2014 (S13_6-10_GSeam) fired at 3:15pm on Friday 16th May 2014 was in compliance. Blast in bottom of pit has previously caused complaints.	Written response provided to complainant.
12	383	22/05/2014 11:14am	Blast (Overpressure or Vibration)	U Werris Creek	Phone to EO	Blast caused significant ground movement and shaking of house.	WCC shot #31-2014 (S13_11-12_GSeam) fired at 11:13pm on Thursday 22nd May 2014 was in compliance. Blast in bottom of pit has previously caused complaints.	Written response provided to complainant.
13-15	384-386	29/05/2014 3:14pm	Blast (Overpressure or Vibration)	AL,AN,BD Werris Creek	Phone to EO	Blast caused significant ground movement and shaking of houses.	WCC shot #31-2014 (S13_11-16_264) fired at 3:13pm on Thursday 29th May 2014 was in compliance. Blast in bottom of pit has previously caused complaints.	Written response provided to complainant.
16	387	3/06/2014 2:00pm	Dust (Mine)	Q Quipolly	Phone to EO	Thick dust cloud over Werris Creek Road at 9:30am on Friday 30th May 2014.	Temperature inversion trapping dust emissions; however no exceedance of dust criteria at the Werris Creek real time dust monitor. Regional dust event also recorded in Tamworth real time dust monitor.	Written response provided to complainant.
17	388	15/06/2014 10:37pm	Noise (Mine)	U Werris Creek	Phone to EO	Excessive noise allegedly from mining operations on Sunday night 15th June 2014.	Elevated noise levels were found to be due to rail yard maintenance activities and not related to WCC operations. The average weather conditions were a moderate north westerly wind (318o @ 3.0m/s) with no inversion present.	Written response provided to complainant.

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YTD	#	Complaint Date/Time	Issue	Complainant	Method	Nature of Complaint	Investigation	Action Taken / Follow-up
18	389	17/06/2014 12:26am	Noise (TLO)	A Werris Creek	Email to Executive Director	Loud noise from coal loader tonight Monday 16th June 2014.	Elevated noise levels were found to be due to rail yard maintenance activities and not related to WCC operations. The average weather conditions were a light northerly wind (353o) at 1.0m/s and a moderate temperature inversion of +4.2oC/100m	Written response provided to complainant.
19	390	17/06/2014 1:13pm	Blast (Other - Vibration)	U Werris Creek	Phone to EO	Blast caused significant ground movement and shaking of house at 1:10pm Tuesday 17th June 2014.	WCC did not blast on Tuesday 17th June 2014 at 1:10pm.	Written response provided to complainant.
20-37, 39-40	391-408, 410-411	02/07/2014 Various	Blast (Overpressure or Vibration) Blast (Fume)	Various Werris Creek	Phone to EO	Blast caused significant ground movement and shaking of houses at 1:05pm Wednesday 2nd July 2014. The blast also generated excessive orange gas that was visible from Werris Creek town.	WCC shot #45-2014 (S15_B12-B16_RL330_EXT) fired at 1:05pm on Wednesday 2nd July 2014 generated an excessively large cloud of fume (Oxides of Nitrogen) that drifted north north west off the mine site and dispersed over vacant agricultural land owned by Whitehaven Coal resulting in 8 complaints. The other 12 complaints were in relation to the blast which had a longer than normal duration due to size of the blast which was one the larger blasts fired at WCC.	EPA were notified in accordance with the Pollution Incident Response notification process. EPA are investigating the incident with a preliminary report submitted 8th July and ICAM investigation report submitted 31st July 2014. Written response provided to complainants.
38	409	03/07/2014 3:00pm	Groundwater (Level)	H Quipolly	Phone to EO	Groundwater level in bore been dropping recently.	The previous measurement on 20th May 2014 was 5.25m while the 2nd July 2014 measurement was 5.38m. This is following a consistent groundwater decline trend since May 2013 of between -1% to -6% fall which is due to the lack of rainfall recharge to the Quipolly alluvial aquifer since the last heavy rain in February 2013.	EO referred to expert Hydrogeologist for analysis. Written response provided to complainant.
41	412	11/07/2014 2:43pm	Dust (Mine)	BG Werris Creek	Phone to EO	The complainant stated that since April 2014 when the mine started mining towards Tony Windsor's (referring to MIA construction) that the house now gets coated in black dust. The complainant has only recently started suffering from rashes/hives that only occur after showering.	Confirmed that the MIA relocation had occurred over 12 months ago (March 2013) and not consistent with the complainants timeline of recent symptoms. No further investigation was undertaken as no specific event identified by the complainant. Nearby Werris Creek TEOM and DG92 demonstrate dust levels well within criteria.	Environmental Officer met with the complainant and observed the alleged black dust on the roof of the house. The roof dust and water tank sludge sampled and tested for composition. Written response provided to complainant.
42	413	24/07/2014 1:04pm	Blast (Overpressure or Vibration)	AL Werris Creek	Phone to EO	Blast caused significant ground movement and rattled sun room at rear of house.	WCC shot #52-2014 (S15_B14-B16_RL330) fired at 1:03pm on Thursday 25th July 2014 was in compliance. Blast performed as expected and both Werris Creek blast monitor results below 0.5mm/s.	Written response provided to complainant.
43	414	25/07/2014 9:50am	Dust (Mine)	M Quipolly	Phone to EO	Alleged dust from WCC causing dust to deposit on the back deck and table. The complainant believes that the black dust wiped up daily from the table is coal dust.	HVAS results for the 27th June and 3rd July 2014 recorded 22µg/m3 and 15µg/m3 and were within criteria limits. Generally when the wind speeds are low on the 27th June and 3rd July, these not usually considered to dusty conditions. The ambient dust levels from all dust sources were not considered excessive and therefore any dust from mining operations on those days would not be considered to have impacted the property.	Environmental Officer met with the complainant and observed the alleged black dust on the back deck of the house. The roof dust and water tank sludge sampled and tested for chemistry and composition. Written response provided to complainant.

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YTD	#	Complaint Date/Time	Issue	Complainant	Method	Nature of Complaint	Investigation	Action Taken / Follow-up
44	415	6/08/2014 1:06pm	Blast (Overpressure or Vibration)	U Werris Creek	Phone to EO	Blast caused back shed to shake significantly and hum.	WCC shot #58-2014 (S15_B3-B5_RL330) fired at 1:05pm on Wednesday 6th August 2014 was in compliance. Through seam blast was fired towards Werris Creek and duration of 5 seconds; both changes were required but outside the usual practice. Actual blast vibration marginally exceeded the predicted and target vibration of 1mm/s; however actual frequency was in the range of natural resonance of buildings. Weather conditions were a north westerly wind (336o) @ 3.7m/s with no inversion present.	Written response provided to complainant.
45 & 46	416 & 417	11/08/2014 1:09pm	Blast (Overpressure or Vibration)	AL & AN Werris Creek	Phone to EO	Blast shook house disturbing the resident.	WCC shot #61-2014 (S16_B12-B13_RL350) fired at 1:08pm on Monday 11th August 2014 was in compliance. Actual blast vibration was below target vibration of 1mm/s; however actual frequency was in the range of natural resonance of buildings. Weather conditions were a west north westerly wind (294o) @ 2.9m/s with no inversion present.	Written response provided to complainant.
47	418	5/09/2014 1:08pm	Blast (Overpressure or Vibration)	Anonymous/EPA Werris Creek	Email to EO	Blast caused whole house to shake significantly and woke up night shift worker.	WCC blast #72-2014 (S17_B13_B16_RL350) fired at 1:08pm on Friday 5th September 2014 was in compliance however the overpressure result recorded at Kyooma was above 115dBL but below the limit of 120dBL. The actual vibration levels were below the predicted vibration. Analysis of the waveform frequency indicates that the peak frequencies were 10.7-13.9Hz which is in the natural resonance range of buildings. The cause of the complaint could have been either overpressure or vibration. Weather conditions were a south easterly wind (135o) @ 6.9m/s with no inversion present.	Written response provided to the EPA.
48	419	18/09/2014 8:17am	Dust (Mine)	Z Quipolly	Phone to EO	Complainant indicated that the mine was dusty this morning and enquired what was going on.	Dump locations on Thursday dayshift 18th September 2014 were RL445m dump and eastern in pit haul road. Visual inspection by Environmental Officer from 8:30am to 9am did not identify any excessive dust or dust haze from WCC. As the air quality in Werris Creek would be classed as good and well below the daily criteria of 50µg/m3; with no visible dust impact from WCC operations, it was unlikely that there was any dust impact offsite on Thursday morning. Weather conditions were a north westerly wind (326o) @ 2.0m/s with no inversion present.	Verbal response provided immediately to the complainant. Complainant requested no written response.

WHITEHAVEN COAL

2014-2015 Complaints Register

YTD	#	Complaint Date/Time	Issue	Complainant	Method	Nature of Complaint	Investigation	Action Taken / Follow-up
49	420	18/09/2014 1:19pm	Blast (Overpressure or Vibration)	U Werris Creek	Phone to EO	Blast caused back shed to shake but not as bad as previously.	WCC blast #80-2014 (S16_B20_B22_RL370) fired at 1:13pm on Thursday 18th September 2014 was in compliance. The actual vibration levels were above the predicted vibration and above the anecdotal threshold for vibration complaints of 0.5mm/s. Analysis of the waveform frequency indicates that the peak frequencies were 11.0-12.2Hz which is in the natural resonance range of buildings. Weather conditions were a westerly wind (278o) @ 3.6m/s with no inversion present.	Written response provided to complainant.
50	421	18/09/2014 2:04pm	Blast (Fume)	Anonymous/EPA Unknown Location	Email to EO	Blast cause large reddish dust plume to travel towards Werris Creek town visible from Kamilaroi Highway.	WCC blast #80-2014 (S16_B20_B22_RL370) fired at 1:13pm on Thursday 18th September 2014 was in compliance and no fume was generated (Level 0) by the blast. The majority of the dust from the blast settled in pit along Strip 17. Weather conditions were a westerly wind (278o) @ 3.6m/s with no inversion present.	Written response provided to the EPA.
51	422	23/09/2014 4:16pm	Blast (Overpressure or Vibration)	AL Werris Creek	Phone to EO	Blast shook house disturbing the resident.	WCC shot #82-2014 (S17_B21-B23_RL370) fired at 4:13pm on Tuesday 23rd September 2014 was in compliance. Actual blast vibration was below the predicted vibration but close to the anecdotal threshold for vibration complaints of 0.5mm/s. Analysis of the waveform frequency indicates that the peak frequencies were 11.5-12.9Hz which is in the natural resonance range of buildings. Weather conditions were a north easterly wind (31o) @ 2.0m/s with no inversion present.	Written response provided to complainant.
52	423	24/09/2014 4:03pm	Dust (Mine)	BH Werris Creek	Phone to EO	WCC is allegedly the cause of the complainants' heart problems and emphysema because of the black dust that is constantly depositing in the house since the mine started.	A review of the PM10 dust data for Werris Creek since 2012 found that there has been no exceedance of dust limits in Werris Creek and that Werris Creek air quality is rated as very good and consistently lower than Tamworth, Muswellbrook, Singleton and Sydney dust levels. No further investigation is required as no specific event was identified by the complainant.	Written response provided to complainant.
53 to 56	424 to 427	3/10/2014 1:19pm	Blast (Overpressure or Vibration)	Various Werris Creek	Phone to EO	Blast caused house to shake significantly.	WCC blast #87-2014 (S16_B13_B16_RL350) was fired at 1:18pm on Friday 3rd October 2014 was in compliance. The actual vibration levels were at the anecdotal vibration complaint threshold of 0.5mm/s. Analysis of the waveform frequency indicates that a single frequency of 18Hz was generated but not normally in the natural resonance range of buildings. Weather conditions were a light north north westerly wind (336o) @ 1.9m/s with no inversion present.	Written response provided to complainant.

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YTD	#	Complaint Date/Time	Issue	Complainant	Method	Nature of Complaint	Investigation	Action Taken / Follow-up
57 to 60	428 to 431	8/10/2014 1:10pm	Blast (Overpressure or Vibration)	Various Werris Creek	Phone to EO	Blast caused house to shake significantly.	WCC blast #88-2014 (S14_B12-B15_Cseam) was fired at 1:08pm on Wednesday 8th October 2014 was in compliance. The actual vibration levels were close to the anecdotal vibration complaint threshold of 0.5mm/s. Analysis of the waveform frequency indicates that a single frequency of 13Hz was generated in the natural resonance range of buildings. Weather conditions were a moderate south westerly wind (214o) @ 4.1m/s with no inversion present.	Written response provided to complainant.
61	432	10/10/2014 11:05am	Groundwater Level	BK Quipolly	Phone to EO	Groundwater in Quipolly has alarming dropped allegedly because of the mine.	The previous measurement on 25th March 2014 was 4.60m which was a decrease of -9% from the previous year; however the groundwater level was still within the historical range of results measured at MW7 since 2005 indicating that there has been no impact to the Quipolly alluvial aquifer over that time. The decline reflects the below average rainfall and reduce rainfall recharge to Quipolly Alluvium Aquifer.	Written response provided to complainant.
62	433	16/10/2014 2:23pm	Groundwater Level	AG Quipolly	Phone to EO	Concerned about water as well level dropped requiring sensor to be lowered.	The last measurement on 19th January 2012 was 5.15m with a recent measurement taken when a groundwater logger was installed on 25th September 2014 at 8.68m - a decrease of 3.53m. This is consistent with other Quipolly Alluvium Aquifer bores which had shown a decline of 4m since 2012 due to below average rainfall resulting in limited rainfall recharge to the aquifer.	Written response including the four weeks of groundwater level data provided to the complainant.
63 & 64	434 & 435	17/10/2014 2:01pm & 2:05pm	Blast (Overpressure or Vibration)	U & AH Werris Creek	Phone to EO	Blast caused house to shake.	WCC blast #94-2014 (S15_B4_B6_RL335_TSB) was fired at 13:58 on Friday 17th October 2014 was in compliance. The actual vibration levels were at the anecdotal vibration complaint threshold of 0.5mm/s. The actual Werris Creek South vibration level of 0.63mm/s was 50% higher than the predicted vibration and above the anecdotal threshold for vibration complaints of 0.5mm/s. Analysis of the waveform frequency did not indicate a dominant frequency but did have peaks in the natural resonance range of buildings. The weather conditions were a moderate south south easterly wind 167o @ 4.1m/s with no temperature inversion (-4.4oC/100m).	Written response provided to complainant.

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YTD	#	Complaint Date/Time	Issue	Complainant	Method	Nature of Complaint	Investigation	Action Taken / Follow-up
65	436	20/10/2014 8:22am	Dust (Mine)	U Werris Creek	SMS to EO	Complainant asked if water carts were broken given the dust haze over the mine.	The weather conditions on Monday morning 20th October 2014 averaged a light east south easterly wind 122o @ 0.8m/s with a peak temperature inversion of +6.2oC/100m resulting in dust emissions being trapped under the temperature inversion, concentrating the particles so that they were visible over the mine. When the wind speed increased after 9am, the dust haze dispersed onsite and was no longer visible.	Written response provided to complainant.
66	437	20/10/2014 1:37pm	Blast (Overpressure or Vibration)	I Werris Creek	Phone to EO	Blast caused house to shake.	WCC blast #95-2014 (S16_B19_B21_RL350_TSB) was fired at 13:33 on Monday 20th October 2014 was in compliance. The actual Werris Creek South vibration level of 0.40mm/s was equal to the predicted vibration and below the anecdotal 0.5mm/s threshold for receiving community blast complaints. Analysis of the waveform frequency indicates a dominant frequency only in the Vertical direction of 24Hz which is not normally considered to be in the natural resonance range of buildings. The weather conditions were a strong southerly wind 177o @ 7.7m/s with no temperature inversion (-4.4oC/100m).	Written response provided to complainant.
67	438	27/10/2014 8:00am	Dust (Mine)	U Werris Creek	SMS to EO	Complainant indicated more dust today and not good that it is starting to smell like the Hunter Valley.	The instantaneous TEOM PM10 dust levels measured in Werris Creek between 7am and 9am averaged 21.5µg/m3 with a peak of 24.5µg/m3 demonstrating that the dust haze was only localised to the mine site not impacting Werris Creek. When the wind speed increased after 9am, the dust haze dispersed onsite and was no longer visible.	Written response provided to complainant.
68	439	27/10/2014 4:00pm	Dust (Mine)	EPA/Anonymous Unknown	Email to EO	A lot of dust coming from WCC on 20th October at 1:50pm on a windy and very dry day. Complainant indicated it is an ongoing issue.	The weather conditions on Monday afternoon 20th October 2014 between 1pm and 2pm averaged a strong southerly wind 177o @ 7.2m/s. To minimise dust emissions during adverse weather, WCC were using either low sheltered dumps at surface or in pit dumps and during inspections on the day found mining operations to not be visual dusty. The instantaneous TEOM PM10 dust levels measured in Werris Creek between 1pm and 2pm averaged 20.3µg/m3 with a peak of 24.3µg/m3; well below the daily PM10 limit of 50µg/m3 despite the TEOM location being almost downwind on this particular day. All water carts were operating with haul roads in pit sufficiently watered preventing trafficable dust and crushing plant/train load out water carts also used to manage trafficable dust and suppress dust from stockpiles.	Written response provided to complainant.

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YTD	#	Complaint Date/Time	Issue	Complainant	Method	Nature of Complaint	Investigation	Action Taken / Follow-up
69 to 71	440 to 442	30/10/2014 10:30pm	Dust (Mine)	Various Werris Creek	Phone to EO	Excessive smoke and dust seen coming from the mine.	The 3600 excavator was digging in overburden in the eastern area of Strip 16 when suddenly excessive dust was generated from hot material. To minimise dust emissions, the OCE relocated the 3600 away from the hot dusty material and set up a water cart to saturate the heat affected area with no further dust visible after 15 minutes. Dust was localised to the pit but because of the thermals generated by the heat and dry material, the dust cloud travelled upwards. The instantaneous TEOM PM10 dust levels measured in Werris Creek between 10am and 11am averaged 31.8µg/m3 with a peak of 34.3µg/m3; well below the daily PM10 limit of 50µg/m3.	Written response provided to complainant.
72	443	4/11/2014 1:05pm	Blast (Overpressure or Vibration)	AL Werris Creek	Phone to EO	Blast shook house disturbing the resident.	WCC shot #105&106-2014 (S14_B14_B16_RL305 and S15_B6_Wedge_UG) fired at 1:04pm on Tuesday 4th November 2014 was in compliance. Actual blast vibration was below the predicted vibration but close to the anecdotal threshold for vibration complaints of 0.5mm/s. Weather conditions were a strong north westerly wind (301o) @ 5.6m/s with no inversion present.	Written response provided to complainant.
73	444	3/11/2014 2:32pm	Noise (TLO)	EPA/A Werris Creek	Email to EO	Noise from railway and mine at 2:51am 31st October 2014 was so loud woke husband.	A review of the audio file between 2:45am and 3am indicates a train arriving into Werris Creek station. As there were no mining or train loading operations occurring at the time of the complaint, the train was unrelated to WCC and likely to be travelling on the main northern rail line. The weather conditions at 2:45am were a very light north westerly wind (325o) @ 0.9m/s with a +12.3oC/100m inversion present.	Written response provided to EPA.
74 & 75	445 & 446	6/11/2014 10:30am	Dust (Mine)	Planning /Anonymous Unknown	Email to EO	Excessive dust emissions allegedly from Werris Creek operations on Wednesday 29th October 2014 at 6:39pm and Thursday 30th October 2014 at 10:30am.	On 29th October 2014 the dust cloud colour was yellow and that it appeared to be behind the product coal stockpile indicates that it was not from activities at the Train Load Out. On 30th October 2014 the dust was from digging into an area of spontaneous combustion adjacent to former underground mine. The excavator was immediately relocated, water cart used to cool the area and dust dissipated within 15 minutes. Weather conditions on both days were not conducive to excessive dust being generated. The instantaneous Werris Creek PM10 TEOM dust levels on both days were below the 50µg/m3 criteria.	Written response provided to Planning.

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YTD	#	Complaint Date/Time	Issue	Complainant	Method	Nature of Complaint	Investigation	Action Taken / Follow-up
76 & 77	447 & 448	1/12/2014 1pm	Dust (Mine)	Y Werris Creek	Phone to EO	Excessive dust emissions allegedly from Werris Creek operations on Wednesday 29th October 2014 at 6:39pm and Thursday 30th October 2014 at 10:30am.	On 29th October 2014 the dust cloud colour was yellow and that it appeared to be behind the product coal stockpile indicates that it was not from activities at the Train Load Out. On 30th October 2014 the dust was from digging into an area of spontaneous combustion adjacent to former underground mine. The excavator was immediately relocated, water cart used to cool the area and dust dissipated within 15 minutes. Weather conditions on both days were not conducive to excessive dust being generated. The instantaneous Werris Creek PM10 TEOM dust levels on both days were below the 50µg/m3 criteria.	Written response provided to Complainant.
78	449	1/12/2014 3pm	Groundwater Level	AG Quipolly	Phone to EO	Concerned about groundwater level decline resulting in losing access to water and how that will affect their livelihood.	The last measurement was on 25th September 2014 at 8.68m when a logger was installed. Data indicates mining is not the cause of the groundwater decline.	Groundwater consultant engaged to review monitoring data. Written response provided to Complainant.
79 & 80	450 & 451	2/12/2014 4:21pm	Dust (Mine) & Road Closure	Planning/ Anonymous Unknown	Email to EO	Allegedly a dust or spontaneous combustion event within the vicinity of the Werris Creek mine on 26 November 2014 and duration of the Werris Creek Road closure for a blast on 25 November 2014 was too long.	No exceedance of criteria on Wednesday 26th November with the peak PM10 24 hour result was 22.6µg/m3. A fire was started by a lighting strike on Monday 24th November occurred immediately to north of the Train Load Out through a paddock of stubble that had been recently harvested. The duration of the road closure was normal approximately 7 to 8 minutes.	Written response provided to Planning.
81	452	9/12/2014 11:02pm	Blast (Damage)	BJ Werris Creek	Phone to EO	Damage/cracking to internal gyprock believed to be from mine blasting (no specific event).	No further investigation was undertaken as no specific event identified by the complainant.	Structural Engineer engaged to undertaken Property Investigation in accordance with Project Approval
82	453	29/01/2015 9:45pm	Noise (Mine)	U Werris Creek	SMS to EO	The complainant indicated that moving more dirt shouldn't lead to excessive noise that they were experiencing.	A review of the audio found the elevated noise levels to be due to rail yard maintenance activities and with WCC mining operations compliant with noise criteria. The average weather conditions were a light southerly wind (170o @ 1.7m/s) with +5oC/100m inversion present.	Written response provided to Complainant.
83 to 85	454 to 456	9/02/2015 7:32am	Dust (Mine)	U, AH, EPA /Anonymous Werris Creek	Various	A dust haze was present over the open cut on Monday morning 9th February 2015 from load face dust and spon comb gases trapped under a temperature inversion.	Weather conditions at 7am were a very light southerly wind (182o) @ 0.8m/s with a strong inversion present (+6.7oC/100m). WCC was mining through a hot area of former underground workings (Panel 3) with gas/thermals resulting in dust from 3600 load face as well as 5600 load face being dusty. Sprinklers had been used since previous week to manage hot area. Two 773 water carts operating from 5am before shift start. 3600 commenced loading from another area and water cart set up at 5600 digface to wet loads. The area will be excavated and extinguished in a week.	No dust issues the following morning as no inversion present. Written response provided to Complainants.

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YTD	#	Complaint Date/Time	Issue	Complainant	Method	Nature of Complaint	Investigation	Action Taken / Follow-up
86	457	10/02/2015 1:10pm	Blast (Overpressure or Vibration)	U Werris Creek	Phone to EO	Blast shook house disturbing the resident.	WCC shot #24-2015 (S18_B11-B12_RL390) fired at 1:08pm on Tuesday 10th February 2015 was in compliance. Actual blast vibration was below the predicted vibration but close to the anecdotal threshold for vibration complaints of 0.5mm/s. Weather conditions were a moderate easterly wind (105o) @ 3.3m/s with no inversion present.	Written response provided to complainant.
87	458	13/02/2015 10am	Groundwater Level	AG Quipolly	Phone to EO	Concerned about groundwater level decline resulting in the loss of access to water and how that will affect their livelihood.	A measurement was taken on 16th February 2015 at 9.43m. Despite groundwater levels declining 0.75m since September 2014; the data indicates mining is not the cause of the groundwater decline.	Complainant did not request a response.
88	459	24/02/2015 12pm	Heritage	OEH/Anonymous Unknown	Phone to EO	Not watering of grinding groove rocks as per 2007 Heritage Management Plan risks breaking to occur during relocation.	LPSC & WCC consulted with Nungaroo LALC and determined that watering of rocks is not required.	Written response provided to DP&E and OEH.
89	460	24/02/2015 4:18pm	Dust (Mine)	U Werris Creek	SMS to EO	Excessive dust generated from top of overburden emplacement.	All mine operations were located in pit (~100m below surface) and dumping in pit (~30m below surface) with no visible dust leaving the mine site. Weather conditions at 4pm were a strong southerly wind (181o) @ 9.7m/s with no inversion present.	Written response provided to complainant.
90	461	5/03/2015 6:38pm	Dust (Mine)	U Werris Creek	SMS to EO	Excessive dust generated from mine.	Dozer was undertaking drill prep and pushing dirt off a 50m high wall in strong southerly winds creating a lot of dust lasting for approximately 15 minutes when the OCE identified the dust and stopped the activity. Weather conditions at 4pm were a strong south south westerly wind (200o) @ 7.4m/s with no inversion present.	Written response provided to complainant.
91 & 92	462 & 463	6/03/2015 9:41pm & 9/03/2015 8:21am	Odour (Mine)	U Werris Creek	SMS to EO	Sulfur like smell coming from mine.	Sprinkler set up to wet down eastern spontaneous combustion area and seal pushed in over western spontaneous combustion area.	Written response provided to complainant.
93 & 94	464 & 465	13/03/2015 1:59pm	Blast (Overpressure or Vibration)	BI & BM Werris Creek	Phone to EO	Blast shook house disturbing the resident.	WCC shot #41-2015 (S14_B7-B10_RL290_TSB) fired at 1:59pm on Friday 13th March 2015 was in compliance. Actual blast vibration was above the predicted vibration of 0.7mm/s and above the anecdotal threshold for vibration complaints of 0.5mm/s. Weather conditions were a strong south easterly wind (140o) @ 6.9m/s with no inversion present. Vibration frequency measured at Werris Creek South was 15Hz which could have attenuated to ~10Hz at the complainants residences.	Written response provided to complainant. Offer to undertake blast monitoring at complainants for next similar shot.

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YTD	#	Complaint Date/Time	Issue	Complainant	Method	Nature of Complaint	Investigation	Action Taken / Follow-up
95	466	27/03/2015 1:14pm	Blast (Dust)	C Werris Creek	Phone to EO	Large black horrible dust cloud hanging over the coal mine.	WCC shot #47-2015 (S15_B18-B22_RL320_TSB) fired at 1:08pm on Friday 27th March 2015 was in compliance. The blast was a thru-seam blast which produces a darker dust due to the coal seams in the blast but also the ground was dry and the pit swirled the dust cloud across the pit. Weather conditions were a light southerly wind (171o) @ 1.7m/s with no inversion present.	Written response provided to complainant.

Piezo ID	MW1				Other Name		Hillview Bore	
Aquifer	Werrie Basalt				Ground RL		418.692	
Coordinates	276322.7		6525107	Elevation	EPL ID 17		Stick Up	0.27m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
5/05/2004	50.36		Water Depth Only Monitored					
Jun-05	44.11		6.5	1240	6.3	7.0	0.1	0.08
Jul-05	49.10		6.8	1190	6.1	5.9	0.1	0.03
Aug-05	Sampling Suspended - Managers Request							
Sep-05	Sampling Suspended - Managers Request							
Oct-05	Sampling Suspended - Managers Request							
Nov-05	Sampling Suspended - Managers Request							
Dec-05	Sampling Suspended - Managers Request							
Jan-06	Sampling Suspended - Managers Request							
Feb-06	Sampling Suspended - Managers Request							
Mar-06	Sampling Suspended - Managers Request							
Apr-06	Sampling Suspended - Managers Request							
Jul-06	Sampling Suspended - Managers Request							
Nov-06	52.00		7.0	1230	6.3	6.7	0.05	0.01
Jan-07	51.05		6.7	1250	6.7	6.9	0.10	0.04
Apr-07	52.40		6.9	730	6.6	7.0	0.09	0.03
Jul-07	Sampling postponed due to unsafe access following wet weather							
Aug-07	51.48		Pump Disconnected					
Oct-07	Pump Failed. Site to be re-sampled in November 2007							
Nov-07	51.00		No sample obtained					
Jan-08	50.91		No sample obtained, no access					
Apr-08	50.92		No sample obtained, no access					
Jul-08	51.07		No sample obtained, no access					
Oct-08	51.35		7.2	1250	7.2	7.9	0.11	0.04
Jan-09	51.16		6.6	1240	6.6	8.2	0.1	0.04
Apr-09	No sample taken - contract change over							
Jun-09	50		6.8	1280	N/T	10.2	0.01	0.04
26/08/2009	51.94		7	1230	Testing for these analytes not undertaken			
Nov-09	51.62		6.86	1254	Testing for these analytes not undertaken			
23/02/2010	52.03		7.65	1289	7.37	7.1	0.03	0.05
20/05/2010	52.34	-1%	7.56	1880	7.06	8.7	0.07	0.05
8/09/2010	52.17	0%	6.71	1235	8.6	9.2	0.13	0.05
11/01/2011	51.32	2%	6.58	952	8.05	10	0.28	0.34
16/03/2011	50.3	2%	6.8	1095	4.68	9.5	0.24	0.24
Lowest	**50.3**		**6.58**	**952**	**4.68**	**8.7**	**0.07**	**0.05**
Highest	**52.34**		**7.56**	**1880**	**8.6**	**10**	**0.28**	**0.34**
Mean	**51.5325**		**6.9125**	**1290.5**	**7.0975**	**9.35**	**0.18**	**0.17**
Number of samples	**4**		**4**	**4**	**4**	**4**	**4**	**4**
18/05/2011	50.6	-1%	6.95	1130	0.9	2.2	0.25	0.21
12/09/2011	51.56	-2%	6.73	1070	1.82	2.5	0.12	0.11
13/12/2011	52.42	-2%	6.77	1036	2.78	4.6	0.14	0.11
26/03/2012	52.2	0%	7.01	1240	2.98	1.4	0.15	0.09
Lowest	**50.6**		**6.73**	**1036**	**0.9**	**1.4**	**0.12**	**0.09**
Average	**51.695**		**6.865**	**1119**	**2.12**	**2.675**	**0.165**	**0.13**
Highest	**52.42**		**7.01**	**1240**	**2.98**	**4.6**	**0.25**	**0.21**
Number of samples	**4**		**4**	**4**	**4**	**4**	**4**	**4**
2/07/2012	52.37		Water Depth Only Monitored					
5/09/2012	52.71	-1%	6.94	1180	4.59	5.6	0.11	0.1
21/11/2012	53.26	-1%	Water Depth Only Monitored					
24/01/2013	53.82	-1%	Water Depth Only Monitored					
25/03/2013	54.1	-1%	7.05	1180	4.67	5.8	0.13	0.11
7/05/2013	54.22	0%	6.87	1190	5.14	6.7	0.14	0.07
25/07/2013	54.06	0%	Water Depth Only Monitored					
24/09/2013	54.9	-2%	6.95	1180	7.05	9.6	0.81	0.08
11/11/2013	55.34	-1%	Water Depth Only Monitored					
20/01/2014	55.94	-1%	Water Depth Only Monitored					
26/03/2014	56.42	-1%	6.90	1170	6.82	7.3	0.03	0.14
21/05/2014	57.11	-1%	Water Depth Only Monitored					
7/07/2014	57.58	-1%	Water Depth Only Monitored					
22/09/2014	58.52	-2%	6.60	1210	6.04	6.7	0.36	0.05
24/11/2014	59.34	-1%	Water Depth Only Monitored					
9/01/2015	59.87	-1%	Water Depth Only Monitored					
19/03/2015	60.82	-2%	7.00	1200	2.54	3.9	0.38	0.38

Piezo ID	MW2				Other Name		Railway View Bore	
Aquifer	Werrie Basalt				Ground RL		413.151	
Coordinates	276816.16		6524331	Elevation	EPL ID 18		Stick Up	0.3m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
5/05/2004	26.2		Water Depth Only Monitored					
Jun-05	24.2		No access					
Jul-05	24.0		7.1	940	5.4	5.3	0.14	0.06
Aug-05	24.9		6.8	940	5.8	5.5	0.90	0.14
Sep-05	25.0		6.9	990	5.5	5.2	0.08	0.06
Oct-05	25.2		7.1	1030	5.7	5.8	0.22	0.08
Nov-05	25.5		6.9	1050	6.3	6.4	0.14	0.12
Dec-05	25.9		7.3	990	6.2	6.6	0.20	0.12
Jan-06	25.9		7.2	1010	7.0	6.5	0.06	0.04
Feb-06	26.3		7.0	1020	5.9	7.0	0.10	0.04
Mar-06	31.3		7.1	990	6.6	6.9	0.12	0.08
Apr-06	26.4		7.3	1200	6.4	6.9	0.29	0.05
Jul-06	26.7		7.1	1000	6.9	7.2	0.08	0.05
Oct-06	27.3		7.0	1010	6.9	7.3	0.08	0.02
Jan-07	27.6		6.9	1020	7.2	7.4	0.12	0.05
Apr-07	27.9		7.0	1020	6.8	7.4	0.11	0.05
Jul-07	Sampling postponed due to unsafe access following wet weather							
Aug-07	28.1		6.8	1030	7.0	7.6	0.08	0.03
Nov-07	27.2		7.2	970	5.5	7.0	0.40	0.09
Jan-08	27.2		7.3	1020	7.6	7.4	0.15	0.05
Apr-08	27.22		7.1	1020	7.4	7.9	0.09	0.06
Jul-08	27.48		7.2	1020	6	7.5	0.06	0.05
Oct-08	N/A		7.1	1010	7.4	8	0.08	0.07
Jan-09	N/A		7.1	970	5.6	6.8	0.07	0.05
Apr-09	No sample taken - contract change over							
Jun-09	N/A		7.2	930	N/T	7.6	0.02	0.03
Aug-09	N/A		7.5	980	Testing for these analytes not undertaken			
Nov-09	26.35		6.7	1020	Testing for these analytes not undertaken			
23/02/2010	26.55		7.57	1027	6.07	7.1	0.03	0.05
20/05/2010	26.91	-1%	8.27	1470	5.68	7.4	0.05	0.05
8/09/2010	25.38	6%	7.5	924	5.14	5.4	0.15	0.07
11/01/2011	23.57	8%	Pump not running - sample not taken					
16/03/2011	23.35	1%	Pump not running - sample not taken					
Lowest	**23.35**		**7.5**	**924**	**5.14**	**5.4**	**0.05**	**0.05**
Highest	**26.91**		**8.27**	**1470**	**5.68**	**7.4**	**0.15**	**0.07**
Mean	**24.80**		**7.89**	**1197**	**5.41**	**6.4**	**0.1**	**0.06**
Number of samples	**4**		**2**	**2**	**2**	**2**	**2**	**2**
17/05/2011	24.04	6%	Pump not running - sample not taken					
12/09/2011	24.80	-3%	7.20	750	0.72	1.00	0.04	0.03
13/12/2011	25.09	-1%	7.36	730	0.68	1.10	0.02	0.01
26/03/2012	23.70	0.06	7.54	810	0.35	0.40	0.06	0.04
Lowest	**23.70**		**7.20**	**730.00**	**0.35**	**0.40**	**0.02**	**0.01**
Average	**24.4075**		**7.37**	**763.33**	**0.58**	**0.83**	**0.04**	**0.03**
Highest	**25.09**		**7.54**	**810**	**0.72**	**1.1**	**0.06**	**0.04**
Number of samples	**4**		**3**	**3**	**3**	**3**	**3**	**3**
2/07/2012	24.32		Water Depth Only Monitored					
5/09/2012	25.09	-3%	7.6	815	0.08	<0.1	0.06	0.06
25/09/2012	25.27	-1%	Water Depth Only Monitored					
21/11/2012	25.68	-2%	Water Depth Only Monitored					
24/01/2013	26.14	-2%	Water Depth Only Monitored					
25/03/2013	25.42	3%	7.58	821	0.01	0.1	0.14	0.02
7/05/2013	25.42	0%	7.9	786	0.24	0.4	0.08	0.07
25/07/2013	25.91	-2%	Water Depth Only Monitored					
24/09/2013	26.25	-1%	7.04	796	2.36	3.7	0.07	0.07
11/11/2013	26.73	-2%	Water Depth Only Monitored					
20/01/2014	27.27	-2%	Water Depth Only Monitored					
26/03/2014	27.87	-2%	7.50	788	3.05	3.4	0.05	0.07
21/05/2014	28.39	-2%	Water Depth Only Monitored					
7/07/2014	28.80	-1%	Water Depth Only Monitored					
22/09/2014	29.61	-3%	7.20	837	2.99	3.4	0.12	0.06
24/11/2014	30.25	-2%	Water Depth Only Monitored					
9/01/2015	30.82	-2%	Water Depth Only Monitored					
19/03/2015	31.84	-3%	7.50	864	3.88	4.6	0.09	0.05

Piezo ID	MW3				Other Name		Eurunderee	
Aquifer	Werrie Basalt				Ground RL		367.267	
Coordinates	274594.69		6522940		EPL ID 19		Stick Up	0.4m/ 0.95m
Sample Date	Depth to Ground - metres		pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
Jun-05	Site Not Sampled - Managers Request							
Jul-05	Site Not Sampled - Managers Request							
Aug-05	16.73		6.9	2360	3.8	4.0	0.06	0.04
Sep-05	15.66		7.7	2610	2.3	2.5	0.44	0.18
Oct-05	16.95		7.7	2940	0.83	2.0	2.30	0.28
Nov-05	7.76		7.0	2770	2.8	3.8	1.70	0.16
Dec-05	15.33		7.3	2530	3.2	3.6	0.27	0.27
Jan-06	15.35		7.4	900	2.2	2.2	0.06	0.02
Feb-06	16.45		7.3	2620	2.7	3.6	0.22	0.08
Mar-06	15.53		7.1	2410	4.0	4.2	0.06	0.04
Apr-06	14.85		7.8	1700	6.4	8.5	0.98	0.37
Jul-06	14.95		7.0	2400	3.8	3.9	0.44	0.08
Oct-06	15.34		7.4	2830	1.1	2.1	0.66	0.2
Jan-07	14.95		7.0	2670	2.4	2.8	0.37	0.18
Apr-07	16.32		7.0	2480	4.1	4.4	0.10	0.07
Jul-07	Sampling postponed due to unsafe access following wet weather							
Aug-07	15.33		7.1	2450	3.9	4.6	0.09	0.05
Nov-07	14.7		7.4	2330	0.54	3.6	1.5	0.29
Jan-08	14.94		7.4	2130	0.28	3.7	0.5	0.39
Apr-08	16.19		7.5	2710	1.3	2.6	0.4	0.11
Jul-08	14.61		7.8	2500	0.7	1.7	0.18	0.15
Oct-08	16.38		7.2	1480	0.13	2.2	1.9	0.14
Jan-09	14.13		7.5	2280	0.27	2.3	2.3	0.06
Apr-09	No sample taken - contract change over							
Jun-09	No access							
Aug-09	N/A		8.1	890	Testing for these analytes not undertaken			
Nov-09	N/A		8.04	840	Testing for these analytes not undertaken			
23/02/2010	N/A		8.36	1742	0.54	0.7	<0.01	0.01
19/05/2010	N/A		7.81	760	0.89	0.9	0.19	<0.01
9/09/2010	N/A		7.7	25	0.42	0.4	0.03	0.02
6/01/2011	N/A		7.02	73	0.03	0.8	<0.01	0.02
15/03/2011	N/A		7.09	42	0.28	0.5	<0.01	0.02
17/05/2011	N/A		6.85	37	0.18	0.3	0.1	<0.01
13/09/2011	11.97		No sample taken - pump not working and tank empty					
14/12/2011	13.91		7.25	50	0.16	0.9	0.25	0.22
27/03/2012	14.1		7.03	82	0.02	0.9	0.42	0.26
9/05/2012	14.17		6.88	3270	16.6	16.6	0.02	0.02
2/07/2012	e27.12		Water Depth Only Monitored					
13/09/2012	15.26		6.89	185	0.78	1.4	0.37	0.35
25/09/2012	15.38	-1%	7.1	150	18.4	20.4	0.03	0.01
21/11/2012	15.59	-1%	Water Depth Only Monitored					
25/01/2013	15.68	-1%	Water Depth Only Monitored					
25/03/2013	15.13	4%	7.36	249	1.65	2.4	0.39	0.41
9/05/2013	15.01	1%	6.78	3160	20.2	25.5	<0.05	0.02
26/07/2013	14.97	0%	Water Depth Only Monitored					
25/09/2013	15.3	-2%	6.74	3080	20.4	24.8	<0.01	<0.01
8/11/2013	15.61	-2%	Water Depth Only Monitored					
21/01/2014	16.01	-2%	Water Depth Only Monitored					
31/03/2014	16.45	-3%	6.70	3320	23	25	0.01	<0.01
23/05/2014	16.69	-1%	Water Depth Only Monitored					
2/07/2014	16.93	-1%	Water Depth Only Monitored					
22/09/2014	17.34	-2%	7.90	544	5.20	6.0	0.30	0.30
24/11/2014	17.63	-2%	6.90	3180	18.30	20.9	0.03	0.02
9/01/2015	17.83	-1%	Water Depth Only Monitored					
19/03/2015	18.15	-2%	6.70	3480	20.60	21.0	<0.01	<0.01

Piezo ID	MW4B				Other Name			
Aquifer	Werrie Basalt				Ground RL		364	
Coordinates	275896.4		6522328		EPL ID 20		Stick Up	0.68m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
5/05/2004	8.8		Water Depth Only Monitored					
Jul-06	7.88		7.2	1000	<0.2	69.0	6.6	3.40
Nov-06	9.71		6.7	2670	Sample contaminated			
Jan-07	9.03		Dry					
Apr-07	9.63		7.2	1040	3.40	34.0	0.08	0.04
Jul-07	Sampling postponed due to unsafe access following wet weather							
Aug-07	9.49		7.0	910	0.04	1.8	0.04	0.02
Nov-07	9.39		7.4	810	0.03	0.34	0.8	<0.01
Jan-08	9.51		Very slow recharge of bore					
Apr-08	9.14		8.0	1040	0.03	6.8	0.82	0.12
Jul-08	9.35		7.9	930	<0.1	6.5	0.03	<0.01
Oct-08	9.62		Dry					
Jan-09	9.48		Dry					
1/04/2009	No sample taken - contract change over							
1/06/2009	9.88		7.9	990	Testing for these analytes not undertaken			
1/08/2009	9.86		7.5	1070	Testing for these analytes not undertaken			
1/11/2009	9.97		7.42	1080	Testing for these analytes not undertaken			
23/02/2010	10.24		7.7	1078	1.45	2.2	0.02	<0.01
19/05/2010	10.38	-1%	8.06	950	1.66	2.6	0.1	0.05
9/09/2010	10.36	0%	7.58	1021	1.48	2.5	0.32	0.05
15/09/2010	10.28	1%	Water Depth Only Monitored					
6/01/2011	10.04	2%	7.53	920	1.1	2.3	0.02	<0.01
15/03/2011	9.38	7%	7.49	674	1.27	2.1	<0.01	0.02
27/03/2012	10.2		7.52	975	1.24	2.5	0.06	0.06
17/05/2011	9.42	0%	7.6	944	0.95	1.2	0.28	<0.01
13/09/2011	9.76	-3%	7.36	880	1.1	1.4	0.02	0.01
14/12/2011	10.26	-5%	7.26	882	1.45	2	0.02	0.01
3/07/2012	8.62		Water Depth Only Monitored					
13/09/2012	10.56	-18%	7.7	970	1.34	1.7	0.04	0.02
25/09/2012	10.64	-1%	Water Depth Only Monitored					
21/11/2012	10.88	-2%	Water Depth Only Monitored					
25/01/2013	11.12	-2%	Water Depth Only Monitored					
25/03/2013	10.39	7%	7.76	978	1.35	2	0.10	0.02
9/05/2013	9.95	4%	7.76	974	1.44	1.6	0.05	0.02
30/05/2013	10.56	-6%	Water Depth Only Monitored					
26/07/2013	10.07	5%	Water Depth Only Monitored					
24/09/2013	10.66	-6%	7.67	981	1.01	1.6	0.11	0.03
8/11/2013	11.10	-4%	Water Depth Only Monitored					
21/01/2014	11.62	-4%	Water Depth Only Monitored					
31/03/2014	12.14	-4%	8	956	1.99	2.1	0.03	0.03
23/05/2014	12.49	-3%	Water Depth Only Monitored					
2/07/2014	12.73	-2%	Water Depth Only Monitored					
22/09/2014	13.46	-5%	7.6	1000	1.82	2.1	0.04	0.03
24/11/2014	13.99	-4%	Water Depth Only Monitored					
12/01/2015	14.32	-2%	Water Depth Only Monitored					
16/03/2015	14.68	-2%	7.8	1000	1.82	2.0	0.03	<0.01

Piezo ID	MW5				Other Name		Narrawolga/Eurundere e Boundary	
Aquifer	Werrie Basalt				Ground RL		360.173m	
Coordinates	274899.5		6522046		EPL ID 21		Stick Up	1.13m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
Jun-05	Site Not Installed							
Jul-05	Site Not Installed							
Aug-05	Site Not Installed							
Sep-05	Site Not Installed							
Oct-05	8.70		6.8	2310	1.2	1.4	0.18	0.02
Nov-05	8.64		6.9	2320	0	0.33	0.16	0.04
Dec-05	8.55		7.5	2160	0	0.51	0.28	0.09
Jan-06	8.56		7.3	1850	3.00	3.7	0.50	0.04
Feb-06	8.38		7.1	2280	0.01	1.9	0.26	0.04
Mar-06	8.30		7.2	2260	0.01	1.7	0.26	0.08
Apr-06	8.33		7.4	1900	<0.01	5.1	1.05	0.05
Jul-06	8.40		7.3	2230	<0.2	2.8	0.16	0.02
Oct-06	8.43		7.2	2180	<0.01	2.0	0.17	0.03
Jan-07	8.63		6.6	2640	2.0	2.0	0.02	0.06
Apr-07	9.74		6.9	2630	2.0	2.2	0.13	<0.01
Jul-07	Sampling postponed due to unsafe access following wet weather							
Aug-07	8.62		6.9	2690	2.0	2.3	0.03	<0.01
Nov-07	8.47		7.0	2620	2.2	2	0.32	<0.01
Jan-08	8.41		7.0	2740	2.2	2.2	0.05	0.01
Apr-08	8.17		6.9	2720	2.3	2.2	0.12	0.01
Jul-08	8.12		6.9	2920	2.3	2.4	0.22	<0.01
Oct-08	7.88		6.8	2780	2.4	2.7	0.04	0.03
Jan-09	7.39		7	2630	1.7	2.6	0.02	0.04
Apr-09	No sample taken - contract change over							
Jun-09	No access							
Aug-09	8.6		7.4	2150	Testing for these analytes not undertaken			
Nov-09	8.77		7	2660	Testing for these analytes not undertaken			
23/02/2010	9.04		7.41	2440	0.97	14.5	0.72	0.73
19/05/2010	9.29	-3%	e7.5	e4080	2.56	2.6	0.08	0.01
9/09/2010	8.41	10%	7.33	1902	0.04	10.9	0.97	0.86
6/01/2011	7.81	8%	7.01	2230	2.3	2.8	<0.01	0.02
15/03/2011	7.19	9%	6.95	2178	2.42	2.9	<0.01	<0.01
17/05/2011	7.28	-1%	7.05	2230	2.06	2.4	0.01	<0.01
13/09/2011	e6.71		7.22	1405	9.18	16.8	1.67	1.6
30/09/2011	7.66	-5%	Water Depth Only Monitored					
14/12/2011	7.81	-2%	7.21	1410	3.78	24	1.86	1.92
27/03/2012	7.89	-0.01	7.64	1640	0.37	72.2	5.07	5.19
8/05/2012			7.05	3040	1.96	2	<0.01	0.01
3/07/2012	8.63		Water Depth Only Monitored					
13/09/2012	8.41	3%	7.43	2030	0.55	17	1.95	1.46
21/11/2012	8.75	-4%	Water Depth Only Monitored					
25/01/2013	8.76	0%	Water Depth Only Monitored					
25/03/2013	7.69	14%	7.57	2260	0.11	8.4	1.27	1.48
9/05/2013	7.44	3%						
30/05/2013	7.54	-1%	Water Depth Only Monitored					
26/07/2013	7.91	-5%	Water Depth Only Monitored					
24/09/2013	8.53	-7%	7.55	2280	1.3	6.4	1.03	1.01
8/11/2013	8.93	-4%	Water Depth Only Monitored					
21/01/2014	9.4	-5%	Water Depth Only Monitored					
31/03/2014	9.88	-5%	7.70	2390	5.8	6.3	0.77	0.78
23/05/2014	10.08	-2%	Water Depth Only Monitored					
2/07/2014	10.31	-2%	Water Depth Only Monitored					
22/09/2014	10.73	-4%	6.90	2440	1.82	2.2	0.03	0.01
24/11/2014	11.02	-3%	Water Depth Only Monitored					
9/01/2015	11.19	-2%	Water Depth Only Monitored					
16/03/2015	11.46	-2%	7.30	2230	1.29	1.4	0.03	0.02

Piezo ID	MW5B				Other Name			
Aquifer					Ground RL		360.187m	
Coordinates	274889.8		6522051				Stick Up	0.810m
Sample Date	Depth to Ground - metres		pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
30/09/2011	7.22		Water Depth Only Monitored					
3/07/2012	7.78		Water Depth Only Monitored					
13/09/2012	7.96	-2%	Water Depth Only Monitored					
21/11/2012	8.3	-4%	Water Depth Only Monitored					
25/01/2013	8.32	0%	Water Depth Only Monitored					
25/03/2013	7.28	14%	Water Depth Only Monitored					
9/05/2013	7.12	2%	7.14	2480	2.02	2.6	0.03	0.03
30/05/2013	7.14	0%	Water Depth Only Monitored					
26/07/2013	7.48	-5%	Water Depth Only Monitored					
24/09/2013	8.09	-8%	Water Depth Only Monitored					
8/11/2013	8.49	-5%	Water Depth Only Monitored					
21/01/2014	8.95	-5%	Water Depth Only Monitored					
31/03/2014	9.42	-5%	7.4	2460	2.13	2.4	0.05	0.04
23/05/2014	9.63	-2%	Water Depth Only Monitored					
2/07/2014	9.86	-2%	Water Depth Only Monitored					
22/09/2014	10.27	-4%	Water Depth Only Monitored					
24/11/2014	10.54	-3%	Water Depth Only Monitored					
9/01/2015	10.72	-2%	Water Depth Only Monitored					
16/03/2015	10.95	-2%	7.8	1000	1.92	2.1	0.02	<0.01

Piezo ID	MW6				Other Name		Plain View Bore	
Aquifer	Werrie Basalt				Ground RL		367	
Coordinates	276810.4		6521544				Stick Up	1.05m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
Jun-05	Site Not Installed							
Jul-05	Site Not Installed							
Aug-05	Site Not Installed							
Sep-05	Site Not Installed							
Oct-05	10.00		6.9	1960	3.3	3.7	0.10	0.08
Nov-05	9.99		6.9	2000	2.1	2.5	3.30	0.08
Dec-05	9.95		7.2	1840	2.8	3.2	2.00	0.14
Jan-06	9.88		7.2	1880	3.3	3.6	0.36	0.04
Feb-06	9.89		7.0	1920	2.6	3.5	0.42	0.10
Mar-06	9.81		7.0	1880	2.8	3.3	0.32	0.08
Apr-06	9.91		7.3	1600	3.1	3.9	0.23	0.04
Jul-06	10.18		7.0	1920	3.6	3.9	0.60	0.24
Oct-06	10.53		7.0	1890	3.5	4.0	0.20	0.07
Jan-07	10.68		6.9	1930	4.0	4.0	0.06	0.13
Apr-07	10.93		6.9	1970	4.1	4.3	0.14	0.06
Jul-07	Sampling postponed due to unsafe access following wet weather							
Aug-07	11.70		6.8	1950	4.0	4.3	0.06	0.03
Nov-07	11.1		7.1	1930	4.3	4.2	0.05	0.04
Jan-08	11.51		7.0	1960	4.2	4.1	0.05	0.04
Apr-08	10.94		7.1	1930	3.4	4.0	0.33	0.05
Jul-08	10.94		7.0	2060	3.8	3.9	0.77	0.09
Oct-08	11.14		7.2	1960	4.4	5.3	0.23	0.1
Jan-09	10.87		7	1940	3.6	4.2	0.08	0.05
Apr-09	No sample taken - contract change over							
Jun-09	11.67		7	2060	N/T	4.9	0.03	0.04
Aug-09	11.83		7.2	1930	Testing for these analytes not undertaken			
Nov-09	12.11		7.61	1973	Testing for these analytes not undertaken			
23/02/2010	12.32		7.54	1990	3.36	3.9	0.46	0.06
20/05/2010	12.53		8.08	2920	3.71	4.5	0.23	0.1
8/09/2010	12.68	-1%	7.13	1966	4.58	5.3	0.57	0.11
15/09/2010	12.6	1%	Water Depth Only Monitored					
11/01/2011	12.31	2%	7.12	1598	4.32	6	0.19	0.09
16/03/2011	11.28	9%	7.11	1669	3.57	5.1	0.11	0.06
18/05/2011	11.19	1%	7.2	1730	3.03	4.2	0.14	0.05
12/09/2011	11.48	-3%	7.05	1610	2.88	4.0	0.06	0.06
13/12/2011	11.83	-3%	6.97	1615	3.10	4.1	0.13	0.07
27/03/2012	12.00	-0.01	7.21	1750	3.37	4.9	0.27	0.08
2/07/2012	11.96		Water Depth Only Monitored					
5/09/2012	12.1	-1%	7.14	1750	3.89	5	0.22	0.03
21/11/2012	12.23	-1%	Water Depth Only Monitored					
24/01/2013	12.41	-1%	Water Depth Only Monitored					
25/03/2013	12.47	0%	7.38	1750	4.85	6.6	0.14	0.08
7/05/2013	12.49	0%	7.3	1760	3.75	5.4	0.44	0.08
25/07/2013	12.49	0%	Water Depth Only Monitored					
24/09/2013	12.45	0%	7.18	1730	4.72	6	0.96	0.08
8/11/2013	12.64	-2%	Water Depth Only Monitored					
20/01/2014	12.83	-1%	Water Depth Only Monitored					
26/03/2014	13.1	-2%	7.40	1720	4.4	5	0.22	0.07
21/05/2014	13.24	-1%	Water Depth Only Monitored					
7/07/2014	13.38	-1%	Water Depth Only Monitored					
22/09/2014	13.62	-2%	7.00	1800	4.74	6.3	1.89	0.02
24/11/2014	13.81	-1%	Water Depth Only Monitored					
12/01/2015	13.95	-1%	Water Depth Only Monitored					
19/03/2015	14.18	-2%	7.40	1840	4.72	5.6	0.9	0.06

Piezo ID	MW7				Other Name		Anderson Irrigation	
Aquifer	Quipolly Creek Alluvium				Ground RL		347.877m	
Coordinates	273181		6519844	Depth	7.25m		Stick Up	0.12m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
Jun-05	4.83		6.0	490	1.3	1.5	0.14	0.12
Jul-05	4.44		6.9	490	1.3	1.5	0.12	0.07
Aug-05	4.47		7.0	520	1.4	1.4	0.08	0.08
Sep-05	4.44		6.8	520	1.4	1.4	0.12	0.08
Oct-05	4.36		7.1	540	1.3	1.5	0.24	0.10
Nov-05	4.44		6.8	530	1.5	1.4	0.16	0.10
Dec-05	4.38		6.8	520	1.2	1.3	0.26	0.14
Jan-06	4.38		7.5	890	2.2	2.4	0.10	0.02
Feb-06	4.42		6.8	500	1.0	1.3	0.12	0.80
Mar-06	4.56		6.9	510	1.1	1.3	0.10	0.80
Apr-06	4.51		7.0	380	0.98	1.1	0.12	0.07
Jul-06	4.35		6.9	520	1.4	1.4	0.10	0.08
Oct-06	4.39		7.1	510	1.1	1.2	0.09	0.03
Jan-07	4.73		6.7	530	1.3	1.4	0.15	0.07
Apr-07	4.60		6.7	550	1.4	1.6	0.12	0.06
Jul-07	Sampling postponed due to unsafe access following wet weather							
Aug-07	4.41		6.3	540	1.4	1.6	0.07	0.04
Nov-07	4.36		7.2	520	1.4	1.3	0.37	0.05
Jan-08	4.35		6.8	520	1.4	1.2	0.52	0.06
Apr-08	4.45		7	530	1.1	1.5	0.52	0.07
Jul-08	4.41		6.8	540	1.3	1.3	0.69	0.06
Oct-08	4.35		7	520	1.3	1.5	0.09	0.07
Jan-09	4.00		8.1	510	1.1	1.5	0.1	0.07
Apr-09	No sample taken - contract change over							
Jun-09	4.28		6.9	510	N/T	1.7	0.02	0.04
26/08/2009	4.43		7.7	520	Testing for these analytes not undertaken			
Nov-09	4.27		7.91	590	Testing for these analytes not undertaken			
23/02/2010	4.42		7.79	561	1.36	1.4	0.06	0.05
30/04/2010	4.48		Water Depth Only Monitored					
19/05/2010	4.55	-2%	e8.2	e479	1.37	2	0.24	0.06
20/07/2010	4.5	1%	Water Depth Only Monitored					
8/09/2010	4.15	8%	7.01	535	1.67	2.2	0.09	0.08
7/10/2010	4.25	-2%	Water Depth Only Monitored					
10/01/2011	4.16	2%	7.1	463	1.24	1.4	0.09	0.07
7/04/2011	4.33	-4%	Water Depth Only Monitored					
13/04/2011	N/A				1.08	1.7	0.1	0.05
7/09/2011	4.29	1%			0.92	1.7	0.07	0.06
14/12/2011	4.28	0%	6.73	560	1.5	1.8	0.11	0.07
26/03/2012	c5.22	-	7.06	588	0.87	1	0.09	0.07
25/03/2013	4.2	2%			4.04	6.4	0.30	0.31
25/03/2014	4.6	-9%	7.20	485	1.23	1.4	0.09	0.08
16/10/2014	4.65	-1%	Water Depth Only Monitored					
2/12/2014	4.82	-4%	Water Depth Only Monitored					
16/02/2015	4.95	-3%	Water Depth Only Monitored					
17/02/2015	4.88	1%	Water Depth Only Monitored					
18/03/2015	4.85	1%	7.00	475	0.94	1.2	0.08	0.07

Piezo ID	MW7b			Other Name		Anderson Windmill	
Aquifer	Alluvium (Black Gully)			Ground RL			
Coordinates	273 318	6 520 157				Stick Up	0.69m
Sample Date	Depth to Ground - metres	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
23/07/2010	4.5	Water Depth Only Monitored					
15/09/2010	3.99	Water Depth Only Monitored					
8/11/2010	4.41	Water Depth Only Monitored					
19/01/2011	4.04	Water Depth Only Monitored					
7/04/2011	4.22	Water Depth Only Monitored					
7/09/2011	4.39	Water Depth Only Monitored					
25/03/2013	4.25	Water Depth Only Monitored					
25/03/2014	4.66	Water Depth Only Monitored					
19/03/2015	4.97	Water Depth Only Monitored					

Piezo ID	MW8				Other Name		Roseneath	
Aquifer	Werrie Basalt				Ground RL		369.576	
Coordinates	277123.8		6519281				Stick Up	
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
Jun-05	Site Not Sampled - Managers Request							
Jul-05	Site Not Sampled - Managers Request							
Aug-05	14.35		6.8	1160	4.5	4.2	0.04	0.01
Sep-05	13.78		6.8	1190	3.8	3.7	0.10	0.04
Oct-05	13.29		7.0	1190	3.4	3.6	0.08	0.06
Nov-05	13.42		6.9	1190	3.5	3.6	0.08	0.06
Dec-05	13.65		7.3	1170	3.2	3.0	0.24	0.11
Jan-06	13.63		7.3	880	2.1	2.2	0.08	0.02
Feb-06	14.33		7.2	1210	3.6	4.3	0.08	0.06
Mar-06	14.55		6.9	1180	4.1	4.2	0.24	0.04
Apr-06	14.93		7.3	1290	4.0	4.4	0.14	0.03
Jul-06	15.75		7.0	1470	5.4	5.2	2.8	0.03
Oct-06	16.60		7.0	790	1.5	1.6	0.09	0.02
Jan-07	17.35		7.1	1650	6.4	6.7	0.07	0.03
Apr-07	18.71		7.1	1700	6.2	7.1	0.04	0.01
Jul-07	Sampling postponed due to unsafe access following wet weather							
Aug-07	17.87		6.8	1730	6.6	7.2	0.02	<0.01
Nov-07	15.9		7.0	1300	5.4	5.5	1.1	0.01
Jan-08	17.6		7.0	1320	4.6	4.5	1	0.01
Apr-08	14.6		7.2	820	1.5	1.7	0.08	0.06
Jul-08	15.79		7.3	1170	3.7	3.8	0.03	0.01
Oct-08	N/A		7.3	1210	4.1	4.3	0.04	0.03
Jan-09	N/A		7.1	1040	2.9	3.4	0.04	0.03
Apr-09	No sample taken - contract change over							
Jun-09	14.67		7.2	1250	N/T	5.6	<0.01	<0.01
Aug-09	15.58		7.6	1240	Testing for these analytes not undertaken			
Nov-09	N/A		7.04	1402	Testing for these analytes not undertaken			
23/02/2010	17.05		7.64	1467	5.24	5.8	<0.01	<0.01
20/05/2010	17.44	-2%	8.05	2190	5.19	6.2	0.05	0.02
8/09/2010	14.33	22%						
8/11/2010	12.82	12%						
11/01/2011	12.06	6%	7.16	813	3.88	4.5	0.14	0.07
16/03/2011	11.68	3%	7.24	620	2.78	4.1	0.09	0.02
18/05/2011	12.72	-8%	7.25	1050	3.72	4.5	0.03	0.02
12/09/2011	14.36	-11%	7.35	1060	3.92	4.9	<0.01	0.01
14/12/2011	14.4	0%	7.05	1075	5.02	5	0.06	0.02
27/03/2012	12.8	0.13	7.88	1020	2.76	3.7	0.03	0.07
3/07/2012	14.16		Water Depth Only Monitored					
5/09/2012	14.2	0%	Water Depth Only Monitored					
16/11/2012	14.27	0%	Water Depth Only Monitored					
24/01/2013	15.05	-5%	Water Depth Only Monitored					
26/03/2013	14.1	7%	Water Depth Only Monitored					
8/05/2013	14.42	-2%	7.38	668	2.81	3.8	0.03	0.02
25/07/2013	15.28	-6%	Water Depth Only Monitored					
24/09/2013	15.86	-4%	Water Depth Only Monitored					
11/11/2013	16.31	-3%	Water Depth Only Monitored					
21/01/2014	16.8	-3%	Water Depth Only Monitored					
31/03/2014	17.22	-2%	7.60	1320	5.83	6.8	0.03	<0.01
20/05/2014	17.48	-1%	Water Depth Only Monitored					
7/07/2014	17.66	-1%	Water Depth Only Monitored					
23/09/2014	18.07	-2%	Water Depth Only Monitored					
25/11/2014	18.38	-2%	Water Depth Only Monitored					
13/01/2015	18.34	0%	Water Depth Only Monitored					
25/03/2015	18.61	-1%	7.6	1010	1.73	2.1	0.18	<0.01

Piezo ID	MW9				Other Name		train load out	
Aquifer	Werrie Basalt				Ground RL		378.059m	
Coordinates	274164.7		6526458				Stick Up	1.07m
Sample Date	Depth to Ground - metres	% Difference	pH - field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
Jun-05	Site Not Installed							
Jul-05	Site Not Installed							
Aug-05	Site Not Installed							
Sep-05	Site Not Installed							
Oct-05	13.78		6.7	1230	17.0	18.0	0.04	0.02
Nov-05	13.53		6.9	1160	9.2	9.0	0.12	0.10
Dec-05	12.55		7.4	1080	14.0	15.0	0.26	0.09
Jan-06	11.72		7.2	2080	25.0	24.0	0.54	0.10
Feb-06	12.86		7.2	980	9.7	11.0	0.12	0.08
Mar-06	13.06		7.2	960	10.0	11.0	0.08	0.06
Apr-06	13.42		7.3	1100	9.2	12.0	0.22	0.33
Jul-06	13.95		7.2	990	8.9	9.6	0.19	0.04
Oct-06	14.46		7.2	970	7.8	8.4	0.10	0.03
Jan-07	14.84		6.8	1120	14.0	14.0	0.07	0.02
Apr-07	14.67		6.9	1120	12.0	12.0	0.04	<0.01
Jul-07	Sampling postponed due to unsafe access following wet weather							
Aug-07	14.25		6.9	1040	8.3	8.9	0.45	<0.01
Nov-07	13.8		7.0	1070	11	10	0.03	<0.01
Jan-08	12.88		7.1	940	6.4	6.2	0.02	<0.01
Apr-08	13.8		Pump Failure					
Jul-08	14.05		7	1010	8.2	8.5	0.04	<0.01
Oct-08	12.89		7	870	4.2	4.5	0.03	0.03
Jan-09	12.55		7.2	770	5.3	6.2	0.02	0.04
Apr-09	No sample taken - contract change over							
Jun-09	14.68		7.2	860	N/T	8.8	<0.01	<0.01
Aug-09	15.17		7.2	900	Testing for these analytes not undertaken			
Nov-09	15.41		7.17	905	Testing for these analytes not undertaken			
23/02/2010	14.3		7.78	885	2.55	3.2	0.04	<0.01
19/05/2010	15.07	-5%	7.79	873	5.62	6.3	0.11	0.01
9/09/2010	13.69	10%						
6/01/2011	13.41	2%	7.32	689	3.29	3.9	<0.01	0.02
15/03/2011	13.48	-1%	7.25	682	3.14	4.9	0.03	<0.01
17/05/2011	14.08	-4%	7.35	781	3.21	4.2	0.06	<0.01
13/09/2011	14.73	-4%	7.03	865	4.62	5.1	0.02	0.02
14/12/2011	13.66	8%	7.13	716	2.74	2.9	0.07	0.01
27/03/2012	14.1	-0.03	7.54	753	2.44	3.9	0.06	0.04
3/07/2012	14.92		Water Depth Only Monitored					
13/09/2012	14.92	0%	Water Depth Only Monitored					
21/11/2012	15.43	-3%	Water Depth Only Monitored					
25/01/2013	15.54	-1%	Water Depth Only Monitored					
25/03/2013	15.47	0%	Water Depth Only Monitored					
9/05/2013	15.27	1%	7.43	763	2.9	4.4	0.37	0.03
26/07/2013	15.74	-3%	Water Depth Only Monitored					
24/09/2013	-	-	Standpipe broken during Rail Loop Construction					
8/11/2013	-	-	Standpipe broken during Rail Loop Construction					
21/01/2014	-	-	Standpipe broken during Rail Loop Construction					
22/09/2014	-	-	Standpipe broken during Rail Loop Construction					
24/11/2014	-	-	Standpipe broken during Rail Loop Construction					
9/01/2015	-	-	Standpipe broken during Rail Loop Construction					
19/03/2015	-	-	Standpipe broken during Rail Loop Construction					

Piezo ID	MW10				Other Name		Zeolite	
Aquifer	Werrie Basalt				Ground RL		371.458m	
Coordinates	273130.6		6526225				Stick Up	0.2m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
Jun-05	17.00		6.8	2120	22	24	0.04	0.02
Jul-05	17.29		6.9	2070	23	23	0.08	0.01
Aug-05	14.26		7.1	2030	23	23	0.04	0
Sep-05	17.75		6.8	2240	23	22	0.06	0.04
Oct-05	17.28		7.1	2210	22	23	0.08	0.04
Nov-05	18.31		6.8	2180	25	25	0.08	0.04
Dec-05	17.32		7.4	2180	23	23	0.24	0.08
Jan-06	17.61		7.1	2050	25	23	0.12	0.02
Feb-06	17.66		7.1	2060	22	24	0.08	0.06
Mar-06	17.5		7.1	2090	23	24	0.04	0.04
Apr-06	17.95		7.2	1800	23	27	0.07	0.01
Jul-06	17.46		7.4	1970	24	25	3.70	0.03
Oct-06	17.38		7.1	2040	22	24	0.06	0.01
Jan-07	17.25		7.2	2040	23	24	0.09	0.02
Apr-07	18.20		7.6	1920	23	24	0.06	<0.01
Jul-07	Sampling postponed due to unsafe access following wet weather							
Aug-07	17.38		7.2	1970	22	23	0.02	<0.01
Nov-07	17.80		7.6	1890	24	24	0.01	<0.01
Jan-08	18.76		7.3	1950	24	24	0.01	<0.01
Apr-08	17.91		7.4	1850	21	23	0.02	0.02
Jul-08	17.85		7.3	2300	24	24	0.05	<0.01
Oct-08	N/A		7.8	1810	20	22	0.04	0.03
Jan-09	N/A		7.5	1920	20	23	0.02	0.02
Apr-09	No sample taken - contract change over							
Jun-09	N/A		7.5	1670	N/T	18.8	<0.01	<0.01
Aug-09	N/A		7.3	1940	Testing for these analytes not undertaken			
Nov-09	18.86		7.3	2007	Testing for these analytes not undertaken			
23/02/2010	18.43		7.48	1875	20.9	21.4	<0.01	<0.01
19/05/2010	17.44	6%	8.5	2860	14.9	17.2	0.15	<0.01
8/09/2010	17.18	2%						
11/01/2011	17.2	0%	7.22	1698	21.9	25.7	0.06	<0.01
16/03/2011	11.25	53%	7.13	1678	19.8	22.7	<0.01	0.01
18/05/2011	17.06	1%	7.3	1080	6.41	8.6	0.13	0.02
12/09/2011	16.98	0%	7.56	1080	6.92	8.3	0.04	0.01
13/12/2011	16.98	0%	7.25	1115	7.25	8.3	0.02	<0.01
26/03/2012	20	-0.15	7.31	1780	18.3	19.5	<0.01	0.01
2/07/2012	18.32		Water Depth Only Monitored					
5/09/2012	18.07	1%	Water Depth Only Monitored					
21/11/2012	17.96	1%	Water Depth Only Monitored					
24/01/2013	17.6	2%	Water Depth Only Monitored					
25/03/2013	17.21	2%	Water Depth Only Monitored					
7/05/2013	17.1	1%	7.87	1200	9.11	10.8	0.01	<0.01
25/07/2013	17.01	1%	Water Depth Only Monitored					
25/09/2013	16.93	0%	Water Depth Only Monitored					
8/11/2013	16.92	0%	Water Depth Only Monitored					
20/01/2014	16.95	0%	Water Depth Only Monitored					
25/03/2014	16.99	0%	7.8	1150	11.1	11.9	0.05	0.03
21/05/2014	17.05	0%	Water Depth Only Monitored					
2/07/2014	17.09	0%	Water Depth Only Monitored					
22/09/2014	17.16	0%	Water Depth Only Monitored					
24/11/2014	17.11	0%	Water Depth Only Monitored					
9/01/2015	17.19	0%	Water Depth Only Monitored					
19/03/2015	17.24	0%	7.5	1230	12.1	14.1	0.04	0.02

Piezo ID	MW11				Other Name		Turnbull's Gap	
Aquifer	Sandstone				Ground RL		347.557m	
Coordinates	272279.663		6528596				Stick Up	
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
Jun-05	Site Not Sampled - Managers Request							
Jul-05	N/A		7.4	1230	0.08	0.31	0.08	0.01
Aug-05	N/A		7.6	1210	0	0.65	0.02	0.01
Sep-05	N/A		7.4	1770	16	17.0	0.08	0.04
Oct-05	N/A		7.6	1430	13	14.0	0.24	0.06
Nov-05	N/A		7.5	1430	12	13.0	0.10	0.06
Dec-05	N/A		7.4	2170	24	22.0	0.20	0.07
Jan-06	N/A		7.4	2070	25	23.0	0.08	0.04
Feb-06	N/A		7.4	1390	11	13.0	0.12	0.08
Mar-06	N/A		7.5	1370	12	13.0	0.06	0.06
Apr-06	Sampling postponed due to unsafe access following wet weather							
Jul-06	N/A		7.4	1840	22	22.0	0.18	0.04
Oct-06	N/A		7.5	1600	16	17.0	0.06	0.02
Jan-07	N/A		7.4	1380	14	14.0	0.09	0.05
Apr-07	N/A		7.4	1380	14	15.0	0.13	0.02
Jul-07	Sampling postponed due to unsafe access following wet weather							
Aug-07	N/A		7.5	1370	13	13.0	0.05	0.01
Nov-07	N/A		7.4	1290	13	13.0	0.04	0.02
Jan-08	N/A		7.6	1350	13	13	0.06	0.03
Apr-08	N/A		7.5	1300	10	12	0.05	0.03
Jul-08	N/A		Pump Failure					
Oct-08	N/A		7.6	1230	11	12	0.06	0.05
Jan-09	N/A		7.6	1190	7.5	8.7	0.05	0.04
Apr-09	No sample taken - contract change over							
Jun-09	N/A		7.5	1270	N/T	14	<0.01	0.02
Aug-09	N/A		7.7	1580	Testing for these analytes not undertaken			
Nov-09	N/A		7.5	1365	Testing for these analytes not undertaken			
23/02/2010	N/A		7.62	1410	12.1	12.8	<0.01	<0.01
20/05/2010	N/A		8.45	2000	10.2	10.8	0.1	0.03
9/09/2010	N/A							
11/01/2011	N/A							
16/03/2011	N/A		7.37	1092	6.23	8.6	0.08	0.04
18/05/2011	Pump over bore	-	7.45	1150	7.17	8.7	0.18	0.03
12/09/2011	Pump over bore	-	7.44	1130	8.25	9.6	0.06	0.03
14/12/2011	Sampling postponed due to unsafe access following wet weather							
26/03/2012	Pump over bore	-	7.6	1150	5.63	7	0.03	0.04
No access to dip bore								
22/09/2014	Pump over bore - no access							
24/11/2014	Pump over bore - no access							
9/01/2015	Pump over bore - no access							
19/03/2015	Pump over bore	-	7.2	1220	13.7	14.2	0.02	0.03

Piezo ID	MW12				Other Name		Hazeldene Bore	
Aquifer	Alluvium (Quipolly Creek)				Ground RL (m)		360.179	
Coordinates	276311.8		6520488.7	Licence	?		Stick Up (m)	0.55
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
Jun-05	7.89		6.6	880	1.8	2.0	0.10	0.10
Jul-05	7.96		7.1	870	1.8	2.0	1.00	0.03
Aug-05	7.73		7.2	850	1.8	1.8	0.06	0.03
Sep-05	7.42		7.1	900	1.8	1.8	0.14	0.06
Oct-05	7.11		7.3	930	1.9	2.0	0.22	0.08
Nov-05	7.12		7.0	940	2.6	2.1	0.16	0.08
Dec-05	6.93		7.4	930	2.0	2.2	2.30	0.12
Jan-06	6.97		7.2	910	2.2	2.5	0.10	0.04
Feb-06	7.02		7.2	940	1.8	2.3	0.10	0.06
Mar-06	7.16		7.3	910	2.1	2.2	0.08	0.08
Apr-06	7.29		7.4	1000	2.0	2.1	2.50	0.05
Jul-06	7.64		7.2	970	2.4	2.5	0.13	0.06
Oct-06	8.02		7.2	920	2.3	2.4	0.07	0.02
Jan-07	8.16		7.2	940	2.3	2.4	0.20	0.06
Apr-07	8.70		7.1	930	2.4	2.5	0.16	0.04
Jul-07	Sampling postponed due to unsafe access following wet weather							
Aug-07	8.55		6.9	930	2.3	2.5	0.05	0.02
Nov-07	7.64		7.3	910	2.4	2.6	0.18	0.02
Jan-08	7.78		7.3	950	2.3	2.2	0.21	0.05
Apr-08	7.78		7.3	930	2.1	2.4	0.31	0.04
Jul-08	7.32		7.3	930	2.1	2.3	0.08	0.03
Oct-08	Pump Failure							
Jan-09	No access							
Apr-09	No sample taken - contract change over							
Jun-09	N/A		7.1	500	N/T	2	<0.01	0.03
26/08/2009	N/A		7.6	570	Testing for these analytes not undertaken			
Nov-09	N/A		7.56	529	Testing for these analytes not undertaken			
23/02/2010	N/A		7.78	602	0.96	1.1	0.03	0.04
20/05/2010	9.52		e8.2	e488	0.95	1.2	0.06	0.05
30/06/2010	9.64	-1%	Water Depth Only Monitored					
8/07/2010	9.66	0%	Water Depth Only Monitored					
23/07/2010	9.64	0%	Water Depth Only Monitored					
6/08/2010	9.03	7%	Water Depth Only Monitored					
19/08/2010	8.27	9%	Water Depth Only Monitored					
8/09/2010	7.59	9%	7.17	505	1.25	1.6	0.04	0.04
8/11/2010	7.11	7%	Water Depth Only Monitored					
11/01/2011	6.43	11%	7.2	361	0.62	0.8	0.06	0.04
16/03/2011	6.13	5%	7.15	440	1.32	1.9	0.12	0.05
18/05/2011	6.78	-10%						
18/05/2011	6.75	0%	7.2	413	0.97	1.7	0.1	0.05
13/09/2011	7.96	-15%	7.23	384	0.69	0.9	0.04	0.04
13/12/2011	7.95	0%	7.03	392	1.16	1.5	0.08	0.06
27/03/2012	7.84	0.014031	7.17	448	0.99	1.5	0.04	0.09
3/07/2012	8.13		Water Depth Only Monitored					
13/09/2012	8.11	0%	Water Depth Only Monitored					
16/11/2012	8.55	-5%	Water Depth Only Monitored					
24/01/2013	8.61	-1%	Water Depth Only Monitored					
26/03/2013	7.03	22%	Water Depth Only Monitored					
9/05/2013	8.1	-13%	7.1	462	0.8	1.1	0.07	0.06
26/07/2013	-		Blockage in bore at 8.5m					
25/09/2013	8.91	-9%	Water Depth Only Monitored					
11/11/2013	10.56	-16%	Water Depth Only Monitored					
3/01/2013	9.88	7%	Water Depth Only Monitored					
21/01/2013	9.62	3%	Water Depth Only Monitored					
28/03/2014	10.01	-4%	7.5	526	0.93	0.9	0.04	0.03
20/05/2014	10.31	-3%	Water Depth Only Monitored					
7/07/2014	10.65	-3%	Water Depth Only Monitored					
23/09/2014	11.15	-4%	Water Depth Only Monitored					
25/11/2014	11.63	-4%	Water Depth Only Monitored					
13/01/2015	11.85	-2%	Water Depth Only Monitored					
18/03/2015	12.24	-3%	7.5	557	0.96	1	0.08	0.05

Piezo ID	MW13				Other Name		Parkhill Bore	
Aquifer	Alluvium (Quipolly Creek)				Ground RL		352.10	
Coordinates	274327.4		6519749				Stick Up	0.45m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
5/05/2004	6.39		Water Depth Only Monitored					
Jun-05	Site Not Sampled - Managers Request							
Jul-05	5.38		6.9	1050	3.4	3.5	0.10	0.07
Aug-05	5.23		6.6	1110	4.4	3.7	0.12	0.05
Sep-05	5.01		6.6	1210	3.9	3.8	0.12	0.08
Oct-05	5.08		6.8	1260	3.9	4.0	0.26	0.10
Nov-05	5.04		6.6	1240	4.0	4.0	0.14	0.10
Dec-05	4.20		7.0	1150	3.5	3.9	0.38	0.14
Jan-06	4.21		7.3	920	2.2	2.3	0.12	0.04
Feb-06	5.27		6.7	1190	3.2	3.8	0.14	0.08
Mar-06	5.76		6.7	1120	3.6	3.7	0.08	0.08
Apr-06	5.24		6.8	900	3.4	3.6	0.16	0.05
Jul-06	5.17		6.7	1120	3.6	3.6	0.10	0.07
Oct-06	5.33		6.7	1030	3.0	3.2	0.09	0.05
Jan-07	5.63		6.6	920	2.6	2.8	0.14	0.08
Apr-07	5.74		6.6	860	2.4	2.6	0.11	0.06
Jul-07	Sampling postponed due to unsafe access following wet weather							
Aug-07	5.77		6.8	790	2.2	2.4	0.07	0.05
Nov-07	5.35		6.9	750	2.3	2.2	0.09	0.06
Jan-08	5.42		7.0	790	2.4	2.3	0.07	0.06
Apr-08	4.95		6.8	840	2.5	2.9	0.12	0.07
Jul-08	4.98		6.6	1120	2.6	2.8	0.14	0.07
Oct-08	4.63		6.9	1000	3.2	3.4	0.11	0.07
Jan-09	4.18		7	930	2.8	3.1	0.07	0.06
Apr-09	No sample taken - contract change over							
Jun-09	4.7		6.8	1050	N/T	4.4	0.02	0.04
Aug-09	5.63		7.3	880	Testing for these analytes not undertaken			
Nov-09	5.6		7.46	912	Testing for these analytes not undertaken			
23/02/2010	5.37		7.79	840	2.03	2.1	0.06	0.06
20/05/2010	5.62	-4%	7.92	676	1.72	1.9	0.11	0.08
8/07/2010	5.68	-1%	Water Depth Only Monitored					
23/07/2010	5.68	0%	Water Depth Only Monitored					
8/09/2010	4.44	28%	Water Depth Only Monitored					
15/09/2010	4.51	-2%						
8/11/2010	4.44	2%						
11/01/2011	3.81	17%	7.09	732	2.64	3.3	0.08	0.07
16/03/2011	4.25	-10%	7.1	887	2.56	3.7	0.07	0.08
18/05/2011	5.03	-16%	7.2	990	1.03	1.4	0.22	0.07
12/09/2011	4.46	13%	6.84	648	1.33	1.6	0.06	0.07
13/12/2011	4.37	2%	6.93	570	1.05	2	0.09	0.08
26/03/2012	4.43	-0.01354	7.12	634	1.22	1.7	0.07	0.09
3/07/2012	4.53		Water Depth Only Monitored					
5/09/2012	4.53	0%	Water Depth Only Monitored					
16/11/2012	4.74	-4%	Water Depth Only Monitored					
24/01/2013	4.98	-5%	Water Depth Only Monitored					
5/02/2013			6.93	651	2.06	2.6	0.08	0.07
26/03/2013	4.4	13%	Water Depth Only Monitored					
8/05/2013	4.52	-3%	7.04	668	1.48	2	0.13	0.1
25/07/2013	4.6	-2%	Water Depth Only Monitored					
25/09/2013	4.63	-1%	Water Depth Only Monitored					
11/11/2013	5.97	-	Water Depth Only Monitored					
20/01/2014	5.34	-13%	Water Depth Only Monitored					
25/03/2014	5.59	7%	7.1	655	1.62	1.9	0.09	0.1
20/05/2014	4.75	18%	Water Depth Only Monitored					
7/07/2014	5.86	-19%	Water Depth Only Monitored					
23/09/2014	6.10	-4%	Water Depth Only Monitored					
22/11/2014	4.78	28%	Water Depth Only Monitored					
13/01/2015	6.42	-26%	Water Depth Only Monitored					
18/03/2015	6.63	-3%	7.2	673	1.88	2.2	0.09	0.09

Piezo ID	MW13b				Other Name		Parkhill Bore	
Aquifer	Alluvium (Quipolly Creek)				Ground RL		350	
Coordinates	273967.8		6519581				Stick Up	0.33m
Sample Date	Depth to Ground - metres		pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
23/07/2010	4.02		Water Depth Only Monitored					
6/08/2010	3.18		Water Depth Only Monitored					
15/09/2010	2.93		Water Depth Only Monitored					
8/11/2010	3.16		Water Depth Only Monitored					
25/07/2012	3.15							
5/09/2012	3.23	-2%	Water Depth Only Monitored					
16/11/2012	3.28	-2%	Water Depth Only Monitored					
24/01/2013	3.49	-6%	Water Depth Only Monitored					
26/03/2013	3.11	12%	Water Depth Only Monitored					
8/05/2013	3.18	-2%						
25/07/2013	3.19	0%	Water Depth Only Monitored					
25/09/2013	3.26	-2%	Water Depth Only Monitored					
11/11/2013	3.35	-3%	Water Depth Only Monitored					
20/01/2014	3.85	-13%	Water Depth Only Monitored					
25/03/2014	4.12	-7%	8.2	1080	0.24	5	0.49	<0.01
20/05/2014	4.17	-1%	Water Depth Only Monitored					
7/07/2014	4.82	-13%	Water Depth Only Monitored					
23/09/2014	4.51	7%	Water Depth Only Monitored					
25/11/2014	4.78	-6%	Water Depth Only Monitored					
13/01/2015	4.91	-3%	Water Depth Only Monitored					
18/03/2015	5.15	-5%	8	1170	<0.01	3.1	0.18	<0.01

Piezo ID	MW13d				Other Name		Parkhill Bore	
Aquifer	Alluvium (Quipolly Creek)				Ground RL		348.79	
Coordinates	273653.6		6519723				Stick Up	0.32m
Sample Date	Depth to Ground - metres		pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
23/07/2010	4.75		Water Depth Only Monitored					
6/08/2010	4.17	14%	Water Depth Only Monitored					
15/09/2010	3.56	17%	Water Depth Only Monitored					
8/11/2010	4.64	-23%	Water Depth Only Monitored					
25/07/2012	4.73	-2%	Water Depth Only Monitored					
5/09/2012	5.30	-11%	Water Depth Only Monitored					
16/11/2012	4.86	9%	Water Depth Only Monitored					
24/01/2013	5.06	-4%	Water Depth Only Monitored					
26/03/2013	4.37	16%	Water Depth Only Monitored					
8/05/2013	4.58	-5%	7.26	1090	0.03	0.1	0.10	0.06
25/07/2013	4.61	-1%	Water Depth Only Monitored					
25/09/2013	4.69	-2%	Water Depth Only Monitored					
11/11/2013	4.82	-3%	Water Depth Only Monitored					
20/01/2014	5.00	-4%	Water Depth Only Monitored					
25/03/2014	4.76	5%	7.2	1120	0.04	0.1	0.09	0.06
20/05/2014	4.82	-1%	Water Depth Only Monitored					
7/07/2014	4.93	-2%	Water Depth Only Monitored					
23/09/2014	4.94	0%	Water Depth Only Monitored					
25/11/2014	5.07	-3%	Water Depth Only Monitored					
13/01/2015	5.02	1%	Water Depth Only Monitored					
18/03/2015	5.16	-3%	7.8	1280	0.07	0.3	0.06	0.06

Piezo ID	MW14				Other Name		Train Load Out	
Aquifer	Werrie Basalt				Ground RL		379.94m	
Coordinates	274322.6		6526454				Stick Up	1.03m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
5/05/2004	14.8		Water Depth Only Monitored					
Jul-05	Site Not Installed							
Aug-05	Site Not Installed							
Sep-05	Site Not Installed							
Oct-05	16.02		6.8	1080	22.0	22.0	2.40	0.02
Nov-05	15.93		6.9	1130	20.0	22.0	0.12	0.06
Dec-05	15.57		7.4	1150	18.0	19.0	0.28	0.10
Jan-06	15.32		7.1	2080	26.0	24.0	0.32	0.04
Feb-06	14.23		7.2	1080	12.0	16.0	0.24	0.08
Mar-06	15.28		7.3	1050	14.0	15.0	0.10	0.06
Apr-06	15.47		7.5	900	11.0	17.0	0.60	0.05
Jul-06	15.88		7.3	1030	6.9	11.0	0.17	0.06
Oct-06	16.17		7.3	1010	4.0	6.9	0.09	0.04
Jan-07	16.46		6.9	1060	15.0	15.0	0.14	0.04
Apr-07	16.41		7.0	1080	19.0	21.0	0.07	<0.01
Jul-07	Sampling postponed due to unsafe access following wet weather							
Aug-07	16.23		6.9	1070	21.0	22.0	0.06	0.04
Nov-07	15.9		7.1	1050	20.0	18.0	0.65	0.01
Jan-08	15.69		7.2	1080	20.0	20.0	0.60	0.03
Apr-08	13.9		7.0	960	20.0	20.0	0.54	0.01
Jul-08	16.0		6.9	1130	18.0	19.0	0.2	<0.01
Oct-08	15.69		6.9	1080	14	16	0.06	0.04
Jan-09	14.78		7	1080	16	18	0.1	0.03
Apr-09	No sample taken - contract change over							
Jun-09	16.41		7.1	1140	N/T	16.6	0.07	0.06
Aug-09	16.81		7.2	1140	Testing for these analytes not undertaken			
Nov-09	16.35		7.04	1260	Testing for these analytes not undertaken			
23/02/2010	16.54		7.74	1310	15.3	16.8	0.09	<0.01
19/05/2010	16.72	-1%	e8.1	e1830	11.3	13.8	0.17	0.07
9/09/2010	15.88	5%	7.01	1220	17.6	18.6	0.12	0.02
6/01/2011	15.59	2%	7.03	1090	13.8	16.4	<0.01	0.02
15/03/2011	15.29	2%	6.98	1100	13.4	17.5	0.12	<0.01
17/05/2011	15.57	-2%	7.1	1080	11	12.7	0.05	0.02
13/09/2011	16.1	-3%	6.92	1040	10.9	15.4	0.24	0.03
14/12/2011	15.49	4%	6.9	1025	12	13.3	0.08	0.05
27/03/2012	15.4	0.01	7.28	1220	20.7	23.5	0.1	0.09
3/07/2012	16.09		Water Depth Only Monitored					
13/09/2012	16.36	-2%	Water Depth Only Monitored					
21/11/2012	16.75	-2%	Water Depth Only Monitored					
25/01/2013	17.05	-2%	Water Depth Only Monitored					
25/03/2013	16.71	2%	Water Depth Only Monitored					
9/05/2013	16.96	-1%	7.28	1100	15.6	23	<0.5	0.06
26/07/2013	17.39	-2%	Water Depth Only Monitored					
24/09/2013	17.55	-1%	Water Depth Only Monitored					
8/11/2013	17.74	-1%	Water Depth Only Monitored					
21/01/2014	17.78	0%	Water Depth Only Monitored					
31/03/2014	18.12	-2%	7.5	1060	14.4	15.6	0.13	0.07
23/05/2014	18.16	0%	Water Depth Only Monitored					
2/07/2014	18.21	0%	Water Depth Only Monitored					
22/09/2014	18.57	-2%	Water Depth Only Monitored					
24/11/2014	18.97	-2%	Water Depth Only Monitored					
9/01/2015	19.39	-2%	Water Depth Only Monitored					
19/03/2015	19.21	1%	7.5	1090	9.13	10.9	0.15	0.14

Piezo ID	MW14B				Other Name			
Aquifer					Ground RL			
Coordinates	274318.6		6526451	Elevation			Stick Up	0.728m
Sample Date	Depth to Ground - metres		pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
3/07/2012	15.86		Water Depth Only Monitored					
13/09/2012	16.14	-2%	Water Depth Only Monitored					
21/11/2012	16.52	-2%	Water Depth Only Monitored					
25/01/2013	16.82	-2%	Water Depth Only Monitored					
25/03/2013	16.47	2%	Water Depth Only Monitored					
9/05/2013	16.72	-1%	7.09	931	5.93	11.1	0.27	0.06
26/07/2013	17.15	-3%	Water Depth Only Monitored					
24/09/2013	17.42	-2%	Water Depth Only Monitored					
8/11/2013	17.52	-1%	Water Depth Only Monitored					
21/01/2014	17.54	0%	Water Depth Only Monitored					
31/03/2014	17.89	-2%	8.2	402	1.98	2.7	0.36	0.36
23/05/2014	17.92	0%	Water Depth Only Monitored					
2/07/2014	18.04	-1%	Water Depth Only Monitored					
22/09/2014	18.35	-2%	Water Depth Only Monitored					
24/11/2014	18.92	-3%	Water Depth Only Monitored					
9/01/2015	19.18	-1%	Water Depth Only Monitored					
19/03/2015	19.02	1%	7.3	905	13.6	28.9	1.06	0.78

Piezo ID	MW15				Other Name		Capp Bore	
Aquifer	Alluvium (Quipolly Creek)				Ground RL		351.47	
Coordinates	274222		6520047				Stick Up	0.50m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
13/05/2010	5.1		Water Depth Only Monitored					
17/05/2010	5.1	0%	Water Depth Only Monitored					
18/05/2010	5.11	0%	Water Depth Only Monitored					
19/05/2010	5.13	0%	8.38	1610	1.15	1.40	0.12	0.07
21/05/2010	5.11	0%	Water Depth Only Monitored					
24/05/2010	5.12	0%	Water Depth Only Monitored					
26/05/2010	5.12	0%	Water Depth Only Monitored					
28/05/2010	5.12	0%	Water Depth Only Monitored					
31/05/2010	5.12	0%	Water Depth Only Monitored					
2/06/2010	5.13	0%	Water Depth Only Monitored					
11/06/2010	5.14	0%	Water Depth Only Monitored					
30/06/2010	5.16	0%	Water Depth Only Monitored					
8/07/2010	5.19	-1%	Water Depth Only Monitored					
6/08/2010	4.47	16%	Water Depth Only Monitored					
8/09/2010	4.69	-5%	7.23	1004	1.42	1.80	0.12	0.09
15/09/2010	3.95	19%	Water Depth Only Monitored					
8/11/2010	3.91	1%	Water Depth Only Monitored					
11/01/2011	3.7	6%	7.18	957	1.14	1.7	0.11	0.07
16/03/2011	3.75	-1%	7.18	980	1.3	1.8	0.1	0.09
18/05/2011	3.81	-2%	7.2	990	1.03	1.4	0.22	0.07
12/09/2011	3.95	-4%	7.12	896	0.89	1.3	0.06	0.07
13/12/2011	3.98	-1%	7.14	890	1.17	1.4	0.12	0.08
26/03/2012	3.89	2%	7.3	1010	0.85	1.2	0.07	0.1
3/07/2012	3.99		Water Depth Only Monitored					
5/09/2012	4.04	-1%	Water Depth Only Monitored					
16/11/2012	4.26	-5%	Water Depth Only Monitored					
24/01/2013	4.47	-5%	Water Depth Only Monitored					
26/03/2013	3.92	14%	Water Depth Only Monitored					
8/05/2013	4.1	-4%	7.1	1030	1.2	1.7	1.90	0.1
25/07/2013	4.13	-1%	Water Depth Only Monitored					
25/09/2013	4.39	-6%	Water Depth Only Monitored					
11/11/2013	4.64	-5%	Water Depth Only Monitored					
20/01/2014	4.82	-4%	Water Depth Only Monitored					
25/03/2014	5.1	-5%	7.4	1000	1.42	1.7	0.08	0.1
20/05/2014	5.25	-3%	Water Depth Only Monitored					
7/07/2014	5.37	-2%	Water Depth Only Monitored					
23/09/2014	5.61	-4%	Water Depth Only Monitored					
22/11/2014	5.84	-4%	Water Depth Only Monitored					
9/01/2015	5.92	-1%	Water Depth Only Monitored					
18/03/2015	6.15	-4%	7.4	987	1.33	1.5	0.07	0.05

Piezo ID	MW16				Other Name		Mountain View Bore	
Aquifer	Alluvium (Quipolly Creek)				Ground RL		353.798	
Coordinates	274657.2		6520225	Licence	Bore Log		Stick Up	0.28m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
5/05/2004	6.95		Water Depth Only Monitored					
8/07/2010	6.1		Water Depth Only Monitored					
23/07/2010	6.04	1%	Water Depth Only Monitored					
6/08/2010	5.39	12%	Water Depth Only Monitored					
8/09/2010	4.43	22%	7.18	1035	20.2	23.3	0.15	0.12
8/11/2010	4.19	6%	Water Depth Only Monitored					
11/01/2011	3.71	13%	7.01	779	10.7	13.5	0.07	0.08
16/03/2011	3.75	-1%	7.17	691	4.3	6.4	0.14	0.09
13/05/2011	3.91							
18/05/2011	3.99	-6%	7.15	661	3.2	5.3	0.02	0.06
12/09/2011	4.26	-6%	7.08	703	6.5	7.2	0.14	0.08
13/12/2011	4.21	1%	7.1	687	4.8	5.3	0.08	0.06
26/03/2012	4.16	0.01	7.17	684	3.33	3.6	0.25	0.09
3/07/2012	4.31		Water Depth Only Monitored					
5/09/2012	4.46	-3%	Water Depth Only Monitored					
16/11/2012	4.81	-7%	Water Depth Only Monitored					
24/01/2013	5.05	-5%	Water Depth Only Monitored					
26/03/2013	4.37	16%	Water Depth Only Monitored					
8/05/2013	4.56	-4%	7.12	638	2.51	3.4	0.09	0.1
26/07/2013	4.65	-2%	Water Depth Only Monitored					
25/09/2013	4.93	-6%	Water Depth Only Monitored					
11/11/2013	5.49	-10%	Water Depth Only Monitored					
20/01/2014	5.51	0%	Water Depth Only Monitored					
28/03/2014	5.97	-8%	6.9	634	1.67	1.7	0.07	0.07
20/05/2014	6.13	-3%	Water Depth Only Monitored					
7/07/2014	6.25	-2%	Water Depth Only Monitored					
24/09/2014	6.63	-6%	Water Depth Only Monitored					
25/11/2014	6.86	-3%	Water Depth Only Monitored					
13/01/2015	6.99	-2%	Water Depth Only Monitored					
18/03/2015	7.27	-4%	7.2	752	1.72	1.9	0.06	0.07

Piezo ID	MW17a				Other Name		Andrews House	
Aquifer	Alluvium (Black Gully)				Ground RL		352.749	
Coordinates	274563		6520332				Stick Up	0.41m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
8/07/2010	5.18		Water Depth Only Monitored					
23/07/2010	5.16	0%	Water Depth Only Monitored					
6/08/2010	4.57	13%	Water Depth Only Monitored					
8/09/2010	3.59	27%	7.02	962	1.2	1.3	0.12	0.09
8/11/2010	3.32	8%	Water Depth Only Monitored					
11/01/2011	3.25	2%	7.18	781	0.86	1.1	0.09	0.08
16/03/2011	2.9	12%	7.26	770	0.8	1.2	0.05	0.08
13/05/2011	3.02	-4%	Water Depth Only Monitored					
18/05/2011	3.04	-1%	7.30	776.00	0.42	1.0	0.32	0.08
12/09/2011	3.37	-10%	7.1	784	0.8	1.0	0.08	0.08
13/12/2011	3.33	1%	7.1	830	1.2	1.2	0.08	0.08
26/03/2012	3.27	2%	7.24	919	0.78	1.0	0.08	0.08
3/07/2012	3.54		Water Depth Only Monitored					
5/09/2012	3.64	-3%	Water Depth Only Monitored					
16/11/2012	3.87	-6%	Water Depth Only Monitored					
24/01/2013	4.15	-7%	Water Depth Only Monitored					
26/03/2013	3.49	19%	Water Depth Only Monitored					
8/05/2013	3.64	-4%	7.15	930	1.02	1.2	0.10	0.08
26/07/2013	3.79	-4%	Water Depth Only Monitored					
25/09/2013	4.04	-6%	Water Depth Only Monitored					
8/11/2013	4.29	-6%	Water Depth Only Monitored					
20/01/2014	4.72	-9%	Water Depth Only Monitored					
26/03/2014	5.07	-7%	7.3	890	1.28	1.3	0.09	0.1
20/05/2014	5.23	-3%	Water Depth Only Monitored					
7/07/2014	5.41	-3%	Water Depth Only Monitored					
23/09/2014	5.7	-5%	Water Depth Only Monitored					
26/11/2014	6.05	-6%	Water Depth Only Monitored					
13/01/2015	6.09	-1%	Water Depth Only Monitored					
18/03/2015	6.32	-4%	7.2	931	1.24	1.5	0.06	0.08

Piezo ID	MW17b				Other Name		Andrews North	
Aquifer	Werrie Basalt				Ground RL		359.633	
Coordinates	274708.2		6521382				Stick Up	0.63m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
Ancedotal	6		Water Depth Only Monitored					
8/07/2010	11.26		Water Depth Only Monitored					
23/07/2010	11.13	1%	Water Depth Only Monitored					
6/08/2010	11.11	0%	Water Depth Only Monitored					
8/09/2010	9.73	14%	8.54	238	0.2	1.0	0.03	0.03
8/11/2010	9.3	5%	Water Depth Only Monitored					
11/01/2011	8.61	8%	8.04	1784	0.24	0.6	<0.01	<0.01
16/03/2011	8.7	-1%	8.11	1810	0.1	0.6	0.04	0.01
13/05/2011	8.75	-1%	Water Depth Only Monitored					
18/05/2011	8.83	-1%	8.25	1890	0.0	0.8	0.08	<0.01
12/09/2011	9.24	-4%	8.25	1930	<0.01	0.5	<0.01	<0.01
30/09/2011	9.26	0%	Water Depth Only Monitored					
13/12/2011	9.18	1%	8.06	2015	0.05	0.2	<0.01	<0.01
26/03/2012	9.4	-2%	8.76	2290	0.0	0.9	0.30	<0.01
3/07/2012	9.47		Water Depth Only Monitored					
5/09/2012	18.77	-50%	Water Depth Only Monitored					
25/09/2012	9.63	-2%	Water Depth Only Monitored					
16/11/2012	9.98	-4%	Water Depth Only Monitored					
24/01/2013	11.89	-16%	Water Depth Only Monitored					
26/03/2013	9.53	5%	Water Depth Only Monitored					
8/05/2013	9.53	0%	8.59	1910	0.21	1	0.05	<0.01
26/07/2013	9.63	-1%	Water Depth Only Monitored					
25/09/2013	9.94	-3%	Water Depth Only Monitored					
11/11/2013	10.26	-3%	Water Depth Only Monitored					
20/01/2014	10.74	-4%	Water Depth Only Monitored					
28/03/2014	11.07	-3%	8.7	2150	0.04	0.6	0.02	<0.01
20/05/2014	11.51	-4%	Water Depth Only Monitored					
7/07/2014	11.47	0%	Water Depth Only Monitored					
23/09/2014	11.83	-3%	Water Depth Only Monitored					
26/11/2014	12.15	-3%	Water Depth Only Monitored					
13/01/2015	12.22	-1%	Water Depth Only Monitored					
18/03/2015	17.60	-	8.6	2620	0.22	0.2	0.06	<0.01

Piezo ID	MW18a				Other Name		Hird House	
Aquifer	Alluvium (Black Gully)				Ground RL		353.036	
Coordinates	274608.4		6520353				Stick Up	0.01m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
5/05/2004	5.86		Water Depth Only Monitored					
23/07/2010	4.99		Water Depth Only Monitored					
6/08/2010	4.39	14%	Water Depth Only Monitored					
15/09/2010	3.3	33%	Water Depth Only Monitored					
8/11/2010	3.07	7%	Water Depth Only Monitored					
19/01/2011	2.55	20%	Water Depth Only Monitored					
6/04/2011	2.68	-5%	Water Depth Only Monitored					
13/05/2011	2.77	-3%	Water Depth Only Monitored					
30/09/2011	3.23	-14%	Water Depth Only Monitored					
25/07/2012	3.35	-4%	Water Depth Only Monitored					
5/09/2012	3.36	0%	Water Depth Only Monitored					
16/11/2012	3.55	-5%	Water Depth Only Monitored					
24/01/2013	3.94	-10%	Water Depth Only Monitored					
26/03/2013	3.3	19%	Water Depth Only Monitored					
8/05/2013	3.45	-4%	7.18	871	1.02	1.4	0.06	0.1
26/07/2013	3.57	-3%	Water Depth Only Monitored					
25/09/2013	3.85	-7%	Water Depth Only Monitored					
11/11/2013	4.16	-7%	Water Depth Only Monitored					
20/01/2014	4.54	-8%	Water Depth Only Monitored					
26/03/2014	4.86	-7%	7.2	859	1.3	1.5	0.09	0.1
20/05/2014	5.07	-4%	Water Depth Only Monitored					
7/07/2014	5.27	-4%	Water Depth Only Monitored					
23/09/2014	5.32	-1%	Water Depth Only Monitored					
26/11/2014	5.76	-8%	Water Depth Only Monitored					
13/01/2015	5.95	-3%	Water Depth Only Monitored					
18/03/2015	6.28	-5%	7.4	973	1.44	1.4	0.08	0.08

Piezo ID	MW19a				Other Name		McCulloch Irrigation	
Aquifer	Werrie Basalt				Ground RL		359.744	
Coordinates	275498.7		6519421				Stick Up	
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
Ancedotal	4.5		Water Depth Only Monitored					
23/07/2010	7.23		Water Depth Only Monitored					
15/09/2010	4.93		Water Depth Only Monitored					
8/11/2010	5.03	-2%	Water Depth Only Monitored					
3/07/2012	5.6	-10%	Water Depth Only Monitored					
5/09/2012	5.77	-3%	Water Depth Only Monitored					
16/11/2012	5.85	-1%	Water Depth Only Monitored					
24/01/2013	6.07	-4%	Water Depth Only Monitored					
26/03/2013	6.89	-12%	Water Depth Only Monitored					
8/05/2013	6.03	14%	8.52	828	<0.01	<0.01	0.02	<0.01
25/07/2013	5.73	5%	Water Depth Only Monitored					
24/09/2013	5.82	-2%	Water Depth Only Monitored					
11/11/2013	5.93	-2%	Water Depth Only Monitored					
20/01/2014	6.04	-2%	Water Depth Only Monitored					
31/03/2014	8.18	-26%	8.8	820	<0.01	<0.1	<0.01	<0.01
20/05/2014	8.29	-1%	Water Depth Only Monitored					
7/07/2014	8.4	-2%	Water Depth Only Monitored					
23/09/2014	8.97	-6%	Water Depth Only Monitored					
25/11/2014	9.15	-2%	Water Depth Only Monitored					
9/01/2015	9.1	1%	Water Depth Only Monitored					
25/03/2015	9.26	-2%	8.7	857	0.04	0.3	0.18	0.01

Piezo ID	MW20				Other Name		Pattersons	
Aquifer	Werrie Basalt				Ground RL		385.085	
Coordinates	275564.8		6527436.9				Stick Up	0.53m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
6/08/2010	19.76		Water Depth Only Monitored					
20/10/2010	17.35	14%	Water Depth Only Monitored					
18/01/2011	17.78	-2%	Water Depth Only Monitored					
31/03/2011	18.6	-4%	Water Depth Only Monitored					
Lowest	**17.35**		**0**	**0**	**0**	**0**	**0**	**0**
Highest	**19.76**		**0**	**0**	**0**	**0**	**0**	**0**
Mean	**18.37**							
Number of samples	**4**		**0**	**0**	**0**	**0**	**0**	**0**
29/09/2011	18.79	-1%	Water Depth Only Monitored					
30/01/2012	18.82	0%	Water Depth Only Monitored					
2/07/2012	18.79		Water Depth Only Monitored					
5/09/2012	18.93	-1%	Water Depth Only Monitored					
21/11/2012	19.19	-1%	Water Depth Only Monitored					
24/01/2013	19.41	-1%	Water Depth Only Monitored					
25/03/2013	19.39	0%	Water Depth Only Monitored					
7/05/2013	19.46	0%	Water Depth Only Monitored					
25/07/2013	19.51	0%	Water Depth Only Monitored					
25/09/2013	19.71	-1%	Water Depth Only Monitored					
8/11/2013	19.83	-1%	Water Depth Only Monitored					
20/01/2014	19.99	-1%	Water Depth Only Monitored					
25/03/2014	20.17	-1%	Water Depth Only Monitored					
21/05/2014	20.29	-1%	Water Depth Only Monitored					
2/07/2014	20.39	0%	Water Depth Only Monitored					
23/09/2014	20.61	-1%	Water Depth Only Monitored					
25/11/2014	20.67	0%	Water Depth Only Monitored					
9/01/2015	20.86	-1%	Water Depth Only Monitored					
19/03/2015	21.02	-1%						

Piezo ID	MW21a				Other Name		Glenara Windmill	
Aquifer	Alluvium (Black Gully)				Ground RL		357.191m	
Coordinates	275669		6520609.4	Depth	12.63m		Stick Up	0.27m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
6/08/2010	8.21		Water Depth Only Monitored					
15/09/2010	6.24	32%	Water Depth Only Monitored					
15/10/2010	6.14	2%	Water Depth Only Monitored					
8/11/2010	5.67	8%	Water Depth Only Monitored					
11/01/2011	4.63	22%	Water Depth Only Monitored					
28/01/2011	4.78	-3%	Water Depth Only Monitored					
6/04/2011	4.88	-2%	Water Depth Only Monitored					
13/05/2011	5.11	-5%	Water Depth Only Monitored					
15/09/2011	5.98	-15%	Water Depth Only Monitored					
19/01/2012	6.01	0%	Water Depth Only Monitored					
29/06/2012	6.24	-4%	Water Depth Only Monitored					
5/09/2012	6.4	-3%	Water Depth Only Monitored					
21/11/2012	6.7	-4%	Water Depth Only Monitored					
24/01/2013	7.09	-6%	Water Depth Only Monitored					
25/03/2013	6.32	12%	Water Depth Only Monitored					
8/05/2013	6.34	0%	7.74	713	1.3	1.6	0.06	0.09
25/07/2013	6.56	-3%	Water Depth Only Monitored					
21/08/2013	6.75	-3%	Water Depth Only Monitored					
25/09/2013	7.09	-5%	Water Depth Only Monitored					
8/11/2013	7.45	-5%	Water Depth Only Monitored					
21/01/2014	7.96	-6%	Water Depth Only Monitored					
26/03/2014	8.38	-5%	7.20	764	1.7	1.8	0.08	0.09
20/05/2014	8.73	-4%	Water Depth Only Monitored					
7/07/2014	8.96	-3%	Water Depth Only Monitored					
23/09/2014	9.32	-4%	Water Depth Only Monitored					
25/11/2014	9.65	-3%	Water Depth Only Monitored					
9/01/2015	10.35	-7%	Water Depth Only Monitored					
19/03/2015	10.10	2%	Water Depth Only Monitored - No sample as windmill disconnected					

Piezo ID	MW22a				Other Name		Smith House	
Aquifer	Quipolly Alluvium				Ground RL		353.661	
Coordinates	274750.2		6520214.3				Stick Up	0.57m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
5/05/2004	7.06		Water Depth Only Monitored					
6/08/2010	5.55		Water Depth Only Monitored					
15/09/2010	4.43	25%	Water Depth Only Monitored					
8/11/2010	4.28	4%	Water Depth Only Monitored					
11/01/2011	3.73	15%	Water Depth Only Monitored					
6/04/2011	3.82	-2%	Water Depth Only Monitored					
13/05/2011	4.02	-5%	Water Depth Only Monitored					
30/09/2011	4.42	-9%	Water Depth Only Monitored					
25/07/2012	4.53	-2%	Water Depth Only Monitored					
5/09/2012	4.53	0%	Water Depth Only Monitored					
16/11/2012	4.79	-5%	Water Depth Only Monitored					
24/01/2013	5.18	-8%	Water Depth Only Monitored					
26/03/2013	4.46	16%	Water Depth Only Monitored					
8/05/2013	4.62	-3%	7.1	538	2.9	4.1	0.06	0.08
26/07/2013	4.77	-3%	Water Depth Only Monitored					
25/09/2013	5.07	-6%	Water Depth Only Monitored					
11/11/2013	5.35	-5%	Water Depth Only Monitored					
21/01/2014	5.74	-7%	Water Depth Only Monitored					
28/03/2014	6.09	-6%	7	515	1.47	1.5	0.07	0.07
20/05/2014	6.27	-3%	Water Depth Only Monitored					
7/07/2014	6.5	-3%	Water Depth Only Monitored					
24/09/2014	6.78	-5%	Water Depth Only Monitored					
26/11/2014	6.95	-2%	Water Depth Only Monitored					
9/01/2015	7.18	-3%	Water Depth Only Monitored					
18/03/2015	7.41	-3%	7.2	625	1.46	1.8	0.08	0.08

Piezo ID	MW22b				Other Name		Smith Irrigation	
Aquifer	Quipolly Alluvium				Ground RL		354.222	
Coordinates	274916.8		6520035.5				Stick Up	0.48m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
6/08/2010	5.77		Water Depth Only Monitored					
15/09/2010	4.48	29%	Water Depth Only Monitored					
8/11/2010	4.34	3%	Water Depth Only Monitored					
11/01/2011	3.74	16%	Water Depth Only Monitored					
6/04/2011	3.93	-5%	Water Depth Only Monitored					
13/05/2011	4.32	-9%	Water Depth Only Monitored					
30/09/2011	4.59	-6%	Water Depth Only Monitored					
25/07/2012	4.72	-3%	Water Depth Only Monitored					
5/09/2012	4.64	2%	Water Depth Only Monitored					
16/11/2012	5.02	-8%	Water Depth Only Monitored					
24/01/2013	5.3	-5%	Water Depth Only Monitored					
26/03/2013	4.63	14%	Water Depth Only Monitored					
8/05/2013	4.89	-5%	7.27	452	0.9	1.3	0.10	0.11
26/07/2013	4.93	-1%	Water Depth Only Monitored					
25/09/2013	5.33	-8%	Water Depth Only Monitored					
11/11/2013	5.57	-4%	Water Depth Only Monitored					
21/01/2014	5.96	-7%	Water Depth Only Monitored					
28/03/2014	6.32	-6%	7.2	390	2.66	3	0.22	0.16
20/05/2014	6.55	-4%	Water Depth Only Monitored					
7/07/2014	6.7	-3%	Water Depth Only Monitored					
24/09/2014	7.0	-4%	Water Depth Only Monitored					
26/11/2014	7.26	-3%	Water Depth Only Monitored					
9/01/2015	7.44	-2%	Water Depth Only Monitored					
18/03/2015	7.68	-3%	7.8	457	2.98	4.6	0.67	0.17

Piezo ID	MW23a				Other Name		Easey Yard	
Aquifer	Quipolly Alluvium				Ground RL		346.058	
Coordinates	272835.7		6519720				Stick Up	0.15m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
6/08/2010	3.51		Water Depth Only Monitored					
15/09/2010	3.26	8%	Water Depth Only Monitored					
8/11/2010	3.74	-13%	Water Depth Only Monitored					
25/07/2012	3.86	-3%	Water Depth Only Monitored					
5/09/2012	3.9	-1%	Water Depth Only Monitored					
16/11/2012	3.7	5%	Water Depth Only Monitored					
24/01/2013	3.85	-4%	Water Depth Only Monitored					
26/03/2013	3.47	11%	Water Depth Only Monitored					
9/05/2013	3.86	-10%	7.16	969	1.3	1.6	0.09	0.08
25/07/2013	3.64	6%	Water Depth Only Monitored					
25/09/2013	3.95	-8%	Water Depth Only Monitored					
11/11/2013	3.93	1%	Water Depth Only Monitored					
20/01/2014	3.96	-1%	Water Depth Only Monitored					
25/03/2014	3.87	2%	7.1	843	1.33	1.5	0.07	0.09
20/05/2014	3.92	-1%	Water Depth Only Monitored					
7/07/2014	4.22	-7%	Water Depth Only Monitored					
23/09/2014	4.32	-2%	Water Depth Only Monitored					
26/11/2014	4.05	7%	Water Depth Only Monitored					
9/01/2015	3.94	3%	Water Depth Only Monitored					
18/03/2015	4.03	-2%	7.1	790	1.35	1.4	0.09	0.09

Piezo ID	MW23b				Other Name		Easey Irrigation	
Aquifer	Quipolly Alluvium				Ground RL		345.59	
Coordinates	272689.2		6519537.1				Stick Up	0.1m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
6/08/2010	3.83		Water Depth Only Monitored					
15/09/2010	4.03	-5%	Water Depth Only Monitored					
8/11/2010	4.10	-2%	Water Depth Only Monitored					
25/07/2012	4.16	-1%	Water Depth Only Monitored					
5/09/2012	4.75	-12%	Water Depth Only Monitored					
16/11/2012	4.21	13%	Water Depth Only Monitored					
24/01/2013	4.37	-4%	Water Depth Only Monitored					
26/03/2013	4.04	8%	Water Depth Only Monitored					
9/05/2013	4.10	-1%	7.29	873	0.9	1.2	0.11	0.1
25/07/2013	4.23	-3%	Water Depth Only Monitored					
25/09/2013	4.70	-10%	Water Depth Only Monitored					
11/11/2013	4.18	12%	Water Depth Only Monitored					
20/01/2014	4.24	-1%	Water Depth Only Monitored					
25/03/2014	4.26	0%	7.1	805	0.87	1	0.11	0.12
20/05/2014	4.40	-3%	Water Depth Only Monitored					
7/07/2014	4.63	-5%	Water Depth Only Monitored					
23/09/2014	4.37	6%	Water Depth Only Monitored					
26/11/2014	4.19	4%	Water Depth Only Monitored					
9/01/2015	4.19	0%	Water Depth Only Monitored					
18/03/2015	4.23	-1%	7.3	776	1.18	1.4	0.1	0.11

Piezo ID	MW24a				Other Name		Marengo - pressure pump bore	
Aquifer	Werrie Basalt				Ground RL			
Coordinates	278471		6524772				Stick Up	m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
28/09/2010					3.05	3.6	0.01	<0.01
29/06/2012	12.94		Water Depth Only Monitored					
13/09/2012	12.78	1%	Water Depth Only Monitored					
16/11/2012	13.12	-3%	Water Depth Only Monitored					
24/01/2013	13.49	-3%	Water Depth Only Monitored					
26/03/2013	13.27	2%	Water Depth Only Monitored					
7/05/2013	13.24	0%	7.03	2250	11.1	12.9	<0.01	<0.01
25/07/2013	13.01	2%	Water Depth Only Monitored					
25/09/2013	14.4	-10%	Water Depth Only Monitored					
8/11/2013	13.34	8%	Water Depth Only Monitored					
21/01/2014	15.42	-13%	Water Depth Only Monitored					
28/03/2014	14.08	10%	6.9	2120	8.69	9.4	<0.01	<0.01
20/05/2014	14.25	-1%	Water Depth Only Monitored					
2/07/2014	14.15	1%	Water Depth Only Monitored					
23/09/2014	14.78	-4%	Water Depth Only Monitored					
25/11/2014	14.84	0%	Water Depth Only Monitored					
13/01/2015	14.86	0%	Water Depth Only Monitored					
19/03/2015	15.04	-1%	7.1	2250	7.24	8.2	<0.01	<0.01

Piezo ID	MW26				Other Name		Blackwells	
Aquifer	Quipolly Alluvium				Ground RL			
Coordinates	275404		6520575				Stick Up	0.6m
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
7/10/2010	5.18		Water Depth Only Monitored					
8/11/2010	5.02		Water Depth Only Monitored					
19/01/2011	4.07	23%	Water Depth Only Monitored					
6/04/2011	4.32	-6%	Water Depth Only Monitored					
13/05/2011	4.46	-3%	Water Depth Only Monitored					
30/09/2011	5.2	-14%	Water Depth Only Monitored					
19/01/2012	5.15	1%	Water Depth Only Monitored					
23/09/2014	8.1	-36%	Water Depth Only Monitored					
21/10/2014	8.65	-6%	Water Depth Only Monitored					
16/02/2015	9.43	-8%	Water Depth Only Monitored					

Piezo ID	MW27				Other Name		Cintra North Paddocl off Escott Road	
Aquifer					Ground RL			
Coordinates	274671		6526082	Elevation			Stick Up	
Sample Date	Depth to Ground - metres		pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
2/07/2012	39.97		Water Depth Only Monitored					
5/09/2012	39.94	0%	Water Depth Only Monitored					
21/11/2012	40.52	-1%	Water Depth Only Monitored					
24/01/2013	40.75	-1%	Water Depth Only Monitored					
25/03/2013	41.43	-2%	Water Depth Only Monitored					
7/05/2013	42.04	-1%	Water Depth Only Monitored					
25/07/2013	43.03	-2%	6.85	1420	14.7	17.7	0.09	<0.01
24/09/2013	43.46	-1%	Water Depth Only Monitored					
8/11/2013	43.41	0%	Water Depth Only Monitored					
20/01/2014	45.76	-5%	Water Depth Only Monitored					
26/03/2014	45.68	0%	7.3	1270	14.9	16.1	0.14	<0.01
21/05/2014	45.20	1%	Water Depth Only Monitored					
2/07/2014	47.49	-5%	Water Depth Only Monitored					
22/09/2014	52.36	-9%	Water Depth Only Monitored					
24/11/2014	52.10	0%	Water Depth Only Monitored					
9/01/2015	51.32	2%	Water Depth Only Monitored					
19/03/2015	50.04	3%	7.5	975	3.74	5.1	0.08	<0.01

Piezo ID	MW28a				Other Name		Woodlands Windmill Northside of Lowes Ck Road	
Aquifer					Ground RL			
Coordinates	277301		6520534	Elevation			Stick Up	0.25m
Sample Date	Depth to Ground - metres		pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
29/06/2012	10.25		Water Depth Only Monitored					
13/09/2012	8.45	21%	Water Depth Only Monitored					
16/11/2012	10.07	-16%	Water Depth Only Monitored					
24/01/2013	11.2	-10%	Water Depth Only Monitored					
26/03/2013	8.97	25%	Water Depth Only Monitored					
7/05/2013	9.97	-10%	Water Depth Only Monitored					
25/07/2013	10.91	-9%	Water Depth Only Monitored					
24/09/2013	11.75	-7%	Water Depth Only Monitored					
11/11/2013	12.22	-4%	Water Depth Only Monitored					
21/01/2014	12.62	-3%	Water Depth Only Monitored					
28/03/2014	12.92	-2%	7.5	337	0.63	5.3	0.32	0.02
20/05/2014	13.12	-2%	Water Depth Only Monitored					
7/07/2014	13.27	-1%	Water Depth Only Monitored					
23/09/2014	13.54	-2%	Water Depth Only Monitored					
25/11/2014	13.80	-2%	Water Depth Only Monitored					
13/01/2015	13.95	-1%	Water Depth Only Monitored					
25/03/2015	14.26	-2%	7.8	542	0.03	0.3	0.17	0.03

Piezo ID	MW29				Other Name		Kyooma	
Aquifer					Ground RL			
Coordinates	278312		6525325	Elevation			Stick Up	
Sample Date	Depth to Ground - metres		pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
29/06/2012	11.91		Water Depth Only Monitored					
13/09/2012	22.84	-48%	Water Depth Only Monitored					
25/09/2012	12.52	82%	Water Depth Only Monitored					
16/11/2012	16.89	-26%	Water Depth Only Monitored					
24/01/2013	16.5	2%	Water Depth Only Monitored					
25/03/2013	11.57	43%	Water Depth Only Monitored					
7/05/2013	11.51	1%	8.59	1090	3.48	5	0.06	<0.01
25/07/2013	11.28	2%	Water Depth Only Monitored					
25/09/2013	11.54	-2%	Water Depth Only Monitored					
8/11/2013	13.68	-16%	Water Depth Only Monitored					
21/01/2014	12.25	12%	Water Depth Only Monitored					
26/03/2014	12.28	0%	8.8	1070	1.08	1.8	<0.01	<0.01
20/05/2014	12.72	-3%	Water Depth Only Monitored					
7/07/2014	12.82	-1%	Water Depth Only Monitored					
23/09/2014	13.67	-6%	Water Depth Only Monitored					
25/11/2014	14.82	-8%	Water Depth Only Monitored					
9/01/2015	13.73	8%	Water Depth Only Monitored					
19/03/2015	13.40	2%	8.5	1020	2.37	3.1	<0.01	<0.01

Piezo ID	MW32				Other Name		Naranji	
Aquifer					Ground RL			
Coordinates	272040		6519023	Elevation			Stick Up	0.46m
Sample Date	Depth to Ground - metres		pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
5/02/2013	3.96		7.6	60	0.52	1	0.08	0.06
20/03/2013			7.1	775	0.79	1.3	0.08	0.07
26/03/2013	3.67	8%	Water Depth Only Monitored					
8/05/2013	4.62	-21%	7.28	726	0.72	0.8	0.1	0.12
25/07/2013	3.92	18%	Water Depth Only Monitored					
25/09/2013	4.02	-2%	Water Depth Only Monitored					
11/11/2013	4.13	-3%	Water Depth Only Monitored					
20/01/2014	4.14	0%	Water Depth Only Monitored					
25/03/2014	4.10	1%	7.00	720	0.86	0.9	0.10	0.12
20/05/2014	4.18	-2%	Water Depth Only Monitored					
7/07/2014	4.02	4%	Water Depth Only Monitored					
23/09/2014	4.10	-2%	Water Depth Only Monitored					
26/11/2014	4.13	-1%	Water Depth Only Monitored					
9/01/2015	4.26	-3%	Water Depth Only Monitored					
18/03/2015	4.19	2%	7.3	760	0.97	1.2	0.12	0.12

Piezo ID	MW34				Other Name		25 Silo Road	
Aquifer	Alluvium (Werris Creek)				Ground RL			
Coordinates	276140		6529966				Stick Up	
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
20/11/2013	11.41		Water Depth Only Monitored					
20/01/2014	12.27	-7%	Water Depth Only Monitored					
19/03/2014	12.53	-2%	Water Depth Only Monitored					
7/07/2014	11.31	11%	Water Depth Only Monitored					
24/09/2014	11.29	0%	Water Depth Only Monitored					
26/11/2014	11.78	-4%	Water Depth Only Monitored					
13/01/2015	11.31	4%	Water Depth Only Monitored					
18/03/2015	11.86	-5%	7.6	1050	3.68	5.7	0.12	0.07

Piezo ID	MW36A				Other Name		Nested Deep Piezo (99m)	
Aquifer	Werrie Basalt (Werris Creek)				Ground RL			
Coordinates	274353	6525997					Stick Up	
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
1/05/2015	23.01		Water Depth Only Monitored					
21/05/2014	23.31	-1%	Water Depth Only Monitored					
2/07/2014	23.41	0%	Water Depth Only Monitored					
22/09/2015	23.96	-2%	Water Depth Only Monitored					
24/11/2014	24.45	-2%	Water Depth Only Monitored					
12/01/2015	24.43	0%	Water Depth Only Monitored					
19/03/2015	24.34	0%	7.3	1070	4.02	4.8	0.09	0.09

Piezo ID	MW36B				Other Name		Nested Deep Piezo (170m)	
Aquifer	Werrie Basalt (Werris Creek)				Ground RL			
Coordinates	274353	6525997					Stick Up	
Sample Date	Depth to Ground - metres	% Difference	pH -field	Electrical Conductivity uS/cm - field	Nitrates_ mg N/L	Total Nitrogen_ mg/L	Total Phosphorus mg/L	Phosphorus - reactive mg/L
1/05/2014	23.84	-	Water Depth Only Monitored					
21/05/2014	22.46	6%	Water Depth Only Monitored					
2/07/2014	22.80	-1%	Water Depth Only Monitored					
22/09/2014	23.75	-4%	Water Depth Only Monitored					
24/11/2014	24.20	-2%	Water Depth Only Monitored					
12/01/2015	24.19	0%	Water Depth Only Monitored					
19/03/2015	24.04	1%	8	507	0.07	0.3	0.34	0.12