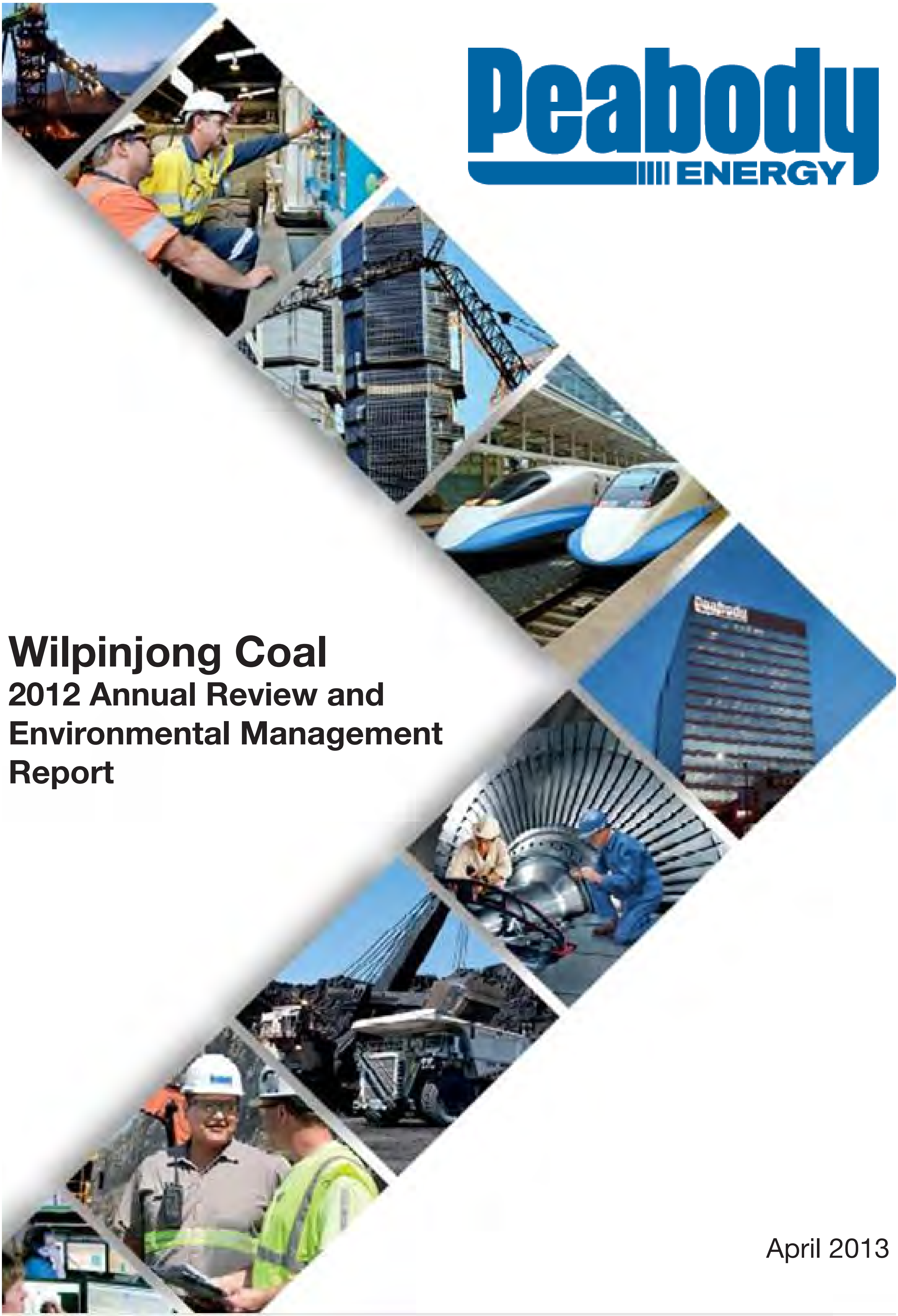


Wilpinjong Coal

2012 Annual Review and Environmental Management Report

April 2013

WILPINJONG COAL MINE

2012 ANNUAL REVIEW

AND ENVIRONMENTAL MANAGEMENT REPORT

APRIL 2013
Project No. WIL-12-11
Document No. 00512609

Name of Mine:	WILPINJONG COAL MINE
Titles/Mining Leases:	ML 1573
MOP Commencement Date:	JANUARY 2012
MOP Completion Date:	JANUARY 2013
AEMR Commencement Date:	1 JANUARY 2012
AEMR End Date:	31 DECEMBER 2012
Name of Leaseholder:	WILPINJONG COAL PTY LIMITED
Name of Mine Operator (if different):	THIESS PTY LTD
Reporting Officer:	KIEREN BENNETTS
Title:	MANAGER ENVIRONMENT & COMMUNITY
Signature:	....
Date:	APRIL 2013

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF TABLES

TABLE OF CONTENTS (Continued)

LIST OF TABLES (Continued)

LIST OF FIGURES

LIST OF CHARTS

TABLE OF CONTENTS (Continued)

LIST OF CHARTS (Continued)

LIST OF PLANS

LIST OF APPENDICES

EXECUTIVE SUMMARY

The Wilpinjong Coal Mine (the Mine) is owned by Wilpinjong Coal Pty Limited, a wholly owned subsidiary of Peabody Energy Australia Pty Ltd. The Mine was operated by Thiess Pty Ltd during the 2012 review period.

The Mine is located approximately 40 kilometres north-east of Mudgee, near the village of Wollar, within the Mid-Western Regional Local Government Area, in central New South Wales (NSW) (Figure 1).

In December 2003, the then Minister for Mineral Resources granted Exploration Licence 6169 to WCPL under the NSW *Mining Act, 1992*. Project Approval (05-0021) was granted by the Minister for Planning under Part 3A of the NSW *Environmental Planning and Assessment Act, 1979* on 1 February 2006, following submission of the *Wilpinjong Coal Project Environmental Impact Statement* in May 2005. A copy of the Project Approval is available on the Peabody website (http://www.peabodyenergy.com.au). Mining Lease (ML) 1573 was subsequently granted by the Minister for Primary Industries on 8 February 2006.

The Mine includes an open cut mining operation, coal handling and preparation plant, associated raw and product coal handling facilities and a rail load-out facility. An aerial photograph of the Mine in September 2012 is presented on Figure 2.

This 2012 Annual Review and Environmental Management Report presents the environmental monitoring data for the past year (i.e. the 2012 review period) from 1 January 2012 to 31 December 2012. The environmental performance of the Mine is assessed against specific performance indicators and impact assessment criteria stipulated in relevant environmental management plans and monitoring programmes prepared in accordance with Project Approval (05-0021).

This document is prepared in accordance with the *Guidelines to the Mining, Rehabilitation and Environmental Management Process* (EDG03) prepared by the NSW Division of Resources and Energy (within the NSW Department of Trade and Investment, Regional Infrastructure and Services); and to meet the Annual Review requirements of Condition 3, Schedule 5 of Project Approval (05-0021).

This 2012 Annual Review and Environmental Management Report includes the following:

- A description of the works that were carried out during the 2012 review period, and the works proposed to be undertaken during the next review period.
- A comprehensive review of the monitoring results and complaints records for the Mine during the 2012 review period.
- Identification of trends in the monitoring data over the life of the Mine.
- A description of what actions were and/or will be taken to ensure compliance.
- A description of what measures will be implemented over the next review period to improve the environmental performance of the Mine.

1 INTRODUCTION

The Wilpinjong Coal Mine (the Mine) is owned by Wilpinjong Coal Pty Limited (WCPL), a wholly owned subsidiary of Peabody Energy Australia Pty Ltd (Peabody). The Mine is operated by Thiess Pty Ltd (Thiess).

The Mine is located approximately 40 kilometres (km) north-east of Mudgee, near the village of Wollar, within the Mid-Western Regional Local Government Area, in central New South Wales (NSW) (Figure 1).

In December 2003, the then Minister for Mineral Resources granted Exploration Licence (EL) 6169 to WCPL under the NSW *Mining Act, 1992*. Project Approval (05-0021) was granted by the Minister for Planning under Part 3A of the NSW *Environmental Planning and Assessment Act, 1979* on 1 February 2006, following submission of the *Wilpinjong Coal Project Environmental Impact Statement* (herein referred to as the EIS [WCPL, 2005]) in May 2005. A copy of the Project Approval is available on the Peabody website (http://www.peabodyenergy.com.au).

A Joint Ore Reserve Committee Resource/Reserves Statement and Geological Report were submitted to the then NSW Department of Primary Industries–Mineral Resources (DPI–MR) in December 2005. Mining Lease (ML) 1573 was subsequently granted by the Minister for Primary Industries on 8 February 2006. Construction of the Mine commenced in February 2006, with mining commencing in September 2006.

The Mine includes an open cut mining operation, coal handling and preparation plant (CHPP), associated raw and product coal handling facilities and a rail load-out facility. An aerial photograph of the Mine in September 2012 is presented on Figure 2.

Approved run-of-mine (ROM) coal production at the Mine is 15 million tonnes per annum (Mtpa). ROM coal is either washed at the CHPP, or by-passed to the product stockpile, prior to being loaded onto trains via the train loading infrastructure. Product coal is then transported by rail to either the Bayswater/Liddell rail unloader or to the Port of Newcastle.

Since the original Project Approval (05-0021) in February 2006, the conditions of approval have been modified on three occasions[1]:

1. In **November 2007**, Project Approval (05-0021) was modified (MOD 1) to allow:
   - an increase in blasting frequency from one to two blasts per day; and
   - a change in the primary access route to the Mine, from Wollar Road to Ulan-Wollar Road (via Ulan Road).
2. In **August 2010**, Project Approval (05-0021) was modified (MOD 3) to allow:
   - an increase in ROM coal extraction from 13 to 15 Mtpa;
   - an increase in average number of laden trains leaving the site from four to five per day; and
   - an expansion of the mining fleet.
3. In **August 2012**, Project Approval (05-0021) was modified (MOD 4) to allow:
   - an increase of the maximum coal production rates from 12 to 12.5 Mtpa;
   - an increase of the average number of laden coal trains leaving the site from 5 to 6 per day;
   - an increase of the maximum number of laden coal trains leaving the Mine from 6 to 10 per day; and
   - the installation and operation of a Reverse Osmosis (RO) plant on-site to treat excess Mine water prior to approved discharge in accordance with Environment Protection Licence (EPL) 12425.

In accordance with Condition 2, Schedule 2 of Project Approval (05-0021), the Mine is carried out generally in accordance with the EIS (WCPL, 2005), MOD 1, MOD 3 and MOD 4, the statement of commitments and the Project Approval conditions.

[1] MOD 2 was in the planning stages, however was withdrawn prior to lodgement.

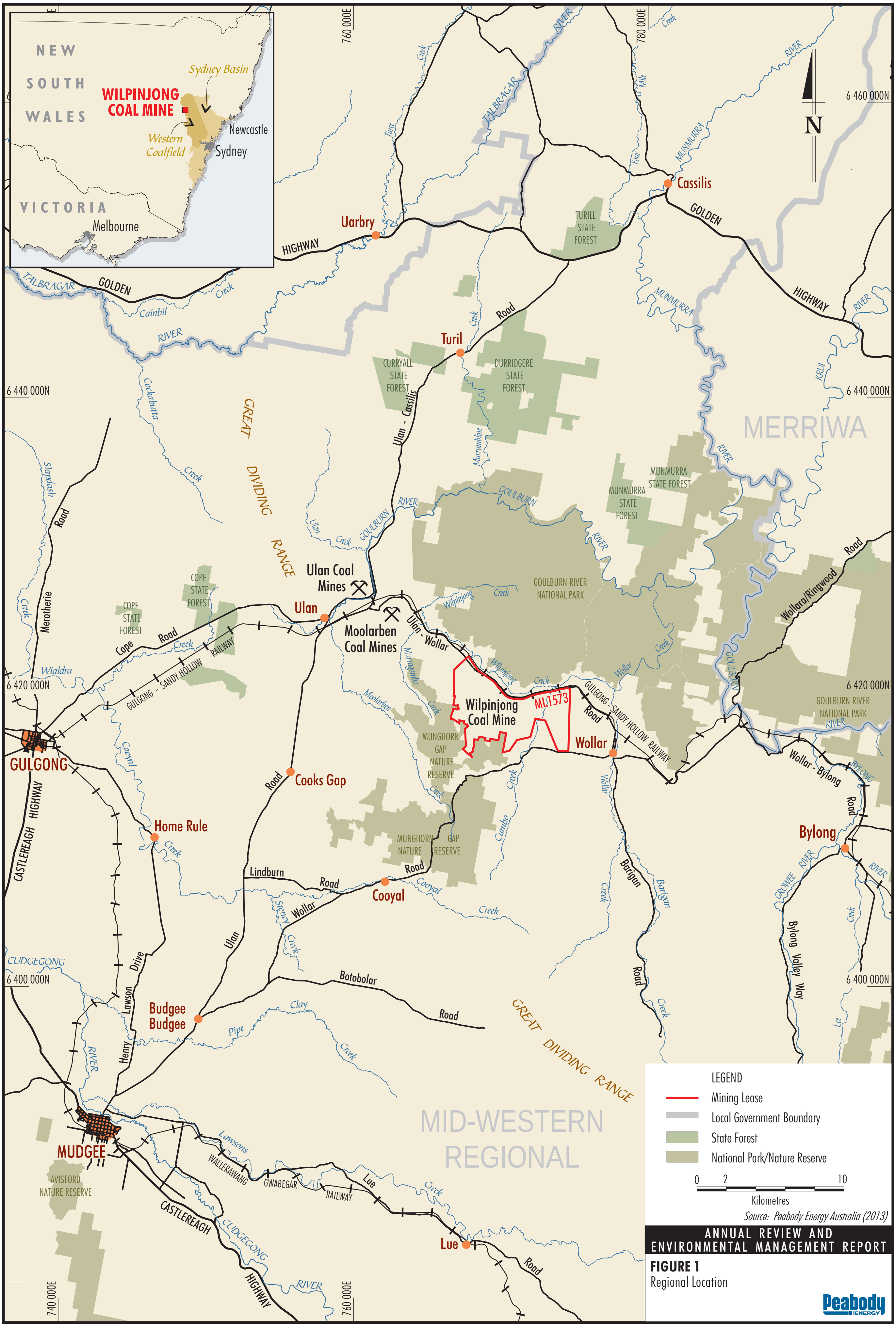


FIGURE 1
Regional Location

WIL-12-11 AR&EMR_001C

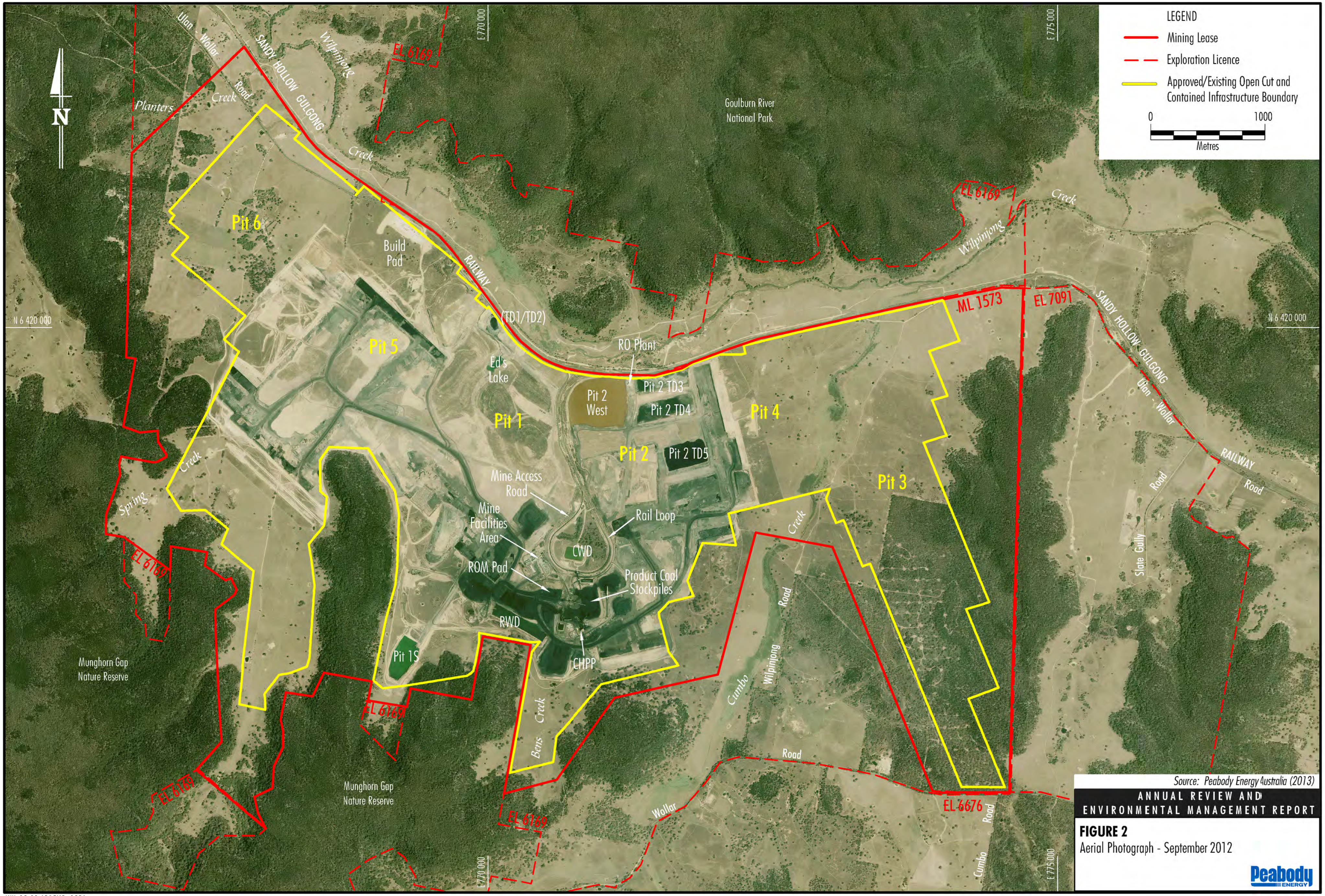


FIGURE 2
Aerial Photograph - September 2012

WIL-12-11 AR&EMR_102A

Mining operations may be undertaken on the site until 8 February 2027, in accordance with Condition 5, Schedule 2 of Project Approval (05-0021).

WCPL implements 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 Mine in accordance with Condition 1, Schedule 2 of Project Approval (05-0021). These measures are discussed in Sections 3, 4 and 6 of this document.

1.1 PURPOSE AND SCOPE

Condition 3, Schedule 5 of Project Approval (05-0021) requires the preparation of an Annual Review, as follows:

Annual Review

3. By the end of December 2011, and annually thereafter, 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 last 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.

This 2012 Annual Review and Environmental Management Report presents environmental monitoring data for the past year (i.e. the 2012 review period) from 1 January 2012 to 31 December 2012, and is prepared in accordance with the *Guidelines to the Mining, Rehabilitation and Environmental Management Process* (EDG03) (MREMP Guidelines) prepared by the Division of Resources and Energy (DRE) within the NSW Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS).

Copies of this 2012 Annual Review and Environmental Management Report will be provided to the following:

- NSW Department of Planning and Infrastructure (DP&I);
- DRE-DTIRIS (Director-General);
- NSW Office of Environment and Heritage (OEH);
- Mid-Western Regional Council (MWRC);
- the Mine Community Consultative Committee (CCC); and
- the NSW Environment Protection Authority (EPA).

In addition, a copy will be made publicly available on the Peabody website (www.peabodyenergy.com.au) in accordance with Condition 11(a), Schedule 5 of Project Approval (05-0021).

1.2 STRUCTURE OF THE ANNUAL REVIEW AND ENVIRONMENTAL MANAGEMENT REPORT

The remainder of this 2012 Annual Review and Environmental Management Report is structured as follows:

Section 1: Provides details of current mine operations and mine contacts, relevant approvals leases and licences, and summarises the actions required as a result of the Annual Environmental Management Report (AEMR) meeting.

Section 2: Summaries the operations carried out during the 2012 review period.

Section 3: Provides a review of the environmental management and performance of mining activities at the Mine during the 2012 review period.

Section 4: Describes the environmental performance of mining activities against other Project Approval (05-0021) requirements.

Section 5: Provides a summary of community consultation including a review of the environmental complaints received during the 2012 review period.

Section 6: Provides a summary of the rehabilitation strategies and measures implemented at the Mine.

Section 7: Outlines the works proposed to be carried out in the next review period (i.e. 1 January 2013 to 31 December 2013).

Section 8: Lists the references cited in this report.

1.3 APPROVALS, LEASES AND LICENCES

1.3.1 Current List of Approvals, Leases and Licences

Table 1 presents the current approvals, leases and licences that the Mine operates under.

Table 1
Mine Approvals, Leases and Licences

Relevant Authority	Instrument	Approval/Licence No.	Expiry Date
DP&I	Project Approval	Project Approval (05-0021) Modified November 2007 Modified August 2010 Modified August 2012	21 years from commencement of Project Approval (i.e. 2027)
DRE-DTIRIS	Mining Lease	ML 1573	February 2027
	Exploration Licence	EL 6169	28/11/2012 (renewal application lodged November 2012)
		EL 7091	03/03/2011 (renewal application lodged March 2011)
	Mining Operations Plan (MOP)	-	31 January 2014
EPA	Environment Protection Licence	EPL 12425	Until the licence is surrendered, suspended or revoked. The licence is subject to review every 3 years.

Table 1 (Continued)
Mine Approvals, Leases and Licences

Relevant Authority	Instrument	Approval/Licence No.	Expiry Date
EPA (Continued)	*NSW Radiation Control Act 1990* Registration	RR33340	28 November 2014
		RR22565	21 July 2013
		RR22566	21 July 2013
WorkCover NSW	Notification for the Keeping of Dangerous Goods	Notification No 35/0237774	6 August 2014
	Explosives Licence	*NSW Explosives Act 2003* Part 3 Licence	20 August 2014

Copies of the Project Approval (05-0021), EPL 12425 and ML 1573 are available on the Peabody website (http://www.peabodyenergy.com.au).

Project Approval

As discussed in Section 1.1, this 2012 Annual Review and Environmental Management Report has been prepared in accordance with Condition 3, Schedule 5 of Project Approval (05-0021).

The relevant sections of this 2012 Annual Review and Environmental Management Report which address Condition 3, Schedule 5 of Project Approval (05-0021) are outlined in Table 2.

Table 2
Summary of Reporting Requirements of Project Approval (05-0021)

Condition 3, Schedule 5 of Project Approval (05-0021)		Annual Review and Environmental Management Report Section
By the end of December 2011, and annually thereafter, the Proponent shall review the environmental performance of the project to the satisfaction of the Director-General. This review must:		This document
(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;*	Section 2
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;*	Sections 3 and 5.1
(c)	*identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;*	Section 3
(d)	*identify any trends in the monitoring data over the life of the project;*	Section 3
(e)	*identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and*	Section 3
(f)	*describe what measures will be implemented over the next year to improve the environmental performance of the project.*	Section 3

Mining Lease

This 2012 Environmental Management Report has been prepared in accordance with Conditions 28 and 29 of ML 1573 and the requirements of the MREMP Guidelines. The relevant sections of this 2012 Annual Review which address Conditions 28 and 29 of ML 1573 are outlined in Table 3.

Table 3
Summary of Reporting Requirements of ML 1573

Conditions 28 and 29 of ML 1573	Annual Review and Environmental Management Report Section
28. The lease holder must lodge Environmental Management Reports (EMR) with the Director-General annually or at dates otherwise directed by the DG.	This document
29. The EMR must:	
- report against compliance with the MOP;	Section 6
- report on progress in respect of rehabilitation completion criteria;	Section 6.6
- report on the extent of compliance with regulatory requirements; and	Table 2
- have regard to any relevant guidelines adopted by the Director-General;	This document

Mining Operations Plan

The 2012 review period was covered by an extension of the September 2010 – January 2012 MOP, and by an interim MOP approved by the DRE-DTIRIS on 25 September 2012 covering works until the end of the 2012 period.

In this report, the term 'Annual Review and Environmental Management Report' shall mean:

- The Annual Review required by Condition 3, Schedule 5 of the Project Approval (05-0021); and
- The Environmental Management Report required by Conditions 28 and 29 of ML 1573.

Water Licences

Table 4 lists the water licences held by WCPL and provides the current status.

Table 4
Summary of Water Licences

Approval Type	Licence	Detail	Expiry
Water Access Licence	WAL9476	The taking of water from the Macquarie and Cudgegong Regulated Rivers Water Source at any time or rate from that part of the water source upstream of the upper limit of Lake Burrendong.	Perpetuity.
Bore Licence	20BL169263	Bore works for test bore purposes.	Granted on 5 August 2004 in perpetuity.
Bore Licence	20BL172784	16 x test bores works for monitoring bore purposes.	Granted on 4 May 2011 in perpetuity.
Bore Licence	20BL117710	Well works for stock and domestic purposes.	Granted on 12 February 1981 in perpetuity.
Bore Licence	20BL170151	1 x bore works for dewatering (groundwater) purposes.	Granted on 31 March 2011 and valid to 30 March 2016.
Bore Licence	20BL170177	1 x excavation (groundwater) works for mining and dewatering (groundwater) purposes.	Granted on 24 October 2008 and valid to 23 October 2013.
Bore Licence	20BL170222	Bore works for monitoring bore purposes.	Granted on 1 May 2006 in perpetuity.
Bore Licence	20BL170223	Bore works for monitoring bore purposes.	Granted on 1 May 2006 in perpetuity.
Bore Licence	20BL173100	Test bore works for monitoring bore purposes.	Granted 2 February 2012 in perpetuity.
Bore Licence	20BL170068	Bore works for the purpose of dewatering (groundwater).	Expired on 14 March 2012.*
Bore Licence	20BL170217	Bore works for monitoring bore purposes.	Granted on 1 May 2006 in perpetuity.
Bore Licence	20BL173101	Bore works for monitoring bore purposes.	Granted on 2 February 2012 in perpetuity.

Table 4 (Continued)
Summary of Water Licences

Approval Type	Licence	Detail	Expiry
Bore Licence	20BL170219	Bore works for monitoring bore purposes.	Granted on 1 May 2006 in perpetuity.
Bore Licence	20BL170149	1 x bore for the purpose of dewatering (groundwater).	Granted on 31 March 2011 and valid to 30 March 2016.
Bore Licence	20BL170150	1 x bore for the purpose of dewatering (groundwater).	Granted on 31 March 2011 and valid to 30 March 2016.
Bore Licence	20BL170228	Bore works for monitoring bore purposes.	Granted on 1 May 2006 in perpetuity.
Bore Licence	20BL167902	Bore works for stock purposes.	Granted on 8 October 2004 in perpetuity.
Bore Licence	20BL169264	Bore works for test bore purposes.	Granted on 5 August 2004 in perpetuity.
Bore Licence	20BL170056	Excavation – groundwater works for the purpose of dewatering (groundwater).	Expired on 14 March 2012.*
Bore Licence	20BL170088	Bore works for the purpose of dewatering (groundwater).	Expired on 14 March 2012.*
Bore Licence	20BL170089	Excavation – groundwater works for the purpose of dewatering (groundwater).	Expired on 14 March 2012.*
Bore Licence	20BL170224	Bore works for monitoring bore purposes.	Granted on 1 May 2006 in perpetuity.
Bore Licence	20BL170226	Bore works for monitoring bore purposes.	Granted on 1 May 2006 in perpetuity.
Bore Licence	20BL170215	1 x bore works for monitoring bore purposes.	Granted on 1 May 2006 in perpetuity.
Bore Licence	20BL170227	Bore works for monitoring bore purposes.	Granted on 1 May 2006 in perpetuity.
Bore Licence	20BL170057	Bore works for dewatering (groundwater) purposes.	Expired on 14 March 2012.*
Bore Licence	20BL170065	Bore works for dewatering (groundwater) purposes.	Granted on 9 May 2007 and valid to 8 May 2012.*
Bore Licence	20BL170221	Bore works for monitoring bore purposes.	Granted on 1 May 2006 in perpetuity.
Bore Licence	20BL169261	Bore works for test bore purposes.	Granted on 5 August 2004 in perpetuity.
Bore Licence	20BL169262	Bore works for test bore purposes.	Granted on 5 August 2004 in perpetuity.
Bore Licence	20BL170147	1 x bore works for dewatering (groundwater) purposes.	Granted on 31 March 2011 and valid to 30 March 2016.
Bore Licence	20BL170148	1 x bore works for dewatering (groundwater) purposes.	Granted on 31 March 2011 and valid to 30 March 2016.
Bore Licence	20BL170152	1 x bore works for dewatering (groundwater) purposes.	Granted on 31 March 2011 and valid to 30 March 2016.
Bore Licence	20BL170153	1 x bore works for dewatering (groundwater) purposes.	Granted on 31 March 2011 and valid to 30 March 2016.
Bore Licence	20BL170218	Bore works for monitoring bore purposes.	Granted on 1 May 2006 in perpetuity.
Bore Licence	20BL170220	Bore works for monitoring bore purposes.	Granted on 1 May 2006 in perpetuity.
Bore Licence	20BL170225	Bore works for monitoring bore purposes.	Granted on 2 May 2006 in perpetuity.

Source: McCullough Robertson Lawyers (2012).

* NSW Office of Water (NOW) is in the process of finalizing expired licences.

1.3.2 Approval Variations

Project Approval

Project Approval (05-0021) was modified (MOD 4) during the 2012 review period. The modification proposed the following:

- to increase the maximum coal production rates from 12 to 12.5 Mtpa;
- to increase the average number of laden coal trains leaving the site from 5 to 6 per day;
- to increase the maximum number of laden coal trains leaving the Mine from 6 to 10 per day; and
- to install and operate a RO plant on-site to treat excess mine water prior to approved discharge in accordance with EPL 12425.

MOD 4 was approved by the Planning Assessment Commission on 24 August 2012.

Environment Protection Licence

There were two EPL variations made during the 2012 review period.

A Variation on 19 June 2012 (Notice 1506541) altered the licence discharge points, water quality and volume discharge limits and water quality monitoring following commissioning of the water treatment plant and finalisation of the discharge location. Two monitoring points were removed for discharge to waters, namely, Site 25 (Ed's Lake) and Site 26 (Recycled Water Dam) (Figure 2).

A second Variation on 20 December 2012 (Notice 1509947) was to remove the premises listed in Condition L5.1 following the acquisition of those properties, to increase the volume of tyres which may be disposed of at the premises and to alter the monitoring frequency of dust deposition gauges to be consistent with the sampling methodology.

1.4 MINE CONTACTS

Contact details for the key WCPL and Thiess personnel responsible for environmental management of operations at the Mine are provided in Table 5.

Table 5
WCPL and Thiess Mine Contacts

Name	Position	Contact Details
Ian Livingstone-Blevins	General Manager Wilpinjong Coal Pty Limited	Work: 02 63702500 Email: llivingstone-blevins@peabodyenergy.com
Nick Collings	Technical Services Manager Wilpinjong Coal Pty Limited	Work: 02 63702500 Email: ncollings@peabodyenergy.com
Kieren Bennetts	Environment & Community Manager Wilpinjong Coal Pty Limited	Work: 02 63702500 Email: kbennetts@peabodyenergy.com
Clark Potter	Senior Environmental Advisor Wilpinjong Coal Pty Limited	Work: 02 63702500 Email: cpotter@peabodyenergy.com
Peter Grosvenor	Project General Manager Thiess Pty Ltd	Work: 02 63702400 Email: pgrosvenor@thiess.com.au
Peter Schmidt	Site Manager Thiess Pty Ltd	Work: 02 63702400 Email: pschmidt@thiess.com.au
Rob Kidd	Manager, Statutory Compliance Thiess Pty Ltd	Work: 02 63702400 Email: rkidd@thiess.com.au
Keith Simkin	Senior Environmental Advisor Thiess Pty Ltd	Work: 02 63702400 Email: ksimkin@thiess.com.au

The street and postal address for the Mine are as follows:

Street Address	**Postal Address**
1343 Ulan-Wollar Road	Locked Bag 2005
WOLLAR NSW 2850	MUDGEE NSW 2850

1.5 ACTIONS REQUIRED AT THE 2010 AND 2011 AEMR MEETINGS

A reconciliation of the actions required at the 2011 AEMR meeting that have been considered in this Annual Review and Environmental Management Report is provided in Table 6.

Table 6
Actions Required at the 2011 AEMR Meeting

Action Required	Annual Review and Environmental Management Report Section/Component
Provide a rehabilitation map.	Plans 3 and 4
Identify the weekly rehabilitation meetings held to highlight the focus on rehabilitation.	Section 6
Provide detail on the construction and use of the RO plant.	Sections 2.3 and 3.7.3
Provide detailed blast monitoring results.	Section 3.9
Include a discussion of noise downtime to demonstrate compliance.	Section 3.10
Establish vegetation in the clean water diversion drains to minimise erosion.	Section 6.2
Document performance against outcomes of the previous AEMR meeting.	This section
Report rehabilitation activities against commitments outlined in the MOP.	Section 6
Discuss why or why not targets have been achieved.	Section 3

In addition, a reconciliation of the actions required at the 2010 AEMR meeting that have been considered in this Annual Review and Environmental Management Report is provided in Table 7.

Table 7
Actions Required at the 2010 AEMR Meeting

Actions Required	Annual Review and Environmental Management Report Section/Component
DRE-DTIRIS Recommendations	
Include a discussion of any penalty infringement notices issued.	Section 3
Ensure plans are clear and convey all the required information.	Plans 1 to 4
DP&I Recommendations	
Provide detailed comparison of monitoring results against baseline data, previous results and relevant criteria for:	
• Waste	Section 2.7
• Air quality	Section 3.4
• Greenhouse gas emissions	Section 3.5
• Surface water quality	Section 3.7
• Creek flow-volumes	Section 3.7
• Stream health	Section 3.7
• Groundwater quality	Section 3.8
• Groundwater levels	Section 3.8

Table 7 (Continued)
Actions Required at the 2010 AEMR Meeting

Actions Required	Annual Review and Environmental Management Report Section/Component
DP&I Recommendations (Continued)	
In accordance with Schedule 5, Condition 7 of the Project Approval (05-0021), WCPL is required to report any exceedance of the criteria to the Department and other relevant agencies.	Section 3
Ensure Plans are of high quality and that the legends are legible.	Plans 1 to 4
Provide windroses of each month or season in order to explain some of the air quality/noise results.	Section 3.3
Provide detailed discussion on the investigations undertaken to ensure that there is no impact on the rock art site in the vicinity of depositional dust gauge (DG) 12.	Section 3.4.3
Provide a detailed discussion on the water quality monitoring stations regarding regular servicing, maintenance and how equipment failures are avoided.	Sections 3.7.2 and 3.7.3
Provide a detailed discussion and explanation of flow volumes being recorded.	Section 3.7.3
Include the stream health monitoring report as an appendix and include a tabulated summary of the results with a comparison to the baseline data.	Section 3.7.3 and Appendix A
Include a full set of results for attended and unattended noise monitoring during the review period.	Section 3.10.3 and Appendices B and C
Include detailed information on the results of the archaeological salvage programme including location, nature and significance of artefacts collected; written reports from the field archaeologist representative; and correspondence from the local Aboriginal community attending the excavation.	Section 3.11.2
Include copies of pre-clearance surveys and habitat tree mapping as an appendix.	Appendix D
Include the rehabilitation monitoring report as an appendix.	Appendix E

2 OPERATIONS DURING THE 2012 REVIEW PERIOD (JANUARY 2012 TO DECEMBER 2012)

The following sections outline the operations and activities undertaken at the Mine during the 2012 review period.

2.1 EXPLORATION

Appendix F provides a summary of the exploration, drilling and other geology-related activities undertaken at the Mine during the 2012 review period.

A total of 173 exploration holes were drilled during the 2012 review period within ML 1573. Two exploration holes were drilled within EL 6169. Of these, seven drill holes were for coal quality testing and analysis and another seven were for gas content and composition. The remaining drill holes were for Line of Oxidation delineation.

In accordance with Condition 7 of ML 1573, an exploration report has been prepared by WCPL and has been lodged with the Director-General of the DRE-DTIRIS.

2.2 LAND PREPARATION

Land preparation activities undertaken during the 2012 review period relating to vegetation clearance, threatened species management and Aboriginal cultural heritage management were implemented in accordance with the MOP, Rehabilitation Management Plan (RMP) and Aboriginal Cultural Heritage Management Plan (ACHMP).

At the end of the 2012 review period, approximately 818,793 bank cubic metres (bcm) of topsoil was stockpiled. During the 2012 review period approximately 93,310 bcm of topsoil was placed on completed mine landforms (Table 8) as shown on Plan 3 of the 2011 Annual Review.

Table 8
Land Preparation Summary

Year	Topsoil Stockpiled (bcm)	Topsoil Placed (bcm)
2012	818,793	93,310

Source: Thiess (2013).

Proposed land preparation activities to be undertaken during the next review period (including topsoil placement) are presented on Plan 3.

2.3 CONSTRUCTION ACTIVITIES

During the 2012 review period, a number of significant construction activities were undertaken at the Mine. These activities included the following:

- construction of the RO plant;
- commencement of assembly of the owner-operator fleet (e.g. laydown/assembly areas); and
- commencement of construction of a new workshop.

No other significant construction activities were undertaken at the Mine during the 2012 review period.

2.4 MINING ACTIVITIES

A summary of the mining production schedule for the period 2009 to 2012 is provided in Table 9. Approximately 14.7 million tonnes (Mt) of ROM coal was mined during the 2012 review period, and remained below the maximum ROM coal production limit of 15 Mtpa as stipulated in Condition 6(a), Schedule 2 of Project Approval (05-0021).

Table 9
Mining Production Schedule

Year	Mine Waste Rock (Overburden) Removed (bcm)	ROM Coal Mined (t)	ROM Coal Crushed (t)	Total ROM Coal Processed (CHPP Feed) (t)	Rejects (CHPP) (t)	Tailings (CHPP) (t)	Product Coal (t)	Product Coal including Bypass Coal (t)
2009	15,887,667	10,301,147	9,923,220	5,202,035	1,487,851	371,963	3,342,221	8,063,406
2010	17,304,139	11,279,474	10,808386	5,655,708	1,615,244	403,811	3,636,653	8,789,331
2011	18,786,228	12,579,891	11,216,769	6,059,262	1,785,841	446,460	3,826,961	8,984,468
2012	23,900,506	14,743,790	13,400,590	8,241,880	2,370,339	592,585	5,278,956	10,437,666

Source: Thiess (2013).

t = tonnes.

At the end of the 2012 review period, open cut mining operations were located in Pit 2, Pit 4 and Pit 5. The proposed mining sequence for the next review period is presented on Plan 4.

2.5 PROCESSING ACTIVITIES

The Mine produces both unwashed (bypass) and washed product coal. The coal handling and processing infrastructure has been established to accommodate the processing of ROM coal, the handling of ROM and washed product coal, and the stockpiling and train loading of product coal. The ROM coal stockpiles located in the Mine infrastructure area were used to stockpile raw coal excavated from the mining pits.

A primary crusher crushes the coal for the secondary crushers to further crush and size the coal. The resultant product is either raw product coal (bypass) or raw feed for the processing plant. Approximately 13.4 Mt of ROM coal was crushed during the reporting period (Table 9). Approximately 8.2 Mt of ROM coal was processed during the reporting period and remained below the maximum limit of 8.5 Mt being processed at the CHPP, consistent with the requirements of Condition 6(b), Schedule 2 of Project Approval (05-0021).

Coal stockpile areas are separated into ROM (unprocessed) and product (processed) stockpiles. Four product stockpiles with a combined capacity of approximately 500,000 t are used to stockpile washed and unwashed coal products prior to reclaim and loading to trains for transport off-site. A series of four feeder valves located beneath the product stockpiles are used to supply the train load out conveyor. The raw feed stockpile supplies the processing plant with product for washing via a feeder valve and conveyor on which the stockpile sits.

Process water is obtained from the raw water dam located within the rail loop, and any necessary makeup water is obtained by recycled water from the tailings dams and/or the active mining areas (i.e. sumps) (Figure 2).

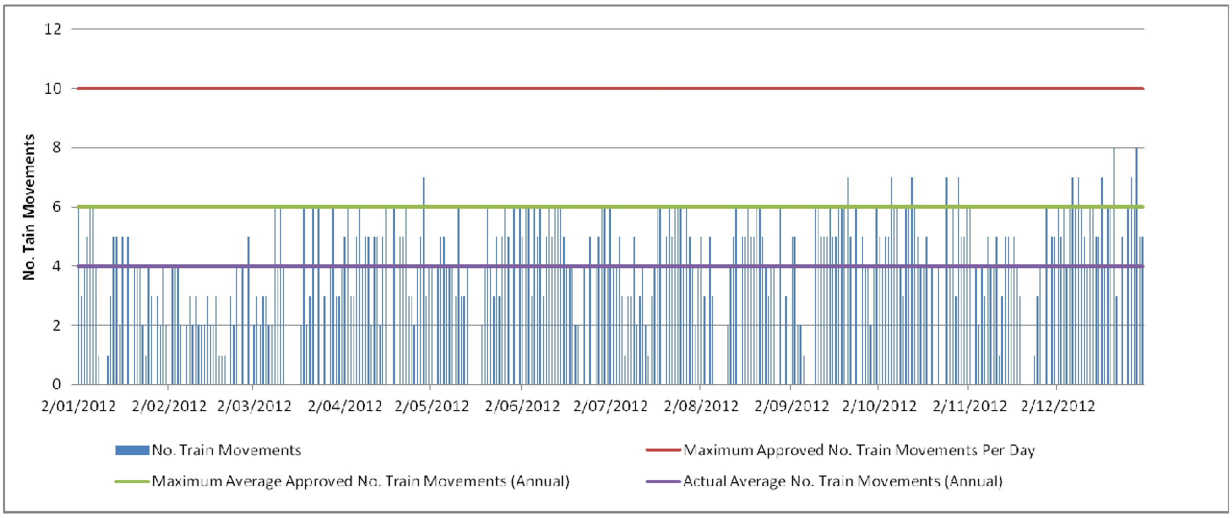
A train loading facility capable of loading coal at a rate of 4,000 tonnes per hour is located at the head of the rail loop within the Mine infrastructure area and receives product coal via a product feed conveyor running the length of the product coal stockpile area. Train loading is available to load trains on a continuous basis, 24 hours a day and 7 days a week, with no more than 10 trains per day and a maximum of six trains per 24 hour period on average over the calendar year, in accordance with Conditions 7(b) and 7(c), Schedule 2 of Project Approval (05-0021).

The CHPP is capable of producing multiple washed coal products for both export and domestic sales which are stockpiled on two stockpiles, one adjacent to the wash plant and the other remotely located behind the original stockpiles. The CHPP has approval to operate up to 24 hours per day, seven days per week.

2.6 TRANSPORT ACTIVITIES

In accordance with Condition 50, Schedule 3 of Project Approval (05-0021), WCPL maintains records of the amount of coal transported from the site each year, and the number of coal haulage train movements generated by the Mine on a daily basis.

Approximately 10.4 Mt of product coal was transported from the Mine via rail during the 2012 review period (Table 9) and involved an average of approximately four train movements per day to the end of the 2012 (Chart 1).



Note: Maximum limits approved as part of MOD 4, in August 2012.

Chart 1 Summary of Daily Train Movements over the 2012 Review Period

Train loading is available to load trains on a continuous basis, 24 hours a day and 7 days per week, with a maximum of 10 laden coal trains leaving the site per 24 hour period and a maximum of six laden coal trains leaving the site per day on average when calculated over one calendar year (Condition 7, Schedule 2 of Project Approval (05-0021)).

2.7 WASTE MANAGEMENT

2.7.1 Mining Waste

Approximately 23.9 million bank cubic metres of mine waste rock (overburden) was handled, and approximately 2.4 Mt of CHPP rejects were produced during the 2012 review period (Table 9).

No overburden material was supplied to regional infrastructure projects in the vicinity of the Mine.

2.7.2 Non-Mining Waste

Sewage Treatment and Disposal

The facilities at the Mine include three aerated sewage and pumping systems that discharge via an irrigation sprinkler system to within the rail loop, remote crib hut garden and/or CHPP area. These facilities are serviced by a licensed contractor on a 6 monthly basis or as required. This is undertaken in accordance with Condition O4 of EPL 12425.

In accordance with Condition 56(d), Schedule 3 of Project Approval (05-0021), irrigation of treated wastewater at the Mine is undertaken in accordance with the *Environmental Guidelines: Use of Effluent by Irrigation* (NSW Department of Environment and Conservation [DEC], 2004).

Oil and Grease Disposal

An oil/water separator is located downstream of the workshop area at the Mine and a manually operated oil/water separator is located at the vehicle washdown bay area.

Oil separators were maintained by Thiess personnel. Any sediment trapped in the oil water separator pump is removed and placed in the site landforms for rehabilitation. All waste hydrocarbons collected via the separators are disposed of via a licensed waste disposal company (i.e. Thiess Services) on a monthly basis.

Waste Disposal

During the 2012 review period, site employees received training on appropriate waste management practices and the importance of minimising resource consumption. Wastes were segregated according to type including recyclable material such as paper and cardboard. Air filters were also re-used. Lids on waste and recyclable skips were also kept closed to prevent the scattering of materials by wind and vermin.

On-site waste is managed in accordance with the principles of waste mitigation. In accordance with the Environmental Monitoring Programme, WCPL has maintained a record of the amount of waste oil and general waste material generated by the Mine (including scrap metal). A comparison of the waste figures for the 2012 review period and the 2011 review period are presented in Table 10.

EPL 12425 Condition L4.1 provides that the total volume of tyres disposed of at the premises must not exceed 350 t per annum. During the 2012 review period, approximately 265 t of tyres were buried within Pit 5.

2.8 PRODUCT COAL STOCKPILES

The product stockpiles had a total capacity ranging between 230,000 and 650,000 t during the reporting period. A large radial stacker manages the stockpiling of sized coal across a product stockpile with a capacity of approximately 250,000 t. The product stockpiles are separated into various unwashed and washed product stockpiles, with different coal qualities, to ensure railed product coal quality is appropriately managed.

The radial stacker is also capable of stockpiling approximately 60,000 t of ROM coal feed for the processing plant. A product stockpile belt with an attached slinger belt is used to stockpile the washed product coal, with a capacity of 80,000 t on the southern end of the product stockpile pad.

2.9 WATER MANAGEMENT

Water management activities were undertaken during the 2012 review period in accordance with the Mine Water Management System outlined in the MOP and in the Site Water Management Plan (SWMP).

A summary of surface water and groundwater management activities undertaken on-site during the 2012 review period is provided in Sections 3.7 and 3.8, respectively.

A comparison of the volumes of water held in water storages at the start and end of the 2012 review period and the 2011 review period, is provided in Table 11.

The total volume of water held in all water storages across the Mine during the 2012 review period were significantly below storage capacity. A lower volume of water was held in Pit 2 and Ed's Lake at the end of the 2012 review period compared to the volumes held in those storages in 2011. In comparison, a higher volume of water was held in the Clean Water Dam and the Recycled Water Dam (Figure 2) by the end of the 2012 review period compared to the volumes held in those storages in 2011.

As discussed in Section 1.3.2, a Variation of EPL 12425 on 19 June 2012 (Notice 1506541) was approved to alter licence discharge points, water quality and volume discharge limits and water quality monitoring following commissioning of the RO plant and finalisation of the discharge location.

Table 10
Monthly Waste Management Summary

Waste	Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
General waste (kg)	2011	10,540	21,570	8,630	8,820	14,485	18,890	7,730	28,910	8,230	20,390	11,570	5,980	165,745
	2012	9,940	11,430	9,175	8,450	8,710	8,740	2,560	1,950	4,720	17,392	8,510	10,840	102,417
Oily rags (kg)	2011	160	0	75	0	160	290	181	283	160	60	100	97	1,566
	2012	36	0	124	401	95	0	0	390	262	986	66	120	1,575
Recycling (paper and cardboard (kg)	2011	600	0	1,225	580	380	460	240	773	623	740	823	1,180	7,624
	2012	710	660	960	852	880	1,380	850	930	632	760	260	570	9,444
Waste oil filters (kg)	2011	2,985	1,446	1,425	991	1,866	3,040	1,838	978	2,632	1,125	1,160	1,276	20,762
	2012	1,479	1,964	1,349	2,494	1,089	3,314	1,922	2,112	3,112	2,134	3,100	2,154	26,223
Scrap steel (kg)	2011	20,400	10,940	2,180	8,560	10,160	16,680	12,880	15,320	12,430	8,320	0	9,160	127,030
	2012	0	8,330	7,160	10,340	8,960	15,370	19,960	23,570	4,740	11,340	10,050	15,010	134,830
Recycled oil (L)	2011	61,500	17,000	33,500	19,000	25,800	41,000	20,000	40,000	40,000	23,400	26,000	23,500	370,700
	2012	24,000	67,000	22,000	24,000	47,500	40,000	24,000	45,000	20,000	48,000	55,600	38,000	455,100

Source: Thiess (2013).

kg = kilogram.

L = litre.

Table 11
Volume of Water Held in Water Storages

Water Storage[#]	Year	Total at Start of Review Period (ML)	Total at End of Review Period (ML)	Storage Capacity (ML)
Clean Water Dam	2011	47	39	50
	2012	39	45	
Pit 2	2011	1,928	2,853	3,470
	2012	2,853	2,449	
Ed's Lake	2011	53	43	80
	2012	43	20	
Recycled Water Dam	2011	323	283	450
	2012	283	299	

Source: Thiess (2013).
ML = megalitres.
[#] Refer to Figure 2.

2.10 HAZARDOUS MATERIALS MANAGEMENT

Hazardous materials used and stored on-site during the reporting period included explosives, diesel, water treatment chemicals and other hydrocarbons such as oil.

Two 28,000 L self-bunded double-skinned hydrocarbon (oil) storage tanks, one multi-compartment 110,000 L self-bunded double-skinned hydrocarbon (oil and coolant) storage tank, one 110,000 L bunded and two bunded 88,000 L diesel tanks were operated in accordance with Australian Standard (AS) 1940:2004 *The Storage and Handling of Flammable and Combustible Liquids* and the NSW *Work Healthy and Saftey Regulation, 2011*. Two shipping containers are used for the storage of grease pods and flammable paints were stored on a containment pallet and in a locked cabinet inside the workshop.

In accordance with the MOP, all chemicals brought on-site are recorded in a register which identifies the compatibility of materials and the emergency response procedures in the event of a spill.

2.10.1 Status of Licences

WCPL currently holds a Notification for the Keeping of Dangerous Goods (Notification No. 35/0237774) under the NSW *Dangerous Goods (Road and Rail Transport) Act, 2008* for the magazine areas. This notification is valid until 6 August 2014.

WCPL also holds a licence granted under Part 3 of the NSW *Explosives Act, 2003*, for the possession and storage of explosives. This licence is valid until 20 August 2014.

WCPL currently holds three Radiation Registrations under the NSW *Radiation Control Act, 1990* for diagnostic imaging apparatus and fixed radiation gauges. Registration RR33340 is valid until 28 November 2014 for the sale and/or the possession of radioactive substances or items containing radioactive substances. Registration RR22565 is valid until 21 July 2013 for the sealed source device at the CHPP thickener underflow line. Registration RR22566 is valid until 21 July 2013 for the sealed source device at the CHPP dense medium circuit. Registration RR21364, for a fixed Radiation Gauge at the train loading conveyor CV801 is currently being renewed by WCPL.

2.10.2 Inventory of Materials Management

An inventory of all goods and materials, including hazardous materials contained on-site, is maintained by WCPL and Thiess mine personnel. Material Saftey Data Sheets for all materials are maintained by Thiess. These sheets provide all critical information for the safe use and handling of substances brought on to the Mine site. The Mine also uses ChemWatch, an online computer-based chemicals management and data system.

2.11 PLANNING AGREEMENT

In accordance with Condition 12A, Schedule 3 of the Project Approval (05-0021), WCPL is currently in negotiations with the MWRC to establish an agreement to pay community infrastructure and amenity contributions. This agreement is yet to be finalised. A payment was made during the 2012 review period based on 100 permanent employees at the Mine site.

3 REVIEW OF ENVIRONMENTAL MANAGEMENT AND PERFORMANCE

Environmental management measures undertaken during the 2012 review period have been conducted in accordance with the MOP and management plans and monitoring programmes developed for the Mine in accordance with Project Approval (05-0021). Monitoring was undertaken throughout the 2012 review period at the locations shown on Figure 3.

No penalty infringement notices were issued to WCPL during the 2012 review period.

3.1 MANAGEMENT PLANS AND MONITORING PROGRAMMES

In accordance with Project Approval (05-0021) and the MOP, the Mine currently operates under a number of management plans and monitoring programmes, including the following:

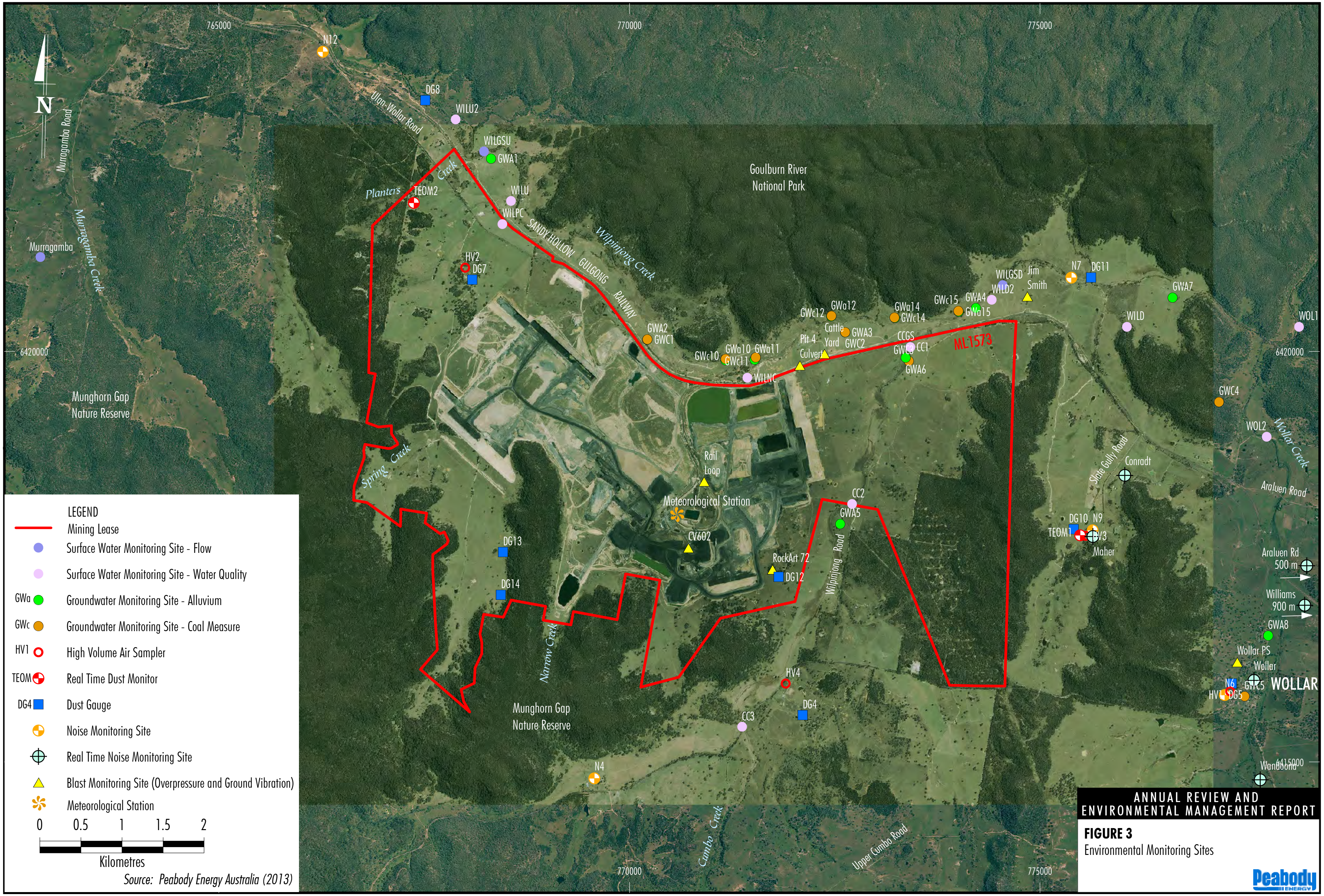
- Environmental Management Strategy (EMS).
- Environmental Monitoring Programme.
- Bushfire Management Plan.
- Blast Management Plan (BMP).
- Noise Management Plan (NMP).
- Air Quality and Greenhouse Gas Management Plan (AQGHGMP).
- ACHMP.
- SWMP including:
  - Site Water Balance;
  - Erosion and Sediment Control Plan;
  - Surface Water Management and Monitoring Plan (SWMMP);
  - Surface and Ground Water Response Plan (SGWRP); and
  - Groundwater Monitoring Programme (GMP).
- Rehabilitation and Landscape Management Plan, including:
  - RMP.
- Spontaneous Combustion Management Plan (SCMP).

Copies of the above management plans and monitoring programmes are publically available on the Peabody website (www.peabodyenergy.com).

The Pollution Incident Response Management Plan (PIRMP) was prepared and implemented in accordance with the NSW *Protection of the Environment Operations Act, 1997*. The PIRMP provides information regarding pollution incidents and the appropriate response and reporting procedures.

3.2 ENVIRONMENTAL RISK IDENTIFICATION

In accordance with the MREMP Guidelines, the Environmental Risk Identification undertaken by Thiess as part of the MOP development has been included in this Annual Review and Environmental Management Report and is presented in Table 12.



ANNUAL REVIEW AND ENVIRONMENTAL MANAGEMENT REPORT

FIGURE 3
Environmental Monitoring Sites

WIL-12-11 AR&EMR_201C

Table 12
WCPL Mining Operations Risk Matrix

Area	Activities	**Dust Generation/ Air Quality**	**Spontaneous Combustion**	**Spills**	**Noise Generation**	**Cultural Heritage Management**	**Erosion and Sediment Control**	**Hazardous/ Regulated Waste and Chemical Management**	**Blasting**	**Flora/Fauna**		**Topsoil**
		Air pollution off-site including dust, odour, impact on visual amenity	Air pollution off-site including dust, odour, impact on visual amenity	Off-site water impacts	Excess noise	Impacts on cultural heritage objects	Off-site water impacts	Off-site water impacts	Excess noise	Flora/Fauna clearance	Threatened flora/fauna clearance	Insufficient topsoil to rehabilitate site
CHPP	Crushing/loading/ processing	x	x		x							
	Stockpiling		x		x							
Mining	Clear and grub	x			x	x				x	x	
	Topsoil stripping/stockpiling	x			x	x						x
	Load and haul and dozer push	x	x		x	x						
	Water storage and movement			X			x	x				
	Tailings			X								
	Rehabilitation											x
	Heavy vehicle and light vehicle movement	x										
Administration	Administrative tasks											x
Drill and Blast	Drill and blast	x			x	x			x			

Source: Thiess (2012).

All mining operations during the 2012 review period were undertaken by Thiess (Section 1).

As discussed in the MOP, a range of environmental management plans have been developed in accordance with Project Approval (05-0021), and contain detailed risk identification and mitigation strategies.

3.3 METEOROLOGICAL MONITORING

In accordance with Condition 22, Schedule 3 of Project Approval (05-0021), on-site meteorological monitoring was conducted during the 2012 review period, in a manner that complies with the requirements set out in the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* guideline (DEC, 2007).

The location of the meteorological station is shown on Figure 3. The meteorological station is maintained by a WCPL contractor (i.e. Advitech), and calibration checks are routinely conducted by appropriately accredited technicians to ensure the maintenance of accurate measurements and calibration.

The meteorological station monitors the following parameters:

- rainfall;
- relative humidity;
- temperature – measured at 2, 10 and 60 metres (m) above ground level;
- wind speed – horizontal and vertical;
- wind direction – measured at 10 m above ground level;
- sigma theta;
- pasquil stability classification;
- solar radiation; and
- temperature lapse rate.

During the 2012 review period, the temperature probes at 2 m, 10 m and 60 m were replaced during maintenance works carried out in accordance with Condition M4.1 of EPL 12425.

3.3.1 Rainfall

A comparison of the rainfall data recorded during the 2012 review period at the on-site meteorological station is provided in Table 13.

Table 13
Summary of Rainfall Data

	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	2012	66.8	105.6	150.0	23.8	48.8	34.2	60.6	13.4	35.4	4.2	20.8	65.6
Cumulative Rainfall (mm)	2012	66.8	172.4	322.4	346.2	395.0	429.2	489.8	503.2	538.6	542.8	563.6	629.2

Source: Peabody (2013).
Note: Recorded using on-site Automatic Weather Station.
mm = millimetres.

The month with the highest total rainfall recorded during the 2012 review period was March with approximately 150 mm of rainfall being recorded (Table 13). The total cumulative annual rainfall recorded for the year (approximately 630 mm) (Table 13) was below the average inferred long-term cumulative annual average rainfall of approximately 653 mm at the Mine.

Chart 2 presents a comparison of monthly rainfall data from the on-site meteorological station over recent years (i.e. 2006 to 2012). A significantly higher amount of rainfall was recorded during January, February and March during the 2012 review period, than was recorded during the previous review period. State-wide climate data suggests that this event was influenced by the La Nina cycle which had a major influence on rainfall in NSW during the first quarter of the year (Commonwealth Bureau of Meteorology [BoM], 2013a).

Chart 2 also presents the long-term average rainfall from 1994 to 2013 for the BoM Mudgee Airport Automatic Weather Station (BoM, 2013b). From the chart it is evident that rainfall in the last quarter of 2012 was below both the recent average and long-term average rainfall trends.

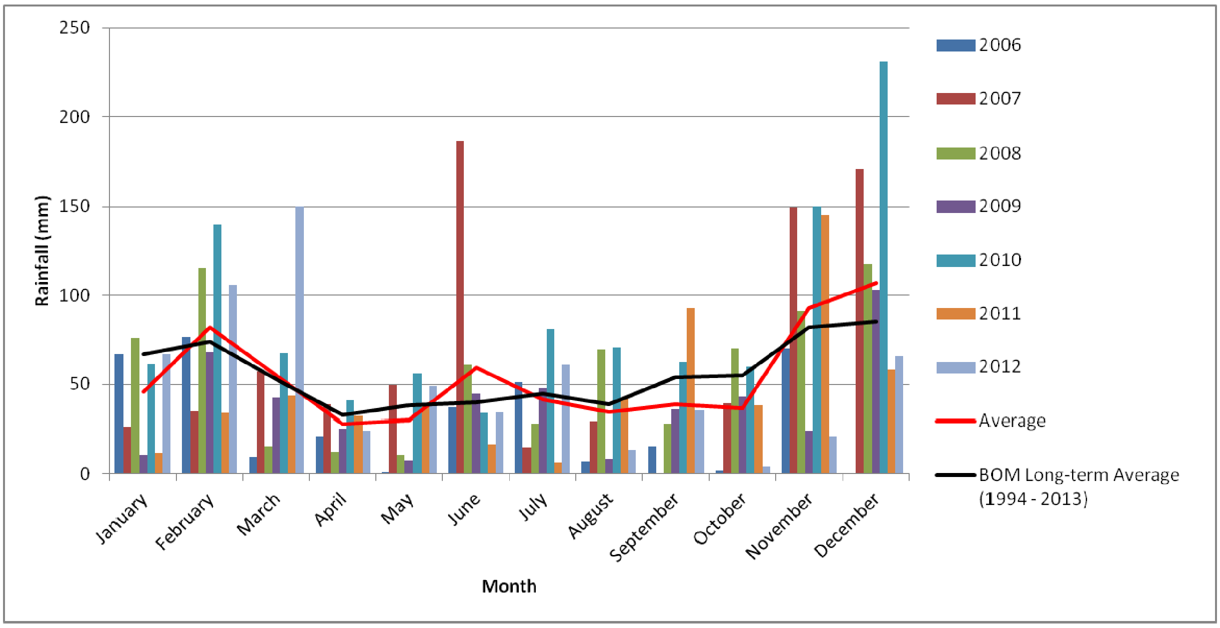


Chart 2 Monthly Rainfall Totals 2006 – 2012

3.3.2 Temperature

A summary of the temperature data recorded during the reporting period at the on-site meteorological station is provided in Table 14.

Table 14
Summary of Temperature Data

Month (2012)	Air Temperature (°C at 2 m)^			Air Temperature (°C at 10 m)#			Air Temperature (°C at 60 m)^		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
January	10.10	34.50	22.06	10.70	33.90	21.93	11.40	33.00	21.46
February	12.00	31.60	21.09	12.40	30.80	20.99	12.70	29.90	20.57
March	6.30	30.30	19.33	6.90	29.90	19.20	7.80	28.90	18.93
April	2.60	29.40	16.26	3.20	28.70	16.32	4.30	27.90	16.40
May	-1.40	25.80	10.62	-0.80	25.40	10.82	0.40	24.60	11.41
June	-1.90	20.70	9.12	-1.50	20.30	9.27	-0.50	19.50	9.56
July	-2.20	18.20	8.13	-1.50	18.10	8.31	0.00	17.60	8.86
August	-2.50	22.70	8.84	-1.70	22.10	9.06	0.10	21.30	9.60
September	-2.20	29.00	13.35	-1.80	28.40	13.48	-0.50	27.40	13.86
October	1.70	32.10	16.50	2.20	31.50	16.58	3.30	33.70	16.62
November	8.10	39.00	21.07	8.90	38.10	21.00	10.50	36.90	20.57
December	7.60	39.00	23.41	8.50	38.50	23.28	9.30	37.50	22.73

Source: Peabody (2013).
°C = degrees Celsius.
^ = recorded at station M3.
# = recorded at station M4.

The highest recorded temperature was 39°C (at 2 m) recorded in November and December (Table 14). The lowest recorded temperature was -2.5°C (at 2 m) recorded in August (Table 14).

3.3.3 Wind Speed and Direction

The annual wind rose data from the on-site meteorological station is shown on Figure 4. Over the 2012 review period, the wind was predominately from an east-southeast direction, with the exception of winter where the wind was predominately from the west-northwest (Figure 4).

Wind speed recorded during the 2012 review period showed an average monthly wind speed range between approximately 1.4 metres per second (m/s) and approximately 2.8 m/s. Maximum recorded wind speed recorded from the on-site meteorological station occurred in January 2012 (11 m/s). Monthly wind speed results are presented in Table 15.

Table 15
Monthly Wind Speeds for 2012

Month	Average Wind Speed (m/s)	Maximum Wind Speed (m/s)
January	2.8	11.0
February	1.9	7.4
March	2.1	8.9
April	1.4	7.4
May	1.4	9.2
June	1.6	7.2
July	1.5	6.9
August	1.9	8.5
September	1.9	10.0
October	2.1	7.5
November	2.6	9.6
December	2.8	10.7

Source: Peabody (2013).

Note: All wind speed data recorded at meteorological station M4.

3.4 AIR QUALITY

3.4.1 Background

Air quality management and mitigation measures were undertaken in accordance with the AQGHGMP (approved by the Director-General of the Department of Planning in February 2006) in accordance with Condition 21, Schedule 3 of Project Approval (05-0021). Since then, the AQGHGMP has undergone periodic revisions, the latest being approved by the DP&I in September 2011.

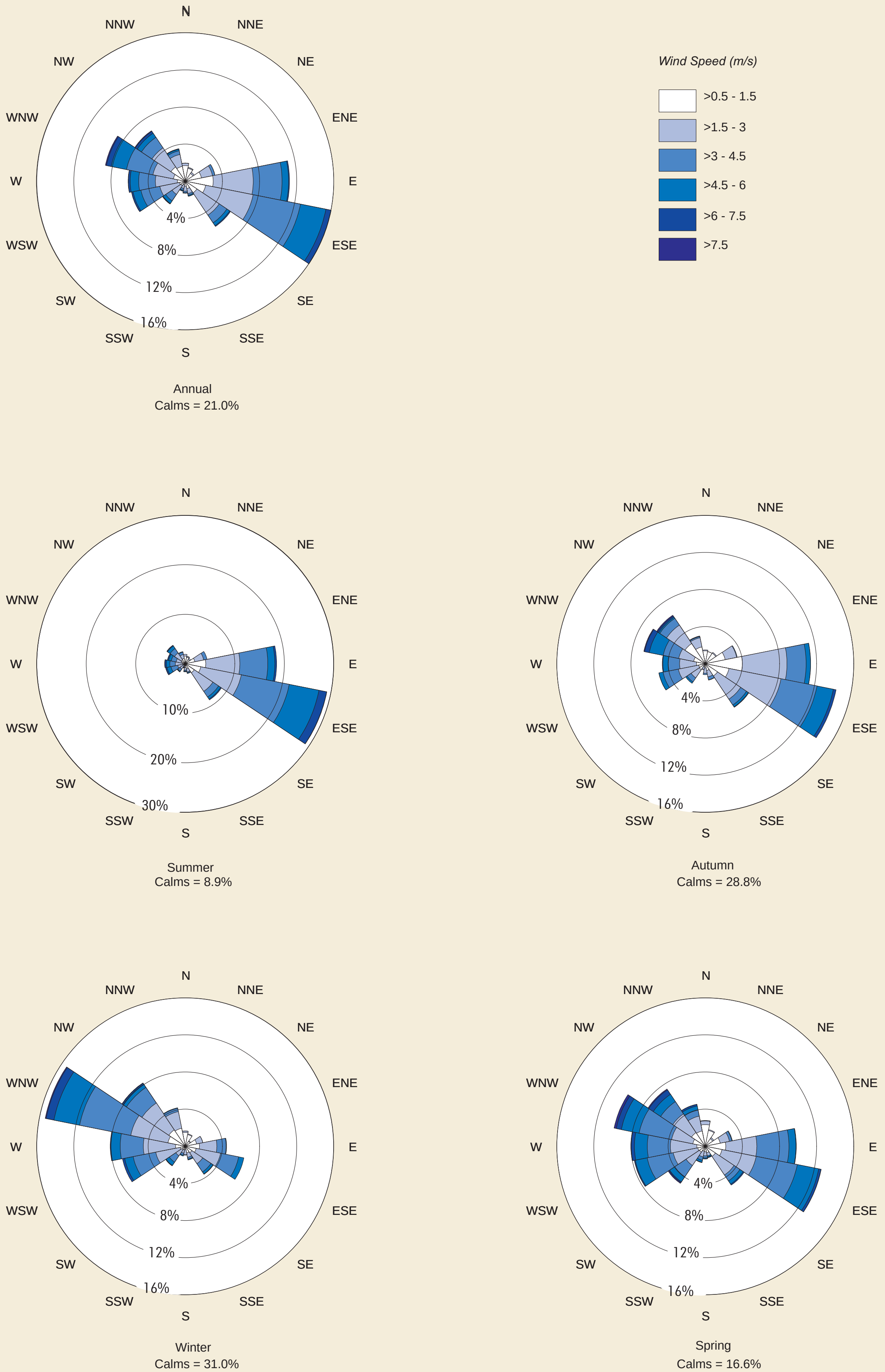
As outlined in Section 9.1 of the AQGHGMP, a Standard Protocol has been designed to facilitate the day-to-day management of dust emissions arising from activities at the Mine. Operations at the Mine during the 2012 review period were carried out in accordance with the MOP and Condition 16 of the ML 1573.

Air quality monitoring results for 2012 are provided in Appendix G.

3.4.2 Monitoring

During the 2012 review period, air quality monitoring was carried out using dust deposition gauges and equipment to monitor suspended particulates. The relevant air quality parameters recorded during the reporting period include the following:

- total suspended particulate (TSP) matter;
- particulate matter less than 10 micrometres (PM_{10}); and
- deposited dust.



Source: Pacific Environment Limited (2013)

ANNUAL REVIEW AND ENVIRONMENTAL MANAGEMENT REPORT

FIGURE 4

Annual Seasonal Windroses

Peabody ENERGY

WIL-12-11 AR&EMR_008A

In accordance with the AQGHGMP, the WCPL air quality monitoring network consists of the following components:

- nine dust deposition gauges to measure deposited dust fall out;
- three high volume air samplers (HVAS) to measure 24-hour average PM_{10} concentrations on a continuous six day cycle;
- one HVAS to monitor TSP concentrations on a continuous six day cycle;
- two Tapered Element Oscillating Microbalances (TEOM) to measure 24-hour real time PM_{10} concentrations continuously; and
- one Automatic Weather Station.

Figure 5 presents the air quality monitoring locations within and surrounding the Mine, in accordance with the AQGHGMP. A summary of the air quality monitoring programme is presented in Table 16.

Table 16
Summary of Air Quality Monitoring Programme

Monitoring Parameter	Monitoring Locations#	Frequency
Dust Deposition	DG4, DG5, DG7, DG8, DG10 and DG11	Monthly.
	DG12, DG13 and DG14 (Aboriginal rock art sites)	Monthly (when mining within 1 km of the rock art site).
High-Volume Air Sampling	HV1, HV2 and HV4	Continuous six day cycle.
TSP	HV3	Continuous six day cycle.
Real Time (PM_{10})*	TEOM1 and TEOM2	Continuous (24 hour average).

\# Refer to Figure 5.

* TEOM data is not for compliance, but for management purposes only in accordance with Condition 20(c), Schedule 3 of Project Approval (05-0021).

3.4.3 Assessment of Environmental Performance

Impact Assessment Criteria

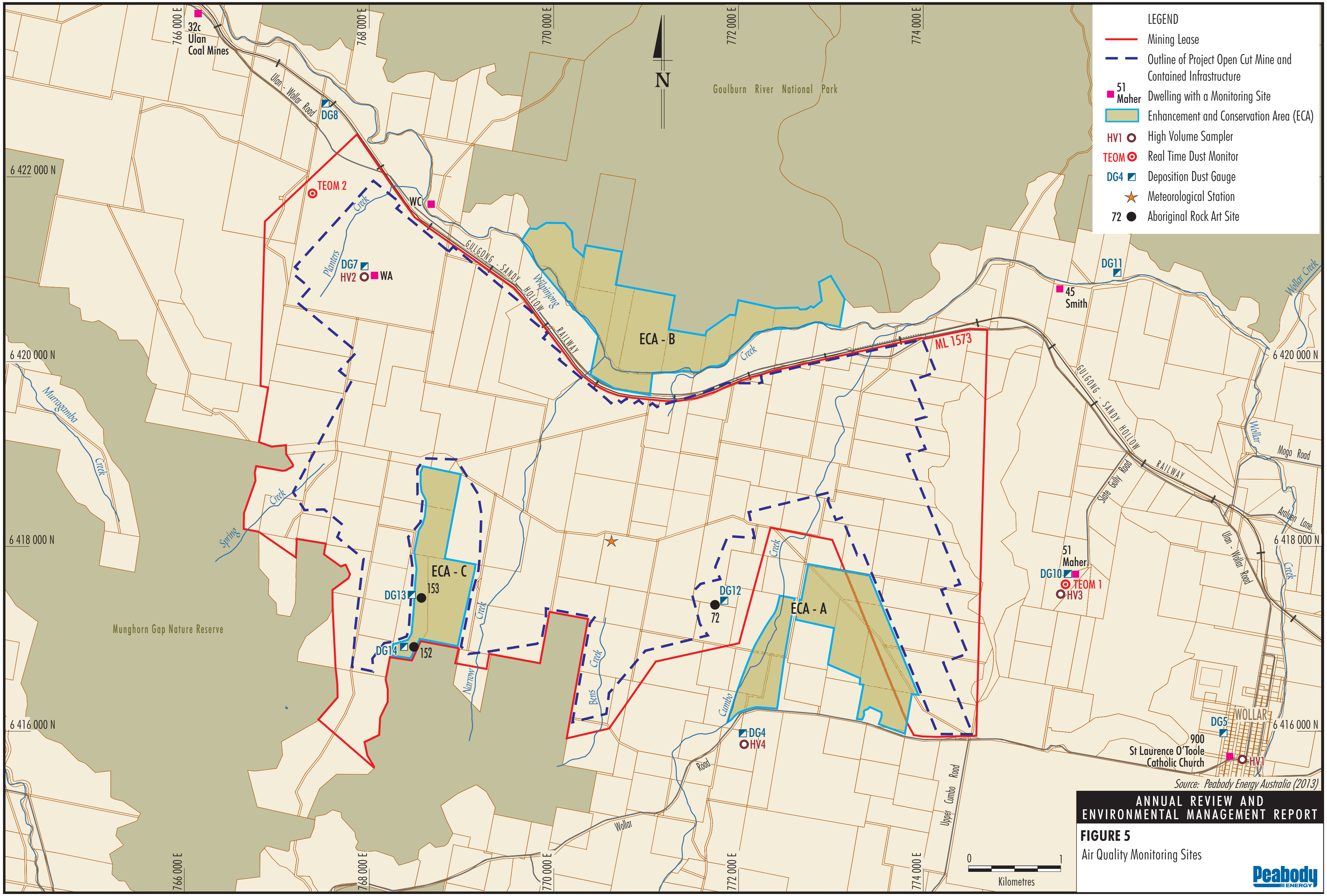
Condition 18, Schedule 3 of Project Approval (05-0021) stipulates the criteria for deposited dust, PM_{10} and TSP, as presented in Table 17.

Table 17
Air Quality Impact Assessment Criteria

Pollutant	Averaging Period	Maximum Increase (from the Mine)	Criterion
Deposited dust	Annual	2 g/m^2/month	4 g/m^2/month
PM_{10}	Annual	-	30 $\mu g/m^3$
PM_{10}	24 hour	-	50 $\mu g/m^3$
TSP	Annual	-	90 $\mu g/m^3$

g/m^2/month = grams per square metre per month.

$\mu g/m^3$ = micrograms per cubic metre.



ANNUAL REVIEW AND ENVIRONMENTAL MANAGEMENT REPORT

FIGURE 5

Air Quality Monitoring Sites

Peabody

WIL-12-11 AR&EMR_003A

Condition 19, Schedule 3 of Project Approval (05-0021) outlines land acquisition criteria relevant to the Mine, as presented in Table 18.

Table 18
Air Quality Land Acquisition Criteria

Pollutant	Averaging Period	Maximum Increase (from the Mine)	Criterion
Deposited dust	Annual	2 g/m^2/month	4 g/m^2/month
PM_{10}	Annual	-	30 $\mu g/m^3$
PM_{10}	24 hour	-	50 $\mu g/m^3$*
	24 hour	-	150 $\mu g/m^3$^
TSP	Annual	-	90 $\mu g/m^3$

* Incremental increase in PM_{10} concentrations due to the mine alone.
^ Background PM_{10} concentrations due to all other sources plus the incremental increase in PM10 concentrations due to the mine alone.

Performance Indicators

Table 19 presents WCPL's internal air quality performance indicators for deposited dust and PM_{10}.

Table 19
Internal Air Quality Performance Indicators

Pollutant	Monitoring Point[#]	Averaging Period	Performance Indicator[1]
Deposited dust	DG4	Annual	3 g/m^2/month
PM_{10}	HV1, HV2, HV3 HV4	24 hour	37.5 $\mu g/m^3$
		Annual	25 $\mu g/m^3$
	TEOM1, TEOM2	24 hour	50 $\mu g/m^3$

1 Indicative performance indicators only – to be reviewed and updated with ongoing monitoring results and operational experience.
\# Refer to Figure 5.

Deposited Dust

Annual average dust deposition data for the 2012 review period is summarised in Table 20.

Table 20
Summary of Annual Average Dust Deposition

Parameter	DG4	DG5*	DG7	DG8	DG10	DG11	DG12	DG13	DG14
2012 Annual Average Total Insoluble Matter (g/m^2/month)	1.1	0.7	1.5	1.0	1.2	1.4	6.5	2.4	2.2

Source: Peabody (2013).
* The 4 g/m^2/month limit only applies to DG5, the limit has been removed from all other dust gauges by the EPA.

Dust deposition results for DG5 during the 2012 review period were below Project Approval (05-0021) long-term impact assessment criteria for annual maximum total deposited dust levels of 4 g/m^2/month (averaged over a 12 month period) (Table 20). Accordingly, the dust deposition results for DG5 are also below the long term land acquisition criteria. In addition, the dust deposition levels recorded at DG4 were also below the WCPL performance indicator of 3 g/m^2/month (Table 20).

The 4 g/m^2/month dust deposition limit no longer applies to monitoring sites DG4, DG7, DG8, DG10 and DG11. These limits were removed by the EPA as the gauges are now situated on mine-owned land and no longer represent sensitive locations. The 4 g/m^2/month dust depositional limit has also been removed by the EPA from DG12, DG13 and DG14 monitoring locations. These limits were removed as the gauges monitor impacts on Aboriginal art sites not human health. DG5 still has the 4 g/m^2/month dust depositional limit as this gauge is located in Wollar.

It was noted that during the 2012 review period, average dust deposition levels at DG12, DG13 and DG14 (Aboriginal Rock Art sites) were above their usual dust levels (Table 20). Upon identification, the air quality monitoring protocol was implemented. The investigation involved consideration of previous monitoring results in conjunction with prevailing and preceding conditions relevant to the locations of DG12, DG13 and DG14. The investigation concluded the following:

- DG12 – High deposited dust concentrations were recorded throughout the year with the highest recordings in May (9.3 g/m^2/month), August (10.9 g/m^2/month) and October (13.6 g/m^2/month). These higher recordings appear to be influenced by the progression of mining closer to the recording site. A rock art specialist has been engaged to assess the rock art site and to advise on any potential dust impacts and controls. Work is continuing to improve the existing dust control strategies.
- DG13 – High deposited dust concentrations were monitored in March (4 g/m^2/month) and November (6.6 g/m^2/month) (Appendix G). This was caused by cattle grazing in the paddock surrounding the dust gauge. Once the cattle were removed from the paddock, monitored dust concentrations returned to normalised levels.
- DG14 – High deposited dust concentrations were monitored in April (14.5 g/m^2/month). As was the case for DG13, this was caused by cattle grazing in the paddock surrounding the dust gauge. Once the cattle were removed from the paddock, monitored dust concentrations returned to normalised levels.

The *Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment* (WCPL, 2010) concluded that the annual average background dust deposition rate is 1.5 g/m^2/month. A comparison of the deposited dust deposition results for the 2012 review period against the pre-mining dust deposition rate, indicated that the Mine is complying with Project Approval (05-0021) criteria of a maximum increase of 2 g/m^2/month from the Mine (when considering those monitoring sites that are for compliance purposes).

Comparison with Data from Previous Years

The deposited dust levels at the Mine have been generally consistent with the levels recorded during the 2011 period, with the exception of DG10 which experienced a significant reduction in dust deposition levels, and DG12 which experienced a significant increase in dust deposition levels as discussed above (Chart 3).

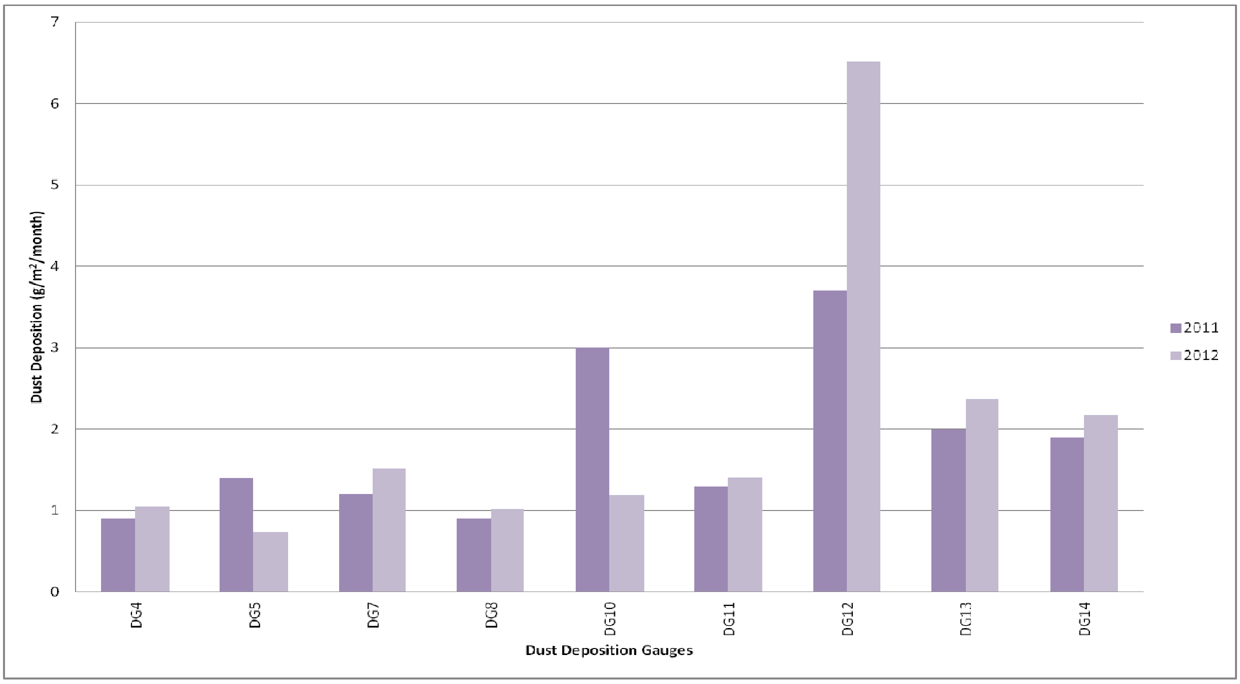


Chart 3 Annual Average Dust Deposition Results 2011-2012

Chart 4 presents the monthly dust deposition data for the dust monitoring sites from June 2006 to the end of the 2012 period. From the data it is apparent that the deposited dust levels at compliance site DG5 have been generally consistent and historically below the Mine criteria of 4 g/m^2/month (as an annual average).

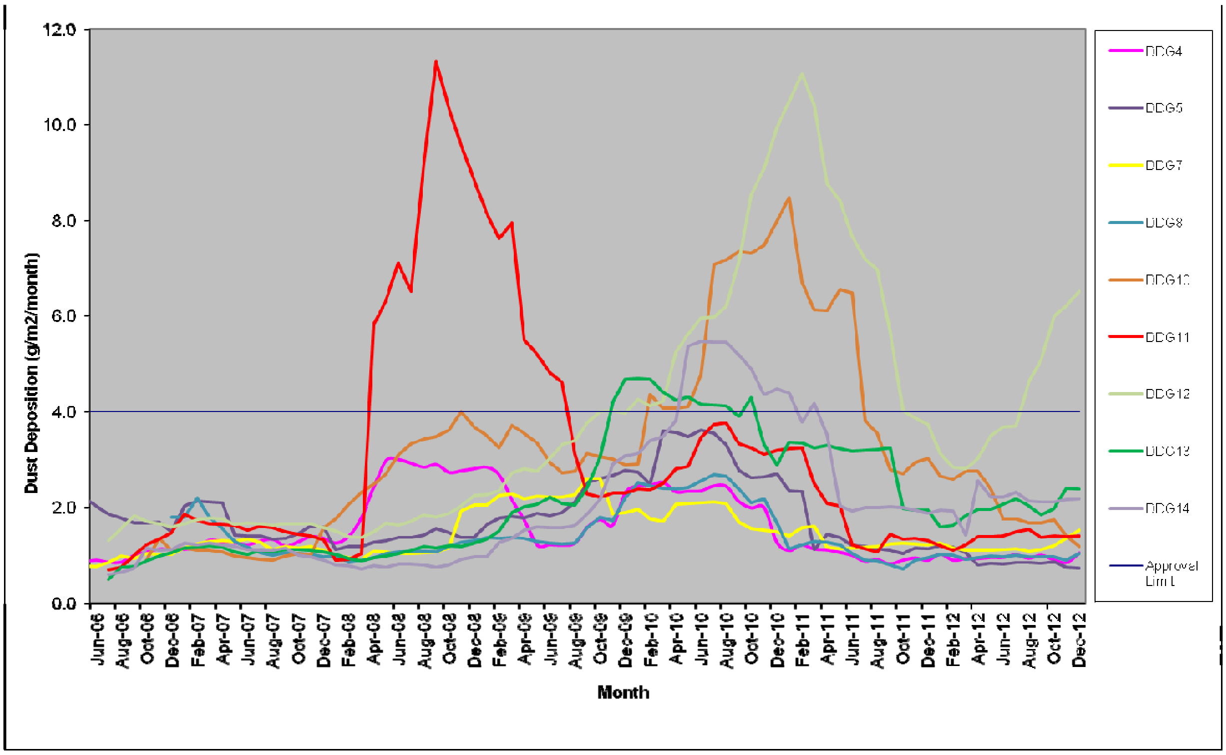


Chart 4 Annual Average Dust Deposition Results 2006-2012

PM_{10} and TSP

Four HVASs and two TEOMs were utilised to monitor particulate matter during the reporting period. The results are summarised in Table 21.

Table 21
Summary of Air Quality Results

	Monitoring Locations[#]					
EPL 12425 ID No.	**13**	**16**	**19**	**20**	**22^**	**23^**
Monitoring ID No.	**HV1**	**HV2**	**HV3**	**HV4**	**TEOM2**	**TEOM1**
PM_{10} (µg/m^3) recorded range*	2.8 – 21.7	3.1 – 47.6	-	12.0 – 21.8	0.1 – 50.8	3.4 – 60.3
PM_{10} (µg/m^3) annual average	9.1	13.6	-	9.7	9.9	13.4
TSP (µg/m^3) recorded range*	-	-	1.9 – 47.0	-	-	-
TSP (µg/m^3) annual average	-	-	18.8	-	-	-

Source: Peabody (2013).

* Data presented is the range of minimum and maximum 24 hour averages.

^ Data recorded at these sites is not for compliance, but for management purposes only.

[#] Refer to Figure 5.

The measured maximum 24-hour average PM_{10} concentrations at all compliance sites did not exceed the 50 µg/m^3 short-term impact assessment criterion for particulate matter on any occasion during the reporting period (Table 21).

The average annual PM_{10} concentrations recorded at HV1 (9.1 µg/m^3), HV2 (13.6 µg/m^3), HV4 (9.7 µg/m^3), TEOM1 (13.4 µg/m^3) and TEOM2 (9.9 µg/m^3) were below the criteria limit of 30 µg/m^3 for average annual PM_{10} concentrations (Table 21).

The average annual TSP concentrations recorded at HV3 (18.8 µg/m^3) were below the criteria limit of 90 µg/m^3 for average annual TSP concentrations (Table 21).

The average 24-hour PM_{10} concentrations recorded at the TEOMs during the 2012 period are presented on Chart 5 below. The TEOM data is only for internal WCPL management and not for compliance purposes, and hence a criteria line is not presented. All recordings are below 50 µg/m^3, except for 25 October 2012 where results above 50 µg/m^3 were recorded at both TEOMs.

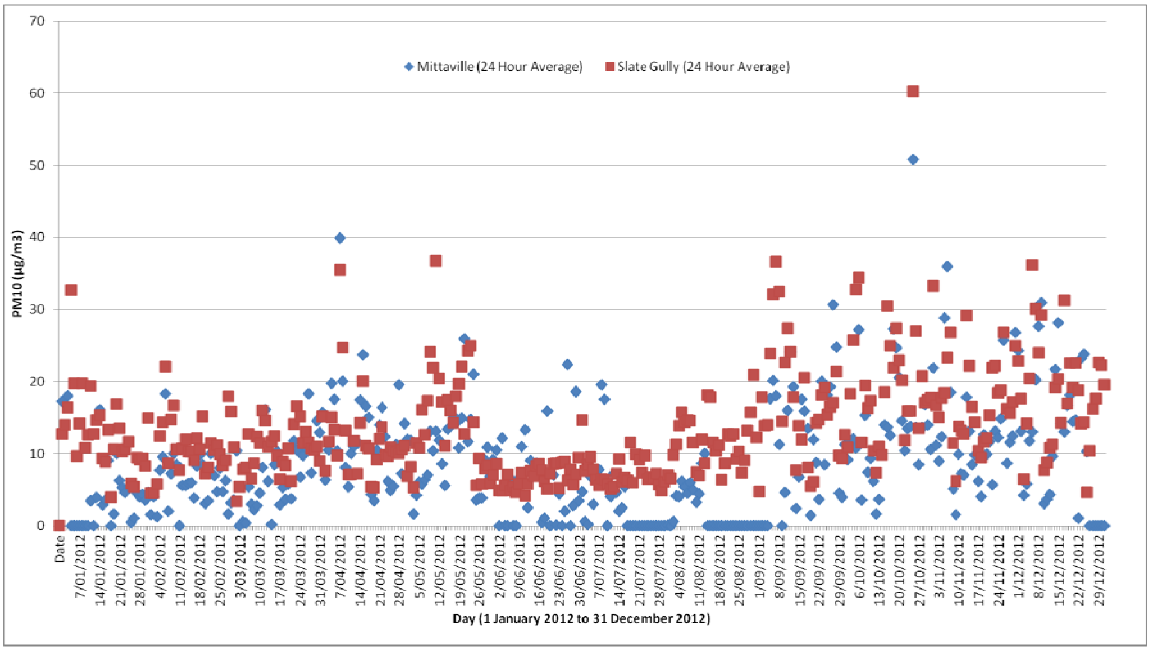


Chart 5 24-hour PM_{10} Concentrations for TEOM1 and TEOM2 During 2012

Comparison with Data from Previous Years

Chart 6 presents the annual average PM_{10} concentrations for HV1, HV2 and HV4 for the period from 2006 to 2012. Chart 7 presents the annual average TSP concentration for HV3 for the period from 2006 to 2012. Chart 8 presents the monthly average PM_{10} concentration for TEOM1 (Slate Gully) for the period 2008 to 2012. Chart 9 presents the monthly average PM_{10} concentration for TEOM2 (Mittaville) for the period 2010 to 2012.

When considering the long-term trends, it is apparent that the annual average PM_{10} data collected during the 2012 period is equal to or lower than that recorded during the 2011 period. Similarly, the annual average TSP concentration recorded at HV3 during the 2012 review period was lower than that recorded during the 2011 period.

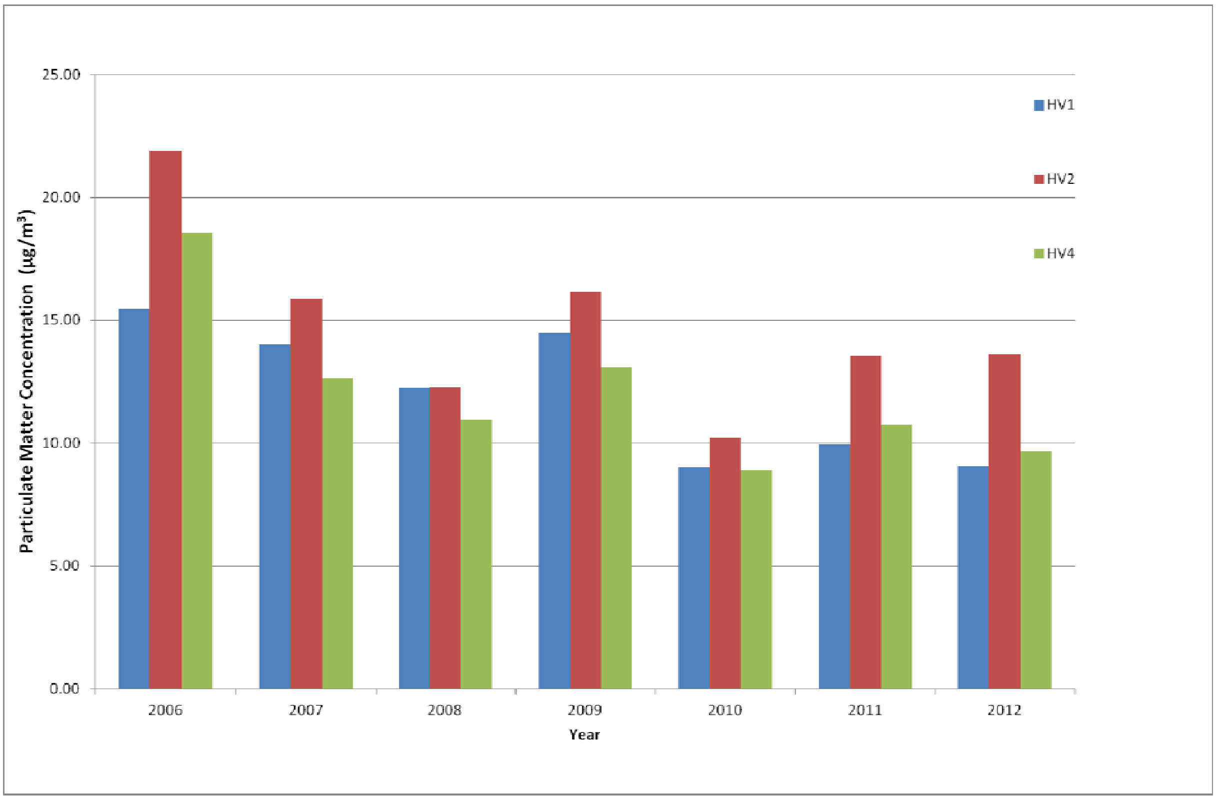


Chart 6 Annual Average PM_{10} Concentrations for HV1, HV2 and HV4 from 2006 – 2012

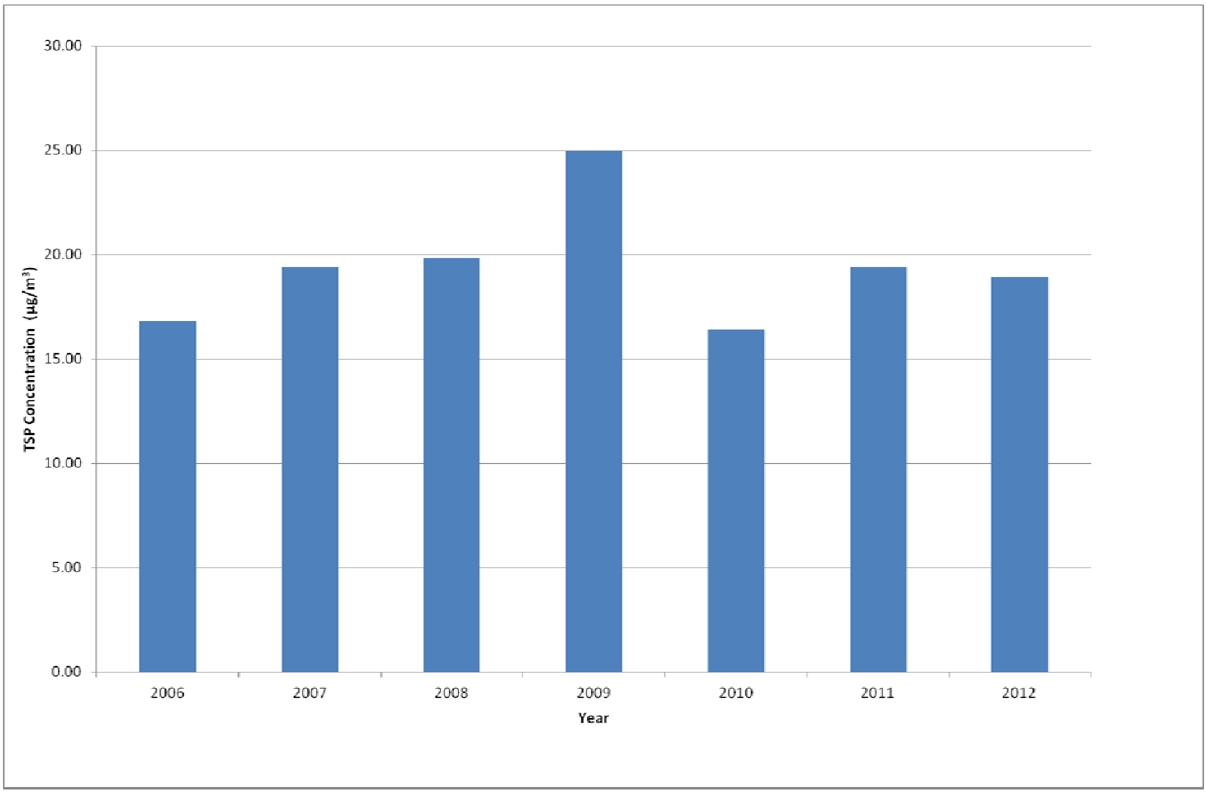


Chart 7 Annual Average TSP Concentration for HV3 from 2006 – 2012

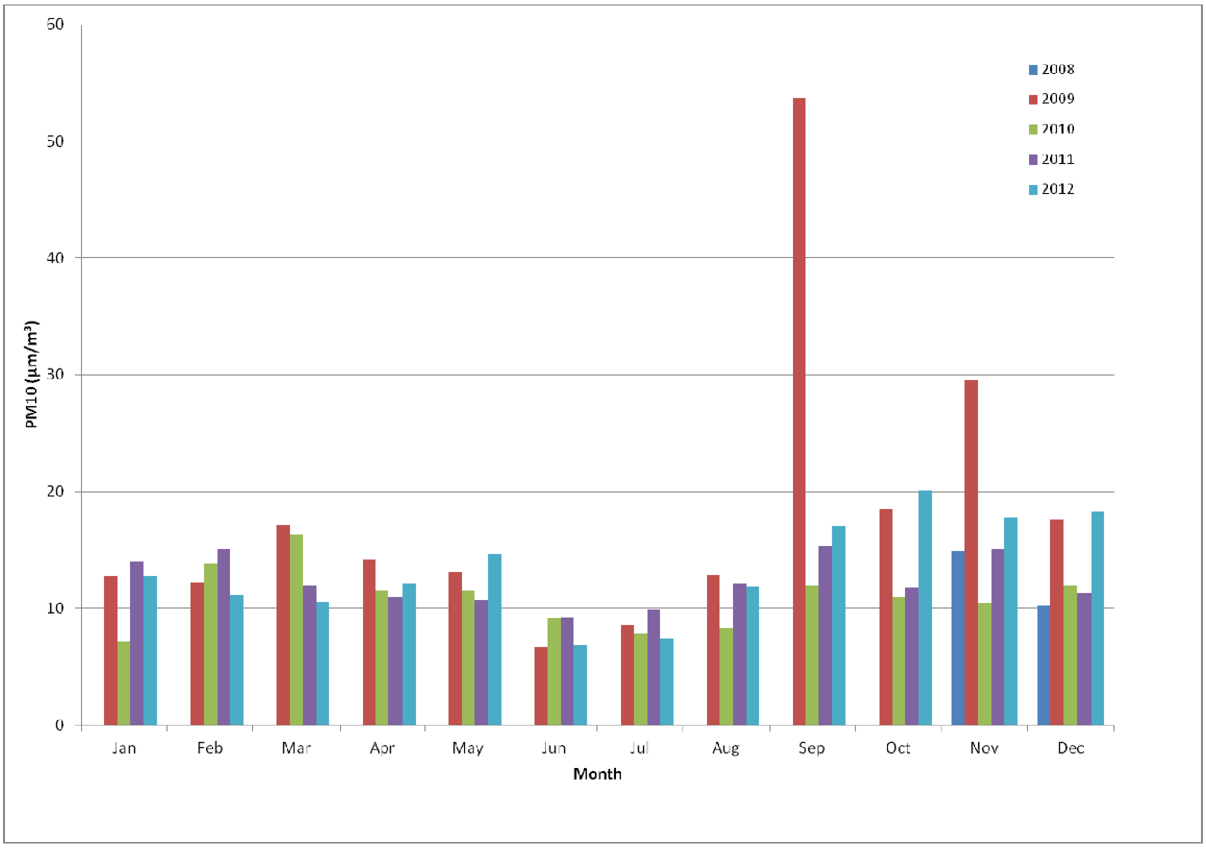


Chart 8 **Monthly Average PM_{10} Concentrations for TEOM1 (Slate Gully) from 2008 – 2012**

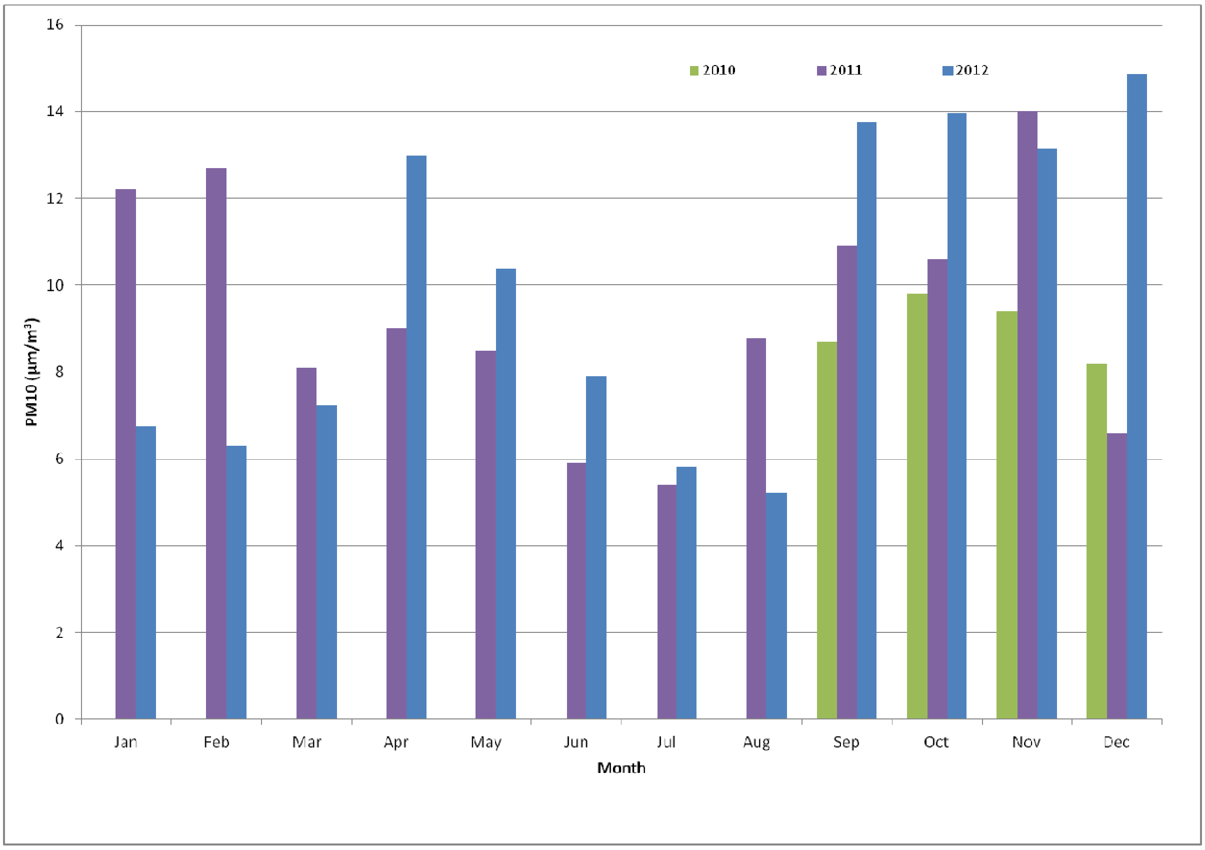


Chart 9 **Monthly Average PM_{10} Concentrations for TEOM2 (Mittaville) from 2010 – 2012**

Comparison with Predictions made in the Environmental Assessment

Monitoring sites HV1, HV3 and HV4 correspond to receiver locations 900 (St Laurence O'Toole Catholic Church), site 58 (Maher property) and site 49 (Harkin property) respectively. No comparable site was available for HV2 as this site is located within ML 1573.

Annual average PM_{10} concentrations were predicted at these receiver locations in the MOD 3 Environmental Assessment for years 2011 and 2014 (WCPL, 2010). The monitoring data recorded for 2012 indicates that annual PM_{10} concentrations are below those predicted for year 2012 in the MOD 3 Environmental Assessment (WCPL, 2010).

At sites HV1 and HV4, the annual average PM_{10} values recorded were 9.1 µg/m^3 and 9.7 µg/m^3, which are below the corresponding impact predictions for the year 2014,of 14 µg/m^3 and 13 µg/m^3, respectively. Site HV3 recorded an annual average TSP value of 18.8 µg/m^3, which is also below the impact predictions for year 2014 of 40 µg/m$^{3.}$

Odour

Condition 16, Schedule 3 of Project Approval (05-0021) requires WCPL to ensure that no offensive odours are emitted from the site, as defined under the *Protection of the Environment Operations Act, 1997*. The SCMP has been developed and implemented to prevent and reduce the potential impacts associated with spontaneous combustion (Section 3.13).

Reportable Incidents

An environmental incident in relation to air quality control at the Mine during the 2012 review period is detailed in Table 22.

Table 22
Summary of Reportable Incidents Relating to Particulate Matter

Date of Incident	Description of Incident	Action Taken
25/10/2012	PM_{10} particulate level recorded above internal action limit (TEOM1 and TEOM 2).	Initial actions taken to reduce dust emissions: • stopping of all work on spontaneous combustion at stockpile 11; • changing the activities occurring in the pit; and • increasing the water carts. At 11.30 am all pit operations ceased, and apart from one dozer at the CHPP and the water carts, all mining equipment was shut down across the site. Operations did not recommence until 12.01 am on 26 October 2012.

Source: Peabody (2013).

An additional reportable incident relating to spontaneous combustion involving ROM Stockpile 11 also occurred during the 2012 review period, and is detailed in Section 3.13.

Environmental Complaints

A total of 22 complaints received during the 2012 review period in relation to air quality, and three complaints were received in relation to noise and air quality. It is noted that of these complaints, only four complaints were related to dust, the remaining complaints were related to spontaneous combustion, discussed in Section 3.13. It is noted that in the majority of complaint cases dust levels were within compliance levels, and accordingly no further action was taken. On one occasion a complaint was received in relation to a dust plume as a result of blasting. WCPL identified the source of the dust plume and all work in the area was stopped until wind levels declined.

As discussed in Section 5.1, all complaints were responded to in accordance with the WCPL Complaints Management Procedure.

3.4.4 Management and Mitigation Measures

A number of measures have been implemented to manage and mitigate air quality impacts at the Mine, include the following (WCPL, 2011a):

- watering of haulage roads to minimise the generation of dust;
- clearly defined haul road edges using marker posts to control their locations;
- ripping and revegetation of obsolete roads;
- limiting development of minor roads;
- minor roads used regularly (e.g. for access) will be watered;
- access tracks used by topsoil stripping equipment during their loading and unloading cycle will be watered;
- revegetation of long-term stockpiles not regularly used (i.e. greater than 12 months);
- dust aprons lowered during drilling;
- assessment of meteorological conditions prior to blasting;
- real time monitoring to assist in the implementation of pre-emptive management actions and to avoid potential non-compliances; and
- the shutting down of operations upon the triggering of relevant real time criteria.

Effectiveness of the Control Strategies

Dust control measures were implemented during the reporting period in accordance with the MOP and AQGHGMP. All active haul roads and traffic areas were watered on an appropriate basis using water carts. Water spray was utilised on the ROM bin, and recently stripped areas. All these methods were utilised to minimise the generation of dust, in accordance with Conditions O3.1 and O3.2 of EPL 12425. In addition, the area disturbed by active mining was minimised as far as practicable. These controls were adequate to control dust generation from the Mine during the 2012 review period.

During the 2012 review period, a total of 239.2 excavator hours were lost as a result of air quality triggers, including 99.2 hours lost in October.

3.4.5 Further Initiatives

During the 2012 review period, WCPL undertook a review of the Mine air quality controls, with a view to being able to improve responsive actions to similar conditions in the future. It was noted that the TEOM1 (Slate Gully) site is now closer to the mining operations and further away from private landholders. This is the result of mining progression and the acquisition of adjoining private land by WCPL since EPL 12425 was issued. Accordingly, an application was lodged with the EPA to move both TEOM1 and TEOM2 to sites located closer to the community. This was approved on 20 December 2012, and was implemented in early 2013.

In accordance with Condition 4, Schedule 5 of Project Approval (05-0021), WCPL will review, and if necessary revise, the AQGHGMP within three months of the submission of this Annual Review and Environmental Management Report.

3.5 GREENHOUSE GAS EMISSIONS

3.5.1 Background

Greenhouse gas management measures were carried out in accordance with the AQGHGMP (approved by the Director-General of the Department of Planning in February 2006) prepared consistent with the requirements of Condition 21, Schedule 3 of Project Approval (05-0021). Since then, the AQGHGMP has undergone multiple revisions, the latest being approved by the DP&I in September 2011.

3.5.2 Monitoring

In accordance with the Environmental Monitoring Programme, diesel and electricity usage was recorded during the 2012 review period, which allows for the calculation of carbon dioxide (CO_2) equivalent emissions.

3.5.3 Assessment of Environmental Performance

The greenhouse gas emissions associated with operations at the Mine during the 2012 review period were primarily associated with the following:

- combustion of diesel;
- electricity usage; and
- fugitive emissions of methane and CO_2 as coal is mined.

Greenhouse gas emission estimates for the 2012 review period is presented in Table 23.

Table 23
Estimated Wilpinjong Coal Mine Greenhouse Gas Emissions

Year	ROM Coal (Mt)	Electricity Consumed (kWh)	Diesel Consumed (kL)	CO_2-e Electricity Usage (t)	CO_2-e Diesel Usage (t)	CO_2-e Fugitive Emissions (t)	Total CO_2-e Emissions (t)
2012	14.48	26,328,000	30,202	23,432	80,673	651,633*	755,738

Source: Thiess (2013).

* A NSW default factor was used to calculate these values.

kWh = kilowatt hours.

kL = kilolitre.

3.5.4 Management Measures

In relation to greenhouse gases, the following abatement measures were undertaken during the 2012 review period:

- Minimisation of fuel usage (i.e. diesel) through:
  - encouragement of staff car pooling;
  - plant and equipment maintenance; and
  - operational practices (e.g. unattended plant is not left idling and is switched off as soon as practicable able after use).
- Use of solar power for monitoring equipment and investigations into its use for other operations.

3.5.5 Further Initiatives

In accordance with Condition 4, Schedule 5 of Project Approval (05-0021), WCPL will review, and if necessary revise, the AQGHGMP within three months of the submission of this Annual Review and Environmental Management Report.

3.6 EROSION AND SEDIMENT

3.6.1 Background

Erosion and sediment control measures have been implemented in accordance with the ESCP (approved by the Director-General of the Department of Planning in February 2006). The ESCP was developed in accordance with Condition 31, Schedule 3 of Project Approval (05-0021).

3.6.2 Monitoring

Routine (i.e. monthly) inspections of sediment control structures as well as inspections following rainfall events of 20 mm or more in a 24 hour period are conducted by mine personnel. During these inspections, sediment control structures are inspected for capacity, structural integrity and effectiveness.

3.6.3 Assessment of Environmental Performance

In accordance with the MOP and ESCP, installation of erosion and sediment control works were undertaken during the reporting period, including the installation of permanent structures for infrastructure components and temporary structures for other disturbance areas.

Independent Environmental Audit Compliance

Two issues of non-compliance relevant to erosion and sediment control were identified (against the ESCP) during the Independent Environmental Audit (AECOM, 2012), and these are outlined in Table 24.

Table 24
Independent Environmental Audit Reconciliation – Erosion and Sediment

Reference	Commitment	Audit Finding	Reconciliation
3.1	Construction of sediment fences (downslope of disturbance and stockpile areas) where required.	No sediment fences observed during site inspection, however query this proposed measure as a long-term strategy for controlling sediment on-site.	Sediment fences have now been installed downslope of disturbance areas that pose a reasonable risk of water flowing off-site.
	Sediment dams will generally be dewatered to well-grassed areas where sufficient grassed buffer exists to prevent the migration of sediments to watercourses. Sediment dam waters will only be released if the suspended sediments content meets the relevant criteria (i.e. 50 milligrams per litre [mg/L]) in accordance with Landcom (2004). Flocculent addition will be used if required to meet the relevant release criteria. Where a suitable dewatering area is not available, sediment dams will be dewatered to mine water storages or will be directly re-used as part of initial development activities, such as dust suppression and moisture conditioning of earthworks. Sediment dam batters will be covered with topsoil and/or seeded with a cover crop to assist with minimising the potential for erosion of the dam batters.	Sediment dam waters not released off-site dewatered to mine water storages and re-used. Sediment dam batters not always well stabilised. Whilst sediment dams are routinely monitored for water quality, based on interview, they are not routinely dewatered following rainfall or desilted.	Water from storage dams is not pumped directly off-site. All water discharged from site is treated through the RO plant. Sediment dam batters and water storage areas are maintained as required.

Reportable Incidents

There were no environmental incidents reported in relation to erosion and sediment control at the Mine during the 2012 review period.

3.6.4 Management and Mitigation Measures

In accordance with the ESCP, the following erosion and sediment control measures were implemented during the 2012 review period:

- minimisation of surface disturbance and restriction of access to undisturbed areas;
- progressive rehabilitation/stabilisation of Mine infrastructure areas;
- separation of runoff from disturbed and undisturbed areas;

- surface drains to facilitate the efficient transport of surface runoff;
- sediment dams to contain runoff up to a specified design criterion; and
- sediment fences installed downslope of disturbance areas that pose a reasonable risk of water flowing off site.

The sediment control structures performed adequately during the year, and specifically after rainfall events experienced during February and March 2012. Water from the sediment control system was recycled for on-site use.

The erosion and sediment control strategies currently in place at the Mine were considered adequate to manage erosion and sediment-related risks associated with operational activities during the 2012 period.

3.6.5 Further Initiatives

In accordance with Condition 4, Schedule 5 of Project Approval (05-0021), WCPL will review, and if necessary revise, the ESCP within three months of the submission of this Annual Review and Environmental Management Report.

3.7 SURFACE WATER

3.7.1 Background

Surface water management and mitigation measures were undertaken in accordance with SWMP, approved by the Director-General of the Department of Planning in March 2006. The SWMP was developed in accordance with Condition 32, Schedule 3 of Project Approval (05-0021). WCPL also continued to operate in accordance with the SGWRP, which outlines surface water monitoring triggers, and the SWMMP.

3.7.2 Monitoring

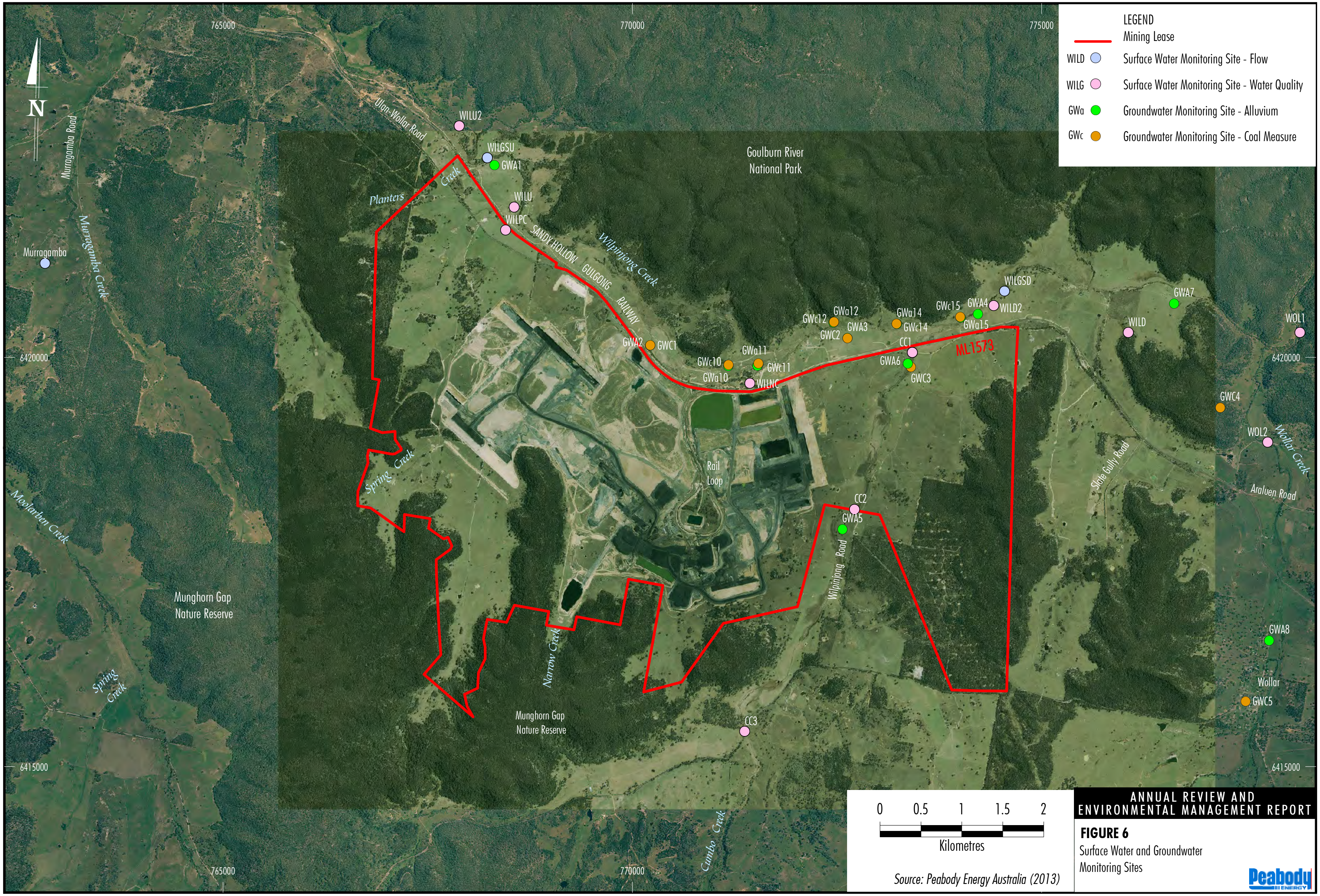
A summary of the surface water monitoring programme is presented in Table 25. The locations of these monitoring sites are presented on Figure 6. Results from the analysis are discussed below.

Table 25
Summary of Surface Water Monitoring Programme

Monitoring Parameter	Monitoring Sites	Frequency
pH, EC, turbidity and SO_4	WIL(U), WIL(U2), WIL(PC), WIL(NC), WIL(D), WIL(D2), CC1 to CC3, WOL1 and WOL2.	Monthly and following significant rainfall events (i.e. greater than 20 mm in 24 hours).
pH, EC, turbidity and SO_4	• Wilpinjong Creek (upstream and downstream) and Cumbo Creek gauging stations. • Site water storages, tailings disposal storages and sediment retention dams.	Monthly.
Flow rate and EC	Wilpinjong Creek (upstream and downstream) and Cumbo Creek gauging stations.	Continuous.
Water level, pH, EC, turbidity and SO_4	Existing waterholes on the McDermott property.	In consultation with individual landholder.
Stream health monitoring	Sections of Wilpinjong Creek and Cumbo Creek.	Annually.
Channel stability monitoring	Long sections of Wilpinjong Creek and Cumbo Creek will be surveyed along the creek alignment.	Every 5 years.

EC = electrical conductivity.
SO_4 = sulphate.

The gauging stations are maintained monthly and the data is reviewed periodically. If equipment failure is observed, the gauging station is repaired as soon as practicable.



WIL-12-11 AR&EMR_203B

3.7.3 Assessment of Environmental Performance

Impact Assessment Criteria

The SWMMP presents the baseline surface water quality ranges for local watercourses in the vicinity of the Mine. A summary of the baseline results are presented in Table 26. Baseline surface water quality monitoring has been undertaken for the Project since June 2004 (generally on a monthly basis and following rainfall events, where possible).

Table 26
Baseline Surface Water Quality Ranges for Local Watercourses

Parameter	Baseline#	
	Minimum	Maximum
EC (µS/cm)	120	12,000
pH	5.8	9.1
SO_4 (mg/L)	7	2,900
Turbidity (NTU)	2	780

Based on baseline range monitoring results specified in the SWMMP.

pH, EC, Turbidity and SO_4

Table 27 provides a summary of the results of the surface water monitoring programme (i.e. minimum and maximum values). A full set of the water quality monitoring results for the 2012 review period are provided in Table H-1 in Appendix H.

Table 27
Summary of Results of Surface Water Monitoring Programme[1]

Parameter	Surface Water Monitoring Location[2]					
	CC1	CC2	CC3	WIL (U)	WIL (U2)	WIL (PC)
EC (µS/cm)	3,310 – 5,400	3,190 – 5,580	2,510 – 3,860	370 – 1,100	390 – 2,520	880 – 3,780
pH (	7.9 – 9.4	7.6 – 9.4	7.9 – 9.3	6.0 – 8.5	6.3 – 7.6	6.1 – 10.3
SO_4 (mg/L)	892 – 1,760	873 – 2,380	866 – 1,660	5 – 19	12 – 73	18 – 279
Turbidity (NTU)	0.2 – 8.4	<0.1 – 151	0.1 – 0.7	6.4 – 34.8	5.3 – 72	2.3 – 278
Parameter	**WIL (NC)**	**WIL (D)**	**WIL (D2)**	**WOL1**	**WOL2**	
EC (µS/cm)	340 – 3,910	1,400 – 3,400	1,490 – 3,400	1,180 – 2,010	890 – 2,420	
pH	6.9 – 8.8	7.5 – 8.9	7.4 – 8.7	8.1 – 9.8	7.3 – 9.9	
SO_4 (mg/L)	33 – 940	171 – 971	239 – 983	137 – 552	105 – 398	
Turbidity (NTU)	1.6 – 7.49	1.0 – 8.9	1 – 6.5	1.6 – 7.7	2 – 14.5	

Source: Peabody (2013).
1 For a full set of water quality monitoring results for the reporting period refer to Table H-1 in Appendix H.
2 Monitoring locations are shown on Figure 6.
mg/L = micrograms per litre.
mS/cm= microSiemens per centimetre.
NTU = nephelometric turbidity units.

Surface water quality monitoring data collected during the 2012 review period for EC were within baseline ranges across all sites.

The majority of monitoring results for sites for Wilpinjong Creek (i.e. WIL[U], WIL[U2], WIL [NC], WIL [D] and WIL [D2]) were within the baseline ranges for pH. Six sites were above the maximum pH baseline value by no greater than 1.2. A high pH level was recorded for site CC1 during February and for sites CC2, CC3, WOL1 and WOL2 during March after which results returned to within the baseline ranges for the remainder of the 2012 review period.

The monitoring results for SO_4 show that levels were below the maximum baseline values across all sites.

Similarly, the monitoring results for turbidity show that the levels were below the baseline value across all sites. Sites CC1, CC2, CC3, WIL(D), WIL (D2) and WOL1 recorded below average turbidity results on several occasions throughout the year.

On-Site Water Storages and Off-site Water Discharges

Monitoring of pH, turbidity, EC and SO_4 was undertaken during February and June 2012 at the following on-site water storages (Figure 2):

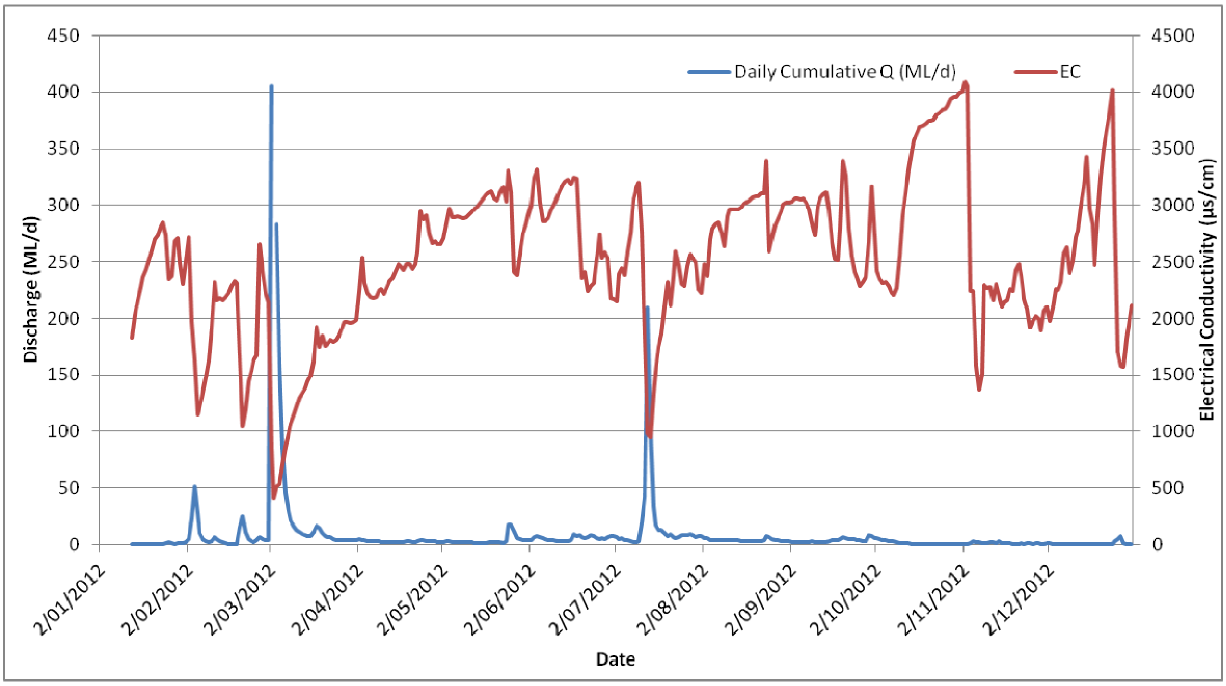
- Raw Water Dam.
- Recycled Water Dam.
- Sediment Control Dams 1 to 9.
- Pit 2.
- Ed's Lake

The monitoring results are presented in Table H-2 in Appendix H.

Flow Rate and EC

WCPL operated three stream gauging stations throughout the 2012 review period. The stations are located upstream and downstream of ML 1573 on Wilpinjong Creek and on Cumbo Creek upstream of the confluence with Wilpinjong Creek (Figure 6). The Cumbo Creek gauging station was hit by lightning during the 2012 review period and no data was recorded prior to 21 October 2012. No EC or pH data was recorded at the Cumbo Creek gauging station from 14 December 2012 onwards due to the sensor cable being destroyed by crows.

The gauging stations monitor stream flow and EC on a daily basis. Charts 10 and 11 demonstrate typical significant reductions in EC levels following rainfall and surface flow events throughout the 2012 review period. Due to the inconsistency of data and no flow data being recorded from 21 October to the end of 2012, no chart is presented for the Cumbo Creek gauging station.



ML/d = megalitres per day.

Chart 10 Downstream Wilpinjong Creek Daily Flow vs Electrical Conductivity

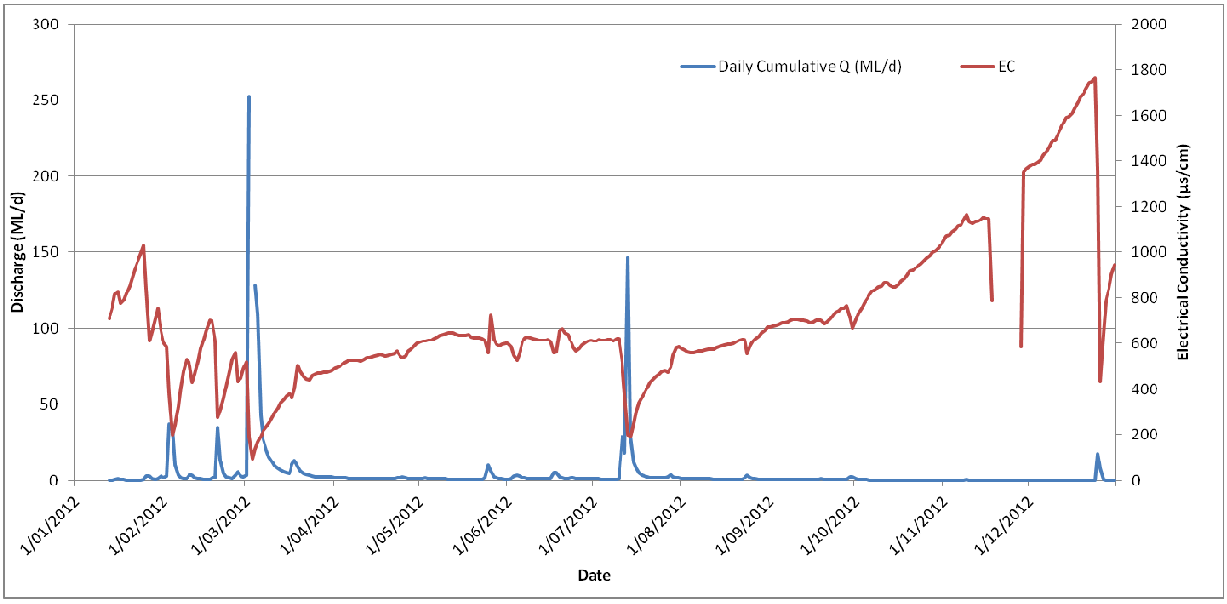


Chart 11 Upstream Wilpinjong Creek Daily Flow vs Electrical Conductivity

RO Plant Release Monitoring

Construction of the RO Plant was completed in June 2012, and approved water releases commenced on 16 June 2012. The total water discharged over the 2012 review period was approximately 182 ML. Chart 12 presents a monthly summary of the RO plant release data during the 2012 review period.

Condition 24, Schedule 3 of the Project Approval (05-0021) specifies that WCPL shall not discharge any water from site or irrigate any waste water on site, except as expressly provide by EPL 12425. On 5 July 2011, EPL 12425 was varied to include monitoring site 24.

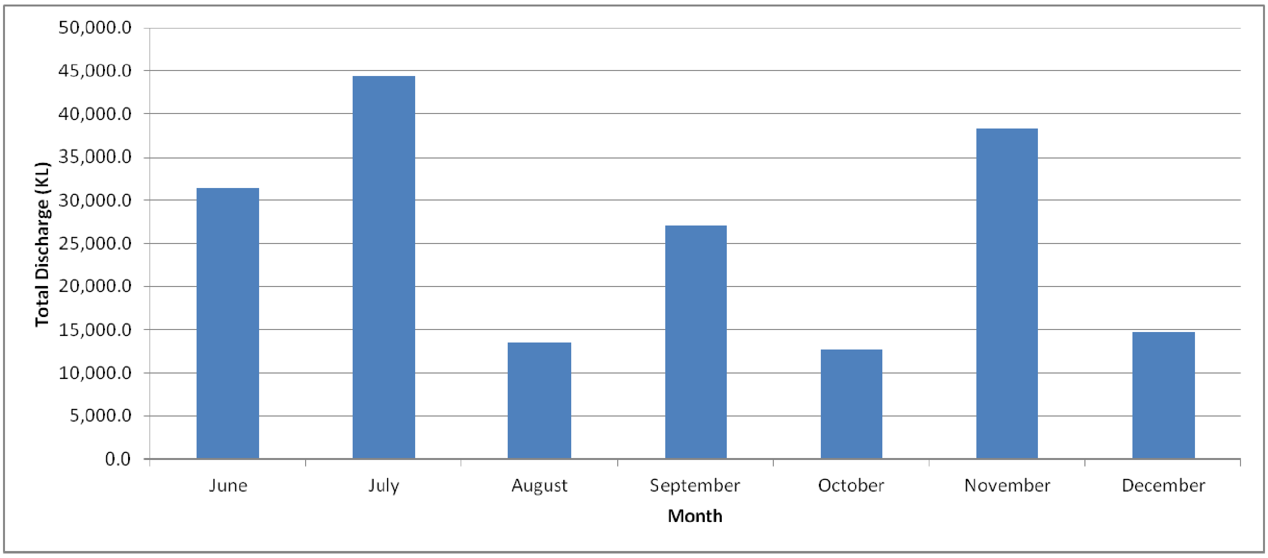


Chart 12 RO Plant Release Data June – December 2012

Stream Health Monitoring

In accordance with the SWMP and Condition 32(d), Schedule 3 of Project Approval (05-0021), stream health monitoring was undertaken by Landline Consulting during the 2012 review period. The 2012 Stream Health Monitoring Report is presented in Appendix A. The findings of this report remain consistent with those in the 2011 and 2010 reports, and a summary of the findings of the 2012 report is provided below.

The survey of aquatic macroinvertebrate fauna at sites within Wilpinjong, Wollar and Cumbo Creeks was undertaken between 11 to 17 September 2012 (Landline Consulting, 2012). At each site, three replicate kick samples were obtained in different riffle/edge sections using a standard 250 µm sampling net. Stream flow was low and stable during most of the survey period, and sampling followed the protocols outlined in the *Australia-Wide Assessment of River Health: New South Wales AusRivAs Sampling and Processing Manual* (Turak and Waddell, 2002).

The fauna assemblage at the monitoring sites in 2012 was similar to that recorded during the 2010 and 2011 surveys, with eight additional families collected during the 2012 survey. The Elmid beetle was the only family that was present in 2010 and 2011 but which was not recorded during the 2012 survey.

The 2012 survey showed some improvement in most stream health indicators at most sites in Wilpinjong Creek, and relatively little change in indicator values at sites in Wollar and Cumbo Creeks.

SIGNAL index scores represent a grading or ranking of pollution sensitivity for macroinvertebrate families (i.e. their tolerance to pollution) (Landline Consulting, 2012). A grading of <4 represents a severely polluted waterway, 4-5 a moderately polluted, 5-6 a mildly polluted and >6 represents a healthy system. Chart 13 presents the SIGNAL Index scores for all monitoring sites recording during the 2012 review period. The majority of the monitoring sites in Wilpinjong and Wollar Creeks reflect a moderately polluted waterway based on the SIGNAL index results for macroinvertebrate abundance. This is an improvement from the 2011 period where Wilpinjong Creek was classified as a severely polluted system based on SIGNAL scores.

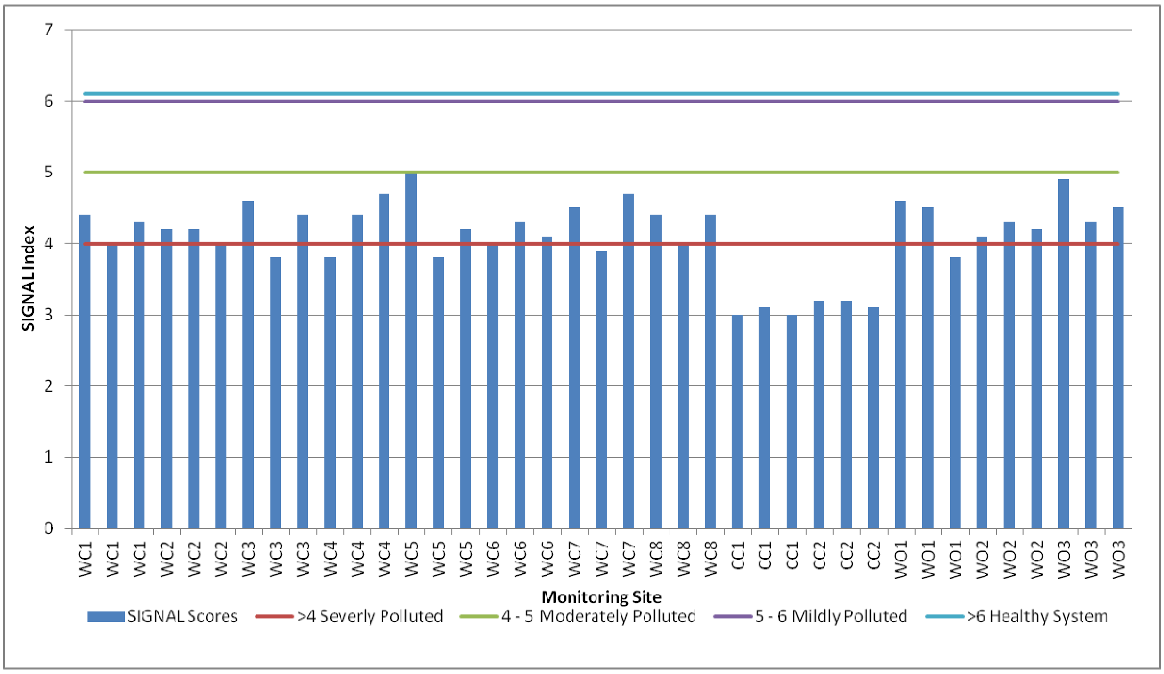


Chart 13 **SIGNAL Index Scores for 2012**

Site CC1 is located on Cumbo Creek, approximately 1 km upstream of Site CC2. During the 2012 survey it was noted that Site CC1 was clogged with *Typha* and the channel bed downstream is muddy and heavily trampled by cattle (Appendix A). Site CC2 is also located on Cumbo Creek, approximately 2 km upstream of the confluence with Wilpinjong Creek. During the 2012 survey it was noted that the creek was severely degraded with no riparian vegetation, few ponded-sections and with muddy to sandy substrate (Appendix A).

These findings are consistent with the findings of the 2011 survey, and suggest an existing poor degraded condition of the Cumbo Creek system.

As detailed in Appendix A, most of the watercourses in the study area have been degraded over a long period of time by physical disturbance including riparian and floodplain clearing, grazing by cattle and kangaroos, and the activities of wombats, rabbits and pigs which have affected bank stability. Wilpinjong and Cumbo Creeks flow intermittently and salinity is naturally high under base flow conditions (Landline Consulting, 2012).

Channel Stability Monitoring

In accordance with the SWMMP and Condition 32(e), Schedule 3 of Project Approval (05-0021), channel stability monitoring is undertaken along Wilpinjong and Cumbo Creeks on a yearly basis. Monitoring results indicated that there was no visible evidence of mining related impacts in the vicinity of the creek, and the discharge of water from the mine has not resulted in creek bed lowering or increased erosion.

A copy of the channel stability monitoring report is provided in Appendix I.

Cumbo Creek Relocation

Conditions 25, 26, 27 and 29 of Schedule 3 of Project Approval (05-0021) relate to the relocation of Cumbo Creek and the preparation of the Cumbo Creek Relocation Plan. Planning has commenced in accordance with Project Approval (05-0021).

Water Supply

In accordance with Condition 23, Schedule 3 of Project Approval (05-0021) and with the Site Water Balance (prepared in accordance with Condition 30, Schedule 3 of Project Approval [05-0021]), sufficient water was available for the Mine during the 2012 review period (i.e. no external water supply sources were required).

As discussed in the Site Water Balance, a predictive model of the performance of the Mine water supply system has been developed, and concluded that no water supply shortfall was predicted, with an estimated supply of reliability of greater than 99%.

Reportable Incidents

There were no environmental incidents reported in relation to surface water management at the Mine during the 2012 review period.

Environmental Complaints

One environmental complaint was received relating to water quality, and this was responded to in accordance with the Complaints Management Procedure (Section 5.1). Concerns were raised by a resident of Wollar regarding the effect that a spontaneous combustion event may have had an effect on the water quality in a water tank. A NATA registered lab was engaged to sample water from the resident's water tank. The results were then assessed against the *Australian Drinking Water Guidelines* (National Health and Medical Research Council, 2011) (the Guidelines). The analysis results were below the limits specified in the Guidelines, aside from zinc, however the level of zinc recorded was not unusual for rainwater harvested from galvanised rooves.

3.7.4 Management and Mitigation Measures

In accordance with the MOP and the SWMP, surface water control structures, works and procedures were implemented during the reporting period. Areas disturbed by active mining were minimised and runoff from catchment areas was isolated and diverted around disturbance areas through the construction of water diversion bunds. Runoff from construction and operation areas was diverted to sediment retention storages across the Mine site. Erosion and sediment control measures were also implemented as described in Section 3.6.4.

The following surface water control strategies were in place at the Mine during the 2012 review period:

- clean water management system containing catchment dams, diversion drains, pumping and water pipe infrastructure;

- dirty water management system containing sediment retention dams, diversion drains, pumping and water pipe infrastructure;
- water holding dams/voids for storage of dirty water or surface water runoff from roads, hardstand and stockpile areas or collected in-pit;
- water treatment facilities including the operation of an RO plant for the treatment of mine water;
- tanks and pipe line infrastructure for the storage and management of potable water; and
- upslope diversions to separate undisturbed and disturbed runoff.

These surface water control strategies were considered adequate to manage surface water-related risks associated with operational activities during the 2012 review period.

3.7.5 Further Initiatives

WCPL will continue to investigate the potential for improvements to the surface water management system over the 2013 review period.

In accordance with Condition 4, Schedule 5 of Project Approval (05-0021), WCPL will review and, if necessary, revise the SWMMP and SGWRP within three months of the submission of this Annual Review and Environmental Management Report.

3.8 GROUNDWATER

3.8.1 Background

Groundwater management and mitigation measures were undertaken during the 2012 review period in accordance with the GMP. The GMP was prepared in accordance with Condition 33, Schedule 3 of Project Approval (05-0021), and was approved by the Director-General of the Department of Planning in March 2006.

In accordance with the MOP and SWMP, the control strategies implemented were considered adequate to manage groundwater-related risks associated with operations during the reporting period.

3.8.2 Monitoring

Table 28 outlines the groundwater monitoring parameters, monitoring locations and frequency of monitoring for the Mine in accordance with the GMP. Groundwater monitoring locations are shown on Figure 6.

Table 28
Summary of the Groundwater Monitoring Programme

Monitoring Parameter	Monitoring Sites[1]	Frequency
Water level, field pH, EC and volume of water extracted	• Open Cut Operations – Main pit sump(s). • Open Cut Operations – Dewatering Bores. • Water Supply Bores – GWs1 to GWs19.	Monthly.
Sodium (Na), Potassium (K), Magnesium (Mg), Calcium (Ca), Chlorine (Cl), Hydrogen Carbondate (HCO_3), SO_4, Total Iron (Fe)	• Wilpinjong Creek – GWa1 to GWa4, GWa7 (Alluvium), GWc1 and GWc2 (Coal Measures). • Cumbo Creek – GWa5 and GWa6 (Alluvium) and GWc3 (Coal Measure). • Wollar Creek – GWc4 (Coal Measures). • Wollar Village – GWa8 (Alluvium) and GWc5 (Coal Measures).	Every six months.
Water level, field pH and EC	• Wilpinjong Creek – GWa1 to GWa4 and GWa7 (Alluvium) and GWc1 and GWc2 (Coal Measures). • Cumbo Creek – Gwa5 and GWa6 (Alluvium) and GWc3 (Coal Measure).	Monthly.
	• Wollar Creek – GWc4 (Coal Measures). • Wollar Village – GWa8 (Alluvium) and GWc5 (Coal Measures).	Quarterly.
Water level, field pH and EC, Na, K, Mg, Ca, Cl, HCO_3, SO_4, and Total Fe	• Landholder bores, wells and waterholes.	In consultation with individual landholders.

1 Monitoring locations are shown on Figure 6.

3.8.3 Assessment of Environmental Performance

Impact Assessment Criteria

Typical baseline EC and pH values are included in the GMP and the SWGRP, and are presented in Table 29.

Table 29
Typical Baseline EC and pH Values by Aquifer Types

Aquifer Type	EC (µS/cm)		pH	
	Average	Maximum	Minimum	Maximum
Alluvium	~2,350	4,100	6.9	8.4
Illawarra Coal Measures	~3,200	6,176	5.6	8.3

Source: WCPL (2006a).

Performance Outcomes

A summary of the groundwater monitoring results for the reporting period is provided in Tables 30 and 31. A complete set of the groundwater monitoring results for the reporting period is provided in Appendix J. Monthly EC, pH and groundwater level results for the alluvial and coal measure aquifer monitoring bores (e.g. GWa1 to GWa8, GWa10 to GWa15, GWc1 to GWc5 and GWc10 to GWc15) are also provided in Appendix J.

Table 30
Summary of Groundwater Monitoring Data – Water Level and Water Quality Indicators

Site	Water Level (mbgl)		pH		EC (µS/cm)	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
GWa1	2.89	3.46	7.1	9.0	640	6,550
GWa2	0.46	1.36	6.7	8.2	900	1,360
GWa3	2.81	3.45	6.5	7.9	860	2,020
GWa4	1.14	1.72	6.8	7.8	730	2,460
GWa5	0.52	0.95	6.1	7.3	5,530	8,240
GWa6	0.00	0.99	7.5	7.9	30	5,280
GWa7	2.91	3.62	6.6	7.6	6,960	10,040
GWa8	0.80	1.28	6.8	7.4	1,340	2,050
GWa10	*	*	6.6	7.7	2,760	3,520
GWa11	*	*	7.2	7.8	4,470	6,350
GWa12	*	*	7.1	8.1	1,210	1,980
GWa14	*	*	6.9	8.6	1,250	2,970
GWa15	*	*	6.7	8.7	880	2,420
GWc1	2.54	5.37	6.8	9.4	1,330	1,180
GWc2	0.00	0.00	7.0	8.4	1,010	1,160
GWc3	0.31	1.15	6.7	7.5	3,270	3,930
GWc4	12.00	12.25	6.4	6.9	1,830	7,230
GWc5	3.57	4.50	6.4	7.9	4,300	5,670
GWc10	*	*	6.7	8.0	2,750	3,460
GWc11	*	*	6.1	7.4	2,620	4,410
GWc12	*	*	7.0	7.8	2,220	2,830
GWc14	*	*	7.0	7.7	1,280	2,250
GWc15	*	*	6.3	7.2	2,080	3,170

Source: Peabody (2013).

* Refer to Table J-1 in Appendix J for water levels.

mbgl = metres below ground level.

Table 31
Summary of Groundwater Monitoring Data – Water Quality Parameters

Site	Na (mg/L)		K (mg/L)		Mg (mg/L)		Ca (mg/L)		Cl (mg/L)		$CaCO_3$ (mg/L)		SO_4 (mg/L)		Total Fe (mg/L)	
	Mar	**Sep**	**Mar**	**Sep**	**Mar**	**Sep**	**Mar**	**Sep**	**Mar**	**Sep**	**Mar**	**Sep**	**Mar**	**Sep**	**Mar**	**Sep**
GWa1	1120	1170	20	17	100	117	88	94	1170	1370	1,210	1,190	226	165	4.5	21.5
GWa2	149	124	7.8	6	35	28	28	18	227	240	160	144	32	16	0.21	2.62
GWa3	276	236	16	10	67	49	79	49	252	289	490	357	169	137	0.86	8.86
GWa4	101	238	10	21	35	91	56	138	85	464	306	470	45	218	0.28	5.23
GWa5	898	1050	35	32	314	403	402	542	1130	1230	265	381	2140	2820	0.26	1.48
GWa6	421	629	17	15	75	93	68	72	319	532	415	649	435	507	1.6	2.76
GWa7	1290	1380	33	28	430	477	348	378	1630	1730	970	1160	1960	2030	1.9	1.77
GWa8	147	184	11	11	75	88	85	89	195	298	210	262	277	374	0.16	1.01
GWa10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWa11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWa12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWa14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWa15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWc1	227	220	10	8	53	46	51	34	347	392	255	233	57	58	4.4	0.18
GWc2	174	173	24	22	22	16	50	38	78	93	450	465	<2	<1	0.48	1.43
GWc3	532	570	42	37	100	109	119	112	475	672	595	671	451	466	0.31	0.09
GWc4	229	214	64	54	79	77	175	164	291	363	635	624	253	220	1.5	1.88
GWc5	907	824	89	74	152	155	279	262	468	572	2240	2130	304	358	0.95	0.38
GWc10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWc11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWc12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWc14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWc15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Source: Peabody (2013).
N/A Monitoring of these parameters not required.
* Refer to Table J-1 in Appendix J for water levels.
Note: Carbonate recorded as $CaCO_3$.

Groundwater impact assessment triggers are included in the GMP. Monitoring results from bores in the alluvium (i.e. GWa1 – Gwa15) during the 2012 review period indicate an exceedance of the relevant groundwater triggers for EC (4,100 µS/cm) at GWa1 (6,550 µS/cm), GWa5 (8,240 µS/cm), GWa6 (5,280 µS/cm), GWa7 (10,040 µS/cm) and GWa11 (6,350 µS/cm). Monitoring results from the bores in the coal measures (i.e. GWc1 to GWc5 and GWc10 to GWc15) during the 2012 review period indicate an exceedance of the relevant groundwater triggers for EC (6,176 µS/cm) at GWc4 (7,230 µS/cm) and GWc5 (5,670 µS/cm). The pH results for bore GWc1 (9.4) also indicated an exceedance of the groundwater triggers for pH (8.3) during the 2012 review period.

As a result of these exceedances, the groundwater impact investigation protocol was implemented in accordance with the GMP. Investigations involved consideration of previous monitoring results in conjunction with prevailing and preceding meteorological conditions. The investigations concluded the following:

- High EC values had been recorded for the alluvium groundwater monitoring sites in 2006; the Wilpinjong Coal Mine Environmental Impact Statement noted that a *highly saline groundwater seep (EC of 11,000 to 12,000 µS/cm) enters Cumbo Creek immediately east of Wilpinjong Road (GWa5)* (WCPL, 2005), consistent with baseline and recent monitoring data suggest this is a naturally saline system.
- High EC values were also recorded during the 2007 reporting period for GWa5 and GWa6. During the 2008 reporting period high EC values were recorded at GWa1, GWa5, GWa6, GWa7 and GWa15. During the 2009 reporting period the EC values recorded at GWa1, GWa5, GWa6, and GWa7 were high. During the 2010 reporting period high EC values were recorded at GWa1, GWa5, GWa6 and GWa7. During the 2011 reporting period high EC values were recorded at GWa1, GWa5, GWa6, GWa7, GWa10 and GWa11.
- The high pH value recorded at GWc1 in March 2012 was a temporary on-off result. After this point the pH results returned to average levels for the remainder of the year consistent with baseline and recent years monitoring data.
- The high EC values recorded at GWc4 and GWc5 were recorded during September 2012. After this point EC values returned to average levels for the remainder of the year consistent with baseline and recent years monitoring data.

Monitoring results from bores in the alluvium were generally consistent with the relevant groundwater triggers for pH (approximately 0.5 above or below the baseline range).

Recorded groundwater levels for the alluvial and coal measure aquifer monitoring bores are also presented in Table J-1 in Appendix J. There were no requests for monitoring to be undertaken at any landholder bores, wells or waterholes during the reporting period.

Reportable Incidents

No environmental incidents were reported relating to groundwater at the Mine during the 2012 review period.

3.8.4 Management and Mitigation Measures

As described in Section 3.8.3 above, a groundwater impact investigation was commenced during the 2012 review period to investigate the elevated EC and pH results recorded. WCPL will continue to undertake monitoring and review of the monitoring results against the impact assessment criteria, in accordance with the GMP.

3.8.5 Further Initiatives

WCPL is proposing to progressively expand the current groundwater monitoring network commencing in 2013, to include the locations presented in Table 32.

In accordance with Condition 4, Schedule 5 of Project Approval (05-0021), WCPL will review, and if necessary revise, the relevant strategies, plans and programmes within three months of the submission of this Annual Review and Environmental Management Report.

Table 32
Proposed Additional Groundwater Monitoring Locations

Bore ID	Easting	Northing	Rationale
R1	769537	6420894	Highest Priority. Between Pit 5 and Wilpinjong Creek. Will respond to mining moving northwards towards the creek. To be screened in alluvium and coal.
R2	768523	6420995	Lowest Priority (R3 serves similar purpose). North-west of Pit 5 (in Pit 6). Adjacent mining in 2013-2014. To be screened in coal.
R3	767998	6420505	West of Pit 5 (in Pit 6). Adjacent mining in 2014. To be screened in coal.
R4	767254	6418729	South-west of Pit 5. Adjacent mining in 2016. To be screened in coal.
R5	768146	6417589	In southern Pit 5. To be mined in 2017 to 2018. To be screened in coal.
R6	771483	6416987	South of Pit 2. Adjacent mining in 2014. To be screened in coal.
R7	772768	6419236	High Priority. In Pit 4. To be mined in 2016 to 2017. Should be on the edge of the Cumbo Creek alluvium. To be screened in alluvium (if sufficient saturated thickness) and coal.
R8	773995	6418003	In Pit 3. To be mined in 2018. To be screened in coal.

Source: Heritage Computing (2013).

3.9 BLASTING

3.9.1 Background

Blast management measures were undertaken during the 2012 review period in accordance with the BMP. The BMP was prepared in accordance with Condition 15, Schedule 3 of Project Approval (05-0021), and was approved by the Director-General of the DP&I in September 2011. The BMP has also been prepared in consultation with stakeholders such as the Australian Rail Track Corporation Ltd (ARTC), MWRC and the OEH.

In accordance with Condition 9, Schedule 3 of Project Approval (05-0021) and Condition L6.5 of EPL 12425, WCPL undertakes blasting at the Mine between the hours of 9.00 am and 5.00 pm Monday to Saturday inclusive. No blasting is undertaken on Sundays, public holidays or at any other time without the written approval of the Director-General of the DP&I.

3.9.2 Monitoring

Table 33 outlines the blasting parameters, blast monitoring sites and frequency of monitoring for the Mine in accordance with the BMP. Blast monitoring locations are shown on Figure 3.

Table 33
Summary of the Blasting and Vibration Monitoring Programme

Monitoring Parameter	Monitoring Sites[1]	Frequency
Ground vibration	V1, V2 and V3 (Aboriginal rock art sites).	Every blast within 1 km of sites.
	• Power poles. • Railway culverts. • Railway bridge.	Every blast within 350 m of sites.
Ground vibration and airblast overpressure	Private residences.	All blasts within 3 km of residences.

1 Monitoring sites are shown on Figure 3.

On 20 December 2012, the blast monitor previously located at “Jim Smith House/Boundary” on land owned by WCPL, was moved to the Wollar Public School. In accordance with Condition M8.1 of EPL 12425, airblast overpressure and ground vibration levels are measured and recorded for all blasts on the premises. Monitoring at the Mine is undertaken in accordance with Condition M8.1(b) of EPL 12425.

During the 2012 review period, blast monitoring was undertaken at the following locations (Figure 3):

- Aboriginal rock art (site 72) V1 Castle Rock;
- Wilpinjong Rail Loop (R5);
- Jim Smith house/boundary;
- Jim Smith 2/cattle yard;
- Wollar Public School (EPL 12425);
- Sandy Hollow Railway;
- Culvert at Sandy Hollow Railway;
- Pit 4 Culvert; and
- CV605 (Wash Plant Stacker).

3.9.3 Assessment of Environmental Performance

Impact Assessment Criteria

Condition 8, Schedule 3 of Project Approval (05-0021) and Conditions L6.1 to L6.4 of EPL 12425 outline the blast impact assessment criteria relevant to the Mine, and a summary is presented in Table 34.

Table 34
Blasting Impact Assessment Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Peak Particle Velocity (mm/s)	Allowable Exceedance[1]
Residence on privately owned land	115	5	5% of the total number of blasts over a period of 12 months
	120	10	0%

[1] Project Approval – Ground vibration levels from blasting at the Mine cannot exceed the criteria at any residence on privately owned land.
EPL The ground vibration peak particle velocity level and the air blast overpressure level from blasting operations in or on the premises cannot exceed the criteria at any point within the grounds of noise and vibration sensitive locations and within 30 m of any residence or other noise sensitive location such as a school or hospital.

mm/s = millimetres per second.

dB (Lin Peak) = decibel linear in peak.

Blasting Frequency

Condition 10, Schedule 3 of Project Approval (05-0021) and Condition L6.6 of EPL 12425 outline the following compliance requirements for blasting frequency:

10. The Proponent shall comply with the following blasting restrictions on site:

(a) a maximum of 2 blasts per day;

(b) a maximum of 5 blasts per week, averaged over any 12 month period;

(c) a maximum of 2 blasts per week where the maximum instantaneous charge (MIC) is greater than 400kg; and

(d) a maximum of 1 blast per week where the MIC is greater than 400kg, when averaged over any 12 month period.

However, the Director-General of the DP&I may approve minor variations to these restrictions for short periods of time.

Other Blast Criteria

The BMP also specifies damage criteria for public infrastructure, which are summarised in Table 35.

Table 35
Peak Particle Velocity Damage Criteria – Public Infrastructure

Infrastructure	Peak Particle Vibration Limit (mm/s)*
Concrete power poles	50
Railway culverts/bridges	80
Railway lines	200
Archaeological Structures	460

* These are not compliance requirements and are for management purposes only.

Performance Outcomes

A summary of the blast monitoring results is provided in Table 36. A complete set of the blast monitoring results is presented in Appendix K.

Table 36
Summary of Blast Monitoring Results

	Aboriginal Rock Art (Site 72) V1 Castle Rock		Wilpinjong Rail Loop R5		Jim Smith House/Boundary	
	Vibration (mm/s)	Overpressure (dB)	Vibration (mm/s)	Overpressure (dB)	Vibration (mm/s)	Overpressure (dB)
Maximum	5.22	130.45	116.9	126.90	2.00	119.17
Minimum	0.36	81.29	0.05	0.29	0.06	78.63
Average	2.08	116.17	8.19	101.32	0.22	97.07
	Jim Smith 2/Cattle Yard		**Wollar Public School**		**Sandy Hollow Railway**	
	Vibration (mm/s)	**Overpressure (dB)**	**Vibration (mm/s)**	**Overpressure (dB)**	**Vibration (mm/s)**	**Overpressure (dB)**
Maximum	86.02	118.82	0.13	98.19	65.24	115.40
Minimum	0.07	77.30	0.07	93.30	65.24	115.40
Average	1.34	102.95	0.10	95.43	65.24	115.40
	Culvert at Sandy Hollow Railway		**Pit 4 Culverts**			
	Vibration (mm/s)	**Overpressure (dB)**	**Vibration (mm/s)**	**Overpressure (dB)**		
Maximum	33.89	125.50	65.24	130.30		
Minimum	16.90	123.50	1.80	83.10		
Average	25.40	124.50	20.72	118.33		

Source: Thiess (2013).

There were no exceedances of the airblast overpressure or ground vibration impact assessment criteria at the relevant blast monitoring sites or the peak particle velocity damage criteria for public infrastructure recorded during the 2012 review period. The only sensitive receptor monitoring location is at the Wollar Public School, and the levels recorded at this site were well below the impact assessment criteria.

Blasting was carried out in accordance with Conditions 10(a), 10(b) and 10(d), Schedule 3 of Project Approval (05-0021). There was one non-compliance recorded at the Mine during the week beginning 28 May 2012, where more than two blasts (i.e. three blasts) were carried out with a Maximum Instantaneous Charge greater than 400kg (Condition 10[c], Schedule 3 of Project Approval (05-0021)). This was due to an oversight of the Blast Controller Checklist, which has been changed to prevent a reoccurrence.

During the 2012 review period, blasting was undertaken within 500 m of the Gulgong-Sandy Hollow Railway and within 500 m of Ulan-Wollar Road. Accordingly, notifications were made to the ARTC and the MWRC in accordance with the BMP and Condition 14, Schedule 3 of Project Approval (05-0021). Road closures are required when blasting is undertaken within 500 m of Ulan-Wollar Road.

In accordance with Condition 13(b), Schedule 3 of Project Approval (05-0021), temporary blasting-related road closures were limited to one per day.

Reportable Incidents

No environmental incidents were reported relating to blasting at the Mine during the 2012 review period.

Environmental Complaints

A total of 29 complaints were received in relation to blasting. This is an increase in the number of complaints compared to previous review periods.

It is noted that in all complaint cases, blasting was undertaken well within compliance levels, and accordingly no further action was taken. In one instance, a blasting complaint was received in relation to a neighbouring mine.

As discussed in Section 5.1, all complaints were responded to in accordance with the Complaints Management Procedure.

3.9.4 Management and Mitigation Measures

In accordance with Condition 13(c), Schedule 3 of Project Approval (05-0021), WCPL co-ordinates the timing of blasting on-site with the timing of blasting at the adjoining Moolarben and Ulan Coal Mines to minimise the potential cumulative blasting impacts of the three mines.

WCPL is committed to implementing best practice blast management procedures and monitoring programmes in accordance with Condition 13(a), Schedule 3 and Appendix 8 of Project Approval (05-0021).

In accordance with the BMP and Condition 13(d), Schedule 3 of Project Approval (05-0021), WCPL maintains a free-call Blasting Hotline in consultation with the Thiess Environmental Advisor and the Drill and Blast Supervisor, to provide information on the daily and proposed weekly blasting schedule. The Blasting Hotline is updated as soon as any change to the programme becomes known. In addition, the Blasting Hotline number is advertised in the local newspapers quarterly, via the Wilpinjong Community Newsletter and on the Peabody website. The Blasting Hotline number is 1800 649 783.

Road closure notification boards are maintained on the Ulan-Wollar Road and will reflect the most current blasting programme. A register is maintained of private residence to be notified of blasting times.

Effectiveness of Control Strategies

In accordance with the MOP, the BMP and Condition 13(a), Schedule 3 of Project Approval (05-0021), the following control strategies are implemented at the Mine in order to minimise the potential for exceedances of the relevant blasting criteria:

- training all relevant personnel on environmental obligations and safe handling of explosives;
- inspections and preparation of proposed blast areas to ensure all soft, loose or blast damaged material is removed prior to drilling;
- designing blasts to ensure that ground vibration and airblast overpressure limits are met, and there is no damage to life or property from flyrock, including consideration of wind speed, direction and other meteorological factors prior to blasting to minimise impacts on neighbours;
- notification of blasting times to private residents within 2 km of the Mine on request and maintenance of a free-call Blasting Hotline;
- use of adequate stemming, a delay detonation system, and careful drilling and hole loading to ensure that the required blast design is implemented;

- assessment of wind speed and direction immediately prior to each blast to minimise the potential for dust emissions from blasting to adversely impact on neighbouring private residencies;
- monitoring of blasts at the closest private residences to determine whether airblast and ground vibration limits are met;
- completion of the Blast Controller Checklist (as amended from time to time);
- review of monitoring results and modification of the blast design, if necessary;
- documentation of the date and time of the blast, location of blast holes and quantity of explosive used in each blast; and
- periodic review of blast management practices to evaluate performance and identify responsive action, if required.

In accordance with the MOP and the BMP, these control strategies were implemented and considered adequate to manage blast related risks associated with operations during the 2012 review period.

3.9.5 Further Initiatives

In accordance with Condition 4, Schedule 5 of Project Approval (05-0021), WCPL will review, and if necessary revise, the BMP within three months of the submission of this Annual Review and Environmental Management Report.

3.10 NOISE

3.10.1 Background

Noise management and mitigation measures were undertaken during the 2012 review period in accordance with the NMP, which was prepared in accordance with Condition 7, Schedule 3 of Project Approval (05-0021) and approved by the Director-General of the DP&I in September 2011.

3.10.2 Monitoring

Table 37 below outlines the noise monitoring programme and presents the noise monitoring parameters, sites and frequency for the Mine in accordance with the NMP. Noise monitoring sites are shown on Figure 7. Noise monitoring for the Mine consisted of both unattended (real time) and attended noise monitoring.

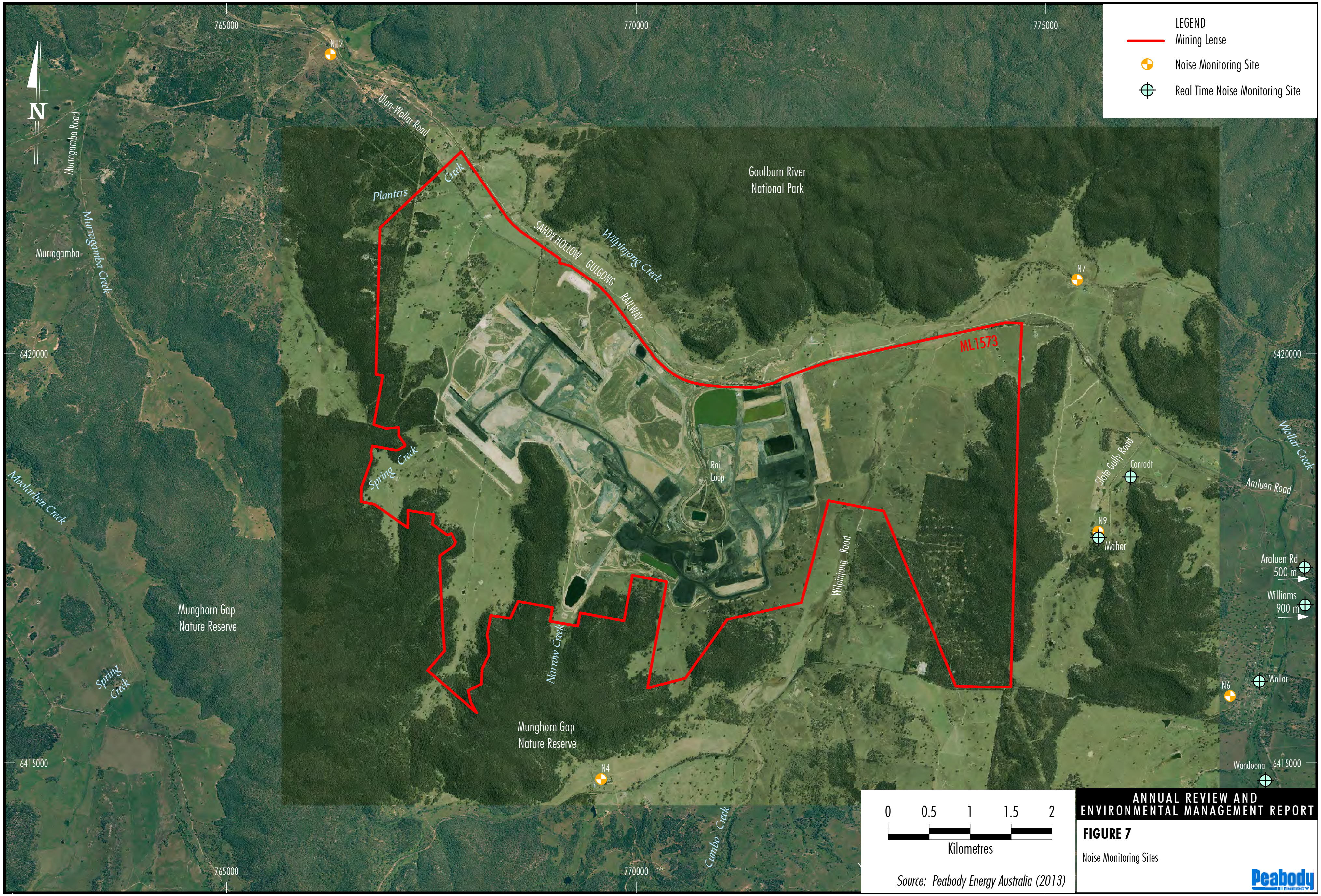
Table 37
Summary of Noise Monitoring Programme

Monitoring Parameter	Monitoring Sites	Frequency
Attended noise monitoring	N4, N6, N7, N9 and N12.	Monitoring undertaken every 2 months in accordance with the NMP.
Real time noise monitoring	Sentinex 30 (“Williams” 142). Sentinex 31 (“Maher” 58), (“Conradt” 31), “Wandoona”). Sentinex 33 (“Wollar Central”). Araluen Road	Continuous.

Attended Noise Monitoring

The attended noise monitoring is conducted every 2 months in accordance with the NMP and is carried out by an independent expert. Monitoring is conducted in accordance with AS 1055:1997 *Acoustics – Description and Measurement of Environmental Nois*e and the *NSW Industrial Noise Policy* (INP) (EPA, 2000).

The NMP requires the attended noise monitoring programme to be conducted at sites that provide good coverage in all directions from the Mine, and are a combination of mine-owned sites, compliance sites and population centers. These locations are presented in Table 37.



ANNUAL REVIEW AND ENVIRONMENTAL MANAGEMENT REPORT

FIGURE 7

Noise Monitoring Sites

WIL-12-11 AR&EMR_202B

In accordance with the NMP, attended noise monitoring was conducted for a 15 minute period during the evening and night-time periods. The monitoring was carried out on two consecutive evenings and nights resulting in at least two 15 minute samples for each monitoring period every 2 months.

Real time Noise Monitoring

Real time monitoring is used as an internal WCPL noise management tool and not for compliance purposes, and involves the use of noise investigation triggers for ongoing performance and assessment.

The noise monitoring system (including a Type 1 sound level meter) records the following parameters:

- 15 minute statistical data (noise exceedance level [LAN]) (L_{A1}, L_{A10}, and L_{A90});
- Equivalent continuous noise level (L_{Aeq}) $L_{Aeq,15minute}$ and $L_{Aeq,period}$ noise levels;
- $L_{Aeq,1minute}$ in 1/3 octave;
- $L_{Aeq,15minute}$ in the 12.5 to 630 Hz range ($L_{Aeq,LF}$);
- digital audio recording 24 hours per day; and
- wind direction, wind speed, temperature, humidity and rainfall.

Each monitor is set up to record noise levels 24 hours a day 7 days per week, and a graphical summary of the previous 24 hour period of noise is sent to mine staff via email on a daily basis.

The continuous recording also includes an audio function which allows the monitor to record audio of the noise signal. This audio information can be downloaded in order to determine whether the noise source is related to the Mine. There are numerous other potential noise sources apart from Mine noise, including frogs, insects, local vehicles, domestic activities and meteorological conditions which may influence monitoring results.

The real time continuous noise monitor Sentinex 31 was relocated from the Maher (58) property on 26 June 2012 to the Conradt (31) Property. Due to property acquisitions by WCPL in the Slate Gully area, the monitor has since been relocated again at the end of October from the Conradt (31) property to a location in Wandoona. Monitoring at the new site commenced 1 November 2012.

3.10.3 Assessment of Environmental Performance

Impact Assessment Criteria

Condition 2, Schedule 3 of Project Approval (05-0021) outlines the noise impact assessment criteria applicable to the Mine. Under the Project Approval, WCPL must ensure that the noise generated by the Mine does not exceed the criteria in Table 38 at any residence on privately-owned land, or on more than 25% of any privately owned land.

During the 2012 review period the Project Approval (05-0021) was updated. Table 38 includes the various criteria that applied during the 2012 period, prior to and after MOD4 approval.

Table 38
Noise Impact Assessment Criteria (dBA)

Day	Evening	Night		Land Number
$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{A1(1\ minute)}$	
35	39	39	45	58 – Maher[#]
				52A – Long[#]
				52B – Long[#]
				53 – Reynolds[#]
35	39	37	45	23B – Bishop[#]
35	39	36	45	25 - Pettit[#]
35	37	37	45	31A – Conradt
35	36	36	45	31B – Conradt
35	37	35	45	100 – Rheinberger [#]
				125 – Roberts [#]

Table 38 (Continued)
Noise Impact Assessment Criteria (dBA)

Day	Evening	Night		Land Number
36	35	35	45	Wollar Village – Residential
35	35	35	45	All other privately owned land
35 (internal) 45 (external) When in use			-	901 – Wollar School
40 (internal) When in use			-	150A – St Luke's Anglican Church
				900 – St Laurence O'Toole Catholic Church
50 When in use			-	Goulburn River National Park/Munghorn Gap Nature Reserve

[#] Criteria only applicable from January 2012 to August 2012, under the MOD 3 Project Approval conditions.
dBA = A-weighted decibels.

Condition 3, Schedule 3 of Project Approval (05-0021) outlines the noise land acquisition criteria applicable to the Mine, and is presented in Table 39 below. Under the Project Approval, WCPL must ensure that the noise generated by the Mine does not exceed the criteria in Table 39 at any residence on privately-owned land, or on more than 25% of any privately owned land.

Table 39
Noise Land Acquisition Criteria (dBA)

Day	Evening	Night	Land Number
$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	
40	40	40	All privately owned land

Attended Noise Monitoring

Attended noise monitoring was undertaken every 2 months at five locations, including the: 'Hillview' Cumbo Road, Wollar (WCPL – N4); St Laurence O'Toole Catholic Church (Wollar) (N6); Ulan-Wollar Road (East) (WCPL – N7); Maher dwelling (Slate Gully Road – Wollar) (WCPL – N9); and Ulan-Wollar Road (West) (Ulan Coal Mines – N12) (Figure 7).

The noise monitoring results for the 2012 review period are summarised in Tables 40 and 41.

Table 40
Intrusive Evening and Night-time $L_{Aeq(15\ minute)}$ Noise Levels Related to the Wilpinjong Coal Mine

Monitor Location	Period	Mine-Related Intrusive $L_{Aeq(15\ minute)}$ (dBA)					
		January – February	March – April	May – June^	July – August^	September – October^	November – December
N4*	Evening	21^, 28	IA^, <20^	NM, 39	24, 37	IA, IA	32^, 26^
	Night	24, <20	NM^, NM^	27, 41	21, 39	IA, 29	32^, IA^
N6	Evening	IA, <20	IA, IA	22, <30	<20, <25	IA, IA	NM^, IA
	Night	IA, IA	IA, IA	28, <30	20, 26	IA, IA	<20, IA
N7	Evening	<20, IA^	NM^, IA^	39, 31	36, 30	IA, <20	30^, NM^
	Night	IA, IA	IA^, IA^	34, 33	35,35	IA, 25	35, IA
N9*	Evening	<20, IA^	IA^, IA^	39, 31	30, 32	IA, <20	33^, 25^
	Night	<20, IA	IA^, IA^	33, 31	33, 35	IA, NM	33^, IA^
N12~	Evening	<30, 33^	29^, 30	35, <30	33, 31	IA, 32	NM^, 27^
	Night	28, 32	27, 31	32, NM	33, <30	23, 33	25^, 27^

IA = inaudible.
NM = audible but not measurable.
^ = impact assessment criterion does not apply due to adverse meteorological conditions.
* = WCPL owned.
~ = Ulan Coal Mine owned.

Table 41
Intrusive Night-time $L_{A1(1\ minute)}$ Noise Levels Related to the Wilpinjong Coal Mine

Monitor Location	Period	Mine-Related Intrusive $L_{Aeq(15\ minute)}$ (dBA)					
		January – February	March – April	May – June^	July – August^	September – October^	November – December
N4*	Night	36, <20	NM^	36, 46	25, 48	IA, 30	41^, IA^
N6	Night	IA, IA	IA, IA	38, 30	30,30	IA, IA	20, IA
N7	Night	IA, IA	IA^, IA^	41, 40	45, 42	IA, 30	40, IA
N9*	Night	<20, IA	IA^, IA^	40, 39	40, 41	IA, NM	40^, IA^
N12~	Night	38, 38	33, 37	43, 25	39,32	33, 35	26^, 32^

IA = inaudible.
NM = audible but not measurable.
^ = impact assessment criterion does not apply due to adverse meteorological conditions.
* = WCPL owned.
~ = Ulan Coal Mine owned.

Attended monitoring at these locations indicated that the mine complied with noise consent limits at all private monitoring locations during the 2012 review period, and accordingly did not exceed the noise land acquisition criteria. It is noted that wind speed and/or estimated temperature inversion conditions result in Project Approval criteria not always being applicable.

Due to recent property acquisitions, WCPL owns many previously private landholdings where monitoring has been undertaken.

Appendix B provides the attended noise monitoring reports for the 2012 review period.

Real Time Noise Monitoring

Three remote continuous noise monitors were utilised throughout the reporting period, and were periodically relocated (Section 3.10.2) (Figure 7).

The continuous noise monitors were installed to continually record noise levels adjacent to the Mine for noise management. These monitors do not discriminate between mine-related noise and other noise sources such as birds, dogs, road traffic, wind, rain, etc.

The continuous noise data is filtered and analysed on a quarterly basis. In the NMP, real time noise data has been utilised to develop data exclusion rules for noise investigation triggers, which are designed to exclude extraneous noise sources. The data exclusion rules are contained in the NMP which can be viewed at www.peabodyenergy.com.au/nsw/wilpinjong-documents.html.

While the real time data is not collected for the purposes of compliance monitoring, the data is analyzed (subject to the limitations of unattended data) and this analysis is provided in Appendix C.

Comparison with Data from Previous Years

As discussed above, attended noise monitoring during the 2012 review period complied with noise consent limits at all provide monitoring locations. This is an improvement on last year, where an exceedance of noise impact assessment criteria was observed at monitoring site N12 in March/April 2011.

Independent Environmental Audit

The Independent Environmental Audit identified two non-compliances against the NMP, and these are outlined in Table 42 below.

Table 42
Independent Environmental Audit Reconciliation – Noise

Reference	Commitment	Audit Finding	Reconciliation
5.1.1	Results from the attended monitoring programme will be used to verify data collected from the real time noise monitors. This will be undertaken where attended monitoring is conducted directly adjacent to real time monitors. The attended monitoring data will also be used to determine whether there is a consistent relationship between real time continuous noise levels and long-term attended monitoring data. This will be done annually to complement the regular maintenance and calibration of the real time monitors.	While attended noise monitoring is conducted on a quarterly basis (Attended Noise monitoring reports produced by Global Acoustics) there is no evidence that this information is currently being used to complement the calibration of the real time monitors.	The current practice for attended noise monitoring does not involve attended monitoring directly adjacent to the real-time monitors, as attended monitoring is focused on key compliance points. It should be noted however, that the real-time monitors are calibrated monthly in accordance with applicable Australia Standards.
5.1.3	Attended noise monitoring will be carried out by an independent expert (i.e. not by mine staff) and will be conducted every 2 months. Monitoring will be conducted in accordance with AS 1055:1997 *Acoustics – Description and Measurement of Environmental Noise and the INP* (EPA, 2000). These operator attended noise measurements will be conducted during normal operations to quantify the intrusive noise emissions from the Mine as well as the overall level of ambient noise.	Attended noise monitoring has historically been conducted on a quarterly basis. More recently (2010) a two-monthly frequency can be seen. Attended noise monitoring reports produced by Global Acoustics sighted by audit team.	During the 2012 review period, attended noise monitoring was conducted on a frequency of every 2 months, and the results of this monitoring were compared against the noise criteria and used to optimise noise management controls.

Reportable Incidents

No environmental incidents were reported relating to noise at the Mine during the 2012 review period.

Environmental Complaints

A total of 62 complaints were received during the 2012 review period in relation to noise and vibration. Although this is an increase on the number of noise complaints received during the 2011 period, this is a significant reduction in comparison to the period 2006 to 2010.

It is noted that in the majority of complaint cases, noise levels were within compliance levels, and accordingly no further action was taken. In some cases, mining operations were moved or stopped until atmospheric conditions changed.

As discussed in Section 5.1, all complaints were responded to in accordance with the Complaints Management Procedure.

3.10.4 Management Measures

In accordance with Condition 6(a), Schedule 3 of Project Approval (05-0021) WCPL implements the following noise management measures:

- During operational activities, fixed plant and mobile equipment was commissioned and maintained in a manner consistent with the manufacturer's recommendations.
- Noise investigation protocol and other additional noise management measures were implemented upon exceedances of the relevant criteria.

WCPL regularly assesses the real time noise monitors and meteorological forecasting data and ensures that operations on-site are relocated, modified and/or ceased to comply with the relevant impact assessment criteria, in accordance with Condition 6(b), Schedule 3 of Project Approval (05-0021).

In accordance with Condition 6(c), Schedule 3 of Project Approval (05-0021), WCPL regularly investigates ways to reduce operational, low frequency rail and road traffic noise generated by the Mine. Feasible projects identified and progressed during the 2012 review period include the car pooling scheme (Section 3.16.3) and the management of shift changes on-site (Section 3.16.2).

In accordance with Condition 6A(a), Schedule 3 of Project Approval (05-0021), during the 2012 period, the rail loop at the Mine was only accessed by locomotives approved to operate on the NSW rail network in accordance with noise limits L6.1 to L6.4 in RailCorp's EPL (No. 12208) and ARTC's EPL (No. 3142), and any Pollution Control Approvals issued under the former *Pollution Control Act, 1970*.

It is understood that there was no noise abatement programme initiated by RailCorp, the ARTC or any rail operators relevant to the Mine during the 2012 review period. (Condition 6A[b], Schedule 3 of Project Approval (05-0021)).

Effectiveness of Control Strategies

As specified in the MOP and NMP, control strategies were implemented during the 2012 review period to minimise noise emissions from operation of the Mine.

During the 2012 review period, a total of 1,193.3 excavator hours was lost as a result of noise downtime, including 314.7 hours lost in June.

Investigations were undertaken during previous reporting periods in regard to the potential for further noise attenuation at the Mine. It was concluded however, that no further feasible or reasonable measures were currently available and efforts were therefore focused on managing noise impacts through operational modifications, refinement of monitoring and management procedures and written agreements with landowners.

In accordance with the MOP and the NMP, these control strategies were implemented and considered adequate to manage noise related risks associated with operations during the 2012 review period.

3.10.5 Further Initiatives

WCPL intends to update the NMP in relation to land ownership changes and mine advances, to ensure that the attended and real time noise monitoring locations better reflect the requirements of EPL 12425 and Project Approval conditions.

In accordance with Condition 6(c), Schedule 3 of Project Approval (05-0021), WCPL investigates ways to reduce the operational, low frequency, rail and road traffic noise generated by the Mine. During the next review period the Mine will convert from a contract mine operation to an owner-operator operation in 2013. Accordingly, the owner-operator equipment fleet will be new equipment sourced from the manufacturer and incoming fleet items are generally expected to have lower sound power levels than the comparable older contractor fleet items that they replace.

In accordance with Condition 4, Schedule 5 of Project Approval (05-0021), WCPL will review and, if necessary, revise the NMP within three months of the submission of this Annual Review and Environmental Management Report.

3.11 ABORIGINAL HERITAGE

3.11.1 Background

An ACHMP has been prepared for the Mine in accordance with Condition 48, Schedule 3 of Project Approval (05-0021), and was approved by the Director-General in February 2008. Control measures for managing and monitoring Aboriginal Heritage were implemented in accordance with the MOP and ACHMP during the 2012 review period and were considered to be effective.

3.11.2 Environmental Management

In accordance with Conditions 45 to 47, Schedule 3 of Project Approval (05-0021), an archaeological salvage programme continued to be implemented during the reporting period. The Aboriginal community was involved in salvage work, in which test excavations have been conducted in the Southern End of Pit 5. A Keeping Place continues to be maintained on-site for the temporary storage of recovered materials prior to their re-placement on rehabilitated landforms.

Monitoring and management of rock art sites occurred throughout the 2012 review period, and included dust deposition and ground vibration monitoring (Sections 3.4 and 3.9).

The distribution of Aboriginal heritage recordings within the Mine area is shown on Figure 8.

3.11.3 Assessment of Environmental Performance

The cultural heritage clearance forms are presented in Appendix L.

Independent Environmental Audit

The Independent Environmental Audit identified that *Cultural heritage [was] not included in the site induction*. Accordingly, cultural heritage education and training has now been incorporated into the site induction programme.

In addition the Independent Environmental Audit also identified that the Cultural Heritage Committee had not been meeting quarterly. Accordingly, the Cultural Heritage Committee met four times during the 2012 review period.

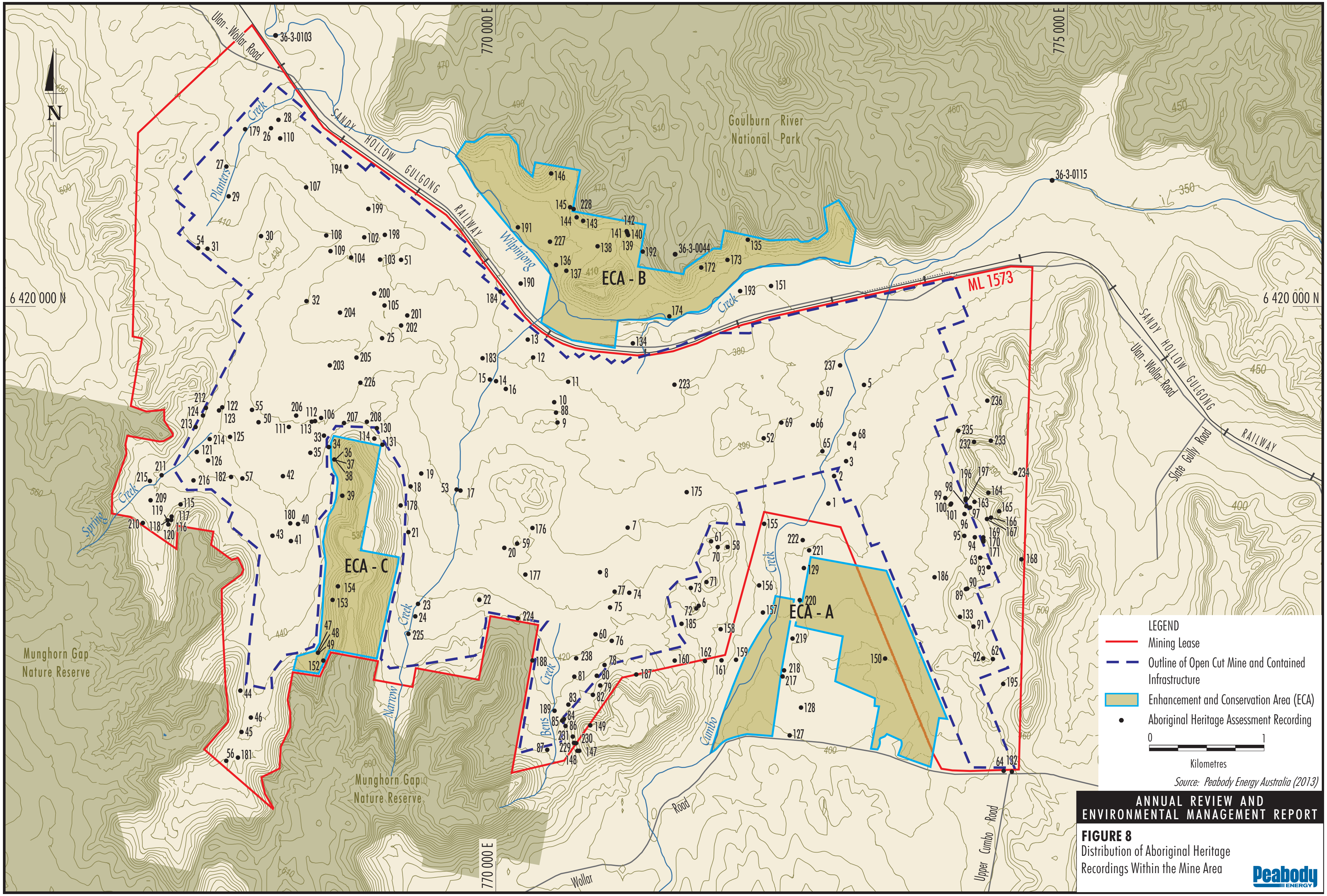
Reportable Incidents

No environmental incidents were reported relating to Aboriginal heritage at the Mine during the 2012 review period.

3.11.4 Management and Mitigation Measures

The ACHMP details various management measures that are implemented at the Mine to manage the impacts of mining operations on items of Aboriginal heritage, including the following:

- General protocol for the management of Aboriginal cultural heritage in ancillary disturbance areas including the ancillary disturbance area protocol.
- General protection measures where necessary to minimise the risk of accidental site disturbance including fencing, signposting and temporary flagging.
- Archaeological salvage programme which allows for the recovery of a sample of surface and subsurface artefactual material in selected areas for the purpose of either re-placing the artefacts onto the rehabilitated post-mining landscape in the future, or otherwise providing for their long-term curation.
- Maintenance of an appropriate Keeping Place for salvaged Aboriginal artefacts located at the WCPL administrative complex.



ANNUAL REVIEW AND ENVIRONMENTAL MANAGEMENT REPORT

FIGURE 8
Distribution of Aboriginal Heritage Recordings Within the Mine Area

WIL-12-11 AR&EMR_004B

- Artefact placement programme for the replacement of artefacts onto the rehabilitated landform if that is the wish of the Aboriginal community.
- Monitoring and management protocol for human skeletal remains.
- Additional escarpment area surveys.
- Monitoring and management of rock art sites including the following:
  - completion of base-line recording of the site and its rock art prior to mining within 1 km of those sites;
  - monitoring of ground vibration levels (Section 3.9.2);
  - monitoring of dust deposition levels (Section 3.4.2); and
  - fencing installation to exclude stock animals from rock art sites.
- Restriction of public access to the ML areas and Enhancement and Conservation Areas (ECAs).
- Education of employees and contractors regarding the potential for incidental damage to Aboriginal cultural heritage sites during land disturbance activities and to minimise disturbance areas as part of the Cultural Heritage Employee and Contractor Training Programme.
- Exclusion of domestic stock from parts of the ECAs and regeneration areas.
- Restriction of mobile vehicles to existing access tracks where practicable.
- Management of dryland salinity, exclusion of stock, regeneration and planting of riparian rehabilitation to stabilise erosion which can cause the destruction of sites in gullies and creek lines.

In accordance with Condition 49, Schedule 3 of Project Approval (05-0021), WCPL prepared and maintained an archival record of the remaining heritage sites prior to any Mine activity with the potential to disturb such sites.

3.11.5 Further Initiatives

In accordance with the EIS (WCPL, 2005) commitments, the ACHMP and the Native Title Agreement the Aboriginal community will continue to be involved in the management of Aboriginal cultural heritage over the life of the Mine.

In accordance with Condition 4, Schedule 5 of Project Approval (05-0021), WCPL will review and, if necessary, revise the ACHMP within three months of the submission of this Annual Review and Environmental Management Report.

3.12 NON-ABORIGINAL HERITAGE

No activities or monitoring relevant to non-Aboriginal heritage occurred during the 2012 review period.

3.13 SPONTANEOUS COMBUSTION

A SCMP has been prepared in accordance with Condition 4 of the MOP approval issued by the then DPI-MR on 7 March 2006 (WCPL, 2006b).

In accordance with Condition 20(a), Schedule 3 of Project Approval (05-0021), WCPL are required to implement all practicable measures to minimise the off-site odour and fume emissions generated by any spontaneous combustion at the Mine.

The SCMP outlines various management procedures, including the following:

- Regular visual inspections of all coal stockpiles, the high wall, the pit, spoil dumps and rehabilitated landforms for evidence of spontaneous combustion.
- Use of heat probes to monitor long-term coal stockpiles where necessary.
- Inspection of pit stratigraphy for likely spontaneous combustion potential horizons and suitable inert material.

- Annual review and inspection of the process and emplacement areas.
- Re-shaping of coal stockpiles using a fleet of dozers when smoke or other visible evidence of spontaneous combustion is identified.
- Re-shaping of the angle of batters of the overburden dumps when smoke or other visible evidence of spontaneous combustion is identified.

During the 2012 review period, all coal stockpiles were visually inspected for evidence of the presence of spontaneous combustion every eight hours. The inspection involved observing the stockpiles for visible signs of smoke or any other obvious signs of heat production within the stockpiles. Similarly, the high wall, spoil dumps and rehabilitated land forms were visually inspected for evidence of spontaneous combustion. Heat probes were used to monitor long term coal stockpiles where necessary and the monitoring stockpiles were compacted to minimise the potential of oxygen and moisture infiltration.

Three locations with spontaneous combustion were identified during the 2012 review period, including the ROM coal stockpile (as a result of temporary stockpiling requirements on site), the noise bund and the waste dump (as a result of the presence of carbonaceous material).

Reportable Incidents

There was one reportable environmental incident reported as uncontrolled emissions into the atmosphere during the 2012 review period as a result of spontaneous combustion (Table 43).

Table 43
Summary of Spontaneous Combustion Incidents

Date of Incident	Description of Incident	Action Taken
16/12/2012	Spontaneous Combustion involving ROM Stockpile 11.	Stockpile 11 has been managed through: • daily inspections; • regular maintenance with dozers (i.e. capping the stockpile when loading is not required); • loading from downwind of stockpile to reduce working face exposure; • dozer maintaining working face during rehandling; and • hot coal covered by cold coal during transportation to the ROM bin.

Source: Peabody (2013).

Environmental Complaints

A total of 21 environmental complaints were received during the 2012 review period in relation to odour that may have been attributed to spontaneous combustion. As discussed in Section 5.1, all complaints were responded to in accordance with the Complaints Management Procedure.

Further Initiatives

In accordance with Condition 4, Schedule 5 of Project Approval (05-0021), WCPL will review and, if necessary, revise the SCMP within three months of the submission of this Annual Review and Environmental Management Report.

During the next review period temporary NO_x, SO_x and H_2S monitors are proposed to be installed during the management of ROM Coal Stockpile 11 (i.e. approximately 3 months when the coal in the stockpile will be processed through the CHPP to control the combustion). Control measures will also be implemented at the ROM coal stockpile, noise bund and waste dump in accordance with the SCMP.

3.14 THREATENED SPECIES

3.14.1 Background

The management of threatened species is detailed in the RMP, which has been developed by WCPL in accordance with Condition 40, Schedule 2 of Project Approval (05-0021). Further detail on the RMP is provided in Section 6.

3.14.2 Monitoring

As outlined in the RMP, a series of monitoring locations have been set up within the ECAs to monitor the regeneration of vegetation (Section 6). The sites are monitored annually to record changes in vegetation progress, including tree and shrub density, height, species and health rating (Landline Consulting, 2012).

3.14.3 Assessment of Environmental Performance

Threatened species management measures were undertaken during the 2012 review period, in accordance with the RMP, prepared in accordance with Condition 40, Schedule 3 of Project Approval (05-0021), and approved by the Director-General of the DP&I in September, 2011.

Control measures for managing and monitoring threatened species were implemented in accordance with the MOP and RMP, and were considered to be effective during the 2012 review period. These measures included implementation of a Vegetation Clearance Protocol (VCP) and specific fauna management strategies including a Threatened Species Management Protocol which is initiated in the event that a threatened species is identified in the mine area or immediate surrounds.

The VCP included delineation of areas to be cleared of remnant vegetation, pre-clearance surveys, management of impacts on fauna, and restrictions on clearing times for fauna breeding seasons (WCPL, 2011b).

Habitat tree mapping and inspection of felled trees was undertaken in February, March, April and December 2012 prior to clearance activities in Pits 1, 2, 3 and 5. A total of 66 habitat trees were felled, and a further 273 habitat trees were inspected during this time. Management strategies were implemented to minimise impacts on fauna during the felling of habitat trees. All felled habitat trees were inspected for evidence of trapped or injured individuals, and any individuals located were either extracted from the hollows and taken into care with a wildlife rescue organisation, or released.

No threatened fauna species were recovered from the felled habitat trees and therefore implementation of the Threatened Species Management Protocol was not required.

Reportable Incidents

No environmental incidents were reported relating to threatened species at the Mine during the 2012 review period.

3.14.4 Management and Mitigation Measures

Other specific fauna management strategies implemented during the 2012 review period included the identification and monitoring of Wombat (*Vombatus ursinus*) burrows, followed by trapping and relocation of individuals prior to vegetation clearance and land disturbance. Appendix D provides the habitat tree register summary results.

Routine monitoring is undertaken at the Mine and surrounds for flora and fauna in accordance with the RMP.

3.14.5 Further Initiatives

In accordance with Condition 4, Schedule 5 of Project Approval (05-0021), WCPL will review and, if necessary, revise the RMP within three months of the submission of this Annual Review and Environmental Management Report.

3.15 WEEDS AND ANIMAL PESTS

3.15.1 Background

The management of weeds and animal pests is detailed in the RMP, which has been developed by WCPL in accordance with Condition 40, Schedule 2 of Project Approval (05-0021). Further detail on the RMP is provided in Section 6.

3.15.2 Monitoring

During the 2012 period, monitoring was undertaken regularly on WCPL-owned lands by Mine consultant and personnel to identify areas requiring follow-up treatment for weed species and the presence of feral animals. Further detail on the control of weeds and animal pests is provided in the RMP and Section 3.15.3.

3.15.3 Assessment of Environmental Performance

During the 2012 review period the control of St John's Wart remained a priority. The weed was found to be very vigorous and similar to the previous review period, required additional spraying treatment to control its propagation. Additionally good progress was made on controlling Bathurst Burr and Blackberry during the 2012 review period.

WCPL also provided financial assistance to the Wild Dog Destruction Board, whose role is to initiate actions aimed at the eradication of dingoes and wild dogs. Operational procedures included the maintenance of a clean rubbish-free environment to discourage scavenging and reduce the potential for colonisation of these areas by non-endemic fauna such as rodents and birds. Lids on waste and recyclable skips were also kept closed to prevent scattering of materials by vermin.

3.15.4 Management and Mitigation Measures

Weed and animal pest management and mitigation measures were undertaken in accordance with the MOP and RMP during the reporting period.

Weed Control

Ongoing monitoring and control of weeds on WCPL-owned land was undertaken as part of general land management practices and included:

- ongoing surveys of WCPL-owned lands to identify areas requiring follow-up herbicide treatment or any new areas requiring treatment;
- implementation of weed management measures including mechanical removal and application of approved herbicides (in accordance with the NSW *Pesticides Act, 1999*) in authorised areas when conditions are favourable;
- follow-up herbicide treatment of noxious weeds such as Blackberry in ECAs; and
- limiting the potential for the establishment of new weeds on ECAs by minimising the transport of weed species to and from ECAs (e.g. limiting vehicle access and minimising stock access through fencing).

Animal/Pest Control

Feral animal control strategies undertaken during the 2012 review period included the following:

- use of poison baits, trapping and feral animal habitat removal to control populations of rabbits and foxes;
- the prohibition of domestic pets on-site; and
- the maintenance of a clean rubbish-free environment to discourage scavenging and reduce the potential for colonisation by non-endemic fauna (e.g. introduced rodents, birds).

Effectiveness of Control Strategies

The above weed and animal/pest control strategies implemented during the 2012 review period were considered adequate to manage weed and animal pest-related risks associated with operations during the 2012 review period.

Reportable Incidents

No environmental incidents were reported relating to weed and animal pest control at the Mine during the 2012 review period.

Independent Environmental Audit Compliance

The Independent Environmental Audit identified a non-compliance regarding noxious and environmental weeds and animal pests, namely, that in the site induction no requests were made of staff and contractors to report any observations of this nature. Accordingly, these issues are now discussed at the site induction and Mine personnel are aware of the need to control weed and animal pest species.

3.15.5 Further Initiatives

In accordance with Condition 4, Schedule 5 of Project Approval (05-0021), WCPL will review and, if necessary, revise the RMP within three months of the submission of this Annual Review and Environmental Management Report.

3.16 ROAD TRANSPORT

3.16.1 Background

The management of traffic and road transport is undertaken in accordance with Condition 53, Schedule 3 of the Project Approval (Section 3.16.3).

3.16.2 Assessment of Environmental Performance

In accordance with Condition 51, Schedule 3 of Project Approval (05-0021), the Ulan Road Strategy was prepared by ARRB Group Ltd in December 2011. The strategy has subsequently been the subject of negotiations between the MWRC, WCPL and the DP&I. These negotiations are ongoing.

In accordance with Condition 53, Schedule 3 and Condition 6, Schedule 5 of Project Approval (05-0021), during the 2012 review period, WCPL believes it has implemented all reasonable and feasible measures to reduce the mine traffic on Ulan Road including the scheduling of shift changes on-site to occur outside school bus hours, and the co-ordination of the shift changes with those of the adjoining Moolarben and Ulan Coal Mines to minimise the potential cumulative traffic impacts of the three mines. However, the traffic on Ulan Road during school bus hours is currently being review by WCPL at the request of the DP&I.

Reportable Incidents

No reportable environmental incidents were reported relating to road transport the Mine during the 2012 review period.

Environmental Complaints

Two environmental complaints were received relating to traffic during the 2012 review period. One complaint related to heavy vehicle movement during school bus operating times. This complaint was investigated by WCPL, and although the heavy vehicle was found to be from a neighbouring mine, WCPL reinforced communications with employees and contractors, regarding appropriate haulage times.

The second complaint received was in relation to traffic rules not being followed. WCPL launched an investigation and the complainant was contacted for further details. Accordingly, traffic rules have now been included in all contractor inductions and toolbox talks.

3.16.3 Management and Mitigation Measures

WCPL encourages staff car pooling by offering financial incentives to Mine employees who engage in the car pooling programme. The Car Pool Reimbursement Scheme was available to WCPL staff in order to supplement the costs associated with general car expenses (e.g. registration, insurance and fuel) (WCPL, 2013).

WCPL also reduces the impact of the Mine on local road users by generally scheduling the delivery of large equipment outside of the school beginning and ending hours, unless specifically scheduled in this period due to NSW Police requirements.

Appendix 8 of Project Approval (05-0021) provides a statement of commitments relating to traffic and public safety, road safety and road surface performance strategy.

3.16.4 Further Initiatives

WCPL will continue to engage in consultation with Ulan and Moolarben Mines in regard to shift timing arrangements. WCPL will continue to engage in negotiations with the MWRC and the DP&I to reach an agreement on the implementation of the Ulan Road Strategy.

4 OTHER APPROVAL CONDITIONS

The Project Approval (05-0021) includes a number of additional conditions that are not specifically addressed in the WCPL management plans or monitoring programmes. There are discussed below.

Structural Adequacy

Condition 8, Schedule 2 of Project Approval (05-0021) requires WCPL to 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 Building Code of Australia.

Building construction activities during the 2012 review period are discussed in Section 2.3. Building Code of Australia requirements were stipulated for all buildings.

Demolition

In accordance with Condition 9, Schedule 2 of Project Approval (05-0021), WCPL is required to ensure that all demolition work is carried out in accordance with AS 2601-2001: *The Demolition of Structures*, or its latest version.

No demolition activities were undertaken at the Mine during the 2012 review period.

Operation of Plant and Equipment

WCPL is required to ensure that all plant and equipment used at the site is maintained in a proper and efficient condition and operated in a proper and efficient manner in accordance with Condition 10, Schedule 2 of Project Approval (05-0021) and Condition O2.1 of EPL 12425.

All plant and equipment in use at WCPL is regularly serviced in accordance with the relevant DRE-DTIRIS NSW Mining Design Guidelines to ensure plant and equipment is maintained in proper and efficient condition. All plant and equipment are operated in a proper and efficient manner.

Visual Impact

Visual Amenity

In accordance with Condition 54, Schedule 3 of Project Approval (05-0021), WCPL is required to minimise the visual impacts of the Mine. The initial design and construction of surface infrastructure was undertaken in a manner that minimises visual contrasts where such infrastructure is potentially visible from private residences or public vantage points.

Lighting Emissions

WCPL has taken all reasonable practicable measures to mitigate off-site lighting impacts from the Mine including the direction of night-lighting towards mining areas, in accordance with Condition 55, Schedule 3 of Project Approval (05-0021).

5 COMMUNITY RELATIONS

5.1 ENVIRONMENTAL COMPLAINTS

A protocol for the management and reporting of complaints has been developed as a component of the Mine EMS.

In accordance with Condition M6.1 of EPL 12425, a dedicated telephone number (1300 606 625) for the provision of comments or complaints is maintained by WCPL. In addition, a separate hotline for blasting information is also maintained by WCPL (1800 649 783). In accordance with Condition M6.2 of EPL 12425, these telephone lines are advertised in local newspapers quarterly, via the Wilpinjong Community Newsletter and on the Peabody website.

WCPL records and responds to all complaints and maintains a complaints register on its website. The complaints are managed in accordance with the WCPL Complaints Management Procedure. The Complaints Management Procedure outlines WCPL reporting requirements as follows:

- A summary of complaints received is reported monthly on the Peabody website.
- A summary of complaints received and actions taken is presented to the WCPL CCC as part of the operational performance review.
- A summary of complaints received and actions taken is included in the Annual Review and Environmental Management Report and the Annual Return to the EPA.

During the 2012 review period, 99 environmental-related complaints were received by WCPL (Appendix M), including the following:

- fifty-three complaints were related to noise;
- three complaints related to noise and air quality;
- one complaint was related to noise and blasting;
- twenty-two complaints were received relevant to air quality;
- twelve complaints were received in relation to blasting;
- one complaint was received in relation to odour;
- two complaints were received for traffic;
- two complaints were received in relation to waste;
- one complaint was received for water quality,
- one complaint was received relating to works depot development; and
- one complaint was received in relation to WCPL property.

Chart 14 presents a comparison of the environmental complaints received by WCPL over the period 2006 to 2012. In particular, it is noted that WCPL received fewer noise and vibration complaints and fewer road use related complaints during the 2012 review period than in previous years. Alternately, WCPL received more blast complaints in 2012 than in previous years, however, most of these complaints were raised by the one complainant.

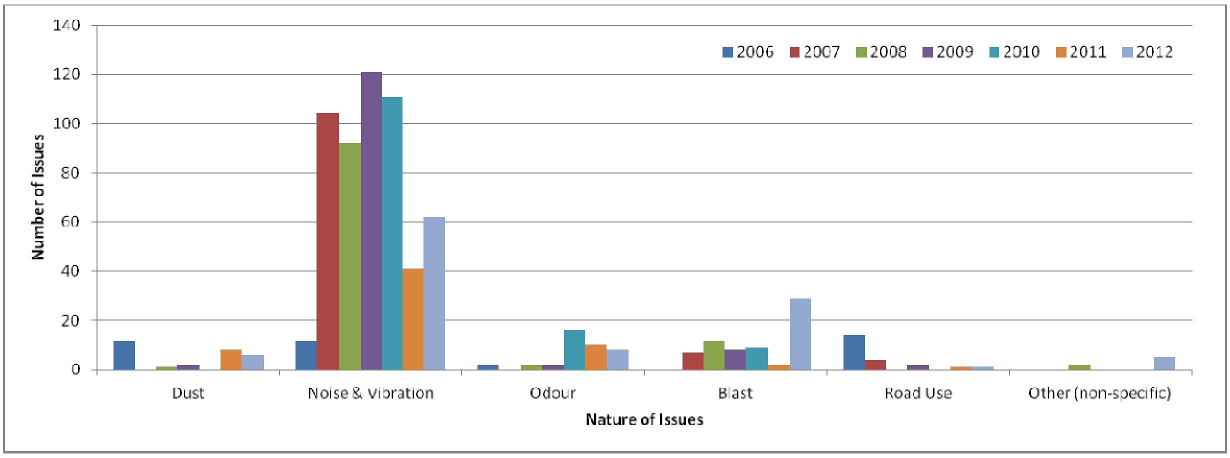


Chart 14 Summary of Environmental Complaints and Issues Raised by Complainants 2006 – 2012

A copy of the complaints register is provided in Appendix M, including actions taken by WCPL to address the complaints received.

5.2 COMMUNITY LIAISON

5.2.1 Community Consultative Committee

In accordance with Condition 5, Schedule 5 of Project Approval (05-0021) the CCC continued to meet during the 2012 review period. The CCC for the Mine is operated in general accordance with the *Guidelines for Establishing and Operating Community Consultative Committees for Mining Projects* (Department of Planning, 2007). Consistent with the requirements of the *Guidelines for Establishing and Operating Community Consultative Committees for Mining Projects*, the CCC is comprised of one independent chairperson, and representatives of the MWRC, WCPL and members of the general community.

Table 44 provides a summary of the CCC meetings held during the 2012 review period.

Table 44
CCC Meeting Summary

Date	Meeting Type	Key Outcomes
Monday 26 March 2012	CCC	• Decision made for Peabody Energy to become the owner/operator of the Mine at the end of the Thiess contract period in April 2013. • Updates provided on monitoring results. • Updates provided on community and public donations.
Monday 25 June 2012	CCC	• Updates provided on monitoring results. • Updates provided on community and public donations. • Detailed discussions on water quality and the RO plant.
Monday 24 September 2012	CCC	• Updates provided on monitoring results. • Updates provided on community and public donations. • Detailed discussions on water quality and the RO plant. • Updates on WCPL land ownership.

In accordance with Condition 11, Schedule 5 of Project Approval (05-0021), the minutes from these CCC meetings are publically available on the Peabody website (www.peabodyenergy.com).

5.2.2 Access to Information

Condition 11, Schedule 5 of Project Approval (05-0021) details the requirements for access to information applicable to the Mine, and outlines the documents required by the Project Approval to be made publicly available on the Peabody website (www.peabodyenergy.com).

Information required by the Project Approval that is currently available on the website includes the following documents:

- a copy of all statutory approvals relevant to the Mine;
- copies of all site management strategies, plans and programmes;
- environmental monitoring reports;
- complaints register updated on a monthly basis;
- CCC meeting minutes; and
- a copy of the Independent Environmental Audit.

Other information available on the website includes the following:

- EPL 12425 monitoring data on a monthly basis; and
- copies of relevant licences.

5.2.3 Stakeholder Consultation

In addition to the consultation undertaken during the 2012 review period discussed above, WCPL also undertakes specific consultation with stakeholders as required. In recent years, this has included extensive consultation with the local community, Aboriginal groups, local and state government authorities and other relevant stakeholders during the assessment of MOD 4.

5.2.4 Corporate Social Involvement

WCPL has been widely recognised for its Native Title Agreement which includes the establishment and joint administration of a business trust for Native Title Claimants.

WCPL also maintains a donations budget for the Mine which is used to support a diverse range of local community-based organisations and activities.

6 REHABILITATION

A RMP has been developed by WCPL in accordance with Condition 40, Schedule 2 of Project Approval (05-0021). The RMP outlines the rehabilitation objectives for the three types of mine rehabilitation areas at the Mine (i.e. Rehabilitation Areas, Regeneration Areas and ECAs). The rehabilitation objectives for these areas are outlined below.

Rehabilitation Areas

Rehabilitation Areas include areas disturbed by the Mine which will be rehabilitated and revegetated. Rehabilitation and revegetation will continue to be undertaken progressively as mining proceeds. Section 5 of the EIS (WCPL, 2005) discusses the Rehabilitation Areas and their role in the successful rehabilitation of the Mine in detail.

Specific rehabilitation objectives for the Rehabilitation Areas are as follows:

- To create safe, stable, adequately drained post-mining landforms that are consistent with the local surrounding landscape. Landforms would be monitored to ensure early identification of potential problems with landform development.
- To produce a net increase in woodland vegetation relative to the landscape described in the EIS (WCPL, 2005).
- To increase the continuity of woodland vegetation by establishing links between woodland vegetation in the Rehabilitation Areas, Regeneration Areas and existing remnant vegetation in the Munghorn Gap Nature Reserve, Goulburn River National Park and the ECAs.
- To preserve the existing beneficial use of water resources.
- Future land use options for the rehabilitation areas include grazing activities of varying intensity and establishment of woodland habitat.

Regeneration Areas

Regeneration areas, which predominantly comprise cleared agricultural land, have been established on areas of WCPL-owned land situated proximal to the Rehabilitation Areas (Plan 4). WCPL will continue to establish woodland vegetation in the Regeneration Areas through natural regeneration and selective planting if required. Section 5 of the EIS (WCPL, 2005) discusses the Regeneration Areas and their role in the successful rehabilitation of the Mine in detail.

Specific rehabilitation objectives for the Regeneration Areas include:

- To establish woodland vegetation in the Regeneration Areas (including the banks of Wilpinjong and Cumbo Creeks) through natural regeneration and selective planting if required (i.e. in areas where natural regeneration is unsuccessful).
- To increase the continuity of woodland vegetation in the region. This will be done by providing woodland corridors between Goulburn River National Park and the remnant to the east as well as between an ECA and remnant vegetation adjoining the Munghorn Gap Nature Reserve.

Enhancement and Conservation Areas

ECAs have been established on areas of WCPL-owned land containing remnant vegetation and grazing land (Plan 4). Section 5 of the EIS (WCPL, 2005) discusses the ECAs and their role in the successful rehabilitation of the mine in detail.

Rehabilitation objectives for the ECAs include:

- Enhancement through the implementation of the land management practices such as the exclusion of livestock to encourage natural regeneration and selective planting if required.
- Conservation through establishment of a voluntary conservation agreement which has rezoned the land associated with the ECAs for the purpose of protecting the land for conservation.

6.1 BUILDINGS

No demolition of buildings occurred during the 2012 review period (Section 4)

6.2 REHABILITATION OF DISTURBED LAND

In accordance with the Project Approval (05-0021) and the RMP, mine waste rock emplacements have been progressively re-shaped behind the active mining block to construct landforms generally consistent with the pre-mining landform surface. Other components of the Mine including areas of tailings emplacements have also been progressively rehabilitated as the area has become available.

As per the RMP, revegetation of completed landforms has been progressively undertaken since 2008 and has included establishing both woodland and grassland vegetation communities, consistent with the Mine's rehabilitation objectives (Section 6) and post-mining land use (Section 6.5.1).

During 2012, approximately 43 ha of disturbed land (mine waste rock emplacement) was rehabilitated in Pit 1 (approximately 16.7 ha) and Pit 5 (approximately 26.7 ha). As at December 2012, approximately 208 ha of completed mine landforms have been rehabilitated (Table 45). Plan 5 shows, for 2012, the planned rehabilitation areas, as shown in the MOP, with the actual areas rehabilitated.

Table 45
Cumulative Rehabilitation Areas

Year Rehabilitated	Area (ha)	Final Land Use	Cumulative Area (ha)	Success Criteria
2008	10	Native Ecosystem	10	As per RMP
2009	25	Native Ecosystem	35	As per RMP
2010	65	Native Ecosystem	100	As per RMP
2011	65	Native Ecosystem	165	As per RMP
2012	43	Pasture	208	As per RMP

Source: Peabody (2013).

Rehabilitation activities were undertaken in accordance with the RMP during 2012 and included the following:

- re-shaping of mine waste rock emplacement;
- capping with approximately 2 m of inert cover material;
- topsoil placement;
- topsoil amelioration with gypsum; and
- contour ripping, direct drilling of seed and fertilising.

A variety of exotic and native pasture grasses were seeded into the 2012 rehabilitation areas, although germination was poor due to low rainfall since seeding.

WCPL note that an outcome of the 2011 AEMR meeting was that vegetation should be established in the clean water diversion drains. Due to low rainfall during 2012, vegetation establishment in the clean water diversion drains is proposed to be undertaken during 2013.

In accordance with the MREMP Guidelines, Table 46 provides a summary of the rehabilitation at the Mine, including an estimate for the next review period (i.e. 2013).

Table 46
Rehabilitation Summary

	Area Affected/Rehabilitated (ha)		
	Current Report	**Last Report**	**Next Report (Estimated)**
A MINE LEASE AREA			
A1 Mine Lease Area	2,857.34	2,857.34	2,857.34
B DISTURBED AREA			
B1 Infrastructure Area[1]	129.2	129.2	131.7
B2 Active Mining Area[2]	66.6	79.4	85.0
B3 Waste Rock Emplacements[3]	45.6	47.9	55.7
B4 Tailings Emplacements	30.4	59	63.5
B5 Shaped Waste Rock Emplacement[4]	-	3	-
ALL DISTURBED AREAS[5]	217.8	318.5	335.9
C REHABILITATION			
C1 Total Rehabilitation Area[6]	165	208	235.4
D REHABILITATION ON SLOPES			
D1 10 – 18 Degrees	-	30	-
D2 Greater than 18 Degrees	0	0	0
E SURFACE OF REHABILITATED LAND			
E1 Pasture and Grasses	0	43	32.5
E2 Native Forest/Ecosystems	165	0	0
E3 Plantations and Crops	0	0	0
E4 Other	0	0	0

1 Includes areas such as ore and soil stockpiles, contained water storages, diversion bunds and structures, processing plant and roads.

2 Open pit area.

3 Areas of out-of-pit dumps yet to be shaped and rehabilitated.

4 Areas of out-of-pit dumps that have been shaped or rehabilitated.

5 Includes any area that has been disturbed by mining activities (excluding temporary stockpile areas).

6 Any areas that have been rehabilitated including areas of waste rock emplacements and tailings storage facilities progressively shaped and rehabilitated.

In accordance with the MREMP Guidelines, Table 47 provides a summary of the maintenance activities undertaken on rehabilitated land during the 2012 review period, and an estimate for the next review period (i.e. 2013).

Table 47
Maintenance Activities on Rehabilitated Land

Nature of Treatment	Area Treated (ha)		Comment/Control Strategies/Treatment Detail
	Current Report	Next Report	
Additional erosion control works (e.g. drains re-contouring, rock protection)	39.3	60.2	Erosion control works carried out within the ML 1573. The estimate for next report picks up works occurring as a result of the Cumbo Creek realignment.
Re-covering (e.g. further topsoil, subsoil sealing, etc.)	0	0	No re-covering occurred in 2012 and not planned for in 2013.
Soil treatment (e.g. fertiliser, lime, gypsum, etc.)	201	200	Fertilizer was applied within the ML 1573 and on all WCPL-owned lands during the reporting period. Within the ML 1573, fertiliser was applied to the rehabilitated No.1 Tailings Dam.
Treatment/Management (e.g. grazing, cropping, slashing, etc.)	301	300	Slashing was undertaken within the ML 1573 and on all WCPL-owned lands during the reporting period. Within the ML 1573 slashing occurred at the rehabilitated No.1 Tailings Dam.
Re-seeding/Replanting (e.g. species density, season, etc.)	91	90	Re-seeding activities were undertaken within the ML 1573 and on all WCPL-owned lands during the reporting period. Within the ML 1573, the rehabilitated No.1 Tailings Dam was seeded with winter grass.
Adversely Affected by Weeds (e.g. type and treatment)	297	126	Weed control activities were undertaken within the ML 1573 and on all WCPL-owned lands during the reporting period. Within the ML 1573, small areas containing Bathurst Burr, St John's Wart and Blackberry were identified and controlled. On WCPL-owned lands control activities were carried out for: Blackberry, St John's Wart, Tree of Heaven, and Blue heliotrope.
Feral Animal control (detail – additional fencing, trapping, baiting, etc.)	2,857.34	2,857.34	Feral animal control activities were undertaken within ML 1573 and on all WCPL-owned lands during the reporting period. Activities included fox and rabbit baiting and financial assistance was provided to the Wild Dog Destruction Board to assist eradication of dingoes and wild dogs.

The above control strategies have been described in detail in this Annual Review and Environmental Management Report where relevant (Section 3).

6.3 OTHER INFRASTRUCTURE

No other infrastructure (e.g. fences, exploration pads or associated infrastructure) were decommissioned or required rehabilitation during the 2012 review period.

6.4 REHABILITATION TRIALS AND RESEARCH

Rehabilitation trials have been established on the first 10 strips of mining in Pit 1. These trials will examine the success of planned landform designs and revegetation strategies and will be used to further refine rehabilitation concepts and methodologies. The trials will include establishment of woodland and grassland communities consistent with the post-mining land use (Section 6.5.1).

During 2012, direct drilling of seed into rehabilitation trial areas was undertaken to assess performance of increasing seed to soil contact and seed germination in comparison to areas which have been rehabilitated using the broadcast seeding method.

Soil amelioration trials were also undertaken during 2012 to assess suitable gypsum application rates into topsoil given soil testing conducted prior to seeding indicated that the soils were sodic.

Rehabilitation trials proposed to be undertaken in the future include:

- Trialling cattle grazing on established rehabilitated areas to evaluate the capacity of the rehabilitated land to sustain livestock grazing. The trial will include assessment of soil structure and the incorporation of vegetation matter into the soil.
- Trialling various topsoil depths to determine optimum growth medium conditions for seeding of pasture grasses and target tree species.
- Trials to evaluate suitable seed mix volumes that reduce the competition of pasture grass species and promote target species growth.

Results of these trials will be used as a guide for progressively rehabilitating disturbed areas across the mining operation and for closure planning and will continue to be reported in future Annual Review and Environmental Management Reports. Further rehabilitation research will be conducted as required and potentially involve participation in Australian Coal Associate Research Program projects, university programmes and campaigns conducted by specialised consultants.

6.5 FURTHER DEVELOPMENT OF THE FINAL REHABILITATION PLAN

Final landform design concepts and preferred post-mining land uses are detailed in the current MOP and RMP. A summary of these concepts is provided in the sub-sections below. A review of the final landform design was undertaken during 2012 which indicated current mine planning remains consistent with the landform design concepts and rehabilitation objectives.

6.5.1 Post-Mining Land Use

The Mine is located in the Wilpinjong Valley between the Goulburn River National Park and the Munghorn Gap Nature Reserve. European settlers cleared the flat valley floor to graze stock and cultivate pastures. The land clearing resulted in a loss of vegetation linkage between the escarpment areas which have now become isolated for the most part. The post-mining landform will therefore reinstate the previous vegetation linkage between the escarpment areas. This will provide corridors for arboreal marsupials, reptiles and other local fauna to move safely between escarpment areas.

Agricultural activities will still be carried out between these wildlife corridors as there will be areas designated for stock grazing.

A conceptual plan of the post-mining landscape is presented in Plan 2. Post-mining land use planning has taken into consideration a range of stakeholder views and has been designed to satisfy both economic needs as well as ecological needs. As a result, the post-mining landform will include a combination of grazing and wildlife areas.

6.5.2 Rehabilitated Areas and Features

Final landform levels and slope would approximate the pre-mining topography (Plan 2). Final landforms would be designed with an allowance for the long-term settlement of mine waste rock and tailings. A final void would be located at the north-eastern extent of the final landform and another at the western extent.

Final landform drainage would be designed to integrate with the surrounding catchment (i.e. in a generally north to south direction) and some permanent creek features formed within rehabilitation areas in locations similar to current creek lines (e.g. Planters Creek). Catchment surface flow will be reinstated from the base of the Munghorn Gap Nature Reserve area north to Wilpinjong Creek and onto the Goulburn River as shown in the proposed final landform design (Plan 2).

Revegetation concepts for the Mine propose a balanced outcome recognising the alternative land uses that exist in the region. The post-mining land use for the Mine area would therefore include establishing areas with the potential for both sustainable agriculture and areas of woodland vegetation.

Mine Waste Rock Emplacements

Mine waste rock emplacements would cover an area of approximately 1,800 ha (Peabody, 2012). Where long slopes are present, contour drains or deep staggered rips would be established to assist in initial surface stabilisation.

The surface of mine waste rock emplacements would be constructed to approximate (where practicable) existing topographic form of the shallow valleys which drain the Mine area. Mine waste rock emplacement surfaces would be formed to enhance rainfall absorption. Regular slopes and sharp transition angles would be varied and rounded to provide a more natural appearance.

A pattern of creek features (flow paths) would be formed over the final landforms comparable to the pre-mine regime. These reconstructed creek features would convey upslope runoff across the Mine area to Wilpinjong Creek.

Tailings Emplacement Areas

Completed tailings emplacement areas would be decommissioned through a capping process in order to create a landform that is stable and can be rehabilitated and revegetated in the same manner as the mine waste rock emplacements. Unless justified otherwise on the basis of tailings cover trials conducted during the life of the Mine, a minimum 2 m cover layer would be used to restrict oxygen and water ingress to underlying tailings and prevent salts from rising to the soil surface.

The final cover design for the tailings emplacement areas would be developed in consultation with the relevant regulatory authorities. The cover design would consider site topography, prevailing climatic conditions and the availability of suitable fine textured material (e.g. highly weathered mine waste rock) as a cover material.

Surface Infrastructure

Infrastructure with no ongoing beneficial use would be removed from the site at the completion of the Mine. Foundation slabs of certain buildings may be retained for suitable end-use goals in agreement with relevant authorities and stakeholders. Alternatively, they would be excavated for disposal or buried in a void in an approved manner.

Process reagents and fuels unused at the completion of mining would be returned to the supplier in accordance with relevant safety and handling procedures.

Foundation soils would be chemically tested, contour ripped and chemically ameliorated, as required (in accordance with relevant EPA relevant requirements). Stockpiled soils would then be applied as necessary and stabilised. Revegetation would be undertaken with suitable native tree species or native/introduced pastures, consistent with the revegetation programme.

Roads that have no specific post-mining use would be ripped, topsoiled and revegetated. Some access roads may be retained post-mining to enable access for use in bushfire and other land management activities.

Water management structures and sediment control structures would either be retained as water sources or decommissioned and rehabilitated.

Final Voids

At the completion of mining, the final landform would include two final voids (Plan 2). Mine planning would target minimising the size of the final voids. The final surface catchment of the final voids would also be minimised by the use of contour landforms.

Perimeter bunding would be formed around the final voids in order to restrict access to steeper slopes. Any further final void access restrictions (e.g. fencing) for safety and exclusion of livestock would be designed and implemented in consultation with relevant authorities.

A Final Void Management Plan would be developed as a component of the Mine Closure Plan in advance of mine closure and decommissioning in consultation with relevant authorities.

Revegetation Concepts

On completion of landform contouring, topsoiling and erosion and sediment control works, a vegetative cover would be applied as soon as practicable. Depending on the proposed post-mining land use for the rehabilitation area, this would involve sowing cover pasture species and seeding and planting of selected shrub and tree species.

Where rehabilitation areas are to be seeded, a suitable seedbed would be prepared using appropriate equipment to increase the chances for successful seedling establishment. Where necessary, pasture seed would be sowed with fertiliser. Areas seeded may be lightly scarified to assist shallow seed burial. Both seeding and direct planting techniques would be utilised for tree and shrub species. Seeding and planting activities would take into account seasonal factors and would be scheduled, where possible, prior to the expected onset of reliable rains.

Revegetation of Mine disturbance areas would be conducted progressively as mining proceeds, with coal removal and the formation of final landforms behind the advancing face of the open cut (i.e. completed mine waste rock emplacements). Rehabilitation and revegetation of Mine infrastructure areas would also be undertaken progressively as infrastructure is decommissioned.

The revegetation programme for Mine rehabilitation areas provides for a combination of woodland areas and mixed woodland/pasture areas, as described below.

The revegetation programme for Mine rehabilitation areas would establish some 850 ha of woodland vegetation over the long-term, and in association with the establishment of woodland vegetation in the regeneration areas and ECAs, would contribute to an overall net increase in woodland vegetation of some 1,095 ha (Peabody, 2012).

In recognition of the importance of vegetation corridors to regional biodiversity, the rehabilitation programme has been designed to link the revegetated woodland areas to the regeneration areas or existing remnant vegetation (Plan 2).

Woodland Areas

The revegetation programme would aim to establish floristic diversity within the woodland areas. The revegetation programme would include the use of endemic plant species, characteristic of the vegetation communities to be disturbed by the Mine. A proposed list of species for the woodland areas is detailed in the RMP. Revegetation of the woodland areas would include the planting of species characteristic of the White Box Yellow Box Blakeley's Red Gum Woodland Endangered Ecological Community (EEC) listed in the NSW *Threatened Species Conservation Act, 1995* (e.g. White Box [*Eucalyptus albens*], Yellow Box [*E. melliodora*] and Blakely's Red Gum [*E. blakelyi*]).

Mixed Woodland/Pasture Areas

The areas proposed to contain a mixture of woodland and pasture would be rehabilitated in a manner that results in patches of woodland within the pasture areas. Woodland vegetation would be revegetated with similar species to that described for the woodland areas above.

The pasture areas would be revegetated using either native and/or improved pasture species. A proposed list of native grasses that could potentially be used in the revegetation of mixed woodland/pasture areas is detailed in the RMP. Rehabilitation of the pasture areas would be conducted in consideration of guidelines such as those presented in the *Rehabilitation of Open Cut Coal Mines using Native Grasses: Management Guidelines* (NSW Department of Land and Water Conservation, 2003) and of species which are commercially available.

Creek Features

Revegetation of the riparian zone of the permanent creek features formed within rehabilitation areas would include the use of native flora species such as River She-oak (*Casuarina cunninghamiana*). Further detail on the revegetation of Cumbo Creek is outlined in the EIS (WCPL, 2005).

6.6 REHABILITATION MONITORING

A Rehabilitation Monitoring Programme has been developed for the Mine and is detailed in the RMP. Rehabilitation monitoring was undertaken during September 2012, in accordance with the RMP, to monitor the performance of the Rehabilitation Areas, Regeneration Areas and ECAs towards a set of completion criteria. The rehabilitation completion criteria are detailed below. The monitoring programme includes 38 ECA sites, seven regrowth sites, five sites along Wilpinjong Creek and seven rehabilitation sites.

Weekly rehabilitation meetings were held during the 2012 review period to discuss rehabilitation performance and requirements for any amelioration measures

In accordance with the recommendations made in the *Wilpinjong ECA Flora and Rehabilitation Monitoring Report*, soil fertility monitoring will be undertaken across all sites during the 2013 monitoring period to assess trends in soil fertility over time. The *Wilpinjong ECA Flora and Rehabilitation Monitoring Report* is presented in Appendix E.

Rehabilitation Completion Criteria

The RMP outlines the rehabilitation completion criteria that are used to evidence achievement of the objectives of the rehabilitation areas, regeneration areas and the ECAs.

Conceptual key completion criteria for the Mine are proposed in Table 48. Monitoring of the analogue sites was still being undertaken throughout 2012, and accordingly quantitative rehabilitation completion criteria have yet been verified. Proposed quantitative criteria are presented in Table 49 and will be verified during the 2013 monitoring period.

Table 48
Key Completion Criteria for Mine Components

Mine Component	Action	Key Completion Criteria
Rehabilitation Areas	Rehabilitation and revegetation of disturbed landforms.	• Woodland/riparian areas on trajectory towards a self-sustaining ecosystem. • Woodland/riparian areas contain flora species characteristic of local native vegetation communities.
Regeneration Areas	Establishing woodland vegetation through natural regeneration and selective planting.	• Woodland/riparian areas on trajectory towards a self-sustaining ecosystem. • Woodland/riparian areas contain flora species characteristic of local native vegetation communities.

Table 49
Proposed Quantitative Completion Criteria for Mine Components

Mine Component	Quantitative Completion Criteria		
	Year 1	Year 5	Year 15
Rehabilitation Areas	• Groundcover > 60%. • Groundcover species > 3. • Stem density of woody plants > 3,000 stems/ha. • Woody plant diversity > 3 upper storey species and > 3 under storey species.	• Groundcover > 60%. • Groundcover species > 3. • Stem density of woody plants > 1,000 stems/ha. • Woody plant diversity > 3 upper storey species and > 3 under storey species. • Erosion less than score 3.	• Groundcover > 60%. • Groundcover species > 3. • Stem density of woody plants > 800 stems/ha or similar to that in analogue site. • Woody plant diversity > 3 upper storey species and > 3 under storey species. • Natural regeneration woody species > 10 stem/ha. • Erosion less than score 3. • Soil chemistry parameters similar to those on analogue sites.

Table 49 (Continued)
Proposed Quantitative Completion Criteria for Mine Components

Mine Component	Quantitative Completion Criteria		
	Year 1	Year 5	Year 15
Regeneration Areas	• Groundcover > 60%. • Groundcover species > 3. • Stem density of woody plants > 1,000 stems/ha. • Woody plant diversity > 3 upper storey species and > 3 under storey species.	• Groundcover > 60%. • Groundcover species > 3. • Stem density of woody plants > 1,000 stems/ha. • Woody plant diversity > 3 upper storey species and > 3 under storey species.	• Groundcover > 60%. • Groundcover species > 3. • Stem density of woody plants >800 stems/ha or similar to that in analogue site. • Woody plant diversity > 3 upper storey species and > 3 under storey species. • Natural regeneration woody species > 10 stem/ha. • Similar species occurrence to adjacent reference sites.
ECAs	• Groundcover > 60%. • Groundcover species > 4. • Stem density of woody plants > 500 stems/ha. • Woody plant diversity > 3 upper storey species and > 3 under storey species.	• Groundcover > 60%. • Groundcover species > 4. • Stem density of woody plants > 500 stems/ha. • Woody plant diversity > 3 upper storey species and > 3 under storey species.	• Groundcover > 60%. • Groundcover species > 4. • Stem density of woody plants > 800 stems/ha. • Woody plant diversity > 3 upper storey species and > 3 under storey species. • Natural regeneration woody species > 10 stem/ha. • Similar species occurrence to adjacent reference sites.
– Establishment of woodland vegetation (excluding the WBYBBRG EEC)	• Groundcover > 60%. • Groundcover species > 3. • Stem density of woody plants > 500 stems/ha. • Woody plant diversity > 3 upper storey species and > 3 under storey species.	• Groundcover > 60%. • Groundcover species > 3. • Stem density of woody plants > 500 stems/ha. • Woody plant diversity > 3 upper storey species and > 3 under storey species.	• Groundcover > 60%. • Groundcover species > 3. • Stem density of woody plants > 800 stems/ha. • Woody plant diversity > 3 upper storey species and > 3 under storey species. • Natural regeneration woody species > 10 stem/ha. • Similar species occurrence to adjacent reference sites.
	• Groundcover > 60%. • Groundcover species > 4. • Stem density of woody plants > 500 stems/ha. • Woody plant diversity > 3 upper storey species and > 3 under storey species.	• Groundcover > 60%. • Groundcover species > 4. • Stem density of woody plants > 500 stems/ha. • Woody plant diversity > 3 upper storey species and > 3 under storey species.	• Groundcover > 60%. • Groundcover species > 4. • Stem density of woody plants > 800 stems/ha. • Woody plant diversity > 3 upper storey species and > 3 under storey species. • Natural regeneration woody species > 10 stem/ha. • Similar species occurrence to adjacent reference sites.

6.7 OFFSET STRATEGY

6.7.1 Background

Conditions 36, 37 and 38, Schedule 3 of the Project Approval (05-0021) outline conditions relating to the offset strategy for the Mine. The offset strategy includes the ECAs and the Regeneration Areas outlined above (Section 6).

6.7.2 Monitoring

Monitoring of the offset areas (including the ECAs) was undertaken in September 2012, as part of an annual monitoring programme which commenced in 2007, and is designed to assess the degree and rate of rehabilitation and/or regeneration in these areas (Appendix E). Monitoring was compared to the baseline data collected in the previous reporting period for a number of long-term monitoring transects that have been established across the Mine.

6.7.3 Assessment of Environmental Performance

The monitoring results showed a marked variation in the rehabilitation progress of the monitoring sites. This is due to the variation in disturbance levels that have occurred at individual sites (i.e. some sites have undisturbed vegetation whereas other sites have pasture generation as the dominant land use and there is little or no generation of native species). It is anticipated that changes in the upper storey vegetation and groundcover in these areas will occur quite rapidly given stock exclusion. However, damage caused by the invasion of rabbits and marsupials will continue to slow the re-establishment of perennial grasses and the successful rehabilitation of the ground layer.

Conservation Agreement

In accordance with Condition 37, Schedule 3 of Project Approval (05-0021), a Conservation Agreement has been implemented between WCPL and the Minister administering the NSW *National Parks and Wildlife Act, 1974*. This agreement provides for the long-term security of the ECAs. In accordance with Condition 38, Schedule 3 of Project Approval (05-0021), this conservation agreement also provides for the security of areas containing Yellow Box White Box Blakely's Red Gum Woodlands EEC.

6.7.4 Management and Mitigation Measures

The offset strategy continued to be implemented during the 2012 review period, in accordance with Condition 36, Schedule 3 of Project Approval (05-0021).

In accordance with the RMP, fencing maintenance was undertaken to continue to exclude stock from the ECAs during the 2012 review period.

6.7.5 Further Initiatives

The offset strategy will continue to be implemented during the new review period. Monitoring of the offset areas (including the ECAs) will be undertaken during the next review period.

7 WORKS PROPOSED IN THE NEXT REVIEW PERIOD

Activities proposed to be carried out by WCPL at the Mine during the 2013 review period (i.e. 1 January 2013 to 31 December 2013) include the following:

- Continued exploration activities in EL 6169 and EL 7091.
- Continued exploration drilling within ML 1573 (including both infill drilling and lower density drilling).
- Continuation of rehabilitation works in completed mined areas.
- Inspection and review of rehabilitation areas to assess maintenance requirements.
- Continued weed and animal pest control across WCPL-owned land.
- Continued stock exclusion in the ECAs to promote regeneration.
- Continued consultation with surrounding landholders.
- Ongoing CCC meetings, including continued publication of the meeting minutes on the Peabody website.

In accordance with Condition 4, Schedule 5 of Project Approval (05-0021), WCPL will review, and if necessary, revise the strategies, plans and programmes required under the Project Approval within three months following submission of this Annual Review and Environmental Management Report.

8 REFERENCES

AECOM (2012) *Wilpinjong Coal Mine Independent Environmental Audit*. Report prepared for Wilpinjong Coal Pty Limited. 6 March 2012.

Bureau of Meteorology (2013a) *NSW in 2012: A cool, wet start and warm, dry finish.*
Website: http://www.bom.gov.au/climate/current/annual/nsw/summary.shtml
Date Accessed: February 2013.

Bureau of Meteorology (2013b) *Climate statistics for Australian locations.*
Website: http://www.bom.gov.au/jsp/ncc/cdio/cvg/av?p_stn_num=062101&p_prim_element_index=18&p_display_type=statGraph&period_of_avg=ALL&normals_years=allYearOfData&staticPage
Date Accessed: February 2013.

Department of Environment and Conservation (2004) *Environmental Guidelines: Use of Effluent by Irrigation.*

Department of Environment and Conservation (2007) *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales.*

Department of Land and Water Conservation (2003) *Rehabilitation of Open Cut Coal Mines using Native Grasses: Management Guidelines*.

Department of Planning (2007) *Guidelines for Establishing and Operating Community Consultative Committees for Mining Projects.* June 2007.

Environment Protection Authority (2000) *NSW Industrial Noise Policy.*

Heritage Computing (2013) *Wilipinjong Coal Mine – Groundwater Licensing*.

Landcom (2004) *Managing Urban Stormwater: Soils & Construction Volume 1*. 4th Edition, March.

Landline Consulting (2012) *Wilpinjong Coal Mine Stream Health Aquatic Macroinvertebrate Survey*. November 2012.

McCullough Robertson Lawyers (2012) *Peabody New South Wales Water Rights Audit – March 2012.*

National Health and Medical Research Council (2011) *Australian Drinking Water Guidelines.*

Thiess Pty Ltd (2012) Wilpinjong Environmental Risk Matrix.

Turak. E, and Waddell. N, (2002) *Australia-Wide Assessment of River Health: New South Wales AusRivAS Samping and Processing Manual.* Monitoring River Health Initiative Technical Report Number 13. Department f Sustainability, Environment, Water, Population and Communities, Canberra.

Wilpinjong Coal Pty Limited (2005) *Wilpinjong Coal Project Environmental Impact Statement.*

Wilpinjong Coal Pty Limited (2006a) *Wilpinjong Coal Project Surface Water Management and Monitoring Plan.*

Wilpinjong Coal Pty Limited (2006b) *Wilpinjong Coal Project Spontaneous Combustion Management Plan*. May 2006.

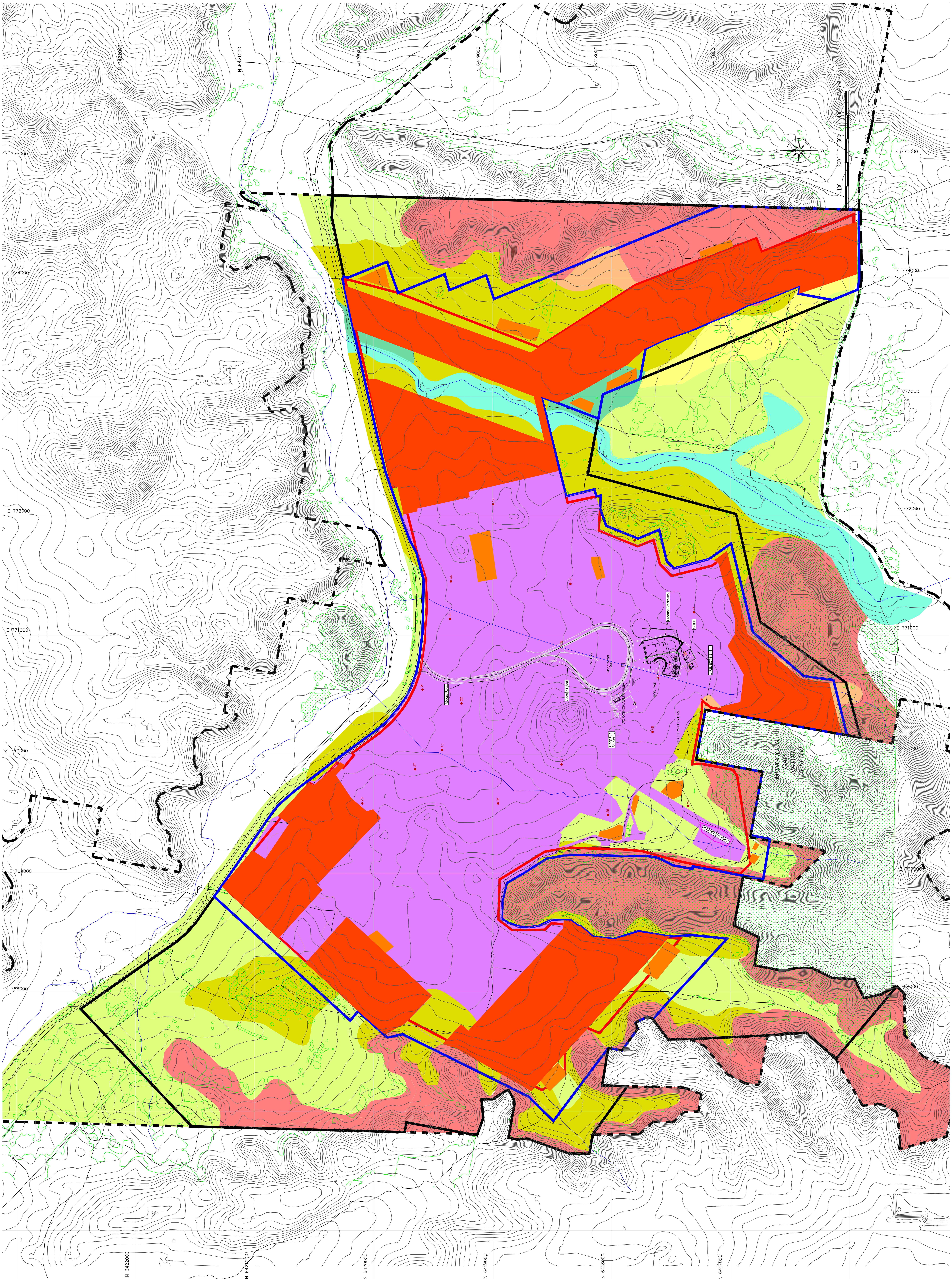
Wilpinjong Coal Pty Limited (2010) *Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment*. May 2010.

Wilpinjong Coal Pty Limited (2011a) *Wilpinjong Coal Mine Air Quality and Greenhouse Gas Management Plan*. September 2011.

Wilpinjong Coal Pty Limited (2011b) *Wilpinjong Coal Mine Rehabilitation Management Plan*. September 2011.

Wilpinjong Coal Pty Limited (2013) *Wilpinjong Site Personnel Car Pool Reimbursement Memo*. 25 February 2013.

PLANS



REV	DESCRIPTION	DATE
B	UPDATED MINING SEQUENCE	27/11/12
A	ISSUED FOR INFORMATION	14/10/10

LEGEND

- MLA 259 Boundary
- EL Boundary
- Proposed Extraction Approval Area
- Area to be disturbed
- Parish Boundary
- Existing native vegetation
- Existing Dam
- Water Course
- Track
- Topsoil Stockpiles
- Out Of Pit Dumps

Topsoil Stripping

- Area Previoiusly Stripped Of Topsoil
- Proposed Area to be Stripped of Topsoil

Soils Sites & Types	Depths
44 Soil Observation Sites	
Alluvial	30cm
Yellow Podzolic	20cm
Red Podzolic	15cm
Earthy Sands	30cm
Brown Earths	25cm
Yellow Solodic	0cm
Lithosols	0cm

I, ..., certify that the information on this plan is a true indication of the proposed development.

.... Manager .... Date

I, ..., certify that to the best of my knowledge and belief this plan conforms to the accuracy standards required by the Division of Resources and Energy, NSW Trade and Investment

.... Mine Surveyor .... Date

Thiess Pty Ltd
THIESS WILPINJONG COAL PROJECT
LOCKED BAG 2000 MUDGEE NSW 2850
PHONE (02) 63 72 0438 FAX (02) 9218 9294

QUALITY RECORD	NAME	SIGNATURE	DATE
REVIEW			
DRAWN	SPD		18/02/2013
DWG CHECKED			
DESIGNER			
DESIGN CHECKED			

SCALE: 1:10,000

JOB REF: 740820

PLOT FILE: 740820–STAT–0017

FILE REF: 740820–STAT–0017

FILE LOCATION: SURVEY SERVICES

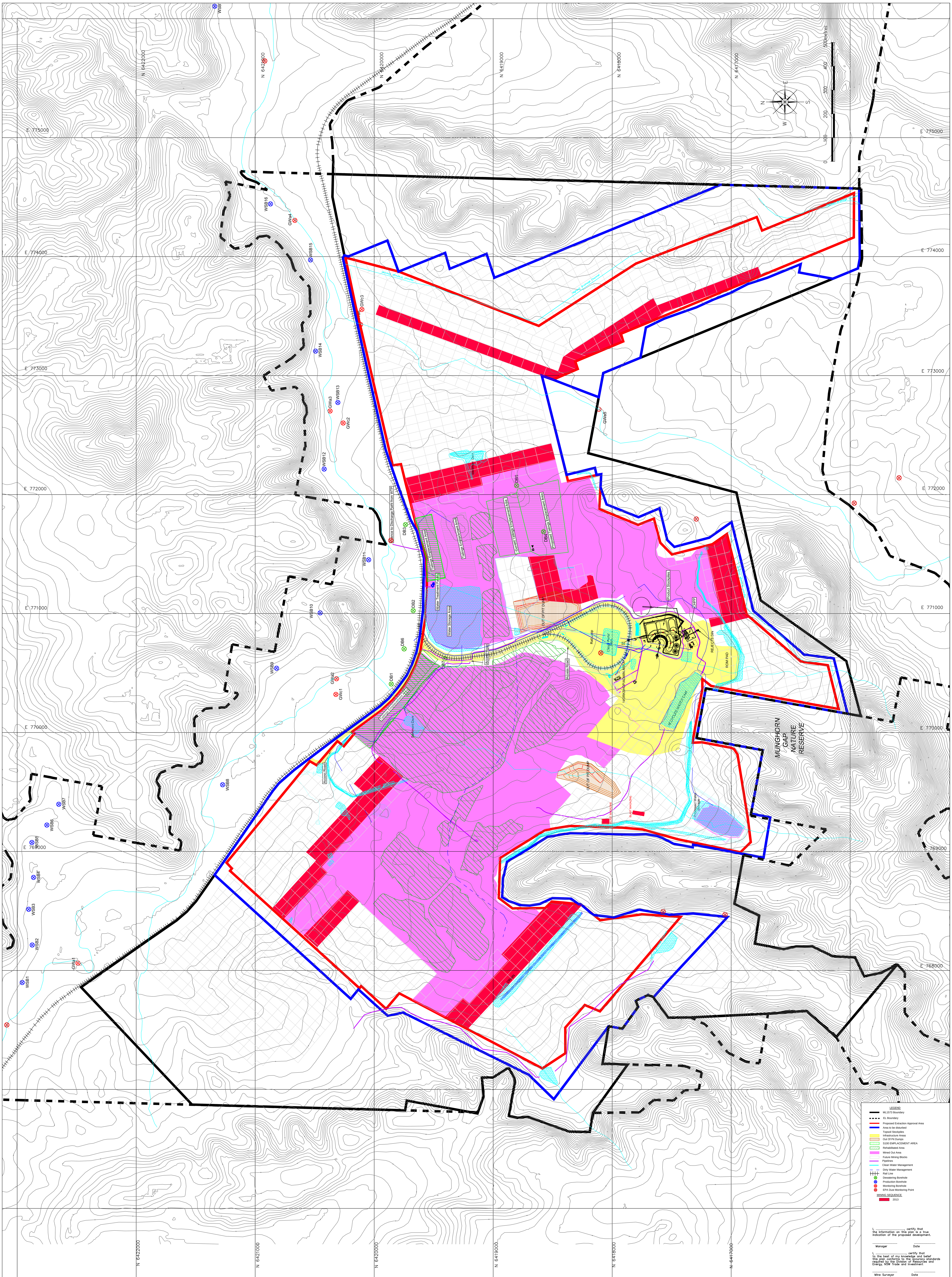
Completion of the Quality Record is evidence that the design and drawing have been verified conforming with the requirements of the Quality Plan. Where the Quality Record is incomplete all information on this drawing is intended for preliminary purposes only as it is unchecked

WILPINJONG COAL

PLAN 1: PROPOSED LAND PREPARATION

DRAWING NO. 740820–STAT–0033

REV ~~A~~ B



I, ..., certify that the information on this plan is a true indication of the proposed development.

.... Manager .... Date

I, ..., certify that to the best of my knowledge and belief this plan conforms to the accuracy standards required by the Division of Resources and Energy, NSW Trade and Investment

.... Mine Surveyor .... Date

REV	DESCRIPTION	DATE
B	REVISED MINING SEQUENCE	27/11/12
A	ISSUED FOR INFORMATION	14/10/10

LEGEND:

QUALITY RECORD	NAME	SIGNATURE	DATE
REVIEW			
DRAWN	SPD		18/02/2013
DWG CHECKED			
DESIGNER			
DESIGN CHECKED			

SCALE: 1:10,000

JOB REF: 740820

PLOT FILE: FILE REF: FILE LOCATION:

WILPINJONG COAL

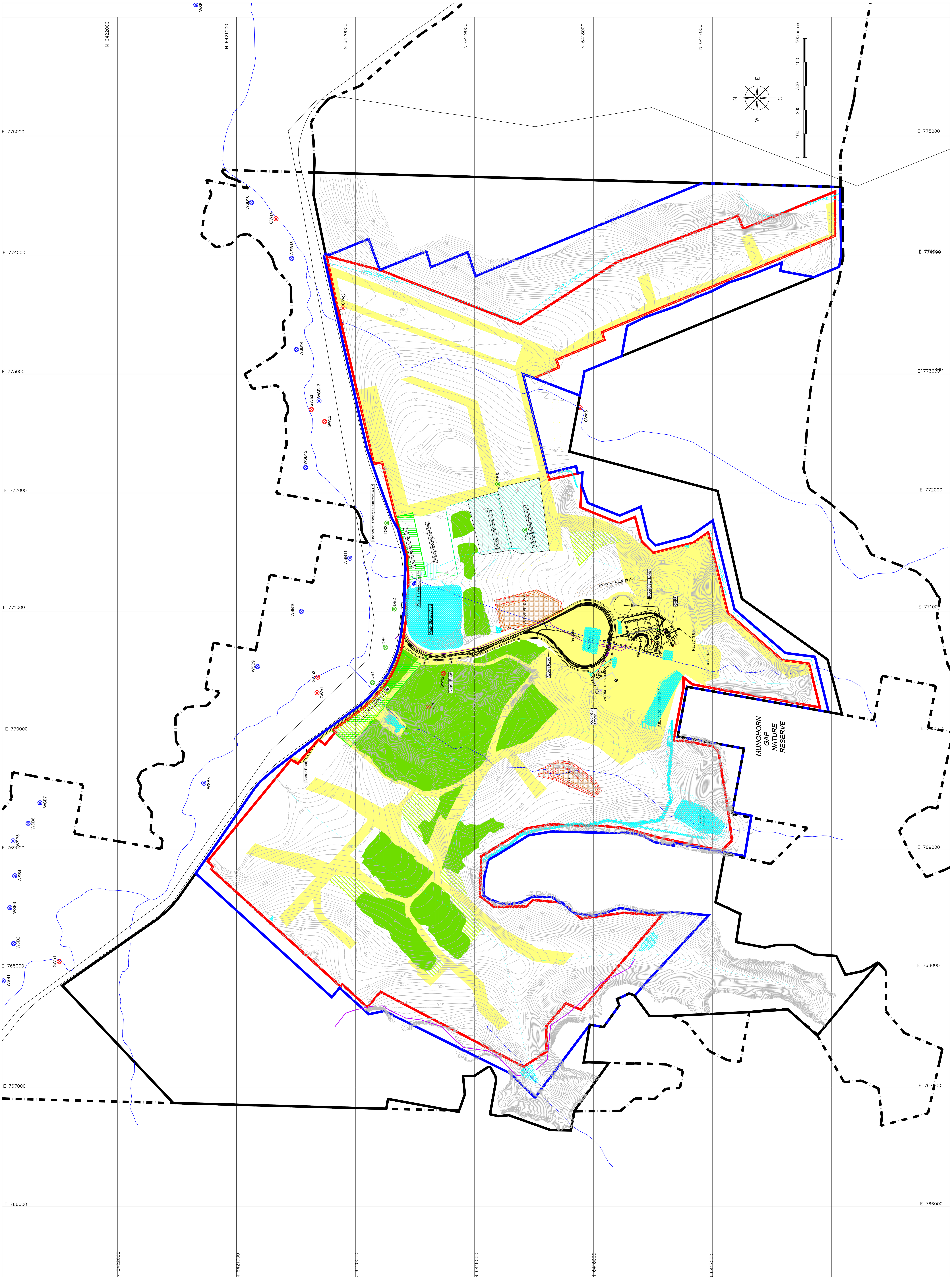
PLAN 2: Proposed Mining Activities

Thiess Pty Ltd
THIESS WILPINJONG COAL PROJECT
LOCKED BAG 2000 MUDGEE NSW 2850
PHONE (02) 63 72 0438 FAX (02) 9218 9294

Completion of the Quality Record is evidence that the design and drawing have been verified conforming with the requirements of the Quality Plan. Where the Quality Record is incomplete all information on this drawing is intended for preliminary purposes only as it is unchecked

DRAWING NO. 740820-STAT-0034

REV A B



REV	DESCRIPTION	DATE
A	ISSUED FOR INFORMATION	14/10/10

LEGEND:

- ML1573 Boundary
- EL Boundary
- Proposed Extraction Approval Area
- Area to be disturbed
- Topsoil Stockpiles
- Infrastructure Areas
- Out Of Pit Dumps
- S100 EMPLACEMENT AREA
- Pipelines
- Clean Water Management
- Dirty Water Management
- 66kv Powerline
- Dewatering Borehole
- Production Borehole
- Monitoring Borehole
- Rehabilitated and Under Maintenance
- Rehabilitation Shaped and Covered
- Proposed 2013 Rehabilitation

I, ..., certify that the information on this plan is a true indication of the proposed development.

.... Manager .... Date

I, ..., certify that to the best of my knowledge and belief this plan conforms to the accuracy standards required by the Division of Resources and Energy, NSW Trade and Investment

.... Mine Surveyor .... Date

Peabody Energy

Wilpinjong Coal Mine

Thiess Pty Ltd

THIESS WILPINJONG COAL PROJECT
LOCKED BAG 2000 MUDGEE NSW 2850
PHONE (02) 63 72 0438 FAX (02) 9218 9294

QUALITY RECORD	NAME	SIGNATURE	DATE
REVIEW			
DRAWN	SPD		18/02/2013
DWG CHECKED			
DESIGNER			
DESIGN CHECKED			

PLOT FILE:

FILE REF:

SCALE: 1:10,000

JOB REF: 740820

FILE LOCATION: SURVEY SERVICES

WILPINJONG COAL

PLAN 3: Proposed Rehabilitation

Completion of the Quality Record is evidence that the design and drawing have been verified conforming with the requirements of the Quality Plan. Where the Quality Record is incomplete all information on this drawing is intended for preliminary purposes only as it is unchecked

DRAWING NO. 740820–STAT–0035

REV A

REV	DESCRIPTION	DATE
B	REVISED DATA	11–2012
A	ISSUED FOR INFORMATION	11–2000

LEGEND:

- ML1573 Boundary
- EL Boundary
- Proposed Extraction Approval Area
- Proposed Area to be disturbed
- Water Course

Area Affected by Mining

- Concervation Areas
- Wildlife Corridors
- Regeneration Area
- Grazing Areas
- Voids

I, ..., certify that the information on this plan is a true indication of the proposed development.

.... Manager .... Date

I, ..., certify that to the best of my knowledge and belief this plan conforms to the accuracy standards required by the Division of Resources and Energy, NSW Trade and Investment

.... Mine Surveyor .... Date

Peabody ENERGY Wilpinjong Coal Mine

Thiess Pty Ltd
THIESS WILPINJONG COAL PROJECT
LOCKED BAG 2000 MUDGEE NSW 2850
PHONE (02) 63 72 0438 FAX (02) 9218 9294

QUALITY RECORD	NAME	SIGNATURE	DATE
REVIEW			
DRAWN	SPD		18/02/2013
DWG CHECKED			
DESIGNER			
DESIGN CHECKED			

PLOT FILE: 2609N002–3A.PLT
FILE REF: 2609N_SKP.PRO
FILE LOCATION: SURVEY SERVICES

Completion of the Quality Record is evidence that the design and drawing have been verified conforming with the requirements of the Quality Plan. Where the Quality Record is incomplete all information on this drawing is intended for preliminary purposes only as it is unchecked

SCALE: 1:10,000
JOB REF: 740820

WILPINJONG COAL

PLAN 4: Final Rehabilitation for Lease Relinquishment.

DRAWING NO. 740820–STAT–0036
REV A B

Legend

(purple outline)	Proposed 2012 Rehabilitaton (MOP)
(red hatched)	2012 Actual Rehabiliation
(green outline)	Pre 2012 Actual Rehabilitation

DISCLAIMER

Peabody Energy Pty Ltd makes every effort to ensure the quality of information available on the map. Before relying on the information on this map, users should carefully evaluate the accuracy, currency, completeness and relevance for their purpose, and should obtain appropriate professional advice relevant to their circumstances.

Peabody Energy Pty Ltd cannot guarantee and assumes no responsibility for the accuracy, currency or completeness of the information and by using this map you accept that Peabody Energy Pty Ltd has no liability for loss or damage in any form whatsoever caused directly or indirectly from the use of this map.

Wilpinjong Coal
Peabody Energy Australia Pty Ltd
Locked Bag 2005
Mudgee NSW 2850
(02) 63702500

Revision	1
Date	24/04/2013

0 0.5 1
kilometers

Plan 5
2012 Actual Rehabilitation vs MOP 2012 Proposed Rehabilitation

N

Peabody ENERGY

Wilpinjong Coal Mine

A4

APPENDIX A

STREAM HEALTH MONITORING REPORT

PEABODY ENERGY

WILPINJPONG COAL MINE

STREAM HEALTH MONITORING

AQUATIC MACROINVERTEBRATE SURVEY

SEPTEMBER 2012

NOVEMBER 2012

Landline Consulting

1 Jack St. Atherton Qld, 4883 Australia

Ph (07) 40916364, Fax 07 40916465 Mobile 0407 955496

Email: admin@landlineconsulting.com

Landline Consulting

1 Jack St. Atherton Qld, 4883 Australia

Ph (07) 40916364, Fax 07 40916465 Mobile 0407 955496

Email: admin@landlineconsulting.com

EXECUTIVE SUMMARY

A survey of the aquatic macroinvertebrate fauna at sites in Wilpinjong Creek, Cumbo Creek and Wollar Creek was undertaken in September 2012. Sites sampled were those which had been established during previous macroinvertebrate studies.

A variety of interpretive indices were applied to the sampling data to evaluate environmental quality at the sample sites. There was a high degree of correspondence between the outputs from these indices.

Values for most stream health indicators in the middle reaches of Wilpinjong Creek showed a modest increase in comparison to previous years, suggesting an overall improvement in stream health. The greatest level of environmental impairment was exhibited at sites CC1 and CC2 in Cumbo Creek.

Unidentified impacts at sites WC3 and WC4 which were evident in previous years appear to have disappeared.

It is thought that the degree of physical habitat degradation is the major factor determining stream health index values at some or all sites.

Salinity may be affecting the occurrence and abundance of some taxa including baetid mayflies at sites with the highest salinity levels.

Contents

Introduction

Background

Wilpinjong Coal Pty Ltd, a wholly owned subsidiary of Peabody Energy Australia (Peabody) operates the Wilpinjong Coal project in the upper Hunter Valley region of NSW. The Project is in the Western Coalfield near the margin of the Sydney-Gunnedah Basin.

The project mining lease covers 2800 hectares and recoverable coal reserves are in excess of 200 million tonnes. The resource is part of the Ulan Coal seam and two other large coal mines are located within a few kilometres of Wilpinjong, at Ulan and Moolarben,

The project is an open-cut thermal coal operation with mining carried out under contract by Thiess. Mining commenced in late 2006 and current annual production is approximately 8 million tonnes, the bulk of which goes to supply the Liddell and Bayswater power stations and the remainder (2 to 2.5 million tonnes per annum) being exported through Newcastle.

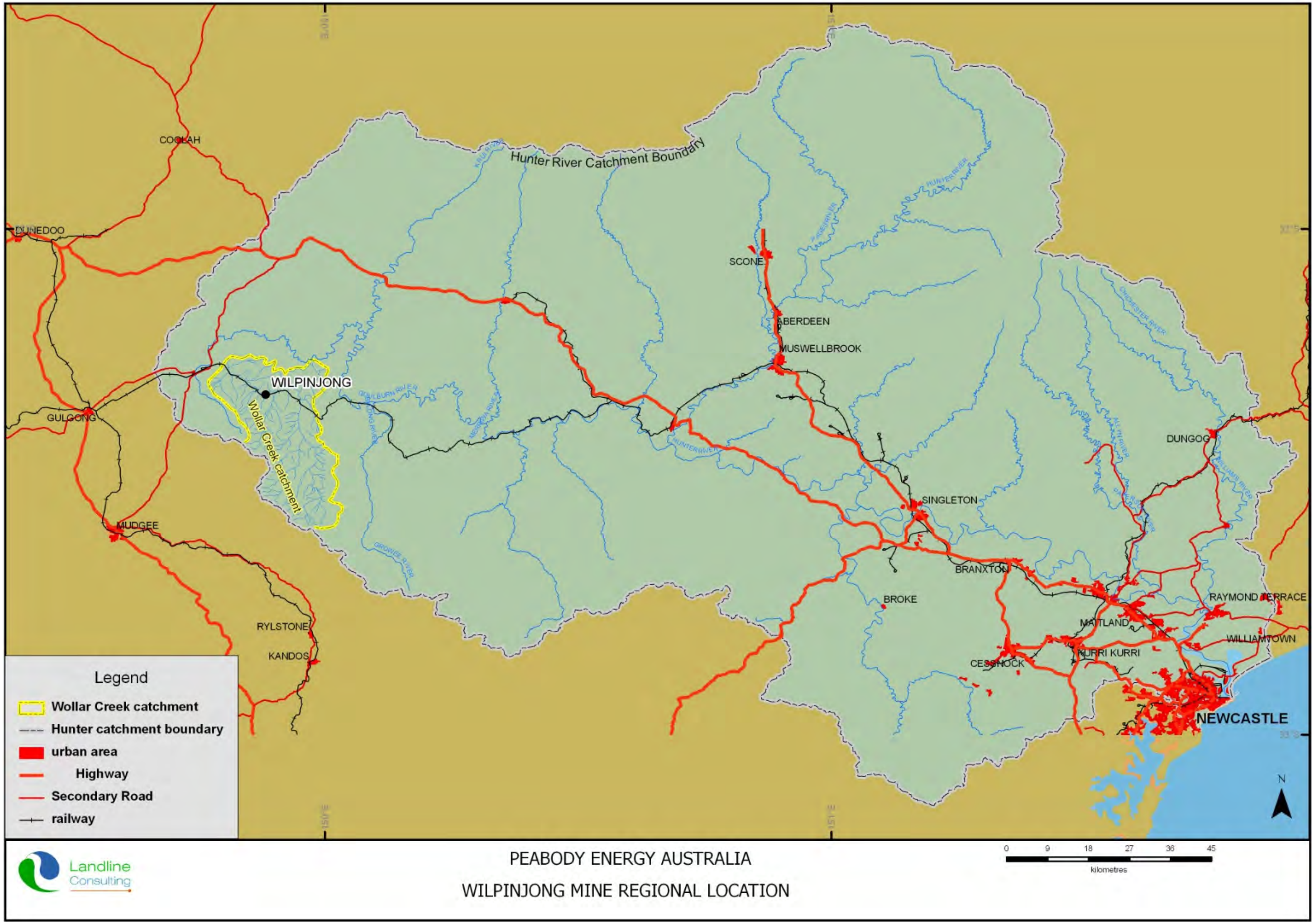
Peabody undertakes annual Stream Health Monitoring in the receiving environment as part of its Surface Water Management Plan. Landline Consulting was commissioned to conduct monitoring and report on stream health during the spring period of 2012.

Study area

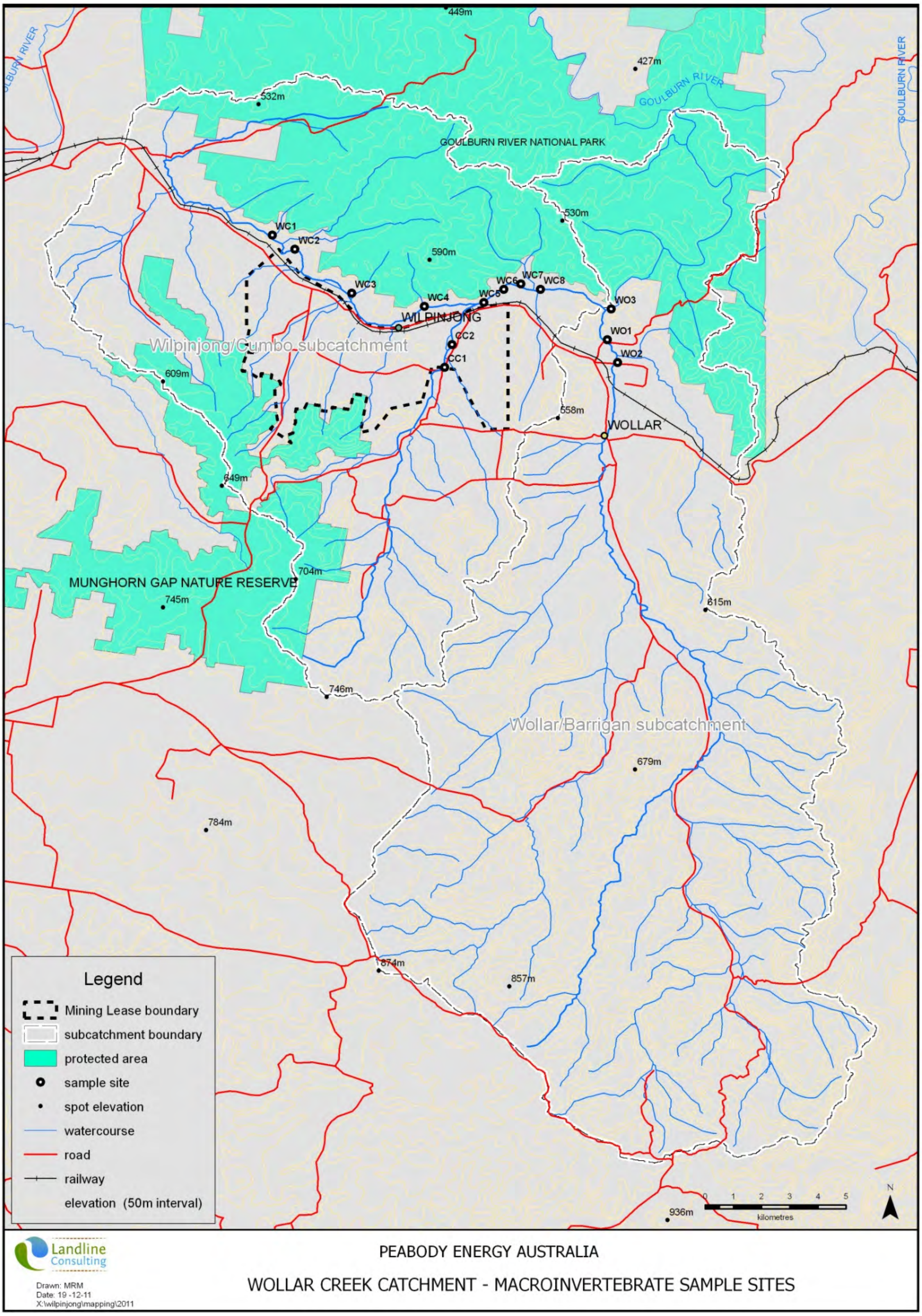
General

Wilpinjong coal mine is located in the upper Hunter River catchment approximately 40km northeast of Mudgee via Ulan Road and Ulan–Wollar Road. The location is shown on a regional scale in Map 1.

Local landforms include narrow flood plains along the middle and lower reaches of tributaries of the Goulburn River, undulating foothills, ridges and escarpments of the Great Dividing Range in the south west and the dissected landforms of the Goulburn River National Park in the northeast. The local coals are part of the Permian Illawarra coal measures and are overlain by Triassic Wollar Sandstones which dominate the surface geology of the Goulburn River National Park and the Munghorn Gap Nature Refuge to the north and south respectively of Wilpinjong. Local relief ranges from approximately 340 m AHD at the junction of Wilpinjong and Wollar Creeks to 870 metres in the headwaters of Wollar Creek. Elevations within the mining lease range from approximately 360m to 550m. Local relief and drainage features are shown in Map 2.



Map 1 Location of Wilpinjong Coal Mine showing Hunter River drainage and local population centres



-Map 2 Wollar Creek catchment showing sample sites and Wilpinjong lease boundary

Surface Water Receiving Environment

As shown in Map2 the Wilpinjong mining lease drains to Wilpinjong Creek and its tributary Cumbo Creek which lie to the north and east respectively of the current mining operations. As coal mining proceeds eastwards across the lease it will ultimately be necessary to divert the Cumbo Creek channel. From its junction with Cumbo Creek near the north-eastern corner of the mining lease, Wilpinjong Creek flows eastward to enter Wollar Creek approximately 5km downstream of the mining lease. The study area covers the portion of the Wilpinjong/Cumbo Creek catchments from upstream of the mining lease boundary to the junction with Wollar Creek as well as a short section of the Wollar Creek catchment upstream and downstream of the confluence with Wilpinjong Creek (see Map 2).

Most of the watercourses in the study area have been degraded over a long period of time by physical disturbance including riparian and floodplain clearing, grazing by cattle and kangaroos, and the activities of wombats, rabbits and pigs which have affected bank stability. Wilpinjong and Cumbo Creeks flow intermittently and salinity is naturally high under base flow conditions.

Sampling Sites

Thirteen sampling sites were sampled in the 2011 survey (Map 2). These included the twelve sites sampled in the 2010 survey and an additional site (WO3) located in Wollar Creek downstream of the junction with Wilpinjong Creek. Sites are coded according to the creek they are located on (WC= Wilpinjong Creek, CC= Cumbo Creek, WO= Wollar Creek) and numbered consecutively from upstream to downstream. Further information on individual sites follows.

Site WC1 MGA Coordinates E767680 N6422970 Stream Order 3

This reach of Wilpinjong Creek is situated approximately 500metres north of the western boundary of the mining lease boundary and two channel kilometres upstream of the junction with Planter Creek, which is the first surface inflow from the mining lease area. The site displays reasonable bank stability and riparian vegetation cover. The flow channel is reasonably well defined with shallow pools and small riffles that are largely dominated by *Phragmites* cover. The physical habitat has shown no signs of improvement over the past three years and at the time of the 2012 survey the pools appear to be less well defined and there has been increased deposition of coarse sand bed sediments covered with red (iron?) stained floc material.

Site WC2 MGA Coordinates E768350 N6422450 Stream Order 3

This reach of Wilpinjong Creek is located approximately 1kilometre downstream of site WC1 and 1 kilometre upstream of Planters Creek. Its physical condition is similar to that of WC1 although the pool/riffle sequence is better preserved at this site.

Site WC3 MGA Coordinates E770010 N6420860 Stream Order 3

This site is located on Wilpinjong Creek approximately 2 kilometres downstream of the Planters Creek junction and upstream of the junction with Narrow Creek. The creek at this site has a poorly defined channel and conforms to the "chain of ponds" type of morphology. It is almost entirely covered by thick growth of *Typha/Phragmites* and the "riffles" available for sampling have a sand/gravel substrate with little cobble or boulder present.

Site WC4 MGA Coordinates E772180 N6420330 Stream Order 3

This site is located on Wilpinjong Creek approximately 1.5 kilometres downstream of the confluence with Narrow Creek and approximately the same distance upstream of the Cumbo Creek junction. The creek banks in this area have been cleared and severely eroded and the poorly defined channel has migrated between the high banks, with swampy edges covered with a dense growth of *Phragmites.* Shallow riffles are largely confined to the stream edges where the channel is controlled by rock bars. The substrate is largely bedrock with limited cobbles and gravel.

Site WC5 MGA Coordinates E773970 N6420420 Stream Order 4

This site is located on Wilpinjong Creek immediately downstream of the Cumbo Creek confluence. The creek here is aggraded and forms a chain of ponds separated by poorly developed riffles with little cobble or rock present. The riparian zone has been entirely cleared for some distance upstream of this site.

Site WC6 MGA Coordinates E774580 N6420860 Stream Order 4

This site is located on Wilpinjong Creek at the downstream flow gauging station close to the eastern extremity of the mining lease. The channel is controlled at this point by a natural bar and weir associated with the gauging station. Riffles are largely bedrock with some cobbles, sand and gravel.

Site WC7 MGA Coordinates E775100 N6421050 Stream Order 4

This site is located on Wilpinjong Creek approximately 500m downstream of WC6 and the riparian vegetation between the two sites is relatively intact. There is reasonable definition of the flow channel with riffles having a mixed substrate of bedrock, cobble, gravel and sand

Site WC8 MGA Coordinates E775680 N6420830 Stream Order 4

This site is the furthest downstream site in Wilpinjong Creek being located approximately 1.5 kilometres east of the mining lease and 2.5 km upstream of the confluence with Wollar Creek. Riparian vegetation in this section of creek is largely absent and the stream bed is sedimented and clogged with reeds and rushes. There are no clearly defined riffles and sampling was carried out mainly along the edges and in small flow paths through the reeds.

Site CC1 MGA Coordinates E772730 N6418150 Stream Order 3

This site is located on Cumbo Creek approximately 1 kilometre upstream of Site CC2 at the place where the creek enters the mining lease. Samples were collected upstream and downstream of the road crossing on the Old Wilpinjong Road. The creek upstream is clogged with *Typha* and the channel bed downstream is muddy and heavily trampled by cattle. There are no riffles. Sampling was mainly along the edges of the creek crossing and the creek margins.

Site CC2 MGA Coordinates E772970 N6418950 Stream Order 3

This site is located in Cumbo Creek approximately 2 kilometres upstream of the confluence with Wilpinjong Creek. There is little habitat complexity as the creek is severely degraded with no riparian vegetation, few ponded sections and the narrow flow channel resembles a constructed drain. There are no defined riffles and the substrate is muddy to sandy.

Site WO1 MGA Coordinates E777930 N6418180 Stream Order 4

The site is located at where Araluen Lane crosses Wollar Creek approximately 1kilometre above site WO2 and 2.5 kilometres downstream of the township of Wollar. No accessible riffles were present at the site and sampling was restricted to the edges.

Site WO2 MGA Coordinates E777640 N6419000 Stream Order 4

This site is located on Wollar Creek approximately 2 kilometres upstream of the junction with Wilpinjong Creek where Mogo Road crosses the creek. There is little riparian vegetation at this site and bank stability is poor. The creek is largely clogged with rushes and reeds. The main riffle zones are located downstream of the road crossing and have a rocky sandy substrate.

Site WO3 MGA Coordinates E777640 N6419000 Stream Order 5

This site is located in Wollar Creek approximately 100 metres downstream of the junction with Wilpinjong Creek. While grazing has had some effect on the creek banks the flow channel is relatively intact and there is a good sequence of riffles with cobble and rock substrate.

Biomonitoring with macroinvertebrates

Aquatic macroinvertebrates include such animals as worms, prawns, crayfish, molluscs and many types of insect larvae. They are commonly used for biomonitoring of water quality for several reasons including the fact that are fairly ubiquitous and are found in almost every water body, even rivers and ponds that dry from time to time. They are also relatively easy to catch and identify.

Macroinvertebrates have differing water quality requirements. Some require very good water quality for survival while others are capable of living in severely polluted environments. Because most stream macroinvertebrates are relatively sedentary examining the animals at a given site can indicate what the water quality has been like over the weeks or even months prior to the sample. A major advantage of biomonitoring is the fact that the record of short term pollution is "stored" in the stream biota for some time after an event causes an impact on the system. This gives a considerable advantage over chemical sampling which can only detect water quality conditions at the time of sampling.

Community diversity is one simple way of assessing water quality. In a sample from a diverse community there is a low probability that any two individual specimens drawn at random from the sample will be of the same type. A sample from a site with low diversity may contain just as many individual animals as the high diversity sample but there is a relatively high probability that two animals drawn sequentially will be of the same type. Sites with good water quality usually have a great variety of animals and the different types of animals are relatively evenly represented in the habitat (high diversity) as compared to sites with poor water quality where the fauna is likely to consist of a few numerically dominant and pollution-tolerant species (low diversity). Various indices can be used to measure the diversity in the sample and assess environmental quality.

Another approach is to produce a biotic index in which categories of animals are ranked on the basis of their tolerance to pollution and rankings of the animals in the sample are used to assess water quality at the site.

A third approach is to rank sites on the basis of the taxa present at the site as compared to the probability of occurrence of a standard list of taxa from suitably selected reference sites. This approach is taken by the AUSRIVAS modelling system.

This survey has used a range of indicators based on community diversity and biotic indices to assess the condition of macroinvertebrate communities. A brief summary of the major indicators used follows.

Number of animals

In non-impacted environments numbers of animals present in samples will normally be reasonably uniform between samples (usually in the order of ±50% around the median value). Large increases or decreases in animal abundance between sites may either indicate significant changes in physical habitat diversity or effects of an environmental stressor.

Number of taxa

In non-impacted environments numbers of taxa present in samples will normally be reasonably uniform between samples (usually in the order of ±25% around the median value). Significant environmental stressor levels are usually accompanied by a significant decrease in the number of taxa present at impacted sites.

Shannon Diversity Index (*H*) and Shannon Equitability Index (E_H)

The Shannon diversity index (Shannon 1949) which measures community diversity is one of the most commonly used tools in rapid assessment biomonitoring. The Shannon index includes information on species richness and abundance values in a single number. It measures the degree of uncertainty of predicting the group to which of an individual specimen, picked at random from the community will belong. The value of the Shannon index (H) is calculated using the following equation:

$$H = \sum_{n=1}^{s} (p_i . \ln(p_i))$$

Where:

p_i = proportional abundance of a species/taxon, (simply the number of an individual taxon present divided by the total number of specimens in the sample)

s= species/taxon richness, the total number of different categories of organisms present.

The related equitability (evenness) index measures how evenly the individuals within the sample are distributed between the taxa that make up the sample. Maximum equitability is 1 which is achieved when each taxon in the sample is represented by the same number of individuals. The equation is:

$$E_H = H/H_{max} = H/\ln s$$

It is important that comparisons of these indices are made at the same level of taxonomic resolution. In this study data processing was carried out at the family level even though some organisms could be identified to the subfamily or genus level.

SIGNAL2 index

The SIGNAL2 Index (Chessman, 2003) is a biotic index which is based on a system of pollution sensitivity grading for macroinvertebrate families which ranks the individual taxa from 1-10 on the basis of their tolerance to pollution (1 being most tolerant and 10 being least tolerant). SIGNAL is an acronym for **S**tream **I**nvertebrate **G**rade **N**umber **A**verage **L**evel.

The abundance-weighted family version of the SIGNAL2 index was used in this study with the modification that water mites (hydracarina) were identified only to the suborder level.

To obtain a SIGNAL ranking sensitivity grade scores for each family present in a sample are recorded and a weighting factor, based on the number of individuals sampled is calculated for each family and applied to the individual grades. The sum of weight factors for all taxa is calculated and the products of grade numbers and weight factors are summed. The second of these totals is divided by the first to produce the abundance-weighted SIGNAL 2 score. Full details of the index can be found at

http://www.environment.gov.au/water/publications/environmental/rivers/nrhp/signal.html

A variation of the SIGNAL index system Signal (-1) in which taxa represented by a single individual are excluded from the calculation of the SIGNAL2 score was also adopted in this study. This modification can reduce the contribution by animals which are drifting or transient rather than resident. The effect of such non resident animals can be important under high flow conditions.

EPT Indices

The orders Ephemeroptera (**E**), Plecoptera (**P**) and Trichoptera (**T**) are generally regarded as being highly sensitive to pollution and there a number of biotic indices of environmental quality based on the number and abundance of families belonging to these orders. Some of the indices based on this common theme include:

- a simple score based on the number of EPT families present in a sample
- the number of EPT families as a proportion of the total number of families in a sample
- total abundance of EPT animals as a proportion of the total number of animals in a sample
- the abundance of EPT animals divided by the abundance of midges (Chironomidae)

Each of these approaches has advantages for specific situations however for simplicity and comparability over a wide range of conditions a simple score representing the number of PET families present is adopted here.

Methodology

Sampling Dates

Sampling was conducted in the period 11-17 September. Stream flow was low and stable during most of the survey period.

Field Sampling

Sampling followed the protocols outlined in the NSW AUSRIVAS manual (Turak and Waddell, 2002).

At each site three replicate kick samples were obtained in different riffle/edge sections using a standard 250µm sampling net. Attention was paid to ensuring that the full range of substrates including edge substrates, and the range of current velocities represented in the riffle were sampled. Each replicate sample covered approximately 10 square metres of riffle area. The composition of sampled substrates was recorded. Samples were transferred to a bucket and live-picked from a white sorting tray by two experienced persons for at least 60 minutes and in most cases until all visible macroinvertebrates had been picked from the sample. Individual rocks and coarse plant material in the sample were removed first and individually scrubbed to remove animals adhering to them. Forceps, probes and Pasteur pipettes were used to transfer animals from the sample tray to a sampling vial containing methylated spirits and a label detailing site number, date and replicate number.

Invertebrate samples were returned to the laboratory for sorting, identification and data entry.

A photograph was taken of each sampling site and the ambient temperature, pH and salinity at the time of sampling was measured with a portable field meter. Turbidity was estimated using a turbidity tube.

Laboratory procedures

To minimise risks of data corruption individual replicate samples were treated sequentially and sorting, identification and data entry procedures relating to each individual sample were completed prior to commencing work on the next sample.

Samples were transferred bit by bit from the sample vial to a Petri dish and examined under a zoom stereomicroscope. Individual animals were sorted into taxa and identified to family level with the exception of cladocera, collembola, hydracarina, oligochaeta and ostracoda. As each animal was identified it was entered on a tally sheet listing the number of individuals for all families present in the sample. At the completion of each sample the data from the tally sheet was copied into the data entry section of a spreadsheet model which was used to calculate various biotic indices. Specimens from each sample were transferred to a new labelled sample vial for storage.

The main identification keys used were the web-based Keys to Australian Aquatic Invertebrate Families hosted on the LUCID central web site with reference to supplementary printed keys where necessary.

Data analysis

Data was entered into a spread sheet which calculated the following values for each individual sample:

- Abundance weighted SIGNAL-2 value
- Number of animals
- Number of families
- Shannon Diversity index at family level
- Shannon evenness value

Data was also exported from the spreadsheet in a format suitable for input to AUSRIVAS river health modelling software (AusRivAS Macroinvertebrate Predictive Modelling Ver. 3.1.1, CRCFE/LWA 2003) and the New South Wales spring riffle model was run. Habitat variables necessary for running the appropriate AUSRIVAS macroinvertebrate model included distance from source, slope, mean annual rainfall, latitude and longitude. Where necessary these variables were calculated from externally sourced data.

Results

General

The study processed a total of 10123 animals from 58 families[1]. The presence and abundance of individual taxa at each sample site are presented in Table 1.

Six ubiquitous taxa which were found at all sample sites included chironomid and simuliid flies, leptocerid trichopterans, baetid mayflies and scirtid and dytiscid beetles. These ubiquitous taxa were all included in the ten most abundant taxa which together accounted for approximately two thirds of all animals collected.

The fauna assemblage in 2011 was similar to that in the previous two annual surveys. Eight families which had not been collected in previous annual surveys were collected in 2012, however most of these families were only represented by a single specimen. Elmid beetles were the only family which had been present in both 2010 and 2011 surveys but which were not detected in 2012.

The values of the various biotic indices from individual replicate samples are tabulated together with site values for AUSRIVAS in Table 2. To facilitate easy comparison the results are also presented graphically in Figure 1.

Combined site values for the biotic indices and AUSRIVAS modelling are presented in Table 3

[1] Chironomid larvae were identified to subfamily level for entry into the spreadsheet model but are considered here as a single family for reasons of consistency when comparing 2012 results with previous survey data.

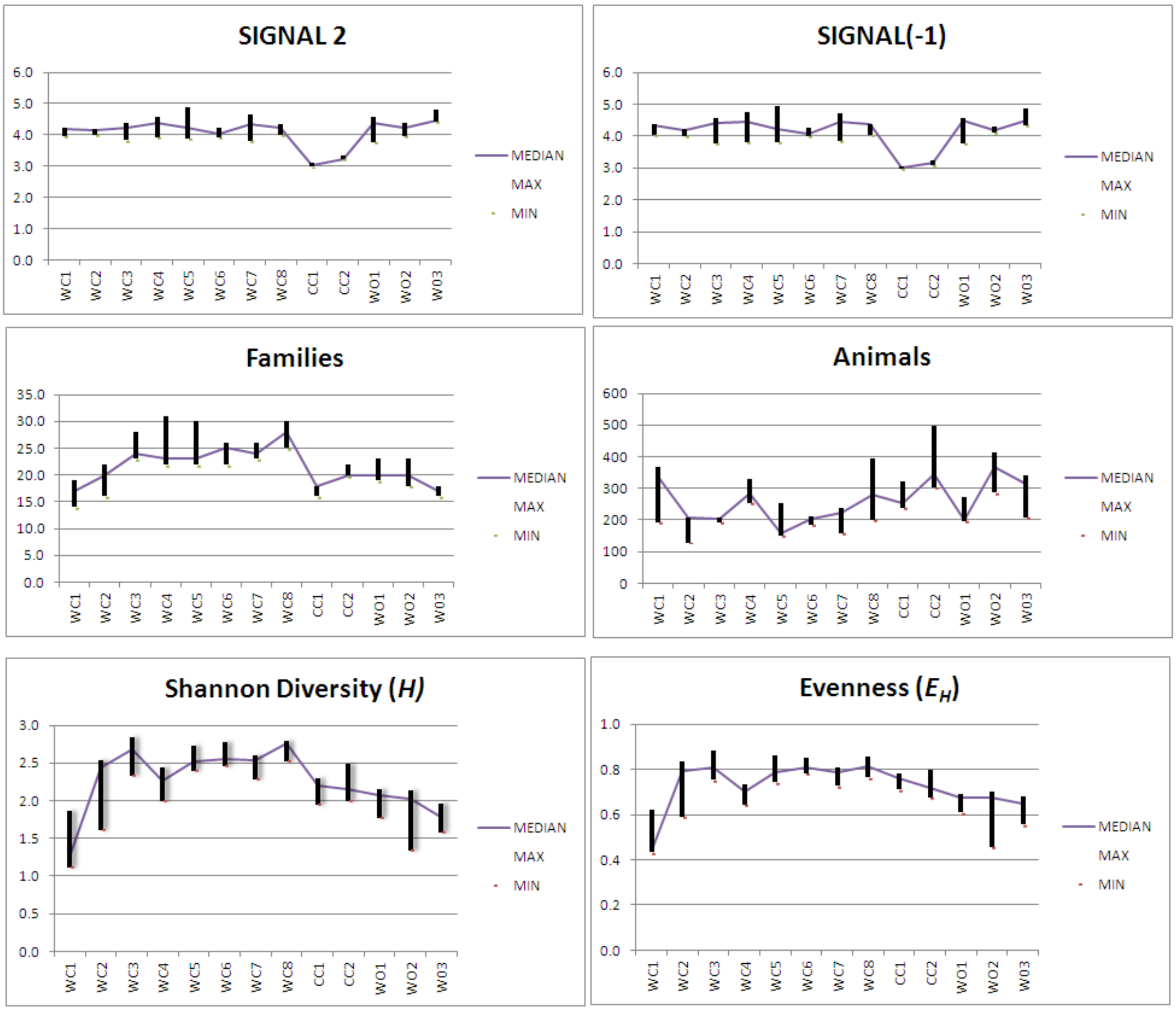
Table 1 Distribution and abundance of invertebrates collected during the study

Family	WC1	WC2	WC3	WC4	WC5	WC6	WC7	WC8	WO1	WO2	WO3	CC1	CC2
Aeshnidae	0	1	0	0	2	0	0	1	0	0	0	0	0
Atyidae	0	107	13	2	37	60	19	37	7	13	60	0	0
Baetidae	22	125	44	16	1	4	2	9	178	201	207	5	4
Caenidae	1	2	2	22	14	14	40	48	1	4	7	0	2
Calamoceratidae	0	32	27	15	37	20	15	71	9	0	0	0	0
Carabidae	0	0	0	0	0	0	0	1	0	0	0	0	0
Ceratopogonidae	28	0	2	1	2	3	1	2	0	6	4	5	2
Chironominae	145	61	149	409	106	144	83	159	276	431	367		
Chrysomelidae	0	0	0	0	0	1	0	0	0	0	0	0	0
Coenagrionidae	0	2	0	0	0	3	8	16	0	0	0	1	26
Corduliidae	0	0	0	1	2	1	0	0	0	0	0	0	2
Corixidae	0	11	4	5	27	68	59	12	26	13	7	0	0
Culicidae	0	0	0	0	0	0	0	5	0	0	0	0	1
Daphniidae	0	0	1	0	0	0	0	0	0	0	0	0	0
Dixidae	0	1	5	5	11	0	0	4	0	0	0	0	0
Dolichopodidae	0	0	0	1	0	0	0	0	0	0	0	0	1
Dugesiidae	3	6	17	63	6	21	8	24	14	9	0	39	0
Dytiscidae	6	2	11	9	7	5	9	7	1	2	1	7	7
Ecnomidae	1	1	0	26	4	11	6	1	2	1	2	0	0
Entomobryidae	0	0	0	0	0	0	0	0	0	0	0	0	2
Erpobdellidae	0	0	1	0	0	0	0	0	0	0	0	0	0
Glossiphonidae	0	0	0	0	0	0	0	0	1	0	0	0	0
Gomphidae	1	6	0	3	0	0	8	1	0	0	1	0	0
Gripopterygidae	0	0	0	0	1	0	1	0	0	1	1	0	0
Gyrinidae	4	7	0	0	2	4	7	0	1	0	2	0	0
Hydracarina	0	0	2	0	14	3	0	14	2	0	0	1	36
Hydraenidae	17	8	21	7	19	4	5	14	7	9	0	13	47
Hydrobiosidae	3	0	0	3	4	2	5	7	9	5	16	0	0
Hydrometridae	0	1	1	0	1	0	0	0	0	0	0	0	0
Hydrophilidae	24	16	29	22	32	23	19	16	7	9	0	41	180
Hydropsychidae	8	4	1	63	3	5	99	22	11	182	137	0	0
Hydroptilidae	0	8	1	0	0	0	1	3	0	0	2	77	0
Leptoceridae	1	27	10	16	87	91	101	143	23	7	2	1	1
Leptophlebiidae	0	27	60	58	11	12	15	67	1	1	0	0	0
Libellulidae	0	0	3	9	1	1	2	6	0	1	0	2	20
Lumbriculidae	1	1	2	1	0	2	1	9	8	4	2	4	0
Lymnaeidae	0	7	26	2	1	1	2	13	7	10	0	165	30
Mesoveliidae	0	0	0	0	0	0	0	0	1	0	0	0	1
Muscidae	0	0	0	0	0	0	0	0	0	0	2	0	0
Naucoridae	0	1	0	0	0	0	0	0	0	0	0	0	0
Notonectidae	1	6	2	1	4	3	1	1	0	0	0	0	0
Notonemouridae	0	0	0	1	0	0	0	0	0	0	0	0	0
Ostracoda	1	1	34	2	3	22	2	22	0	2	0	65	23
Palaemonidae	0	0	0	0	0	0	0	1	0	0	5	0	0
Philopotamidae	0	0	0	1	0	0	0	0	0	0	0	0	0
Pisauridae	1	5	3	1	5	1	1	2	0	0	0	2	18
Planorbidae	0	0	8	4	0	4	11	12	6	5	1	50	5
Poduridae	0	0	0	1	4	0	1	2	0	0	0	4	41
Pyralidae	0	0	2	0	0	0	0	0	0	0	0	0	0
Saldidae	0	0	0	0	0	0	0	1	0	0	0	0	0
Scirtidae	22	3	16	38	81	29	30	47	16	19	17	18	3
Simuliidae	596	59	99	50	25	38	52	58	49	121	16	119	137
Staphylinidae	0	0	0	3	0	1	0	0	0	0	0	0	2
Stratiomyidae	0	0	0	1	0	0	0	8	5	0	0	45	84
Synlestidae	0	0	4	0	2	0	0	0	0	0	0	0	0
Tabanidae	0	2	0	0	1	0	1	0	0	0	0		
Thiaridae	0	0	0	0	0	0	0	0	0	1	0	0	0
Tipulidae	12	0	0	3	2	1	1	1	1	11	4	1	12
Veliidae	2	2	3	2	6	0	1	4	1	0	0	3	12

Table 2 Values of biotic indicators for individual replicate samples

site	rep	no families	no animals	SIGNAL2	SIGNAL-1	Shannon	evenness	EPT taxa
WC1	a	19	194	4.2	4.4	1.8	0.6	
WC1	b	14	339	4.0	4.0	1.1	0.4	
WC1	c	17	367	4.2	4.3	1.3	0.4	
WC2	a	20	129	4.2	4.2	2.5	0.8	
WC2	b	16	206	4.2	4.2	1.6	0.6	
WC2	c	22	207	4.0	4.0	2.4	0.8	
WC3	a	28	202	4.4	4.6	2.7	0.8	
WC3	b	24	194	3.8	3.8	2.8	0.9	
WC3	c	23	209	4.2	4.4	2.4	0.8	
WC4	a	22	253	3.9	3.8	2.3	0.7	
WC4	b	23	330	4.4	4.4	2.0	0.6	
WC4	c	31	284	4.6	4.7	2.4	0.7	
WC5	a	30	255	4.9	5.0	2.5	0.7	
WC5	b	22	159	3.9	3.8	2.4	0.8	
WC5	c	23	152	4.2	4.2	2.7	0.9	
WC6	a	22	213	3.9	4.0	2.5	0.8	
WC6	b	25	186	4.2	4.3	2.7	0.9	
WC6	c	26	203	4.0	4.1	2.6	0.8	
WC7	a	23	157	4.4	4.5	2.5	0.8	
WC7	b	26	239	3.8	3.9	2.6	0.8	
WC7	c	24	221	4.6	4.7	2.3	0.7	
WC8	a	30	395	4.3	4.4	2.8	0.8	
WC8	b	25	199	4.0	4.0	2.8	0.9	
WC8	c	28	281	4.2	4.4	2.5	0.8	
CC1	a	18	323	3.0	3.0	2.3	0.8	
CC1	b	18	237	3.1	3.1	2.2	0.8	
CC1	c	16	252	3.0	3.0	2.0	0.7	
CC2	a	22	302	3.3	3.2	2.5	0.8	
CC2	b	20	345	3.2	3.2	2.0	0.7	
CC2	c	20	496	3.2	3.1	2.2	0.7	
WO1	a	23	199	4.6	4.6	2.1	0.7	
WO1	b	20	198	4.4	4.5	2.1	0.7	
WO1	c	19	273	3.8	3.8	1.8	0.6	
WO2	a	20	369	4.0	4.1	1.4	0.5	
WO2	b	18	286	4.4	4.3	2.0	0.7	
WO2	c	23	413	4.2	4.2	2.1	0.7	
WO3	a	16	313	4.8	4.9	1.8	0.6	
WO3	b	17	208	4.5	4.3	1.9	0.7	
WO3	c	18	342	4.4	4.5	1.6	0.6	

-Figure 1. Median values (represented by line) and range (high and low values at extremities of bar) of replicate samples



Indicator values calculated from the total collection at each site are presented in Table 3.

Table 3 Combined site values for environmental quality indicators at Wilpinjong invertebrate sample sites

Site	Taxa	Animals	SIGNAL2	SIGNAL(-1)	Shannon *H'*	E_H	*EPT taxa*
WC1	22	900	4.1	4.0	1.4	0.5	6
WC2	31	542	4.1	4.9	2.2	0.7	8
WC3	33	605	4.2	2.0	2.6	0.8	8
WC4	36	867	4.3	3.8	2.2	0.7	10
WC5	36	566	4.3	3.7	2.6	0.8	9
WC6	32	602	4.1	3.7	2.6	0.8	8
WC7	34	617	4.3	4.1	2.5	0.8	10
WC8	40	875	4.2	4.3	2.7	0.8	9
CC1	23	812	3.0	4.6	2.1	0.8	8
CC2	25	1143	3.3	4.9	2.2	0.7	8
WO1	27	670	4.2	4.7	2.0	0.7	8
WO2	25	1068	4.2	3.9	1.8	0.6	8
WO3	22	863	4.6	3.2	1.8	0.6	8

Water Quality and Stream Conditions

During the sampling period local streams had a low flow following below average rainfall in August and early September. The flow conditions contrasted with the previous two years when rainfall during the period preceding sampling was well above average. Stream height data from the Wilpinjong downstream gauging station for the winter months of 201,2011 and 2012 are compared in Figure 2.

Electrical conductivity at most sites was lower than at the time of the 2011 sampling but higher than in 2010 when flood conditions prevailed (Figure 5).

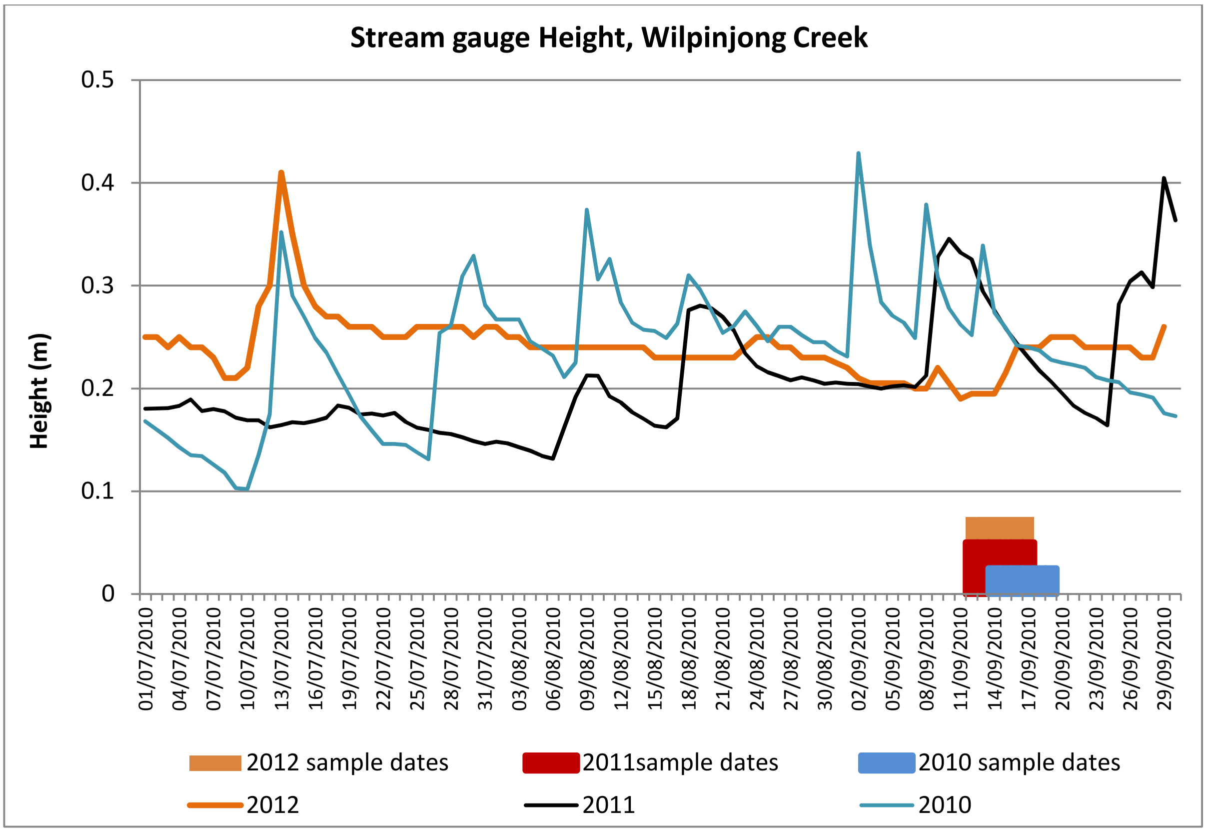


Figure 2 Stream Gauge height, Wilpinjong Creek downstream gauging station, period June – September in 2010, 2011 and 2012

Discussion

Wilpinjong Creek, Cumbo Creek and Wollar Creek are all significantly degraded ecosystems which have been adversely affected by loss of riparian vegetation, physical damage to banks, and erosion of watersheds over a long period. Previous surveys have established that stream health at all survey sites is significantly impaired with some sites being severely impaired.

In general terms the 2012 survey showed some improvement in most stream health indicators at most sites in Wilpinjong Creek and relatively little change in indicator values at sites in Wollar Creek and Cumbo Creek. The most obvious improvement was at sites WC 3, WC4, and WC5 which all showed the highest values to date for taxon richness, animal abundance, SIGNAL2 score, Shannon diversity, and EPT taxa. Sites WC6, WC7 and WC8 exhibited the highest values to date for four of the abovementioned five indicators.

In the previous two annual surveys sites CC1 and CC2 stood out as sites showing the greatest degree of environmental impairment in both years together with sites WC4 (in 2010) and WC3 (in 2011). The results of the 2012 survey show that the Cumbo Creek sites are the most impaired but the unidentified factors which had clear impacts at sites WC3 and WC4 over the past two years were not in evidence and these two sites were no more impaired than any of the other Wilpinjong Creek sites.

As in previous annual reports the SIGNAL2 index is interpreted here with the aid of a biplot quadrant diagram which helps to place the results in context to the local biogeography. The use of the quadrant biplot is discussed in the SIGNAL2 manual which can be accessed at:

(http://www.environment.gov.au/water/publications/environmental/rivers/nrhp/signal.html

Because there are no undisturbed habitats sampled in the survey the quadrant boundaries for the diagram are based on example biplot quadrant in the SIGNAL manual which is based on sites in the upper Macquarie River catchment, adjacent to the Wollar Creek catchment on the opposite side of the Great Divide. Based on an assumption that quadrant boundaries in neighbouring catchments on either side of the divide will be similar the quadrant boundaries from the SIGNAL manual have been applied to the biplot of site data shown in Figure 3.

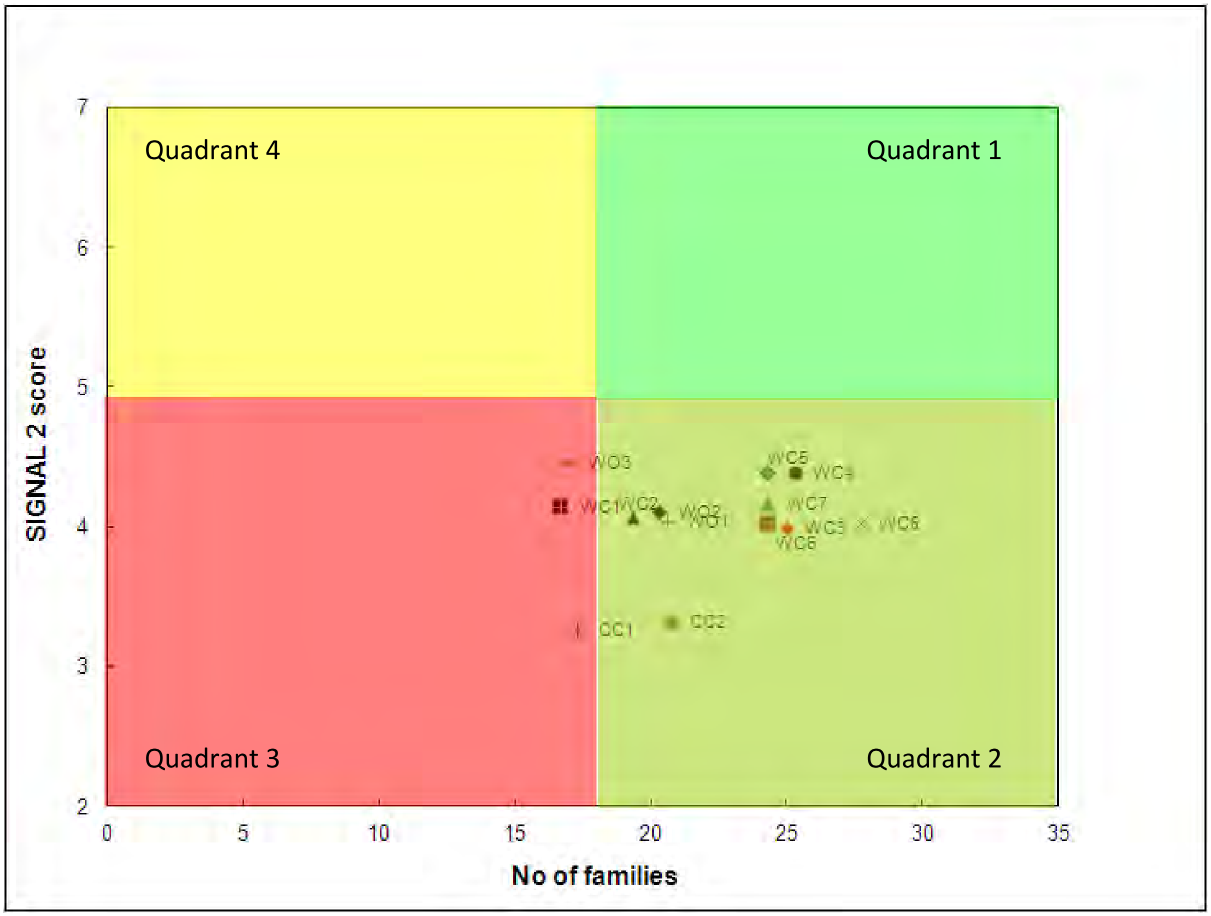


Figure 3 SIGNAL2 quadrant diagram showing 2012 sampling results (Site mean values)

With the exception of sites CC1,WC1 and WO1 all the sample sites fit within Quadrant 2 (lower right quadrant) of the diagram. This quadrant generally indicates the presence of environmental stressors such as elevated levels of turbidity, salinity or nutrients. Relatively low SIGNAL score indicates that the extremely sensitive taxa found in pristine environments do not make up a large proportion of the assemblage. The number of families present is still quite high however, suggesting that acutely toxic chemicals or depressed oxygen concentrations are not likely to be an issue.

Sites WC1And WO3 exhibit a loss of taxa but the SIGNAL scores for these sites are amongst the highest at all sites and species with a sensitivity rating of 8 are present at both. Such a result might be indicative of harsh physical conditions however this is unlikely as these both sites, especially site WO3, display a greater degree of physical habitat diversity than most of the other sites. On the other hand there does appear to have been some impairment of physical habitat conditions at Site WC1 since the last survey, with increased deposition of sediment and an orange coloured floc material which may indicate levels of iron or manganese. A more plausible explanation for the loss of taxa is an agent which is toxic to some taxa. Groups which are present at all other sites in Wilpinjong Creek but which are either absent or greatly reduced in numbers at these two sites include leptocerid caddises, leptophlebiid mayflies, dugesiid flatworms and gastropod molluscs.

Comparison with previous survey data

The last three winters have each exhibited very different flow patterns in Wilpinjong Creek as shown in Figure 4. 2010 was an extremely wet year with rainfall for the months January to August being 1.5 times the long term average. 2011 was drier than normal with January-August rainfall total being 63 % of the long term average for these months but there were several minor floods. In 2012 there was only one major flood event in July and water level slowly fell from that time until the time of sampling. No figures are available for releases from the desalination plant at Wilpinjong into the creek but these may have contributed to the relatively stable creek flow in 2012 when compared to the previous two years.

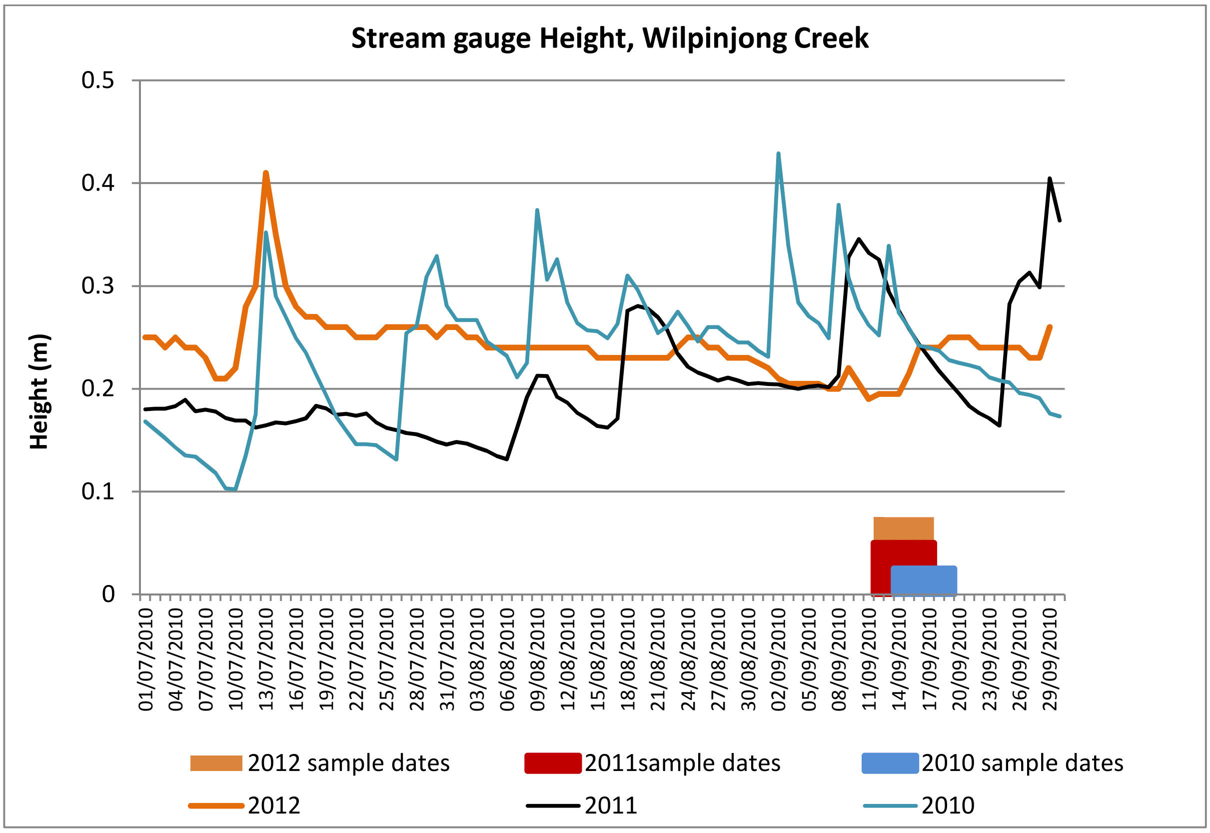


Figure 4 Comparison of stream flow conditions in Wilpinjong Creek for months July –September in 2010 and 2011

Salinities in the flooding conditions of 2010 were lower than in succeeding years and at sites along Wilpinjong Creek conductivity in 2012 was slightly lower than in 2011. This may have been a result of releases from the reverse osmosis plant at the mine however no data on releases has been accessed to support this notion.

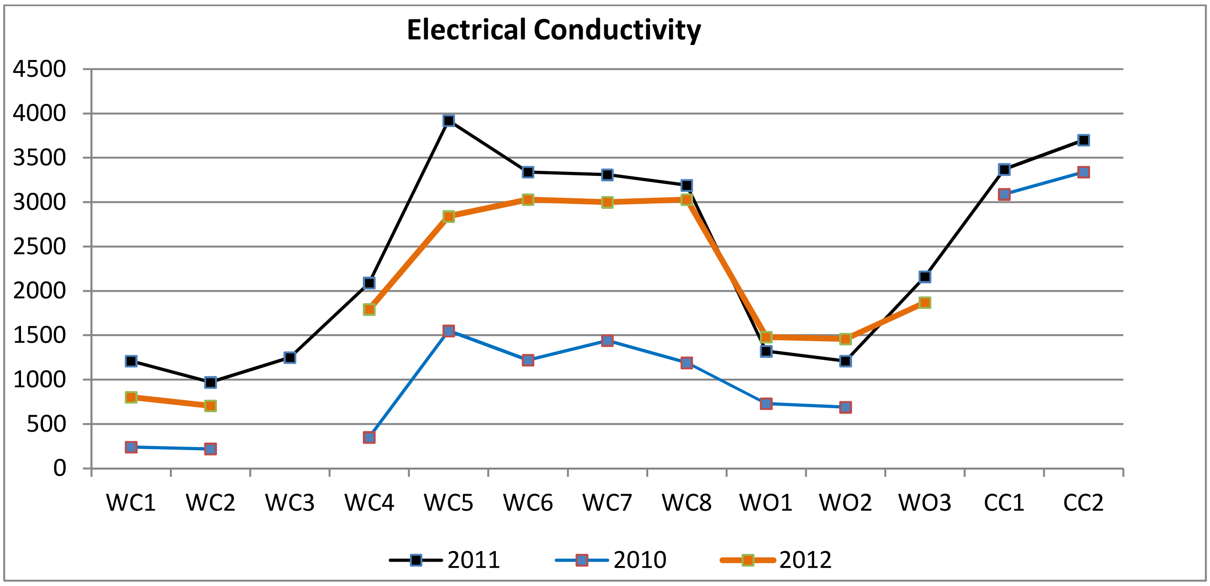


Figure 5 Electrical conductivity measured at time of sampling, 2010,2011 and 2012 stream health surveys

Stream health indicator values for the past three years are compared in Figure 6.

After extreme physical degradation of habitat at most sample sites, salinity would appear to be the most obvious environmental stressor factor in the Wilpinjong Creek catchment. Nielsen et.al (2003) suggest that adverse effects on aquatic fauna can be expected when salinities exceed 1000 mg/L Conductivity readings suggest the salinity Wilpinjong Creek and Wollar Creek in the upper reaches of Wilpinjong Creek and Wollar Creek are slightly below this level whereas salinity in the middle reaches of Wilpinjong Creek and in Cumbo Creek are high enough to expect deleterious effects. There is however no marked reduction in taxon richness in the middle reaches of Wilpinjong Creek and only the Cumbo Creek sites display a markedly reduced number of taxa in all three years. While salinity at these sites is higher than at all others they are also the sites with the most extreme degradation of the physical habitat structure and there is no certainty that salinity is the prime cause for loss of taxa at these sites and Mcevoy and Goonan (2003) show that salinity, while broadly negatively correlated with reduced taxon richness is not necessarily associated with loss of biodiversity and catastrophic species loss and that much of the Australian freshwater invertebrate fauna is somewhat adapted to raised salinities.

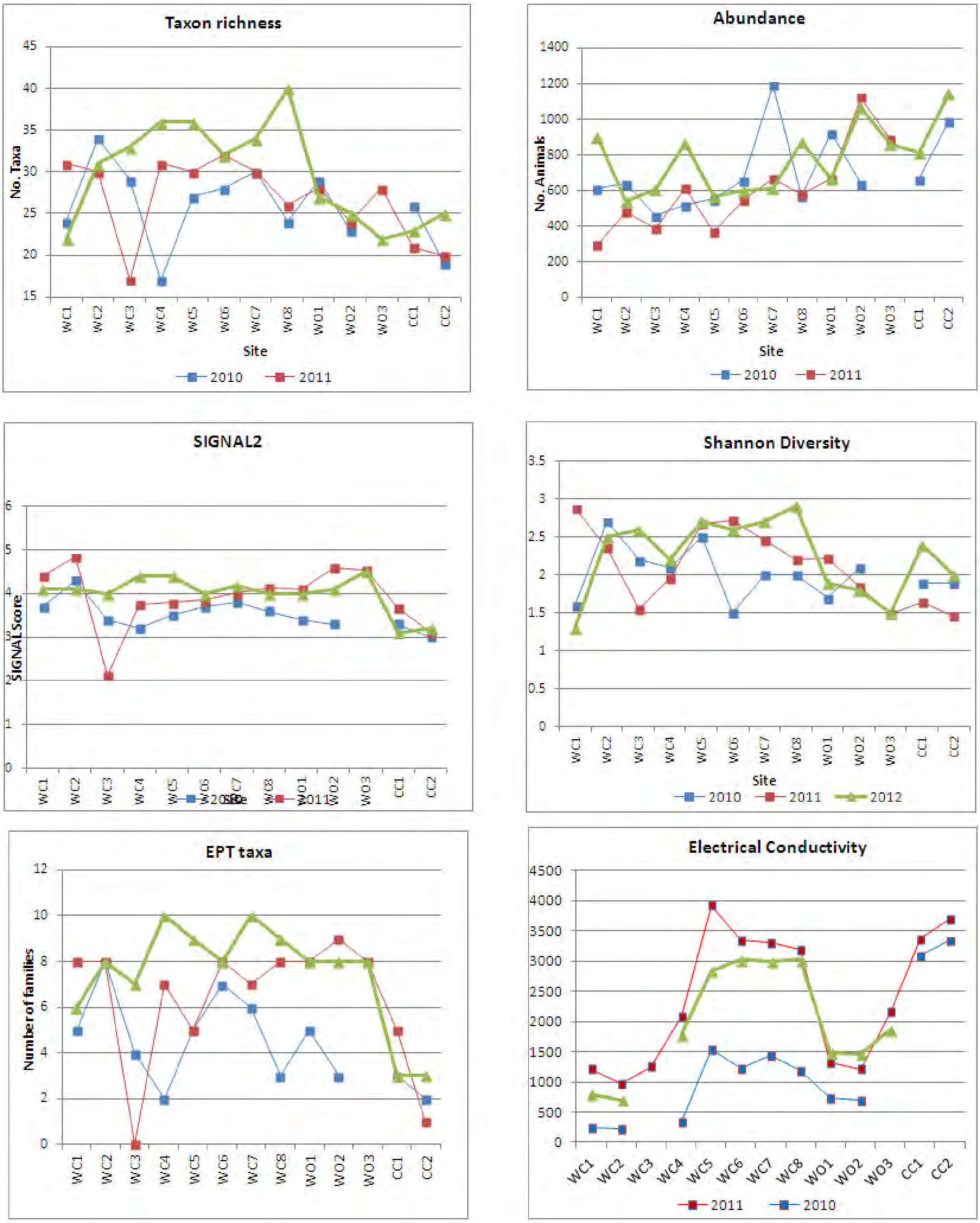


Figure 6 Comparison between bioindicator and electrical conductivity site values in 2010,2001 and 2012.

The data presented in Figure 5 show a general improvement in taxon richness, SIGNAL2 values, Shannon Diversity and EPT taxa at sites in the middle and lower reaches of Wilpinjong Creek in 2012. This improvement in environmental quality could be due to a combination of factors including lowered salinity as a result of desalinator discharge, more even stream flow conditions or improved physical habitat quality.

No detailed analysis of distribution/abundance of individual taxa over the three years was carried out. On the other hand a perusal of distribution patterns suggests that distribution of baetid mayflies throughout the study area may be influenced by salinity. Baetids are identified in the literature (Dunlop et.al,. 2008; Szocs et.al.,2012) as being one of the most salinity sensitive macroinvertebrate taxa and it is noteworthy that very few of these animals have been present in any of the three years at sites CC1 and CC2 in Cumbo Creek or at site WC6 downstream of the confluence with Cumbo Creek. The abundance of baetids in 2011 and 2012 is shown in Figure 6 and in both years the numbers were greatest at the sites with lower conductivity readings and very few specimens were found at the Cumbo Creek sites and in Wilpinjong Creek downstream of the confluence with Cumbo Creek.

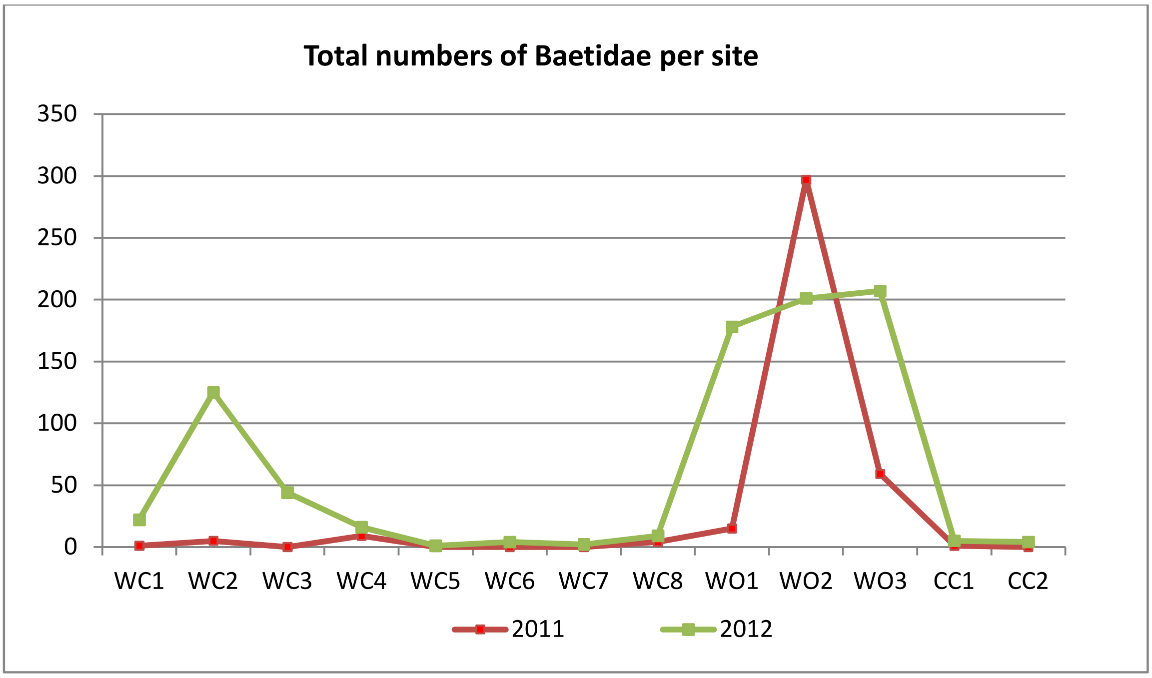


Figure 7 Total numbers of baetid mayflies collected ate each site during 2011 and 2012 stream health surveys

References

Bio- Analysis Pty Ltd (2009). Macroinvertebrate and water quality (stream health) monitoring for Wilpinjong Creek and Cumbo Creek - Spring 2009. Unpublished Report prepared for Wilpinjong Coal Pty Ltd.

Chessman, B. C. (2003) SIGNAL 2.iv – A Scoring System for Macroinvertebrates ('Water Bugs') in Australian Rivers. User Manual. Monitoring River Health Initiative Technical Report Number 31. Dept Environment and Heritage , Canberra.

Dunlop, J.E., Horrigan,N. McGregor,G.,Kefford.B.J.,Choy,S.,and Prasad,R. (2008) Effect of spatial variation on salinity tolerance of macroinvertebrates in Eastern Australia and implications for ecosystem protection trigger values. Environmental Pollution 151:621-630

Mcevoy, P. & Goonan, P. 2003. Salinity is not necessarily bad for biodiversity: case studies of invertebrates from South Australian streams and River Murray wetlands. Records of the South Australian Museum No. 7: 131-134.

Nielsen,D.L, Brock,M.A, Rees,G.N., and Baldwin,D.S. 2003 Effects of increasing salinity on freshwater ecosystems in Australia. Australian Journal of Botany 51: 655-665

Peabody Pacific Pty Ltd (2010). Annual Environmental Management Report 1 January 2009 - 31 December 2009. Peabody Pacific Pty Ltd.

Szocs,E, Kefford,B.J., and Schafer,R.B. 2012 Is there an interaction of the effects of salinity and pesticides on the community structure of macroinvertebrates? Science of The Total Environment, 437: 121-126

Turak, E, and Waddell,N. (2002) Australia-Wide Assessment of River Health: New South Wales AusRivAS Sampling and Processing Manual. Monitoring River Health Initiative Technical Report Number 13. Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Wilpinjong Coal Pty Ltd (2006). Surface Water Management and Monitoring Plan. Wilpinjong Coal Pty Ltd

Malcolm MacKinnon

Landline Consulting

APPENDIX B

ATTENDED NOISE MONITORING REPORTS

Wilpinjong Coal

January / February 2012

Environmental Noise Monitoring

Prepared for

ALS Environmental Division

Global Acoustics

Noise and Vibration Analysis and Solutions

Global Acoustics Pty Ltd
PO Box 3115 | Thornton NSW 2322
Telephone +61 2 4966 4333 | Facsimile +61 2 4966 4330
Email global@globalacoustics.com.au
ABN 94 094 985 734

Wilpinjong Coal

January / February 2012
Environmental Noise Monitoring

Reference: 12059_R01_Draft01.doc

Report date: 28 May 2012

Prepared for

ALS Environmental Division
PO Box 1034
Mudgee NSW 2850

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322

Prepared:	Amanda Borserio Environmental Scientist	QA Review:	Katie Weekes Environmental Scientist

EXECUTIVE SUMMARY

Global Acoustics was engaged by ALS Environmental Division to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine operated by Wilpinjong Coal. WCP was given approval on 1 February 2006. A modification to the consent was approved in August 2010.

An environment protection licence (EPL) was issued in early 2006 with subsequent variations approved. A revised noise-monitoring program (NMP) for WCP was approved in September 2011. Results of two-monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at five locations on 13 and 14 February 2012. The survey purpose is to quantify and describe the acoustic environment around the site and compare results with specified limits.

Attended monitoring was conducted in accordance with the NSW Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. The duration of each evening and night measurement was 15 minutes.

WCP complied with noise consent limits at the monitoring locations during the January / February 2012 monitoring period. Wind speed and/or estimated temperature inversion conditions resulted in development consent criteria not always being applicable, as indicated in Table 4.2 and Table 4.3.

For some measurements in January/February 2012, the application of a 5 dB low frequency penalty would possibly result in a change from compliance to non-compliance. Based on the data provided in Table 4.6, the following conclusions can be made:

- Of the 2 measurements that exceeded the INP low frequency criterion, 1 resulted in a significant exceedance of the relevant impact assessment criterion (significant being more than a 2 dB exceedance). These exceedances occurred at N12, which is a mine owned (non-WCP) property; and
- There were no exceedances of the relevant mitigation or acquisition criterion at this location.

Table of Contents

Appendices

1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by ALS Environmental Division to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine operated by Wilpinjong Coal.

Environmental noise monitoring described in this report was undertaken at five locations on 13 and 14 February 2012. Figure 1 shows the regular monitoring locations.

The purpose of the survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were five regular monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the Noise Monitoring Program (NMP).

Table 1.1 NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location	Owner
N4	'Hillview' Cumbo Road, Wollar	Wilpinjong Coal Mine
N6	St Laurence O'Toole Catholic Church, representative of Wollar - Residential	NA
N7	Ulan-Wollar Road (East)	Smith
N9	Slate Gully Road, Wollar	Wilpinjong Coal Mine
N12	Ulan-Wollar Road (West)	Ulan Coal Mines

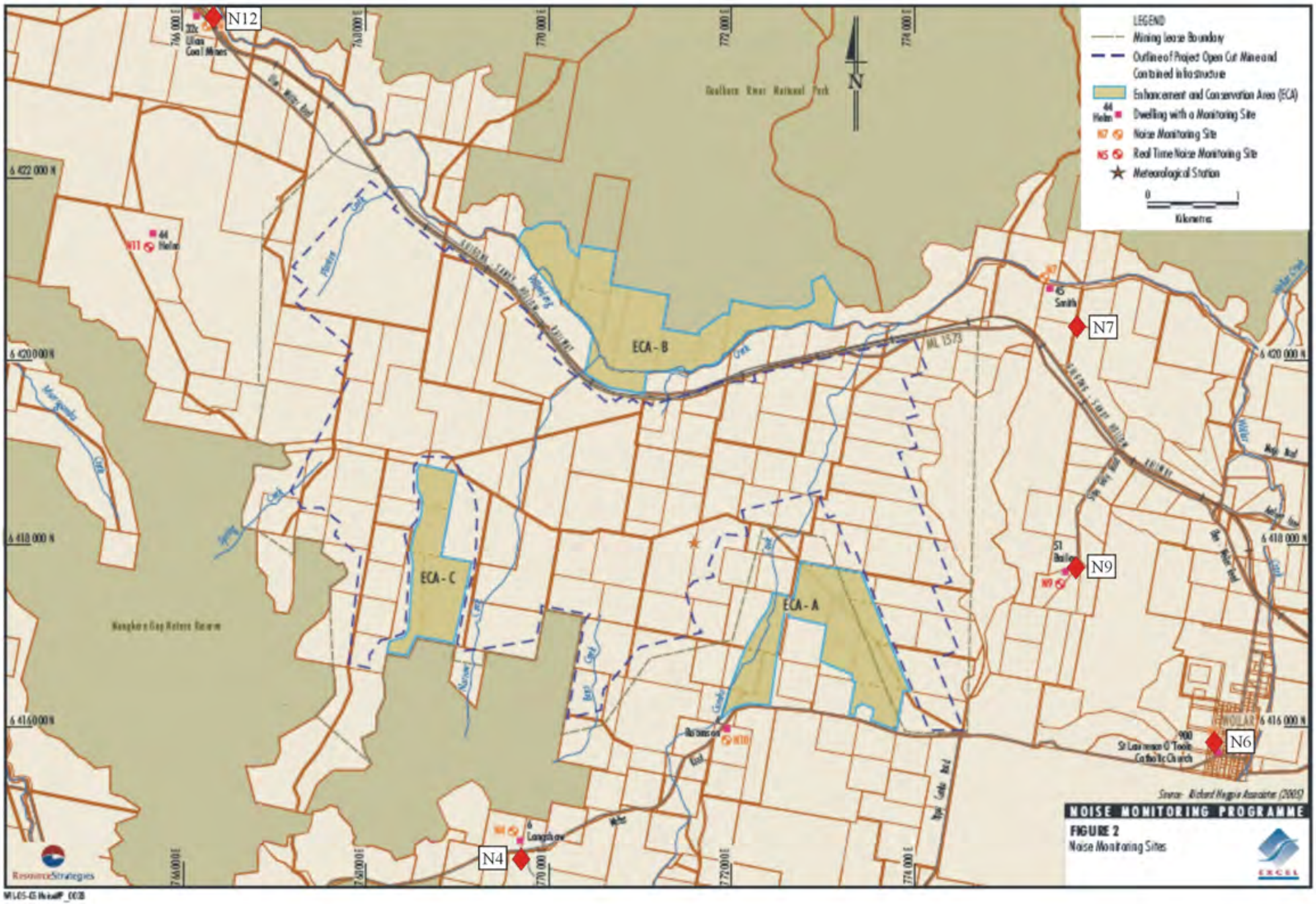


Figure 1 **Monitoring Sites**

1.3 Terminology

Some definitions of terminology, which may be used in this report, are provided in Table 1.2.

Table 1.2 TERMINOLOGY

Descriptor	Definition
L_A	The A-weighted root mean squared (RMS) noise level at any instant
L_{Amax}	The maximum A-weighted noise level over a time period or for an event
L_{A1}	The noise level which is exceeded for 1 per cent of the time
L_{A10}	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L_{A50}	The noise level which is exceeded for 50 per cent of the time
L_{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes
L_{Amin}	The minimum A-weighted noise level over a time period or for an event
L_{Aeq}	The average noise energy during a measurement period
$L_{A1,1minute}$	The highest noise level generated for 0.6 second during one minute
L_{pk}	The unweighted peak noise level at any instant
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
SEL	Sound exposure level (SEL), the A-weighted noise energy during a measurement period normalised to one second
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
ABL	Assessment background level (ABL), the 10th percentile background noise level for a single period (day, evening or night) of a 24 hour monitoring period
RBL	Rating background level (RBL), the background noise level for a period (day, evening or night) determined from ABL data

2 CONSENTS AND CRITERIA

2.1 Development Consent

WCP was given approval on 1 February 2006. A modification to the consent was approved in August 2010. The relevant noise conditions from Section 3 - Specific Environmental Conditions of the consent are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in December 2011.

Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise-monitoring program for WCP was revised in September 2011. Section 5.1 details attended monitoring locations and methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Specific Criteria

Day, evening and night criteria are detailed in Table 2.1. These have been selected as the most appropriate for each monitoring location and are based on the consolidated consent or environment protection licence associated with Wilpinjong Coal Project operations.

Table 2.1 WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident number[1]	Monitoring Location	Day $L_{Aeq(15\ minute)}$	Evening $L_{Aeq(15\ minute)}$	Night $L_{Aeq(15\ minute)}$/ $L_{A1(1\ minute)}$
N4	'Hillview' Cumbo Road, Wollar[5]	NA	NA	NA/NA
N6 / Wollar	Catholic Church representative of Wollar – Residential	35[3]	35[3]	35[3]/45[3]
N7 / 45	Ulan-Wollar Road (East)	35[3]	40[3]	47[3]/45[3]
N9 / 58	Slate Gully Road, Wollar[5]	NA	NA	NA/NA
N12 / All	Ulan-Wollar Road (West)[4]	35[2]	35[2]	35[2]/45[2]

Notes: 1. "All" indicates location is not mentioned specifically in Section 2 of the 2010 Modification and therefore has criteria applied to "all other privately owned land";

2. From 2010 Modification;

3. From Environment Protection Licence No. 12425;

4. Property is designated as a non-WPL mining interest in the 2010 Modification; and

5. These properties are owned by WCP, so criteria are NA, 'not applicable'.

Condition L5.3 in the EPL states:

The noise limits set out in condition 5.1 apply under all meteorological conditions except for the following:

a) Wind speeds greater than 3 metres per second at 10 metres above ground level; or

b) Temperature inversion conditions of up to 3°C per 100 m and wind speeds greater than 2 metres per second at 10 metres above the ground level; or

c) Temperature inversion conditions greater than 3°C per 100 m.

2.5 Acquisition Criteria

As detailed in condition 3 of Schedule 3 of the consent, acquisition criteria for WCP are to consider noise in respect to the criteria detailed in Table 2.2 for all privately owned land (excluding land owned by Gaffney – 30, Smith – 45, Evans – 48, Thomson & Hopper - 50 and McKenzie – 94).

Table 2.2 WILPINJONG COAL ACQUISITION CRITERIA, dB

Property	L_{Aeq} (15 minute)
All privately owned land	40

2.6 Additional Mitigation Criteria

As detailed in condition 4 of Schedule 3 of the consent, additional mitigation criteria for WCP are to consider noise in respect to the criteria detailed in Table 2.3 for most privately owned land.

Table 2.3 WILPINJONG COAL ADDITIONAL MITIGATION CRITERIA, dB

Property	L_{Aeq} (15 minute)
All other privately owned land, excluding those listed below	38

Land listed in Table 1 of the consent, or property numbers 23B, 25, 52A, 52B, 53 or 58 will receive mitigation upon request.

2.7 INP Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). Chapter 4 of the INP deals specifically with modifying factors that may apply to industrial noise. The most common modifying factors are addressed in detail below.

2.7.1 Tonality, Intermittent and Impulsive Noise

As defined in the Industrial Noise Policy:

> *Tonal noise contains a prominent frequency and is characterised by a definite pitch.*
>
> *Impulsive noise has high peaks of short duration or a sequence of such peaks.*
>
> *Intermittent noise is characterised by the level suddenly dropping to the background noise levels several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only.*

Years of monitoring have indicated that noise levels from mining operations, particularly those levels measured at significant distances from the source are relatively continuous. Given this, noise levels at the monitoring locations are unlikely to be intermittent. In addition, there is no equipment on site that is likely to generate tonal or impulsive noise as defined in the INP.

2.7.2 Low Frequency Noise

As defined in the Industrial Noise Policy:

> *Low frequency noise contains major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum.*

As detailed in Chapter 4 of the INP, low frequency noise should be assessed by measuring the C-weighted and A-weighted level over the same time period. The correction/penalty of 5 dB is to applied *if the difference between the two levels is 15 dB or more*.

Low frequency noise can also be assessed against criteria specified in the paper "A Simple Method for Low Frequency Noise Emission Assessment "(Broner JLFNV Vol29-1 pp1-14 2010). If the total predicted C – weighted noise level at a receptor exceeds the relevant criterion, a 5 dB penalty (modifying factor) is added to predicted levels.

2.8 Low Frequency Criteria

Low frequency criteria are detailed in Table 2.4.

Table 2.4 $L_{Ceq,15minute}$ CRITERIA (dBC)

Method	Calculation Method	Night-time Criterion	Daytime Criterion
Broner, 2010	L_{Ceq} to 250 Hz	60	65
INP, total	Total L_{Ceq} minus L_{Aeq}	15	15

3 METHODOLOGY

3.1 Assessment Method

Attended monitoring was conducted in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken. The duration of each evening and night measurement was 15 minutes.

The terms "Inaudible" (IA) and "Less than 20 dB" (<20 dB) are used in this report. When site noise is noted as IA then there was no site noise at the monitoring location.

However, if site noise is noted as <20 dB, this means some noise was audible but could not be quantified. This means that noise from the site was either very low, or, being masked by other noise that was relatively loud. In the former case (very low site levels) we consider it not necessary to attempt to accurately quantify site noise as it would be significantly less than any criterion and most unlikely to cause annoyance (and in many cases, to be even noticed).

If site noise were <20 dB due to masking then we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting if deemed necessary. All sites <20 dB in this report are due to low absolute values.

A measurement of $L_{A1,1minute}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from the Wilpinjong Coal Project (WCP) noise source during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

As indicated in note (a) and (b) below Table 2 of the consent conditions, the L_{A1} measurement should be undertaken at 1 metre from the dwelling façade and the L_{Aeq} measurement within 30 metres of the dwelling. However, the direct measurement of noise at 1 metre from the façade is not practical during monitoring for this project. In most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements for this survey were undertaken at a suitable and representative location.

As indicated in note (a) of Table 2 of the consent, modifying factors from Section 4 of the INP should be implemented where applicable. Low frequency from WCP was assessed by analysis of the measured L_{Aeq} spectrum.

3.2 Attended Monitoring

The equipment used to measure environmental noise levels are listed in Table 3.1.

Table 3.1 MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	01070590	09/11/2013
Rion NC-74 calibrator	50941314	31/10/2013

Calibration certificates are included as Appendix B.

4 RESULTS

4.1 Attended Noise Monitoring

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. Table 4.2 and Table 4.3 detail $L_{Aeq\ (15\ minute)}$ and $L_{A1\ (1\ minute)}$ noise levels from WCP in the absence of other noise sources with impact assessment criteria. Criteria are then applied if weather conditions are in accordance with the mine's development consent. There were no modifying factors applicable to measured noise levels during this survey.

Discussion as to the noise sources responsible for these measured levels is provided in Chapter 5 of this report.

Table 4.1 MEASURED NOISE LEVELS – JANUARY / FEBRUARY 2012

Location	Date And Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB	L_{Aeq} dB
	Evening							
N4	13/02/2012 21:33	43	38	38	37	36	35	37
N6	13/02/2012 21:08	51	47	46	44	43	39	44
N7	13/02/2012 20:21	42	40	39	38	35	33	38
N9	13/02/2012 20:44	52	51	49	36	33	31	44
N12	13/02/2012 19:48	57	45	42	38	35	33	39
	Night-Time							
N4	13/02/2012 22:00	39	37	36	35	34	32	35
N6	13/02/2012 22:24	51	48	47	45	44	34	45
N7	13/02/2012 23:12	56	46	45	40	35	31	41
N9	13/02/2012 22:48	55	50	44	33	31	29	39
N12	13/02/2012 23:47	46	38	37	35	34	32	36
	Evening							
N4	14/02/2012 19:43	54	48	46	39	37	34	41
N6	14/02/2012 20:08	54	50	49	47	44	40	48
N7	14/02/2012 20:57	52	44	42	39	37	34	40
N9	14/02/2012 20:32	50	44	42	38	34	31	39
N12	14/02/2012 21:31	53	42	40	39	38	36	39
	Night-Time							
N4	14/02/2012 23:55	48	37	36	35	32	29	35
N6	14/02/2012 23:30	52	48	44	41	39	34	42
N7	14/02/2012 22:41	46	39	37	35	33	29	35
N9	14/02/2012 23:05	40	34	32	30	28	25	30
N12	14/02/2012 22:03	47	41	39	38	37	35	38

Note: Noise levels in this table are not necessarily the result of activities at WCP.

Table 4.2 $L_{Aeq\ (15\ minute)}$ dB GENERATED BY WCP AGAINST IMPACT ASSESSMENT CRITERIA – JANUARY / FEBRUARY 2012

Location	Date And Time	Wind Speed m/s [8]	VTG °C per 100m [6,8]	Criterion dB [,7]	Criterion Applies?[1,5]	WCP L_{Aeq} (15min) dB [2,3]	Exceedance[4,5,7]
	Evening						
N4	13/02/2012 21:33	2.0	-0.3	NA	Y	21	N
N6	13/02/2012 21:08	1.9	0.0	35	Y	IA	N
N7	13/02/2012 20:21	2.0	-0.5	40	Y	<20	N
N9	13/02/2012 20:44	1.5	-0.2	NA	Y	<20	N
N12	13/02/2012 19:48	4.0	-1.2	35	N	<30	NA
	Night-Time						
N4	13/02/2012 22:00	2.0	-0.3	NA	Y	24	N
N6	13/02/2012 22:24	1.2	0.0	35	Y	IA	N
N7	13/02/2012 23:12	0.1	0.3	47	Y	IA	N
N9	13/02/2012 22:48	1.2	0.0	NA	Y	<20	N
N12	13/02/2012 23:47	1.0	0.0	35	Y	28	N
	Evening						
N4	14/02/2012 19:43	3.7	-0.9	NA	N	28	NA
N6	14/02/2012 20:08	2.9	-0.7	35	Y	<20	N
N7	14/02/2012 20:57	4.2	-0.9	40	N	IA	NA
N9	14/02/2012 20:32	3.4	-0.9	NA	N	IA	NA
N12	14/02/2012 21:31	2.7	-0.9	35	Y	33	N
	Night-Time						
N4	14/02/2012 23:55	2.4	-0.5	NA	Y	<20	N
N6	14/02/2012 23:30	2.9	-0.9	35	Y	IA	N
N7	14/02/2012 22:41	2.7	-0.7	47	Y	IA	N
N9	14/02/2012 23:05	2.9	-0.9	NA	Y	IA	N
N12	14/02/2012 22:03	2.8	-0.7	35	Y	32	N

Notes: 1. *Noise emission limits apply for winds up to 3 metres per second (at a height of 10 metres, or, vertical temperature gradients of up to 3 degrees/100m with wind speed up to 2 m/s;*

2. *These are results for WCP in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;*
2. *NA in criterion column means the criteria are not applicable at this location, NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified; and*
7. *Atmospheric data is sourced from the WCP weather station.*

Table 4.3 $L_{A1\ (1\ minute)}$ dB GENRATED BY WCP AGAINST IMPACT ASSESSMENT CRITERIA – JANUARY / FEBRUARY 2012

Location	Date And Time	Wind Speed m/s [8]	VTG °C per 100m [6,8]	Criterion dB [,7]	Criterion Applies? [1,5]	WCP L_{A1} (1 min) dB [2,3]	Exceedance [4,5,7]
	Night-Time						
N4	13/02/2012 22:00	2.0	-0.3	NA	Y	36	N
N6	13/02/2012 22:24	1.2	0.0	45	Y	IA	N
N7	13/02/2012 23:12	0.1	0.3	45	Y	IA	N
N9	13/02/2012 22:48	1.2	0.0	NA	Y	<20	N
N12	13/02/2012 23:47	1.0	0.0	45	Y	38	N
	Night-Time						
N4	14/02/2012 23:55	2.4	-0.5	NA	Y	<20	N
N6	14/02/2012 23:30	2.9	-0.9	45	Y	IA	N
N7	14/02/2012 22:41	2.7	-0.7	45	Y	IA	N
N9	14/02/2012 23:05	2.9	-0.9	NA	Y	IA	N
N12	14/02/2012 22:03	2.8	-0.7	45	Y	38	N

Notes:
1. *Noise emission limits apply for winds up to 3 metres per second (at a height of 10 metres, and, vertical temperature gradients of up to 3 degrees/100m with wind speed up to 2 m/s;*
2. *These are results for WCP in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;*
7. *NA in criterion column means the criteria are not applicable at this location, NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified; and*
8. *Atmospheric data is sourced from the WCP weather station.*

Where WCP only noise levels are within the impact assessment criteria, it is not necessary to compare these noise levels to acquisition or mitigation criteria as these levels are higher. Compliance with impact assessment indicates compliance with acquisition or mitigation criteria.

4.2 Low Frequency Assessment

Table 4.4 provides statistics for attended noise monitoring undertaken around WCP during January and February 2012 monitoring. A total of 6 out of 20 measurements occurred during which WCP was directly measurable (not "inaudible", "not measurable" or less than a maximum cut-off value "<30 dB") and where meteorological conditions resulted in criteria applying (in accordance with the consent). These 6 results were analysed for low frequency content for this report.

Table 4.4 ATTENDED MEASUREMENT STATISTICS FOR WCP – JAN/FEB 2012

	January / February 2012
No. of measurements	20
Measurements where met applies	16
WCP is measurable and met applies	6

Table 4.5 details L_{Ceq} noise levels from WCP. Results have been compared to relevant criteria (as detailed in Section 2 of this report). Only measurements occurring during applicable meteorological conditions and where WCP was audible have been presented.

Table 4.5 MEASURED $L_{Ceq,15\ minute}$ NOISE LEVELS AGAINST LOW FREQUENCY NOISE CRITERIA – JANUARY / FEBRUARY 2012

Location	Date And Time	WCP only L_{Aeq} dB[1]	L_{Ceq} Criterion[2]	L_{Ceq} (less than 250 Hz) dB[3,7]	INP L_{Ceq} Criterion[4]	Total L_{Ceq} minus L_{Aeq} dB[5,6]	Comments
N4	13/02/2012 21:33	21	60	40	15	4	Measurement included insects and frogs.
N4	13/02/2012 22:00	24	60	45	15	10	Measurement included insects and frogs.
N12	13/02/2012 23:47	28	60	49	15	14	Measurement included insects.
N4	14/02/2012 19:43	28	60	49	15	8	Measurement included dogs, birds, frogs and insects.
N12	14/02/2012 21:31	33	60	**61**[7]	15	**22**[7]	Measurement included breeze on the microphone and in foliage, insects and frogs.
N12	14/02/2012 22:03	32	60	58	15	**20**[7]	Measurement included breeze on the microphone, breeze in foliage, insects and frogs.

Notes:
1. *WCP only L_{Aeq} provided as a guide;*
2. *Night L_{Ceq} criterion as detailed in Broner (2010);*
3. *These are measured C-weighted noise levels (at frequencies less than 250 Hz) and are not always the result of activity at WCP. Guidance on this is provided in the Comments column;*
4. *Low frequency criterion as detailed in the INP;*
5. *This is the total measured C-weighted noise level less the total measured A-weighted noise level and are not always the result of activity at WCP. Guidance on this is provided in the Comments column;*
6. *Bolded results in red are those greater than the relevant criterion; and*
7. *Other noise sources occurring during the measurement.*

Where the above results exceed the INP low frequency criterion, a 5 dB penalty is applied to the measured L_{Aeq} level. More detail is provided in Table 4.6.

Table 4.6 INP LOW FREQUENCY PENALTY FOR WCP – JANUARY / FEBRUARY 2012

Location	Date and Time	WCP only L_{Aeq} dB	INP Low Frequency Penalty dB	Revised WCP L_{Aeq} dB	Exceedance of Impact Assess Criterion dB	Exceedance of Mitigation or Acquisition Criterion dB	Comments
N12[1]	14/02/2012 21:31	33	5	38	3	No	Mine owned residence
N12[1]	14/02/2012 22:03	32	5	37	2	No	Mine owned residence and not a significant exceedance

Notes: 1. Property is designated as a non-WPL mining interest in the 2010 Modification.

4.3 Atmospheric Conditions

Atmospheric condition data measured at each location are shown in Table 4.7. Data obtained concurrently by the WCP meteorological station is provided in Table 4.8.

Table 4.7 MEASURED ATMOSPHERIC CONDITIONS

Location	Date And Time	Temperature (º C)	Wind Speed (m/s)	Wind Direction (º MN)	Cloud Cover (eighths)
	Evening				
N4	13/02/2012 21:33	22	0.1	60	1
N6	13/02/2012 21:08	20	0.1	10	1
N7	13/02/2012 20:21	22	0.1	90	1
N9	13/02/2012 20:44	19	0.1	0	1
N12	13/02/2012 19:48	20	1.3	80	2
	Night-Time				
N4	13/02/2012 22:00	19	0.1	60	2
N6	13/02/2012 22:24	19	0.3	340	1
N7	13/02/2012 23:12	15	0.0	-	1
N9	13/02/2012 22:48	18	0.3	120	1
N12	13/02/2012 23:47	17	0.2	180	0
	Evening				
N4	14/02/2012 19:43	22	0.8	80	1
N6	14/02/2012 20:08	22	1.1	60	1
N7	14/02/2012 20:57	21	1.3	60	1
N9	14/02/2012 20:32	22	0.1	100	1
N12	14/02/2012 21:31	19	0.8	90	1
	Night-Time				
N4	14/02/2012 23:55	21	0.1	60	1
N6	14/02/2012 23:30	21	0.0	-	1
N7	14/02/2012 22:41	18	1.3	80	3
N9	14/02/2012 23:05	19	0.1	100	1
N12	14/02/2012 22:03	19	0.8	70	1

Notes: 1. Wind speed and direction measured at 1.8 metres.

Table 4.8 WCP METEOROLOGICAL STATION DATA

Date and Time	Wind Speed (m/s)	Rainfall (mm)	Sigma Theta	WCP Lapse Rate
13/02/2012 18:00	3.4	0	15.8	-2.2
13/02/2012 18:15	3.1	0	18.8	-2.1
13/02/2012 18:30	3.2	0	9.9	-1.9
13/02/2012 18:45	3.5	0	11.6	-1.7
13/02/2012 19:00	3.2	0	12.3	-1.6
13/02/2012 19:15	3.3	0	9.2	-1.4
13/02/2012 19:30	4.0	0	7.4	-1.2
13/02/2012 19:45	4.0	0	11.0	-1.2
13/02/2012 20:00	4.2	0	11.4	-1.0
13/02/2012 20:15	2.5	0	14.4	-0.9
13/02/2012 20:30	2.0	0	11.8	-0.5
13/02/2012 20:45	2.2	0	12.2	-0.5
13/02/2012 21:00	1.5	0	14.3	-0.2
13/02/2012 21:15	1.9	0	13.4	0.0
13/02/2012 21:30	2.0	0	14.9	-0.3
13/02/2012 21:45	2.0	0	19.6	-0.3
13/02/2012 22:00	2.0	0	18.6	-0.3
13/02/2012 22:15	1.5	0	17.4	-0.2
13/02/2012 22:30	1.6	0	16.4	-0.3
13/02/2012 22:45	1.2	0	22.0	0.0
13/02/2012 23:00	0.3	0	18.2	0.0
13/02/2012 23:15	0.5	0	16.1	0.2
13/02/2012 23:30	0.1	0	11.1	0.3
13/02/2012 23:45	0.7	0	24.5	-0.2
14/02/2012 00:00	1.0	0	12.5	0.0
14/02/2012 00:15	1.2	0	11.5	-0.2
14/02/2012 00:30	1.3	0	8.6	0.3
14/02/2012 00:45	1.6	0	11.2	-0.2
14/02/2012 01:00	1.6	0	5.8	0.2
14/02/2012 18:00	5.4	0	13.8	-1.9
14/02/2012 18:15	5.5	0	10.4	-1.7
14/02/2012 18:30	5.4	0	12.4	-1.7
14/02/2012 18:45	4.8	0	11.4	-1.7
14/02/2012 19:00	4.2	0	11.4	-1.4
14/02/2012 19:15	3.8	0	13.3	-1.2
14/02/2012 19:30	3.4	0	14.2	-0.9

Table 4.8 WCP METEOROLOGICAL STATION DATA

Date and Time	Wind Speed (m/s)	Rainfall (mm)	Sigma Theta	WCP Lapse Rate
14/02/2012 19:45	3.7	0	13.5	-0.9
14/02/2012 20:00	3.3	0	14.6	-0.7
14/02/2012 20:15	2.9	0	16.9	-0.7
14/02/2012 20:30	3.4	0	12.6	-0.9
14/02/2012 20:45	4.2	0	10.7	-0.9
14/02/2012 21:00	3.9	0	10.7	-0.9
14/02/2012 21:15	4.2	0	10.1	-0.9
14/02/2012 21:30	3.2	0	15.6	-0.7
14/02/2012 21:45	2.7	0	15.5	-0.9
14/02/2012 22:00	2.8	0	13.7	-0.7
14/02/2012 22:15	2.9	0	14.2	-0.7
14/02/2012 22:30	2.8	0	16.4	-0.7
14/02/2012 22:45	2.7	0	13.7	-0.7
14/02/2012 23:00	3.0	0	12.5	-0.7
14/02/2012 23:15	2.9	0	10.4	-0.9
14/02/2012 23:30	2.9	0	9.4	-0.9
14/02/2012 23:45	2.6	0	8.7	-0.9
15/02/2012 00:00	2.4	0	8.2	-0.5
15/02/2012 00:15	2.4	0	7.4	-0.5
15/02/2012 00:30	2.4	0	10.1	-0.5
15/02/2012 00:45	2.2	0	7.8	-0.2
15/02/2012 01:00	2.7	0	9.8	-0.3

Notes: 1. Data supplied by WCP.

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 and Table 4.2 present data gathered during attended monitoring. These noise levels are the result of many sounds reaching the sound level meter microphone during monitoring. Received levels from various noise sources were noted during attended monitoring and particular attention was paid to the extent of WCP's contribution, if any, to measured levels. At each receptor location, WCP's $L_{Aeq,15\ minute}$ and $L_{A1,1\ minute}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis.

From these observations summaries have been derived for each location. The following chapter sections provide these summaries. Statistical 1/3 octave band analysis of environmental noise was undertaken, and Figures 3 to 22 display the frequency ranges for various noise sources at each location for L_{A1}, L_{A10}, L_{A90}, and L_{Aeq}. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 2 where it can be seen that frogs and insects are generating noise at frequencies above 1000 Hz; mining noise is at frequencies less than 1000 Hz (this is typical). Adding levels at frequencies that relate to mining only allows separate statistical results to be calculated. This analysis cannot always be performed if there are significant levels of other noise at the same frequencies as mining; this can be dogs, cows, or, most commonly, road traffic.

It should be noted that the method of summing statistical values up to a cutoff frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq}.

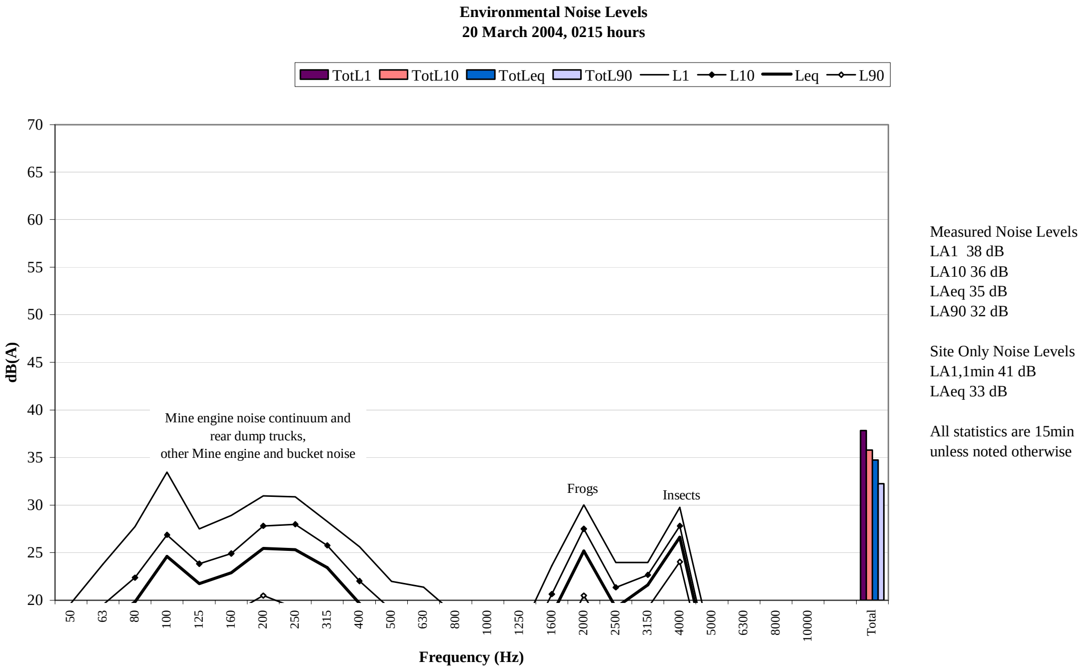


Figure 2 Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N4, 13 February 2012, Evening

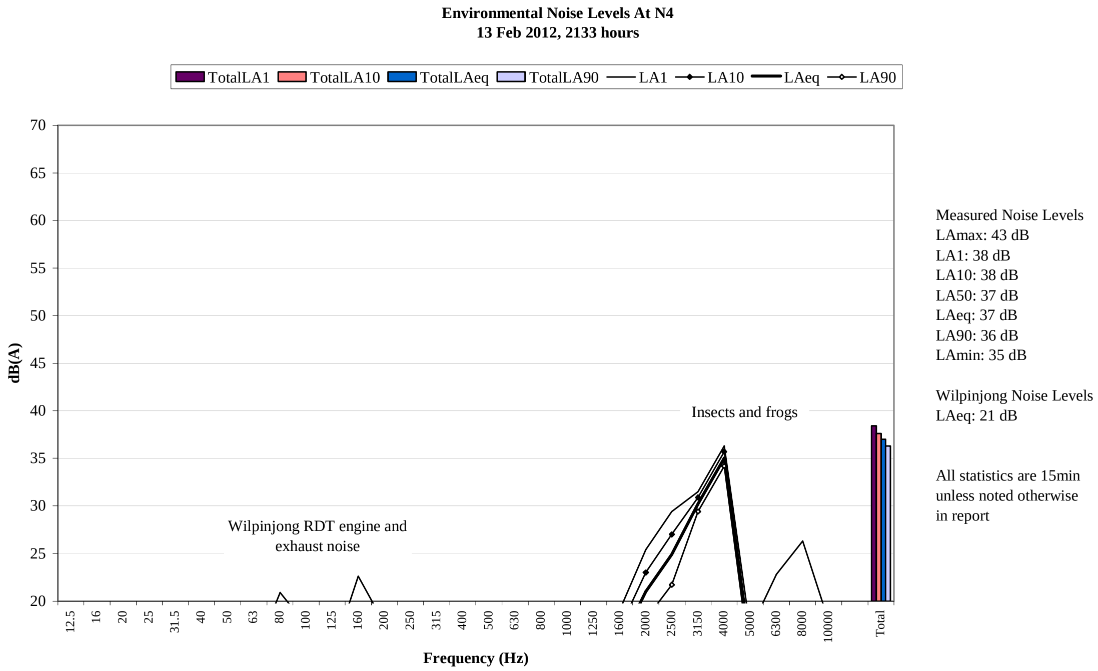


Figure 3 Environmental Noise Levels, N4 – Cumbo Road

Rear dump truck engine and exhaust noise, dozer tracks and an impact noise from WCP were audible during the measurement. These sources resulted in a WCP only L_{Aeq} of 21 dB.

Insects and frogs were responsible for all measured levels.

An owl and an aircraft were also noted.

5.1.2 N6, 13 February 2012, Evening

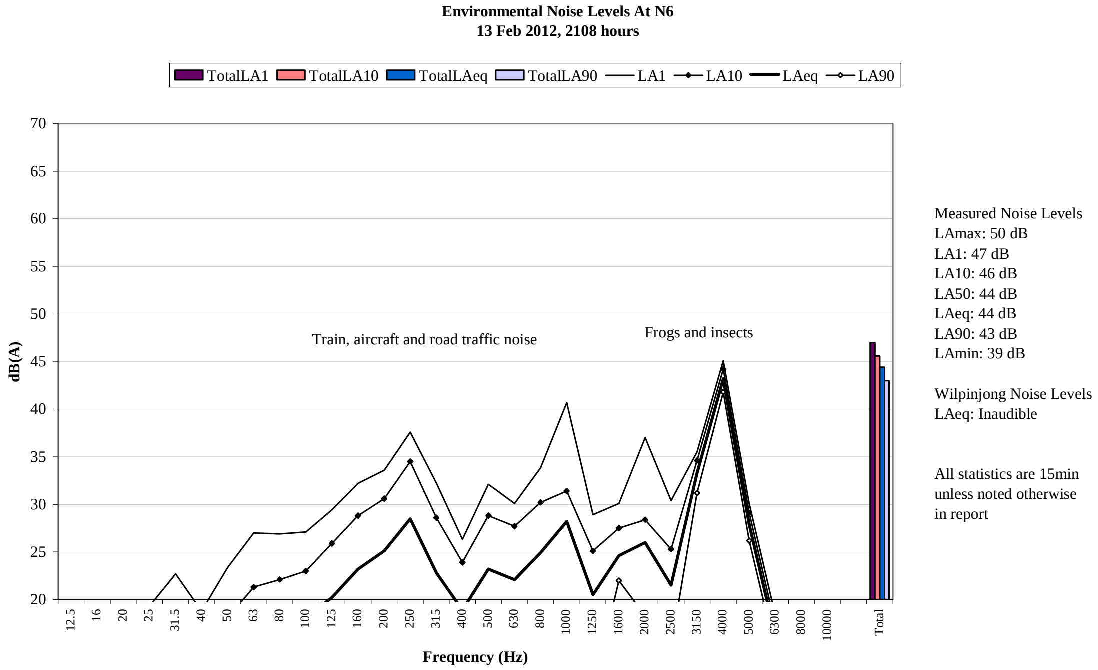


Figure 4 Environmental Noise Levels, N6 – Wollar Church

WCP was inaudible.

Frogs and insects were primarily responsible for all measured levels.

A train, road traffic noise, aircraft, dogs birds, and a continuum from a residence in Wollar were also noted.

5.1.3 N7, 13 February 2012, Evening

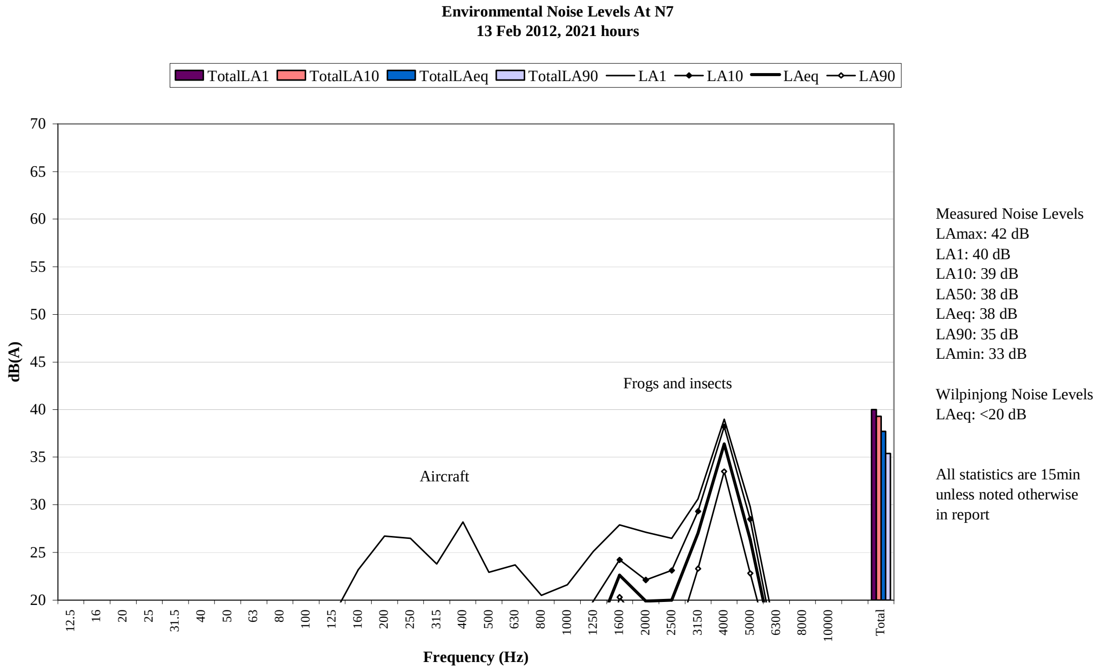


Figure 5 Environmental Noise Levels, N7 – Ulan-Wollar Road (East)

Low-level rear dump truck engine continuum and dozer tracks from WCP were audible during the measurement. WCP generated a site only L_{Aeq} of <20 dB.

Insects and frogs generated all measured levels.

Birds, an aircraft and cows were also noted.

5.1.4 N9, 13 February 2012, Evening

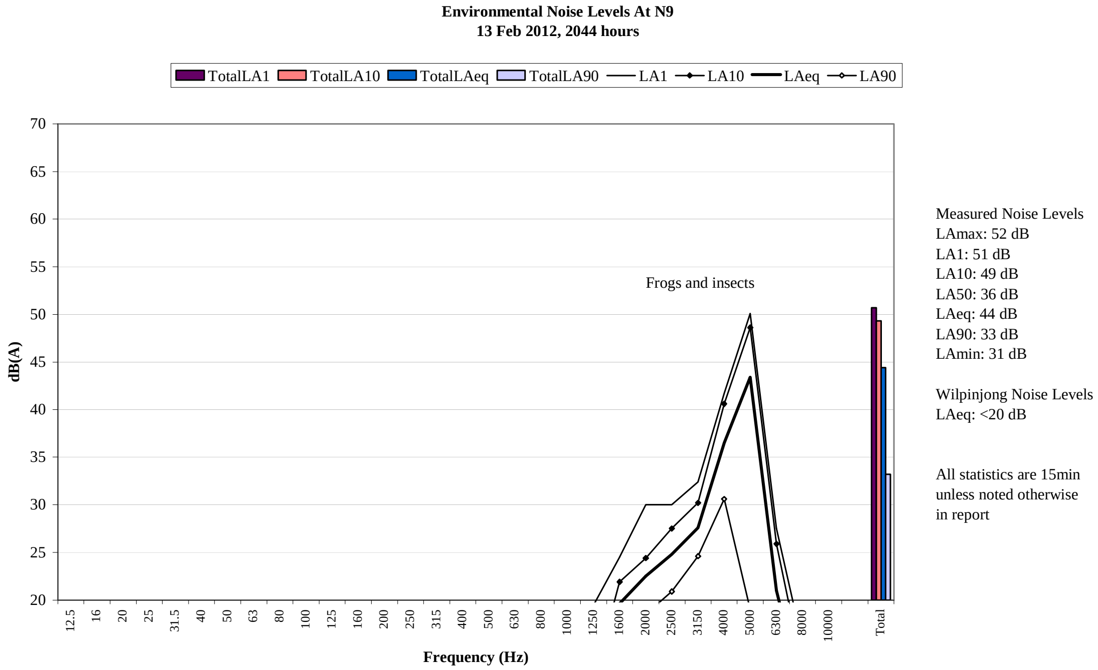


Figure 6 Environmental Noise Levels, N9 – Slate Gully Road

A low-level engine continuum and exhaust noise from WCP was audible during the measurement. WCP generated a site only L_{Aeq} of <20 dB.

Frogs and insects generated all measured levels.

Birds and possums were noted on occasion.

5.1.5 N12, 13 February 2012, Evening

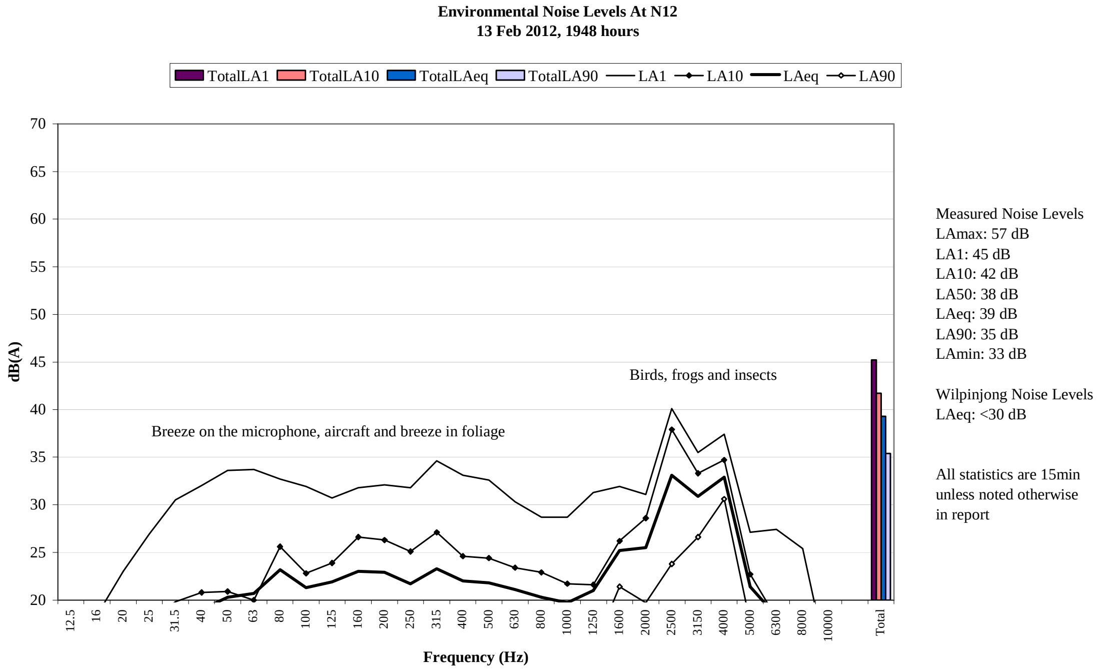


Figure 7 Environmental Noise Levels, N12 – Ulan-Wollar Road (West)

A rear dump truck engine continuum from WCP was audible throughout the measurement and exhaust noise was noted often. These sources resulted in a WCP only L_{Aeq} of <30 dB.

Birds, frogs and insects were primarily responsible for measured levels.

Breeze on the microphone, breeze in foliage and two aircraft were also noted.

5.1.6 N4, 13 February 2012, Night-time

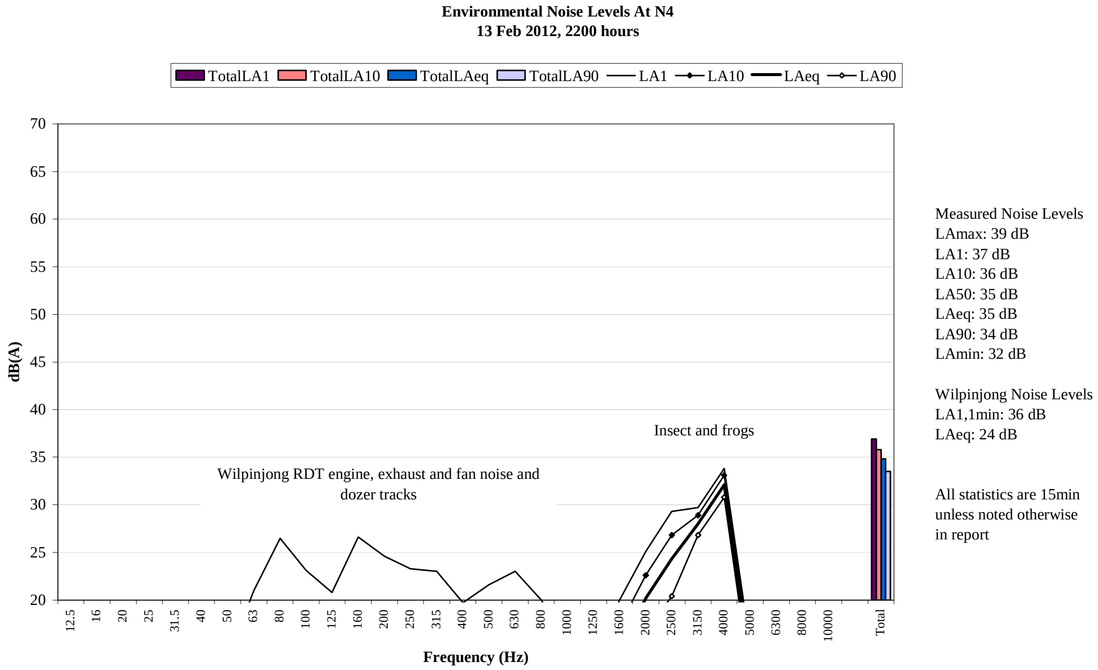


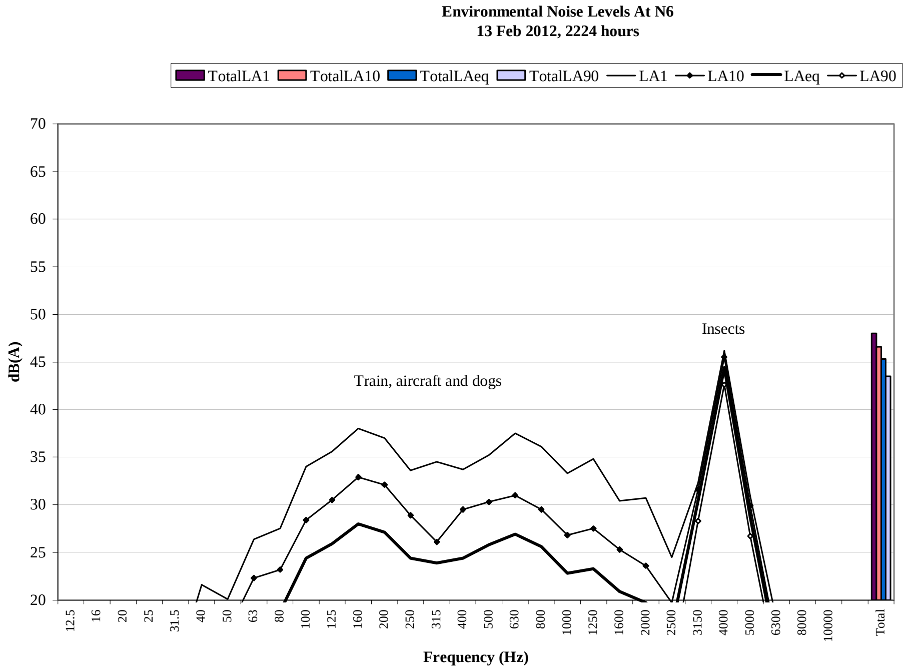
Figure 8 Environmental Noise Levels, N4 – Cumbo Road

WCP was audible throughout the measurement as a rear dump truck engine continuum resulting in a WCP only L_{Aeq} of 24 dB. Rear dump truck engine, exhaust and fan surge generated the WCP only $L_{A1,1minute}$ of 36 dB. Dozer tracks, impact noise and horns were also noted.

Insects and frogs were primarily responsible for measured levels.

Birds, thunder and bats were also noted.

5.1.7 N6, 13 February 2012, Night-time



Measured Noise Levels
LAmax: 51 dB
LA1: 48 dB
LA10: 47 dB
LA50: 45 dB
LAeq: 45 dB
LA90: 44 dB
LAmin: 34 dB

Wilpinjong Noise Levels
LA1,1min: Inaudible
LAeq: Inaudible

All statistics are 15min unless noted otherwise in report

Figure 9 Environmental Noise Levels, N6 – Wollar Church

WCP was inaudible.

Insects were primarily responsible for measured levels.

A train passby, dogs, frogs, birds and an aircraft were also noted.

5.1.8 N7, 13 February 2012, Night-time

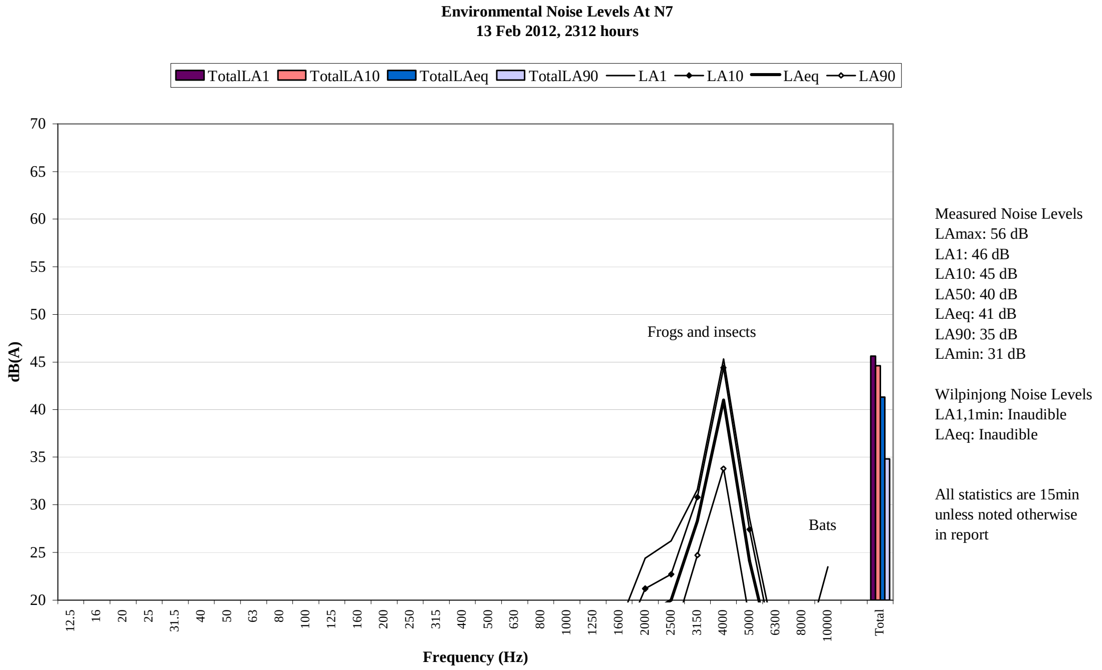


Figure 10 Environmental Noise Levels, N7 – Ulan Wollar Road (East)

WCP was inaudible.

Frogs and insects generated measured levels.

Bats and an owl were also noted at low levels.

5.1.9 N9, 13 February 2012, Night-time

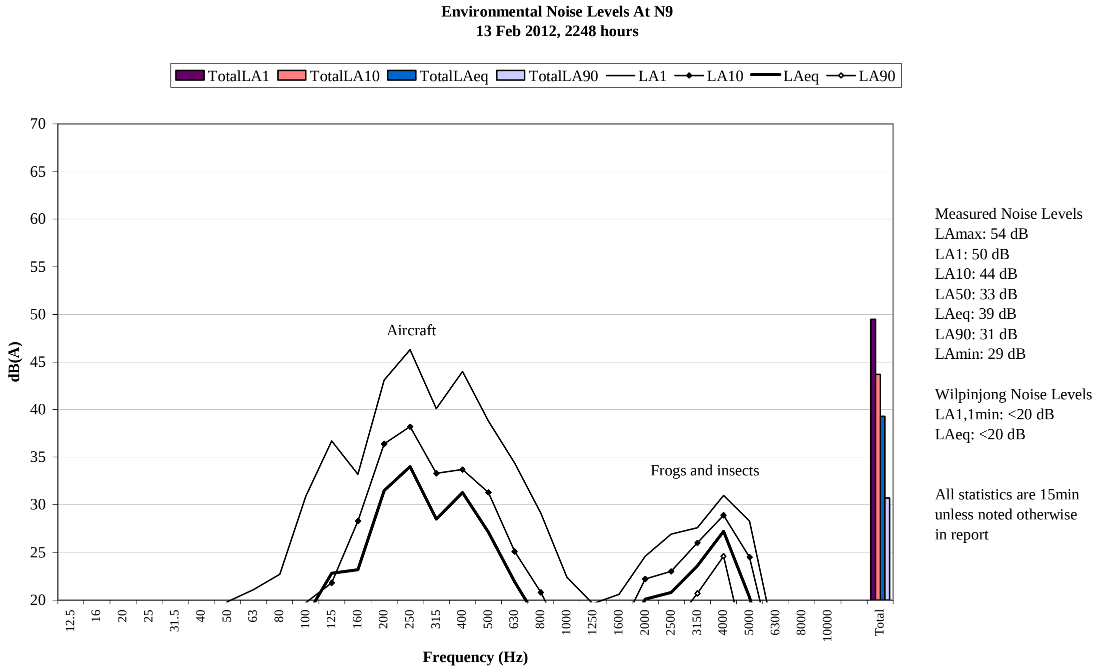


Figure 11 Environmental Noise Levels, N9 – Slate Gully Road

WCP was audible as a low-level continuum at times during the measurement, resulting in a WCP only L_{Aeq} of <20 dB and a WCP only $L_{A1,1minute}$ of <20 dB.

Multiple aircraft flyovers generated the measured L_{A1}, L_{A10} and L_{Aeq}.

Frogs and insects were responsible the measured L_{A90}.

Bats were also noted.

5.1.10 N12, 13 February 2012, Night-time

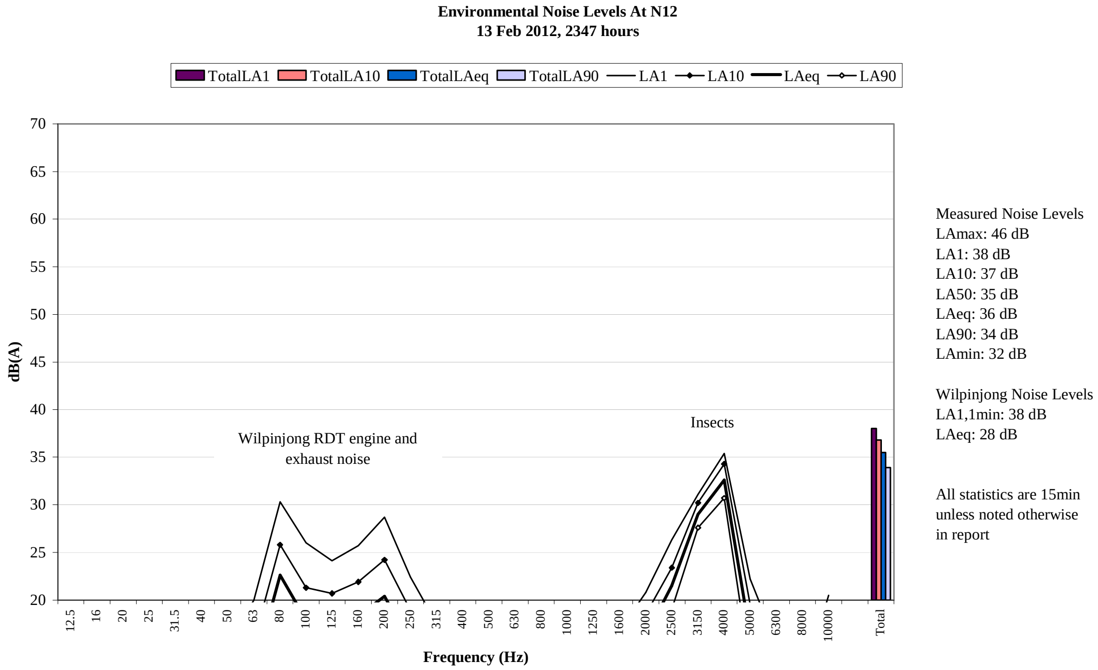


Figure 12 Environmental Noise Levels, N12 – Ulan Wollar Road (West)

WCP was audible as a rear dump truck engine and exhaust continuum throughout the measurement resulting in a WCP only L_{Aeq} of 28 dB. A surge in the engine and exhaust continuum generated the $L_{A1,1minute}$ of 38 dB. Dozer tracks, horns and squeal were also noted at low levels.

Insects were primarily responsible for measured levels.

Bats, frogs and road traffic tyre noise were also noted.

5.1.11 N4, 14 February 2012, Evening

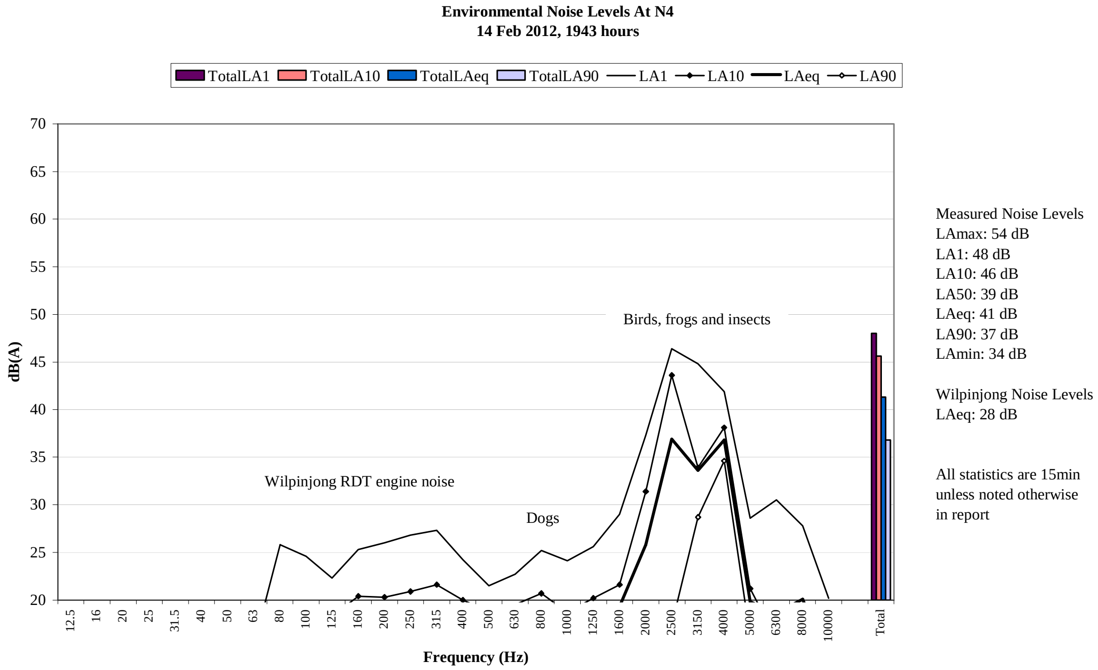


Figure 13 Environmental Noise Levels, N4 – Cumbo Road

A rear dump truck engine continuum from WCP was audible throughout the measurement, generating the WCP only L_{Aeq} of 28 dB. Dozer tracks were also noted.

Birds, frogs and insects generated measured levels.

Breeze in foliage, a train horn, a train, dogs and an aircraft were also noted.

5.1.12 N6, 14 February 2012, Evening

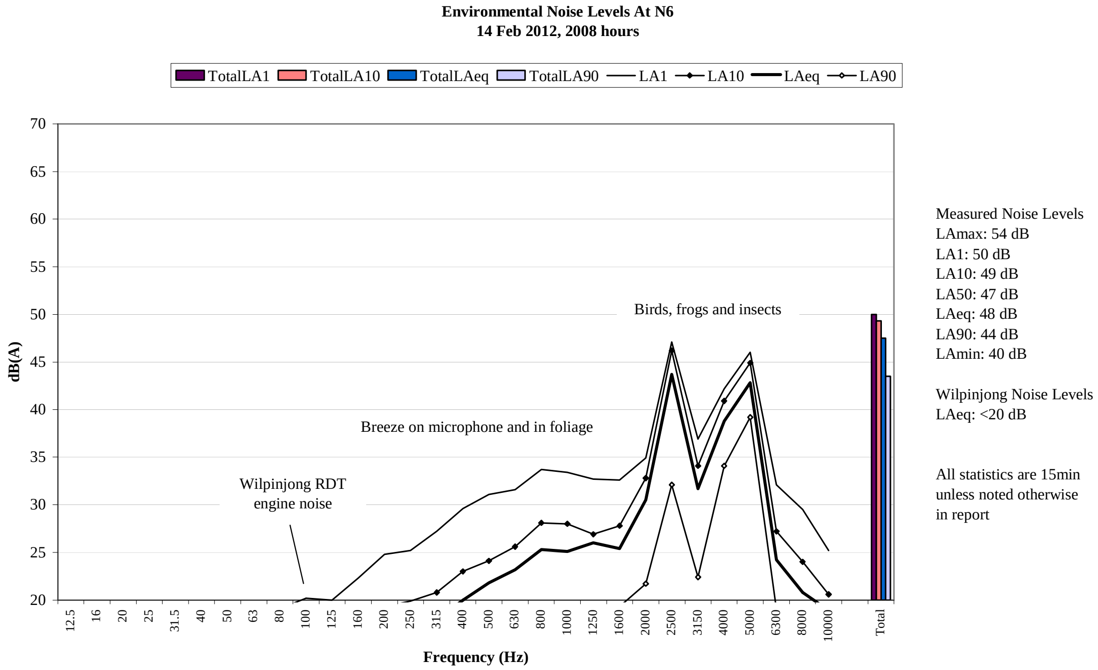


Figure 14 Environmental Noise Levels, N6 – Wollar Church

A low-level engine continuum and dozer track noise from WCP was audible briefly during the measurement. These sources resulted in a WCP only L_{Aeq} of <20 dB.

Birds, insects and frogs generated measured levels.

Breeze on the microphone, breeze in foliage, cows, dogs, a train, train horn and an aircraft were also noted.

5.1.13 N7, 14 February 2012, Evening

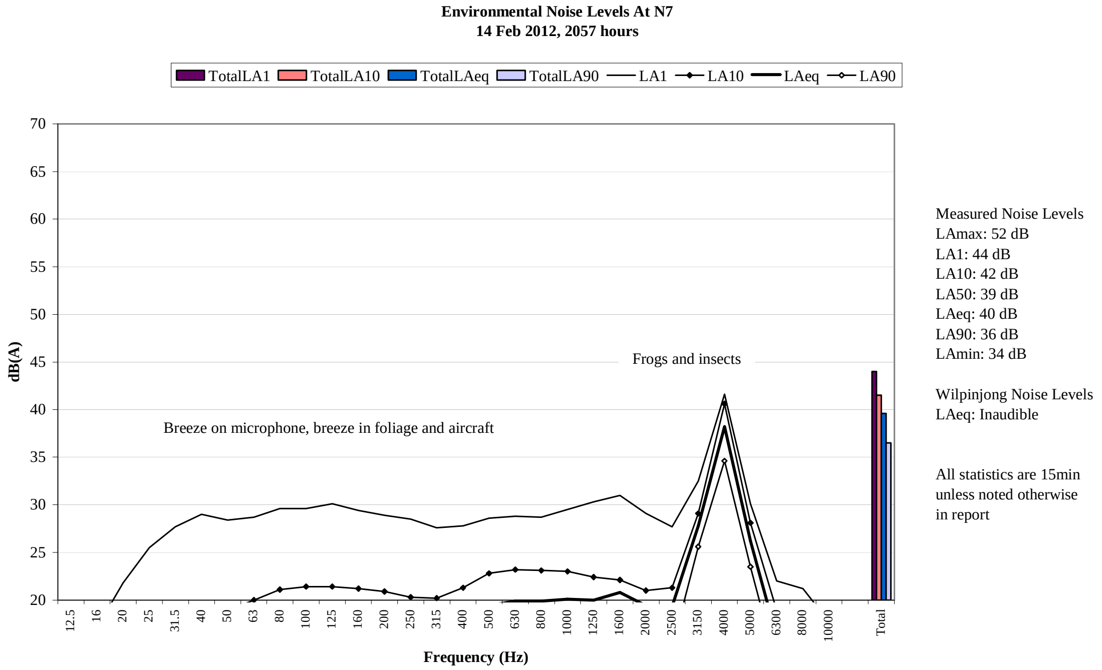


Figure 15 Environmental Noise Levels, N7 – Ulan-Wollar Road (East)

WCP was inaudible.

Frogs and insects were responsible for all measured levels.

Birds, distant dogs, an aircraft, breeze in foliage and on the microphone were also noted throughout the measurement.

5.1.14 N9, 14 February 2012, Evening

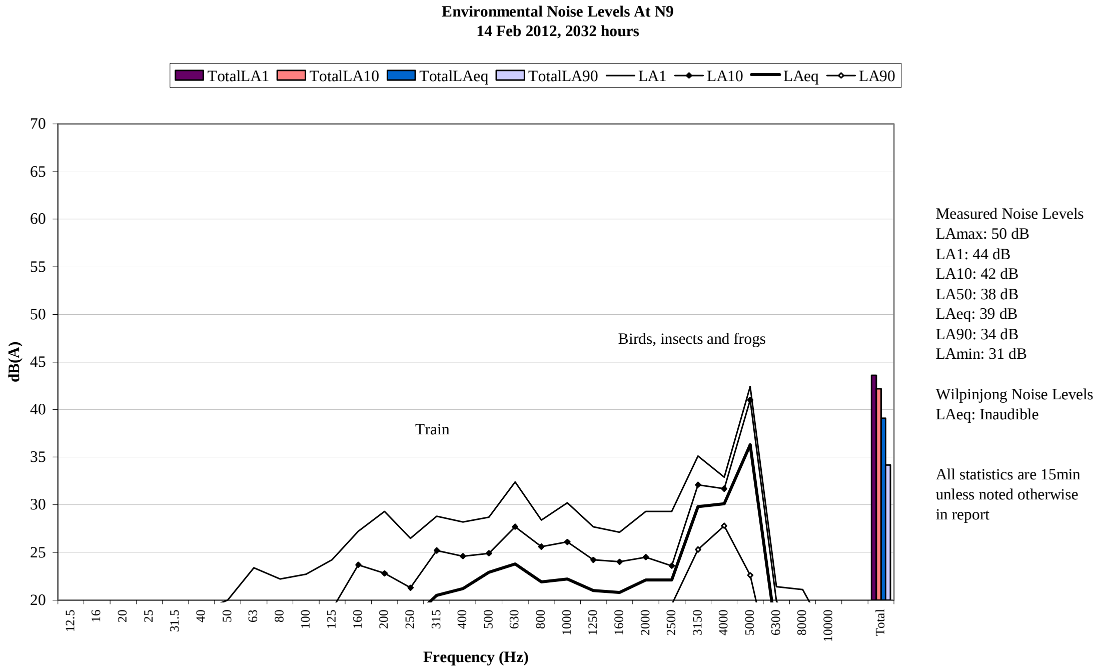


Figure 16 Environmental Noise Levels, N9 – Slate Gully Road

WCP was inaudible.

Birds, insects and frogs were primarily responsible for measured levels.

A train, train horn and breeze in foliage were also noted.

5.1.15 N12, 14 February 2012, Evening

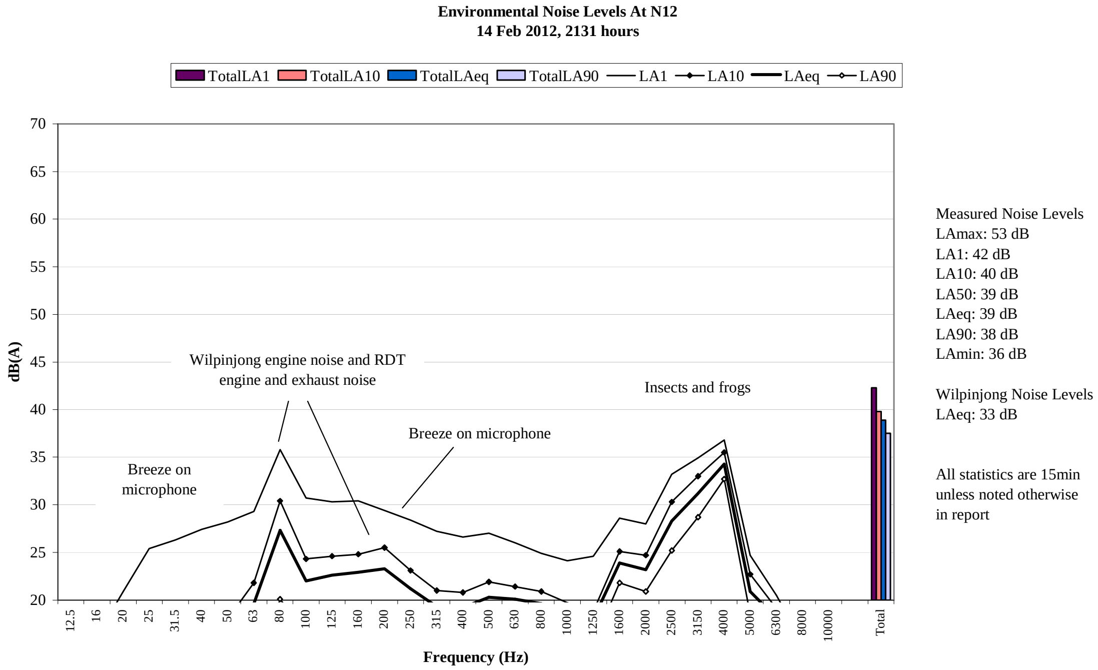


Figure 17 Environmental Noise Levels, N12 – Ulan-Wollar Road (West)

An engine continuum from WCP was audible throughout the measurement. Rear dump truck engine and exhaust noise and horns were also noted during the measurement. These sources generated the WCP only L_{Aeq} of 33 dB.

Insects, frogs and Wilpinjong rear dump truck engines and exhaust noise combined to generate the measured L_{A1}. Insects and frogs were primarily responsible for the measured L_{A10}, L_{Aeq} and L_{A90}.

Breeze in foliage and breeze on the microphone were also noted.

5.1.16 N4, 14 February 2012, Night-time

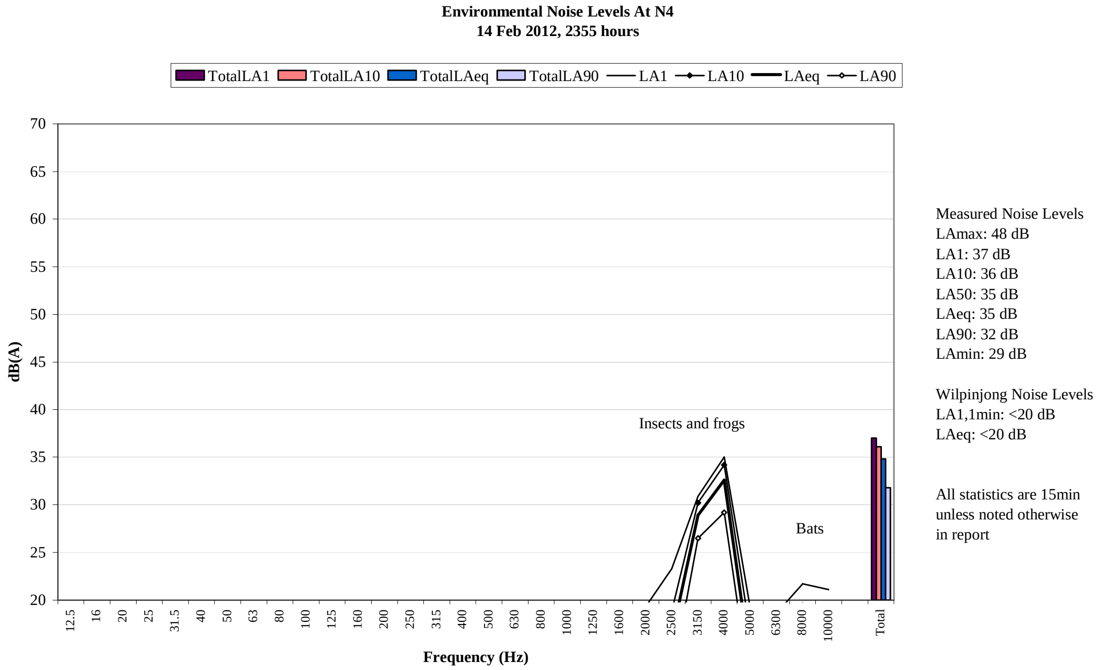


Figure 18 Environmental Noise Levels, N4 – Cumbo Road

A general continuum from WCP was audible throughout most of the measurement. Dozer tracks and rear dump trucks were also noted briefly at low levels. These sources generated the WCP only L_{Aeq} of less than 20 dB and the WCP only $L_{A1,1min}$ of less than 20 dB.

Insects and frogs generated all measured levels.

Breeze in foliage, dogs, bats and a distant train were also noted.

5.1.17 N6, 14 February 2012, Night-time

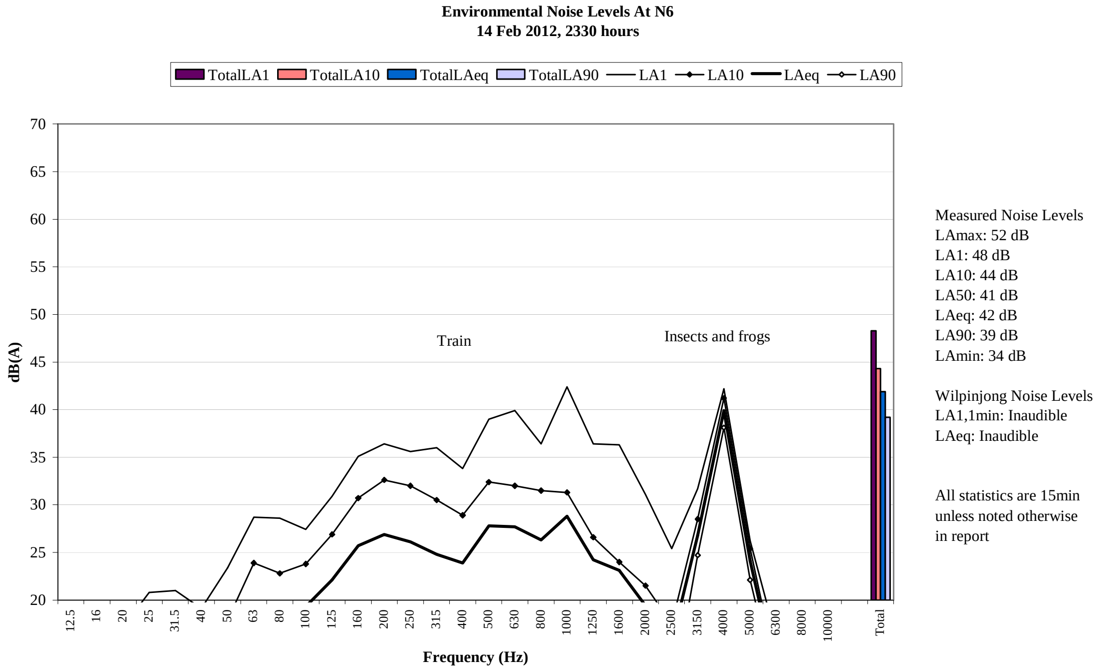


Figure 19 Environmental Noise Levels, N6 – Wollar Church

WCP was inaudible.

Insects and frogs were primarily responsible for most measured levels. Trains were responsible for the L_{Amax} and L_{A1}.

Birds, bats, ducks, cows and an aircraft were also noted.

5.1.18 N7, 14 February 2012, Night-time

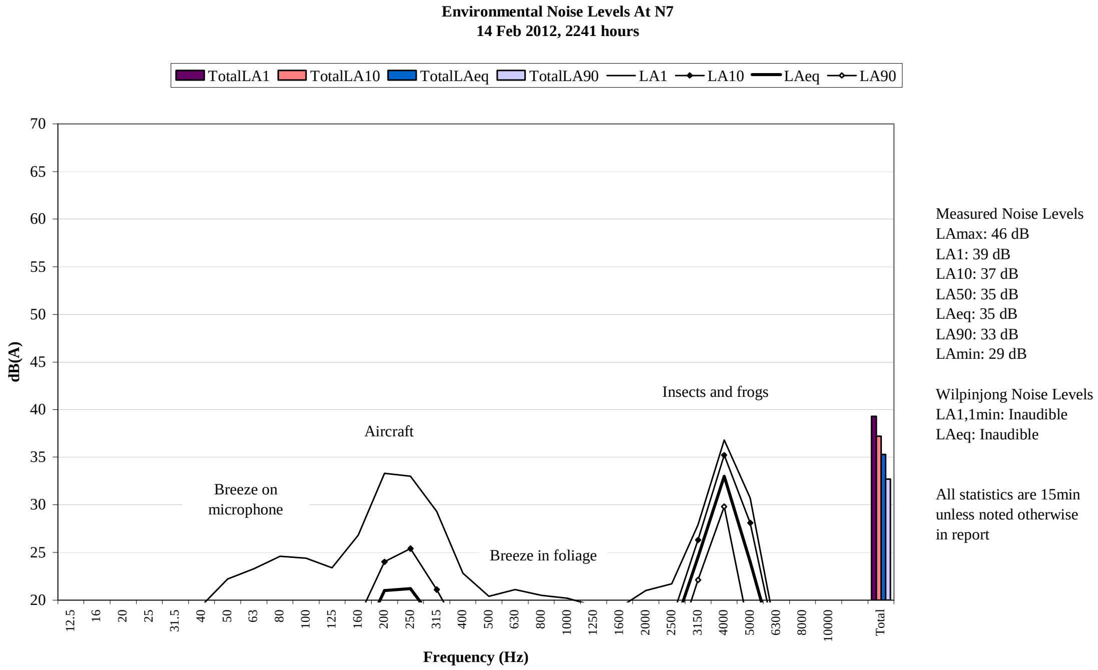


Figure 20 Environmental Noise Levels, N7 – Ulan Wollar Road (East)

WCP was inaudible.

Insects and frogs were largely responsible for measured levels.

An aircraft, breeze on the microphone, breeze in foliage and road traffic tyre noise were also noted.

5.1.19 N9, 14 February 2012, Night-time

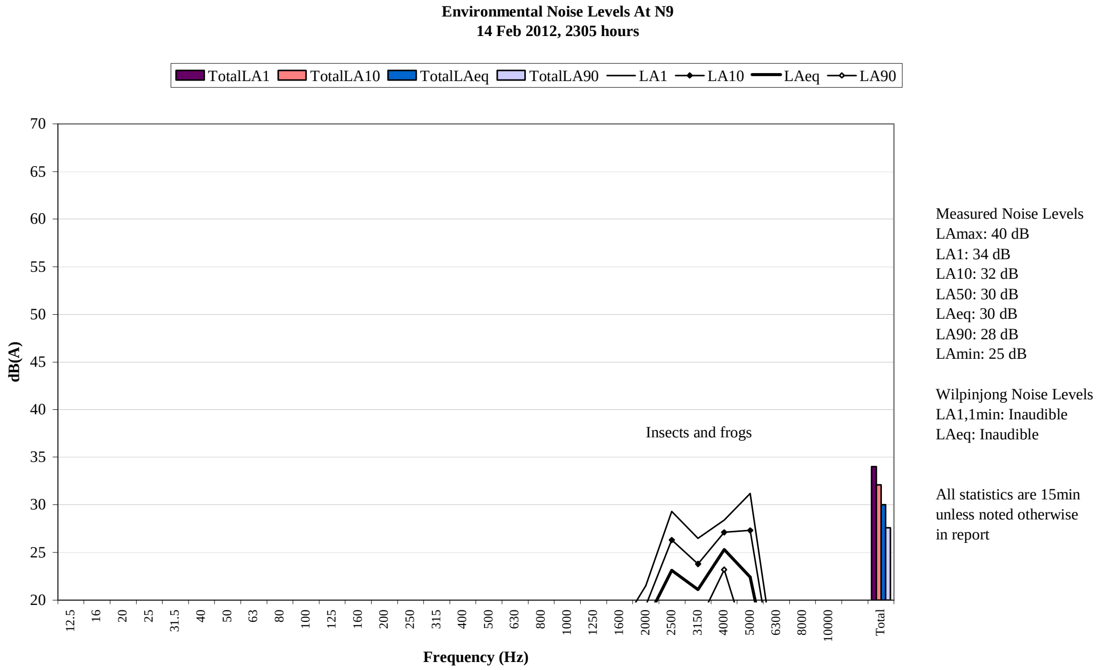


Figure 21 Environmental Noise Levels, N9 – Slate Gully Road

WCP was inaudible.

Insects and frogs were responsible for measured levels.

Birds, breeze in foliage, a local continuum and bats were also noted.

5.1.20 N12, 14 February 2012, Night-time

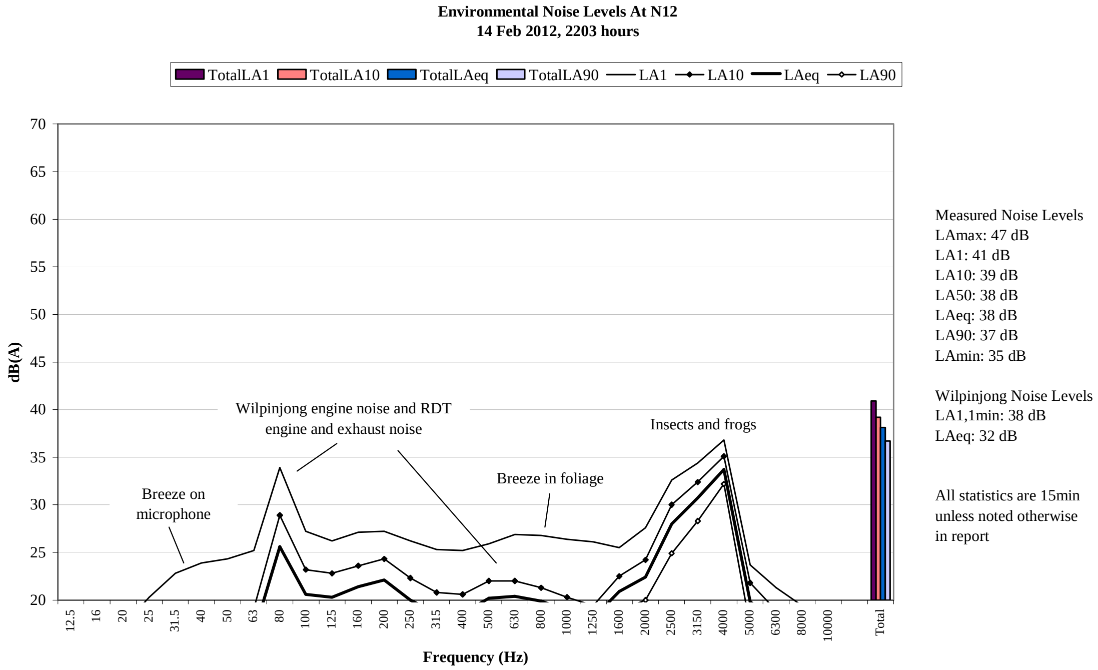


Figure 22 Environmental Noise Levels, N12 – Ulan Wollar Road (West)

An engine continuum from WCP was audible throughout the measurement. WCP rear dump truck engine and exhaust noise and dozer tracks were also noted. These sources generated the WCP only L_{Aeq} of 32 dB. Dozer track noise generated the WCP $L_{A1,1min}$ of 38 dB.

Insects and frogs were primarily responsible for the measured levels. WCP contributed to the measured L_{A10} and L_{Aeq}.

Birds, bats, breeze in foliage and breeze on the microphone were also noted.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the evening and nights of the 13 and 14 February 2012. Attended noise monitoring was conducted at five sites. The duration of all measurements was 15 minutes.

Wind speed and/or estimated temperature inversion conditions resulted in development consent criteria not always being applicable, as indicated in Table 4.2 and Table 4.3.

Wilpinjong Coal Project (WCP) complied with noise consent limits at the monitoring locations during the January / February 2012 monitoring period.

For some measurements in January/February 2012, the application of a 5 dB low frequency penalty would possibly result in a change from compliance to non-compliance. Based on the data provided in Table 4.6, the following conclusions can be made:

- Of the 2 measurements that exceeded the INP low frequency criterion, 1 resulted in a significant exceedance of the relevant impact assessment criterion (significant being more than a 2 dB exceedance). These exceedances occurred at N12, which is a mine owned (non-WCP) property; and
- There were no exceedances of the relevant mitigation or acquisition criterion at this location.

Global Acoustics Pty Ltd

A. DEVELOPMENT CONSENT

Several documents specifying noise criteria apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Project Development Consent

Wilpinjong Coal Project was given approval on 1 February 2006. A modification to the consent was approved in August 2010.

The relevant noise conditions from Section 3 - Specific Environmental Conditions of the modified consent is reproduced below.

ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Proponent shall acquire the land in accordance with the procedures in conditions 6 – 7 of schedule 4.

Table 1: Land subject to acquisition upon request

30 – Gaffney	45 – Smith
48 – Evans	50 – Thompson & Hopper
94 – McKenzie	

Note:

- *To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.*

Noise Impact Assessment Criteria

2. Except for the land referred to in Table 1, the Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land, or on more than 25 per cent of any privately-owned land.

Table 2: Noise Impact assessment criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{A1(1\ minute)}$
58 – Maher 52A – Long 52B – Long 53 – Reynolds	35	39	39	45
23B – Bishop	35	39	37	45
25 – Pettit	35	39	36	45
31A – Conradt	35	37	37	45
31B – Conradt	35	36	36	45
100 – Rheinberger 125 – Roberts	35	37	35	45
Wollar Village – Residential	36	35	35	45
All other privately owned land	35	35	35	45
901 – Wollar School		*35(internal) 45 (external) When in use*		-
150A – St Luke's Anglican Church 900 – St Laurence O'Toole Catholic Church		*40 (internal) When in use*		-
Goulburn River National Park/Munghorn Gap Nature Reserve		*50 When in use*		-

However, the criteria in Table 2 do not apply if the Proponent has an agreement with the relevant owner/s to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:

- *To interpret the locations referred to in Table 2, see the applicable figures in Appendix 7.*
- *Noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.*
- *For the Goulburn River National Park/Munghorn Nature Reserve noise levels are to be assessed at the most affected point at the boundary of the Goulburn River National Park/Munghorn Nature Reserve.*

Noise Acquisition Criteria

3. If the noise generated by the project exceeds the criteria in Table 3 at any residence on privately-owned land or on more than 25 per cent of any privately-owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 6 – 7 of schedule 4.

Table 3: Land acquisition criteria dB(A)

Day/Evening/Night $L_{Aeq(15\,minute)}$	Land
40	All privately owned land, excluding the land listed in Table 1

Note:

- *Noise generated by the project is to be measured in accordance with the notes presented below Table 2. For the condition to apply, the exceedances must be systemic.*

Additional Noise Mitigation Measures

4. Upon receiving a written request from the owner of any residence:
   (a) on the land listed in Table 1; or
   (b) on the land listed 23B, 25, 52A, 52B, 53, or 58 in the applicable figures in Appendix 7; or
   (c) where subsequent noise monitoring shows that the noise generated by the project is greater than, or equal to, $L_{Aeq(15\,minute)}$ 38 dB(A),

   the Proponent shall implement reasonable and feasible noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the landowner.

   If within 3 months of receiving this request from the landowner, the Proponent and the landowner 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.

5. By 30 November 2010, or within 1 month of obtaining monitoring results showing an exceedance of the relevant criteria listed in condition 4(c) above, the Proponent shall notify all applicable owners that they are entitled to ask for additional noise mitigation measures to be installed at their residence.

Operating Conditions

6. The Proponent shall:
   (a) implement all reasonable and feasible noise mitigation measures;
   (b) ensure that the real-time noise monitoring and meteorological forecasting data are assessed regularly, and that operations on site are relocated, modified, and/or stopped to ensure compliance with the relevant criteria in conditions 2 to 4 of this schedule; and
   (c) regularly investigate ways to reduce the operational, low frequency, rail, and road traffic noise generated by the project; and report on these investigations in the annual review (see condition 2 of schedule 5),

   to the satisfaction of the Director-General.

Noise Management Plan

7. The Proponent shall prepare and implement a Noise Management Plan for the project, in consultation with DECCW, and to the satisfaction of the Director-General. This plan must:
   (a) describe the noise mitigation measures that would be implemented to ensure compliance with the relevant noise impact assessment criteria in this approval, including the proposed real-time noise management system and associated meteorological forecasting; and
   (b) include a noise monitoring program, that uses a combination of real-time and supplementary attended monitoring measures to evaluate the performance of the project, and includes a protocol for determining exceedances with the relevant conditions of this approval.

A.2 Environment Protection Licence

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in December 2011.

The relevant section reproduced below.

L5 Noise limits

L5.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The locations referred to in the table below are indicated by the property identification numbers on Figure 4A Relevant Land Ownership Plan Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment 17 May 2010. The property identification numbers are indicated on Figure 4B Relevant Land Ownership List Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment 17 May 2010.

Location	Day	Evening	Night	Night
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
25 Pettit - Lot 16 DP250053	35	39	36	45
52A Long - Lot 8 DP250053	35	39	39	45
52B Long - Lot 8 DP250053	35	39	39	45
51 Bailey - Lot 5, 6 & 7 DP250053	35	39	39	45
58 Maher	35	39	39	45
31A Conradt - Lot 10, 11 & 12 DP250053 & Lot 160 DP723767	35	37	37	45
31B Conradt - Lot 10, 11 & 12 DP250053 & Lot 160 DP723767	35	36	36	45
Wollar village	35	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
125 E & K Roberts	35	37	35	45

L5.2 For the purpose of condition L5.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L5.3 The noise limits set out in condition L5.1 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 3ºC/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
c) Temperature inversion conditions greater than 3ºC/100m.

L5.4 For the purpose of condition L5.3:
a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station identified as EPA identification Point 21 in condition P1.1; and
b) Temperature inversion conditions (vertical temperature gradient in degrees C) are to be determined by direct measurement over a minimum 50m height interval as referred to in Part E2 of Appendix E to the NSW Industrial Noise Policy.

L5.5 To determine compliance:
a) With the Leq(15 minute) noise limits in condition L5.1, 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 3 metres 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 Nature Reserve

b) With the LA1(1 minute) noise limits in condition L5.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.

c) With the noise limits in condition L5.1, 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 conditions L5.5(a) or L5.5(b).

L5.6 A non-compliance of condition L5.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:

a) at a location other than an area prescribed by conditions L5.5(a) and L5.5(b); and/or
b) at a point other than the most affected point at a location.

L5.7 For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

A.3 Noise Monitoring Programme

The noise monitoring program for WCP was revised in September 2011 and the relevant sections are reproduced below.

5 MONITORING AND INTERPRETATION

The noise monitoring programme comprises both attended and real-time monitoring (Sections 5.1 and 5.2, respectively). Integrated protocols for both monitoring methodologies are outlined in Sections 5.1.4 and 5.2.4, respectively. Meteorological monitoring will also be conducted as described in Section 5.3.

Attended monitoring will be used for demonstrating compliance with noise criteria (Section 3.3), whilst real-time monitoring will be used as a management tool to assist WCPL to take pre-emptive management actions to avoid potential non-compliances.

5.1 ATTENDED NOISE MONITORING

5.1.1 Purpose

The main aim of attended noise monitoring is to determine compliance with Project Approval and EPL noise criteria.

Results from the attended monitoring programme will be used to verify data collected from the real-time noise monitors. This will be undertaken where attended monitoring is conducted directly adjacent to real-time monitors. The attended monitoring data will also be used to determine whether there is a consistent relationship between real-time continuous noise levels and long-term attended monitoring data. For example if there is a consistent correlation between a real-time monitor and an attended monitoring site, then the real-time monitoring results could reasonably be used to predict noise levels at the attended site when attended monitoring is not being undertaken. This will be done annually to complement the regular maintenance and calibration of the real-time monitors.

5.1.2 Monitoring Locations

The attended noise monitoring programme will be conducted at sites adjacent to the Mine on non-Mine owned land to measure noise levels at nearby residences. Operational experience and investigations (Section 7.1) have shown that the Mine noise effects are experienced predominantly to the south and east of the Mine. Attended noise monitoring is presently concentrated in these areas, however this does not exclude monitoring to the west of the Mine.

Attended noise monitoring locations are shown on Figures 4. These locations provide good coverage in all directions from the Mine and are a combination of compliance sites and population centres. These locations include:

- N4 – W&V Langshaw dwelling 'Hillview';
- N6 – St Laurence O'Toole Catholic Church;
- N7 – Road reserve adjacent the Smith property;
- N9 – Maher dwelling; and
- N12 – Ulan Coal Mine Limited-owned dwelling.

5.1.3 Methodology

Attended noise monitoring will be carried out by an independent expert (i.e. not by mine staff) and will be conducted every 2 months. Monitoring will be conducted in accordance with Australian Standard (AS) 1055:1997 *Acoustics – Description and Measurement of Environmental Noise* and the INP (EPA, 2000). These operator-attended noise measurements will be conducted during normal operations to quantify the intrusive noise emissions from the Mine as well as the overall level of ambient noise.

Following the completion of the attended noise monitoring by the independent expert, the two monthly monitoring reports will be submitted to OEH and DP&I and will be made publically available on the Peabody website (Section 8.2).

Timing

Attended noise monitoring will be conducted for 15 minute periods day, evening and night. Day is defined as between 7am and 6pm, evening is described as being between 6pm and 10pm and night is between 10pm and 7am.

The monitoring will be carried out on two consecutive nights resulting in 2 x 15 minute samples for each location every two months. By sampling two consecutive nights, it is likely that different meteorological conditions are sampled for each site, providing more useful information.

Particular attention will be given to monitoring between 7pm and 2am (i.e. evening/night-time periods). Experience has shown that it is during these periods that noise can be at its most intrusive and results in more complaints. This is due to the very low background noise levels experienced during these periods and the presence of temperature inversions that are a relatively common phenomenon in this area, particularly during winter months.

Measurement

Acoustic instrumentation used in attended monitoring will comply with AS 1259.2:1990 *Sound Level Meters*.

The intrusive noise level (L_{Amax}, L_{A1}, L_{A10} and L_{Aeq}) contribution from mine operation activities will be quantified over a 15 minute measurement period. In addition, the overall levels of ambient noise (i.e. L_{Amax}, L_{A1}, L_{A10}, L_{A50}, L_{A90}, L_{Amin} and L_{Aeq}) over the 15 minute period will be quantified and characterised.

A measurement of $L_{A1(1\ minute)}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from the Mine during the entire measurement period (i.e. the highest level of the maximum minute during the 15 minute measurement).

The L_{A1} measurement should be undertaken at 1 m from the dwelling façade and the L_{Aeq} measurement within 30 m of the dwelling. However, the direct measurement of noise at 1 m from the façade is not always practical. In most cases monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In these cases measurements are undertaken at a suitable and representative location as close to the dwelling as practicable. Modifying factors from section 4 of the INP are used where applicable. Tonality and low frequency are assessed by analysis of the measured L_{Aeq} spectrum.

Recording

An example of an attended monitoring recording sheet is provided in Attachment 5. During attended monitoring, the following information will be recorded:

- operator's name;
- locations of attended and unattended noise instruments;
- recording intervals;
- meteorological conditions (i.e. temperature, humidity, cloud cover, and wind speed and direction);
- statistical noise level descriptors together with notes identifying the principle noise sources; and
- instrument calibration details.

The meteorological conditions listed above will be recorded local to the noise measurement as well as on-site at the Mine Automatic Weather Station (AWS) (Section 5.3). Prevailing weather conditions determined from the AWS (in the first instance) to be outside of the meteorological constraints stipulated in the Project Approval will be excluded from further analysis.

Additional information (such as general mobile and fixed plant locations) will be collected at the time of (or soon after) monitoring to enable correlation between Mine noise, meteorological conditions, general plant locations, plant operating conditions and topography.

5.1.4 Compliance Assessment

As discussed in Section 5.1.1, the results of attended noise monitoring will be compared against the relevant noise criteria set out in Section 3.3 of this NMP. The comparison will be undertaken following the exclusion of data using meteorological conditions described as part of Table 2 as well as observations of non-Mine noise by the person undertaking the attended noise monitoring programme.

In the event of an exceedance of the noise criteria, an assessment will be conducted to determine:

- Timing of the exceedance.
- Location of the exceedance.
- Exclusion of non-mine related noise and noise from non-WCPL mining activities (e.g. can the exceedance be attributed directly to the Mine). This will include consideration of:
  - the methods and type of equipment being used by WCPL at the time of the exceedance and proximity to the locations at which the exceedance was recorded; and
  - the location of non-WCPL mining activities or agricultural activities and proximity to the locations at which the exceedance was recorded.
- Meteorological conditions at the time of the exceedance – including confirmation that meteorological conditions are in accordance with Condition 2, Schedule 3 of the Project Approval.

If the above assessment determines that an exceedance is due to Mine noise then management strategies detailed in Sections 6 and 7 to help prevent recurrence will be implemented in an effort to reduce noise levels below those set out in Table 2.

Exceedances of criteria will be determined in consideration of Table 2 of the Project Approval (e.g. the meteorological conditions under which they apply) and the INP. Section 11.1.3 of the INP states the following in relation to when a development is in non-compliance with a noise condition:

> *A development will be deemed to be in non-compliance with a noise consent or licence condition if the monitored noise level is more than 2 dB above the statutory noise limit specified in the consent or licence condition. This may occur for two reasons:*
>
> - *The noise from the development is excessive, in which case the development is truly not complying with its consent or licence condition.*
> - *The noise was increased by extreme, nonstandard weather effects—in which case the development is not considered to be in noncompliance with its consent or licence condition. Non-standard weather effects can be considered to be present during monitoring if the cloud cover is less than 40 per cent and the wind speed (at 10 m height) is less than 1.0 m/s (represents an extremely adverse weather condition for noise)—during the period from 6 pm to 7 am in non-arid areas (see Section 9.2).*
>
> *In this latter case, further monitoring at a later date is required to determine compliance under the meteorological conditions specified in the consent/licence condition.*

For the purposes of the NMP, the monitored noise level is the attended noise monitoring results at the locations listed in Section 5.1.2.

In accordance with Condition 7, Schedule 5 of the Project Approval, The Proponent shall notify the Director-General and any other relevant agencies of any incident associated with the project 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.

In accordance with Condition 2, Schedule 4 of the Project Approval, the proponent shall notify the Director-General, the affected landowners and tenants (including tenants of mine-owned properties) accordingly, and provide monitoring results to each of these parties until the results show that the project is complying with the criteria in schedule 3.

B. CALIBRATION CERTIFICATES

Acoustic Research Laboratories
Proprietary Limited
A.B.N. 47 050 100 804
Noise and Vibration Monitoring Instrumentation for Industry and the Environment

Sound Level Meter Test Report

Report Number : C11616

Date of Test : 09/11/2011

Report Issue Date : 10/11/2011

Equipment Tested/ Model Number: **Rion NA-28 Sound Level Meter**

Instrument Serial Number: 01070590

Microphone Serial Number: 00533

Preamplifier Serial Number: 70607

Client Name : Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Contact Name : Tony Welbourne

Tested by : Brianna Sparre

Approved Signatory :

Date : **10 November 2011**

NATA
WORLD RECOGNISED ACCREDITATION

Acoustic Research Laboratories Pty Ltd is NATA Accredited Laboratory Number. 14172.

This document is issued in accordance with NATA's accreditation requirements.

Accredited for compliance with ISO/IEC 17025

This document shall not be reproduced except in full.

Level 7 • Building 2 • 423 Pennant Hills Rd • Pennant Hills • NSW 2120 • AUSTRALIA
Telephone +61 2 9484 0800 • Facsimile +61 2 9484 0884
www.acousticresearch.com.au

Acoustic Research Laboratories
Proprietary Limited A.B.N. 47 050 100 804
Noise and Vibration Monitoring Instrumentation for Industry and the Environment

Acoustic Calibrator Test Report

Report Number : C11599

Date of Test : 31/10/2011

Report Issue Date : 31/10/2011

Equipment Tested: **Rion Acoustic Calibrator**

Model Number: NC-74

Serial Number: 50941314

Client Name : Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Contact Name : Jodi Higginbottom

Tested by : Adrian Walker

Approved Signatory :

Ken Williams

Date : **31 October 2011**

NATA
WORLD RECOGNISED ACCREDITATION

Acoustic Research Laboratories Pty Ltd is NATA Accredited Laboratory Number. 14172.
This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025
This document shall not be reproduced except in full.

Level 7 ♦ Building 2 ♦ 423 Pennant Hills Rd ♦ Pennant Hills ♦ NSW 2120 ♦ AUSTRALIA
Telephone +61 2 9484 0800 ♦ Facsimile +61 2 9484 0884
www.acousticresearch.com.au

Wilpinjong Coal

March / April 2012

Environmental Noise Monitoring

Prepared for

ALS Environmental Division

Global Acoustics

Noise and Vibration Analysis and Solutions

Global Acoustics Pty Ltd
PO Box 3115 | Thornton NSW 2322
Telephone +61 2 4966 4333 | Facsimile +61 2 4966 4330
Email global@globalacoustics.com.au
ABN 94 094 985 734

Wilpinjong Coal

March / April 2012
Environmental Noise Monitoring

Reference: 12144_R01.doc

Report date: 29 May 2012

Prepared for

ALS Environmental Division
PO Box 1034
Mudgee NSW 2850

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322

Prepared: Imran Khan
Acoustic Engineer

QA Review: Katie Weekes
Environmental Scientist

Global Acoustics Pty Ltd ~ Environmental noise modeling and impact assessment ~ Sound power testing ~ Noise control advice ~ Noise and vibration monitoring ~ OHS noise monitoring and advice ~ Expert evidence in Land and Environment and Compensation Courts ~ Architectural acoustics ~ Blasting assessments and monitoring ~ Noise management plans (NMP) ~ Sound level meter and noise logger sales and hire

EXECUTIVE SUMMARY

Global Acoustics was engaged by ALS Environmental Division to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine operated by Wilpinjong Coal. WCP was given approval on 1 February 2006. A modification to the consent was approved in August 2010.

An environment protection licence (EPL) was issued in early 2006 with subsequent variations approved. A revised noise-monitoring program (NMP) for WCP was approved in September 2011. Results of two-monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at five locations on 17, 18 and 19 April 2012. The survey purpose is to quantify and describe the acoustic environment around the site and compare results with specified limits.

Attended monitoring was conducted in accordance with the NSW Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. The duration of each evening and night measurement was 15 minutes.

WCP complied with noise consent limits at all monitoring locations during the March / April 2012 monitoring period. Wind speed and/or estimated temperature inversion conditions resulted in development consent criteria not always being applicable, as indicated in Table 4.2 and Table 4.3.

Table of Contents

Appendices

1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by ALS Environmental Division to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine operated by Wilpinjong Coal.

Environmental noise monitoring described in this report was undertaken at five locations on 17, 18 and 19 April 2012. Figure 1 shows the regular monitoring locations.

The purpose of the survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were five regular monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the Noise Monitoring Program (NMP).

Table 1.1 NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location	Owner
N4	'Hillview' Cumbo Road, Wollar	Wilpinjong Coal Mine
N6	St Laurence O'Toole Catholic Church, representative of Wollar - Residential	NA
N7	Ulan-Wollar Road (East)	Wilpinjong Coal Mine
N9	Slate Gully Road, Wollar	Wilpinjong Coal Mine
N12	Ulan-Wollar Road (West)	Ulan Coal Mines

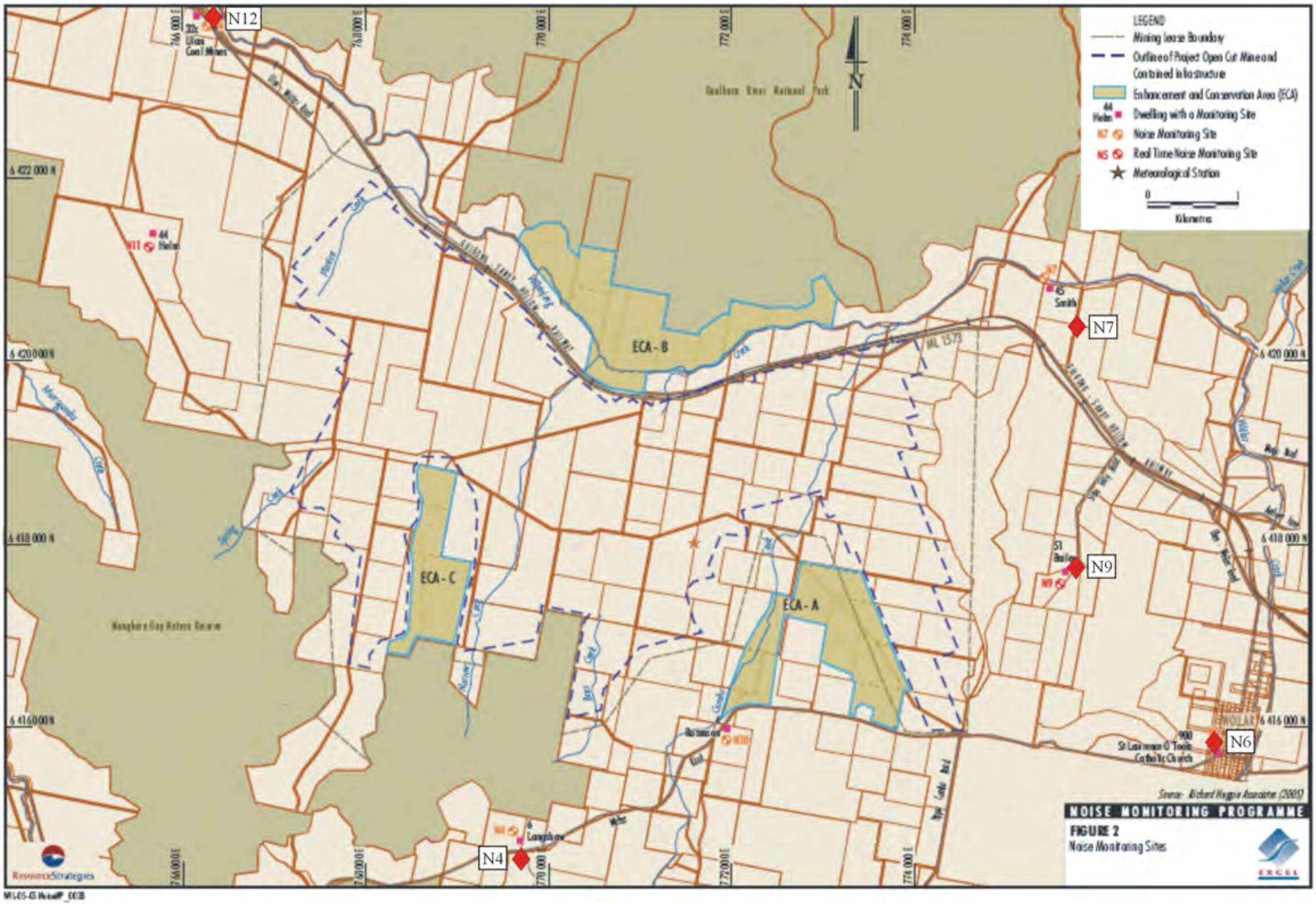


Figure 1 **Monitoring Sites**

1.3 Terminology

Some definitions of terminology, which may be used in this report, are provided in Table 1.2.

Table 1.2 TERMINOLOGY

Descriptor	Definition
L_A	The A-weighted root mean squared (RMS) noise level at any instant
L_{Amax}	The maximum A-weighted noise level over a time period or for an event
L_{A1}	The noise level which is exceeded for 1 per cent of the time
L_{A10}	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L_{A50}	The noise level which is exceeded for 50 per cent of the time
L_{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes
L_{Amin}	The minimum A-weighted noise level over a time period or for an event
L_{Aeq}	The average noise energy during a measurement period
$L_{A1,1minute}$	The highest noise level generated for 0.6 second during one minute
L_{pk}	The unweighted peak noise level at any instant
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
SEL	Sound exposure level (SEL), the A-weighted noise energy during a measurement period normalised to one second
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
ABL	Assessment background level (ABL), the 10th percentile background noise level for a single period (day, evening or night) of a 24 hour monitoring period
RBL	Rating background level (RBL), the background noise level for a period (day, evening or night) determined from ABL data

2 CONSENTS AND CRITERIA

2.1 Development Consent

WCP was given approval on 1 February 2006. A modification to the consent was approved in August 2010. The relevant noise conditions from Section 3 - Specific Environmental Conditions of the consent are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in December 2011.

Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise-monitoring program for WCP was revised in September 2011. Section 5.1 details attended monitoring locations and methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Specific Criteria

Day, evening and night criteria are detailed in Table 2.1. These have been selected as the most appropriate for each monitoring location and are based on the consolidated consent or environment protection licence associated with Wilpinjong Coal Project operations.

Table 2.1 WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident number[1]	Monitoring Location	Day $L_{Aeq(15\ minute)}$	Evening $L_{Aeq(15\ minute)}$	Night $L_{Aeq(15\ minute)}$/ $L_{A1(1\ minute)}$
N4	'Hillview' Cumbo Road, Wollar[5]	NA	NA	NA/NA
N6 / Wollar	Catholic Church representative of Wollar – Residential	35[3]	35[3]	35[3]/45[3]
N7 / 45	Ulan-Wollar Road (East) [5]	NA	NA	NA/NA
N9 / 58	Slate Gully Road, Wollar[5]	NA	NA	NA/NA
N12 / All	Ulan-Wollar Road (West)[4]	35[2]	35[2]	35[2]/45[2]

Notes:
1. *"All" indicates location is not mentioned specifically in Section 2 of the 2010 Modification and therefore has criteria applied to "all other privately owned land";*
2. *From 2010 Modification;*
3. *From Environment Protection Licence No. 12425;*
4. *Property is designated as a non-WPL mining interest in the 2010 Modification; and*
5. *These properties are owned by WCP, so criteria are NA, 'not applicable'.*

Condition L5.3 in the EPL states:

The noise limits set out in condition 5.1 apply under all meteorological conditions except for the following:

a) Wind speeds greater than 3 metres per second at 10 metres above ground level; or

b) Temperature inversion conditions of up to 3°C per 100 m and wind speeds greater than 2 metres per second at 10 metres above the ground level; or

c) Temperature inversion conditions greater than 3°C per 100 m.

2.5 Acquisition Criteria

As detailed in condition 3 of Schedule 3 of the consent, acquisition criteria for WCP are to consider noise in respect to the criteria detailed in Table 2.2 for all privately owned land (excluding land owned by Gaffney – 30, Smith – 45, Evans – 48, Thomson & Hopper - 50 and McKenzie – 94).

Table 2.2 WILPINJONG COAL ACQUISITION CRITERIA, dB

Property	L_{Aeq} (15 minute)
All privately owned land	40

2.6 Additional Mitigation Criteria

As detailed in condition 4 of Schedule 3 of the consent, additional mitigation criteria for WCP are to consider noise in respect to the criteria detailed in Table 2.3 for most privately owned land.

Table 2.3 WILPINJONG COAL ADDITIONAL MITIGATION CRITERIA, dB

Property	L_{Aeq} (15 minute)
All other privately owned land, excluding those listed below	38

Land listed in Table 1 of the consent, or property numbers 23B, 25, 52A, 52B, 53 or 58 will receive mitigation upon request.

2.7 INP Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with The Office of Environment and Heritage (OEH, formerly DECCW) 'Industrial Noise Policy' (INP). Chapter 4 of the INP deals specifically with modifying factors that may apply to industrial noise. The most common modifying factors are addressed in detail below.

2.7.1 Tonality, Intermittent and Impulsive Noise

As defined in the Industrial Noise Policy:

> *Tonal noise contains a prominent frequency and is characterised by a definite pitch.*
>
> *Impulsive noise has high peaks of short duration or a sequence of such peaks.*
>
> *Intermittent noise is characterised by the level suddenly dropping to the background noise levels several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only.*

Years of monitoring have indicated that noise levels from mining operations, particularly those levels measured at significant distances from the source are relatively continuous. Given this, noise levels at the monitoring locations are unlikely to be intermittent. In addition, there is no equipment on site that is likely to generate tonal or impulsive noise as defined in the INP.

2.7.2 Low Frequency Noise

As defined in the Industrial Noise Policy:

> *Low frequency noise contains major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum.*

As detailed in Chapter 4 of the INP, low frequency noise should be assessed by measuring the C-weighted and A-weighted level over the same time period. The correction/penalty of 5 dB is to applied *if the difference between the two levels is 15 dB or more*.

Low frequency noise can also be assessed against criteria specified in the paper "A Simple Method for Low Frequency Noise Emission Assessment "(Broner JLFNV Vol29-1 pp1-14 2010). If the total predicted C – weighted noise level at a receptor exceeds the relevant criterion, a 5 dB penalty (modifying factor) is added to predicted levels.

2.8 Low Frequency Criteria

Low frequency criteria are detailed in Table 2.4.

Table 2.4 $L_{Ceq,15minute}$ CRITERIA (dBC)

Method	Calculation Method	Night-time Criterion	Daytime Criterion
Broner, 2010	L_{Ceq} to 250 Hz	60	65
INP, total	Total L_{Ceq} minus L_{Aeq}	15	15

3 METHODOLOGY

3.1 Assessment Method

Attended monitoring was conducted in accordance with the NSW Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken. The duration of each evening and night measurement was 15 minutes.

The terms "Inaudible" (IA) and "Less than 20 dB" (<20 dB) are used in this report. When site noise is noted as IA then there was no site noise at the monitoring location.

However, if site noise is noted as <20 dB, this means some noise was audible but could not be quantified. This means that noise from the site was either very low, or, being masked by other noise that was relatively loud. In the former case (very low site levels) we consider it not necessary to attempt to accurately quantify site noise as it would be significantly less than any criterion and most unlikely to cause annoyance (and in many cases, to be even noticed).

If site noise were <20 dB due to masking then we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting if deemed necessary. All sites <20 dB in this report are due to low absolute values.

A measurement of $L_{A1,1minute}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from the Wilpinjong Coal Project (WCP) noise source during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

As indicated in note (a) and (b) below Table 2 of the consent conditions, the L_{A1} measurement should be undertaken at 1 metre from the dwelling façade and the L_{Aeq} measurement within 30 metres of the dwelling. However, the direct measurement of noise at 1 metre from the façade is not practical during monitoring for this project. In most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements for this survey were undertaken at a suitable and representative location.

As indicated in note (a) of Table 2 of the consent, modifying factors from Section 4 of the INP should be implemented where applicable. Tonality and low frequency from WCP were assessed by analysis of the measured L_{Aeq} spectrum.

Years of monitoring have indicated that noise levels from mining operations, particularly those levels measured at significant distances from the source are relatively continuous. Given this, noise levels from WCP at the monitoring locations are unlikely to be intermittent. In addition, there is no equipment on site at WCP that would generate impulsive noise as defined in the INP.

3.2 Attended Monitoring

The equipment used to measure environmental noise levels are listed in Table 3.1.

Table 3.1 MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	701424	27/04/2013
Pulsar 106 acoustic calibrator	57413	21/09/2013

Calibration certificates are included as Appendix B.

4 RESULTS

4.1 Attended Noise Monitoring

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. Table 4.2 and Table 4.3 detail $L_{Aeq\ (15\ minute)}$ and $L_{A1\ (1\ minute)}$ noise levels from WCP in the absence of other noise sources with impact assessment criteria. Criteria are then applied if weather conditions are in accordance with the mine's development consent. There were no modifying factors applicable to measured noise levels during this survey.

Discussion as to the noise sources responsible for these measured levels is provided in Chapter 5 of this report.

Table 4.1 MEASURED NOISE LEVELS – MARCH/ APRIL 2012

Location	Date And Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB	L_{Aeq} dB
	Evening							
N4	17/04/2012 18:35	45	40	37	36	35	33	36
N6	17/04/2012 19:04	37	32	29	27	27	26	28
N7	17/04/2012 20:01	45	42	40	38	37	35	39
N9	17/04/2012 19:33	40	37	35	34	33	30	34
N12	17/04/2012 20:38	41	38	36	35	33	31	35
	Night-Time							
N4	18/04/2012 00:19	51	32	28	26	24	22	28
N6	17/04/2012 23:32	41	34	26	23	22	20	25
N7	17/04/2012 22:36	46	45	42	37	35	32	39
N9	17/04/2012 23:02	46	35	33	31	29	24	31
N12	17/04/2012 22:00	41	37	35	34	33	31	34
	Evening							
N4	18/04/2012 18:49	52	43	34	32	32	30	34
N6	18/04/2012 19:22	42	32	29	27	27	25	28
N7	18/04/2012 20:13	45	42	40	38	36	34	38
N9	18/04/2012 19:48	41	38	35	33	31	28	33
N12	18/04/2012 20:47	47	40	39	38	37	35	38
	Night-Time							
N4	19/04/2012 00:09	42	30	28	26	25	23	26
N6	18/04/2012 23:50	44	40	29	25	24	24	28
N7	18/04/2012 22:32	44	41	39	37	35	32	37
N9	18/04/2012 22:56	43	40	38	36	33	27	36
N12	18/04/2012 22:00	41	39	38	37	36	34	37

Note: Noise levels in this table are not necessarily the result of activities at WCP.

Table 4.2 $L_{Aeq\ (15\ minute)}$ dB GENERATED BY WCP AGAINST IMPACT ASSESSMENT CRITERIA – MARCH / APRIL 2012

Location	Date And Time	Wind Speed m/s [8]	VTG °C per 100m [6,8]	Criterion dB [,7]	Criterion Applies? [1,5]	WCP L_{Aeq} (15min) dB [2,3]	Exceedance [4,5,7]
	Evening						
N4	17/04/12 18:35	3.3	-0.7	NA	N	IA	NA
N6	17/04/12 19:04	2.7	-0.7	35	Y	IA	N
N7	17/04/12 20:01	2.8	-0.9	NA	N	NM	NA
N9	17/04/12 19:33	2.5	-0.9	NA	N	IA	NA
N12	17/04/12 20:38	3.2	-1.0	35	N	29	NA
	Night-Time						
N4	18/04/12 00:19	1.2	-0.9	NA	N	NM	NA
N6	17/04/12 23:32	1.5	-0.9	35	Y	IA	N
N7	17/04/12 22:36	1.3	-0.9	NA	N	IA	NA
N9	17/04/12 23:02	1.3	-0.7	NA	N	IA	NA
N12	17/04/12 22:00	1.7	-0.9	35	Y	27	N
	Evening						
N4	18/04/12 18:49	2.4	-0.7	NA	N	<20	NA
N6	18/04/12 19:22	1.7	-0.9	35	Y	IA	N
N7	18/04/12 20:13	2.5	-0.9	NA	N	IA	NA
N9	18/04/12 19:48	1.5	-0.7	NA	N	IA	NA
N12	18/04/12 20:47	2.3	-0.9	35	Y	30	N
	Night-Time						
N4	19/04/12 00:09	2.8	-1.2	NA	N	NM	NA
N6	18/04/12 23:50	2.4	-1.0	35	Y	IA	N
N7	18/04/12 22:32	2.0	-1.0	NA	N	IA	NA
N9	18/04/12 22:56	2.5	-1.0	NA	N	IA	NA
N12	18/04/12 22:00	1.6	-0.9	35	Y	31	N

Notes:
1. *Noise emission limits apply for winds up to 3 metres per second (at a height of 10 metres, or, vertical temperature gradients of up to 3 degrees/100m with wind speed up to 2 m/s;*
2. *These are results for WCP in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;*
7. *NA in criterion column means the criteria are not applicable at this location, NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified; and*
8. *Atmospheric data is sourced from the WCP weather station.*

Table 4.3 $L_{A1\ (1\ minute)}$ dB GENRATED BY WCP AGAINST IMPACT ASSESSMENT CRITERIA – MARCH / APRIL 2012

Location	Date And Time	Wind Speed m/s [8]	VTG °C per 100m [6,8]	Criterion dB [,7]	Criterion Applies?[1,5]	WCP L_{A1} (1 min) dB [2,3]	Exceedance[4,5,7]
	Night-Time						
N4	18/04/12 00:19	1.2	-0.9	NA	N	NM	NA
N6	17/04/12 23:32	1.5	-0.9	45	Y	IA	N
N7	17/04/12 22:36	1.3	-0.9	NA	N	IA	NA
N9	17/04/12 23:02	1.3	-0.7	NA	N	IA	NA
N12	17/04/12 22:00	1.7	-0.9	45	Y	33	N
	Night-Time						
N4	19/04/12 00:09	2.8	-1.2	NA	N	NM	NA
N6	18/04/12 23:50	2.4	-1.0	45	Y	IA	N
N7	18/04/12 22:32	2.0	-1.0	NA	N	IA	NA
N9	18/04/12 22:56	2.5	-1.0	NA	N	IA	NA
N12	18/04/12 22:00	1.6	-0.9	45	Y	37	N

Notes:
1. *Noise emission limits apply for winds up to 3 metres per second (at a height of 10 metres, and, vertical temperature gradients of up to 3 degrees/100m with wind speed up to 2 m/s;*
2. *These are results for WCP in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;*
7. *NA in criterion column means the criteria are not applicable at this location, NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified; and*
8. *Atmospheric data is sourced from the WCP weather station.*

Where WCP only noise levels are within the impact assessment criteria, it is not necessary to compare these noise levels to acquisition or mitigation criteria as these levels are higher. Compliance with impact assessment indicates compliance with acquisition or mitigation criteria.

4.2 Low Frequency Assessment

Table 4.4 provides statistics for attended noise monitoring undertaken around WCP during March and April 2012 monitoring. A total of 3 out of 20 measurements occurred during which WCP was directly measurable (not "inaudible", "not measurable" or less than a maximum cut-off value "<30 dB") and where meteorological conditions resulted in criteria applying (in accordance with the consent). These 3 results were analysed for low frequency content for this report.

Table 4.4 ATTENDED MEASUREMENT STATISTICS FOR WCP – MARCH / APRIL 2012

	March / April 2012
No. of measurements	20
Measurements where met applies	18
WCP is measurable and met applies	3

Table 4.5 details L_{Ceq} noise levels from WCP. Results have been compared to relevant criteria (as detailed in Section 2 of this report). Only measurements occurring during applicable meteorological conditions and where WCP was audible have been presented.

Table 4.5 MEASURED $L_{Ceq,15\ minute}$ NOISE LEVELS AGAINST LOW FREQUENCY NOISE CRITERIA – MARCH / APRIL 2012

Location	Date And Time	WCP only L_{Aeq} dB[1]	L_{Ceq} Criterion[2]	L_{Ceq} (less than 250 Hz) dB[3,6]	INP L_{Ceq} Criterion[4]	Total L_{Ceq} minus L_{Aeq} dB[5,6]	Comments
N12	17/04/12 22:00	27	60	47	15	13	Measurement included insects and frogs.
N12	18/04/12 20:47	30	60	52	15	14	Measurement included insects.
N12	18/04/12 22:00	31	60	52	15	**15**[7]	Measurement included insects and frogs.

Notes:

1. *WCP only L_{Aeq} provided as a guide;*
2. *Night L_{Ceq} criterion as detailed in Broner (2010);*
3. *These are measured C-weighted noise levels (at frequencies less than 250 Hz) and are not always the result of activity at WCP. Guidance on this is provided in the Comments column;*
4. *Low frequency criterion as detailed in the INP;*
5. *This is the total measured C-weighted noise level less the total measured A-weighted noise level and are not always the result of activity at WCP. Guidance on this is provided in the Comments column;*
6. *Bolded results in red are those greater than the relevant criterion; and*
7. *Other noise sources occurring during the measurement.*

4.3 Atmospheric Conditions

Atmospheric condition data measured at each location are shown in Table 4.6. Data obtained concurrently by the WCP meteorological station is provided in Table 4.7.

Table 4.6 MEASURED ATMOSPHERIC CONDITIONS

Location	Date And Time	Temperature (º C)	Wind Speed (m/s)	Wind Direction (º MN)	Cloud Cover (eighths)
	Evening				
N4	17/04/12 18:35	18	0.8	120	2
N6	17/04/12 19:04	18	0.0	-	3
N7	17/04/12 20:01	19	0.6	160	8
N9	17/04/12 19:33	20	0.0	-	6
N12	17/04/12 20:38	20	0.8	180	8
	Night-Time				
N4	18/04/12 00:19	18	0.0	-	8
N6	17/04/12 23:32	18	0.0	-	8
N7	17/04/12 22:36	18	0.0	-	8
N9	17/04/12 23:02	19	0.0	-	6
N12	17/04/12 22:00	18	0.0	-	8
	Evening				
N4	18/04/12 18:49	19	0.0	-	3
N6	18/04/12 19:22	20	0.0	-	2
N7	18/04/12 20:13	18	0.9	140	5
N9	18/04/12 19:48	20	0.0	-	3
N12	18/04/12 20:47	17	1.1	100	6
	Night-Time				
N4	19/04/12 00:09	18	0.0	-	8
N6	18/04/12 23:50	19	0.0	-	3
N7	18/04/12 22:32	19	0.0	-	6
N9	18/04/12 22:56	20	0.0	-	8
N12	18/04/12 22:00	17	0.5	100	7

Notes: 1. Wind speed and direction measured at 1.8 metres.

Table 4.7 WCP METEOROLOGICAL STATION DATA

Date and Time	Wind Speed (m/s)	Rainfall (mm)	Sigma Theta	WCP Lapse Rate
17/04/2012 18:00	3.1	0	11.1	-0.9
17/04/2012 18:15	2.9	0	9.9	-0.9
17/04/2012 18:30	2.2	0	12.4	-0.7
17/04/2012 18:45	3.3	0	12.1	-0.7
17/04/2012 19:00	3.1	0	9.8	-0.9
17/04/2012 19:15	2.7	0	15.2	-0.7
17/04/2012 19:30	2.7	0	10.9	-0.9
17/04/2012 19:45	2.5	0	15.4	-0.9
17/04/2012 20:00	3.2	0	13.5	-0.9
17/04/2012 20:15	2.8	0	15.3	-0.9
17/04/2012 20:30	3.3	0	13.5	-1.0
17/04/2012 20:45	3.2	0	14.7	-1.0
17/04/2012 21:00	3.1	0	12.9	-0.9
17/04/2012 21:15	2.9	0	14.3	-1.0
17/04/2012 21:30	2.4	0	13.1	-0.9
17/04/2012 21:45	2.4	0	13.9	-1.0
17/04/2012 22:00	1.9	0	14.8	-0.9
17/04/2012 22:15	1.7	0	10.9	-0.9
17/04/2012 22:30	1.5	0	10.6	-0.9
17/04/2012 22:45	1.3	0	13.1	-0.9
17/04/2012 23:00	1.5	0	7.9	-0.7
17/04/2012 23:15	1.3	0	6.5	-0.7
17/04/2012 23:30	1.7	0	7.0	-0.7
17/04/2012 23:45	1.5	0	14.4	-0.9
18/04/2012 00:00	1.5	0	13.5	-0.9
18/04/2012 00:15	1.3	0	9.4	-0.9
18/04/2012 00:30	1.2	0	9.0	-0.9
18/04/2012 00:45	1.2	0	10.6	-0.9
18/04/2012 01:00	2.1	0	6.5	-0.9
18/04/2012 01:15	1.9	0	10.0	-0.7
18/04/2012 01:30	1.8	0	6.4	-0.5
18/04/2012 01:45	1.9	0	9.2	-0.5
18/04/2012 02:00	1.7	0	10.7	-0.7
18/04/2012 18:00	3.3	0	9.0	-0.9
18/04/2012 18:15	3.6	0	9.9	-1.9
18/04/2012 18:30	2.7	0	8.6	-1.7

Table 4.7 WCP METEOROLOGICAL STATION DATA

Date and Time	Wind Speed (m/s)	Rainfall (mm)	Sigma Theta	WCP Lapse Rate
18/04/2012 18:45	2.3	0	10.0	-1.5
18/04/2012 19:00	2.4	0	9.1	-0.7
18/04/2012 19:15	1.9	0	17.7	-0.9
18/04/2012 19:30	1.7	0	17.2	-0.9
18/04/2012 19:45	1.6	0	16.5	-0.7
18/04/2012 20:00	1.5	0	19.2	-0.7
18/04/2012 20:15	2.7	0	13.0	-0.9
18/04/2012 20:30	2.5	0	13.4	-0.9
18/04/2012 20:45	2.1	0	13.7	-0.9
18/04/2012 21:00	2.3	0	14.7	-0.9
18/04/2012 21:15	2.1	0	9.1	-0.9
18/04/2012 21:30	2.5	0	6.9	-0.9
18/04/2012 21:45	2.3	0	10.0	-1.0
18/04/2012 22:00	1.4	0	16.3	-0.9
18/04/2012 22:15	1.6	0	16.9	-0.9
18/04/2012 22:30	2.4	0	8.5	-1.0
18/04/2012 22:45	2.0	0	7.6	-1.0
18/04/2012 23:00	1.9	0	9.4	-1.0
18/04/2012 23:15	2.5	0	7.9	-1.0
18/04/2012 23:30	2.4	0	9.5	-0.9
18/04/2012 23:45	2.7	0	6.8	-0.9
19/04/2012 00:00	2.4	0	7.8	-1.0
19/04/2012 00:15	2.5	0	8.8	-1.0
19/04/2012 00:30	2.8	0	9.5	-1.2

Notes: 1. Data supplied by WCP.

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 and Table 4.2 present data gathered during attended monitoring. These noise levels are the result of many sounds reaching the sound level meter microphone during monitoring. Received levels from various noise sources were noted during attended monitoring and particular attention was paid to the extent of WCP's contribution, if any, to measured levels. At each receptor location, WCP's $L_{Aeq,15\ minute}$ and $L_{A1,1\ minute}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis.

From these observations summaries have been derived for each location. The following chapter sections provide these summaries. Statistical 1/3 octave band analysis of environmental noise was undertaken, and Figures 3 to 22 display the frequency ranges for various noise sources at each location for L_{A1}, L_{A10}, L_{A90}, and L_{Aeq}. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 2 where it can be seen that frogs and insects are generating noise at frequencies above 1000 Hz; mining noise is at frequencies less than 1000 Hz (this is typical). Adding levels at frequencies that relate to mining only allows separate statistical results to be calculated. This analysis cannot always be performed if there are significant levels of other noise at the same frequencies as mining; this can be dogs, cows, or, most commonly, road traffic.

It should be noted that the method of summing statistical values up to a cutoff frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq}.

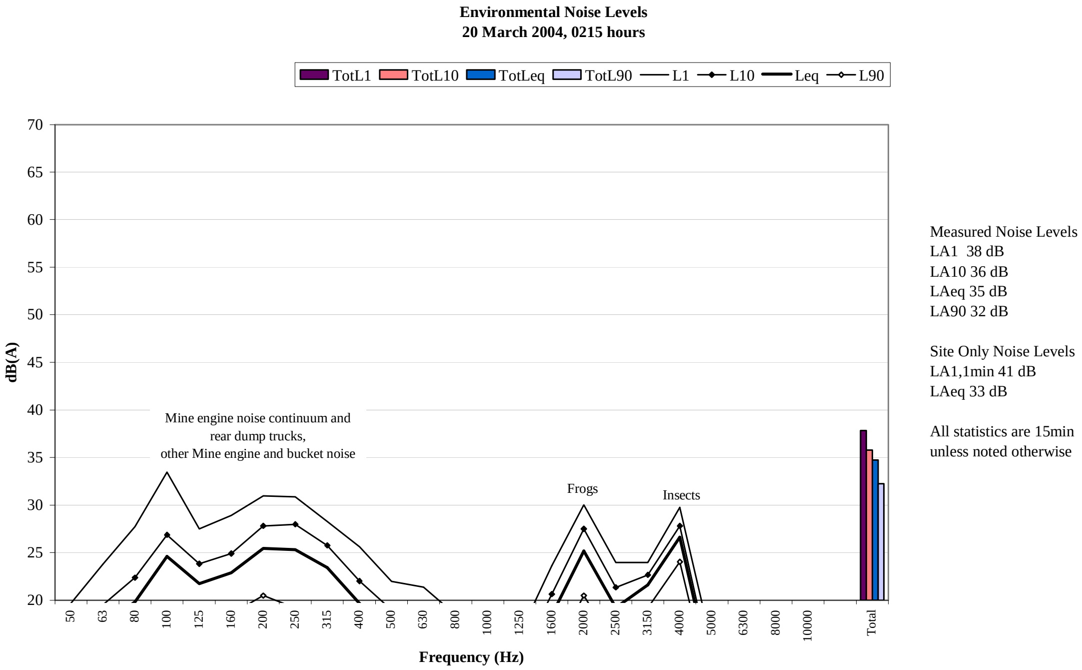


Figure 2 Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N4, 17 April 2012, Evening

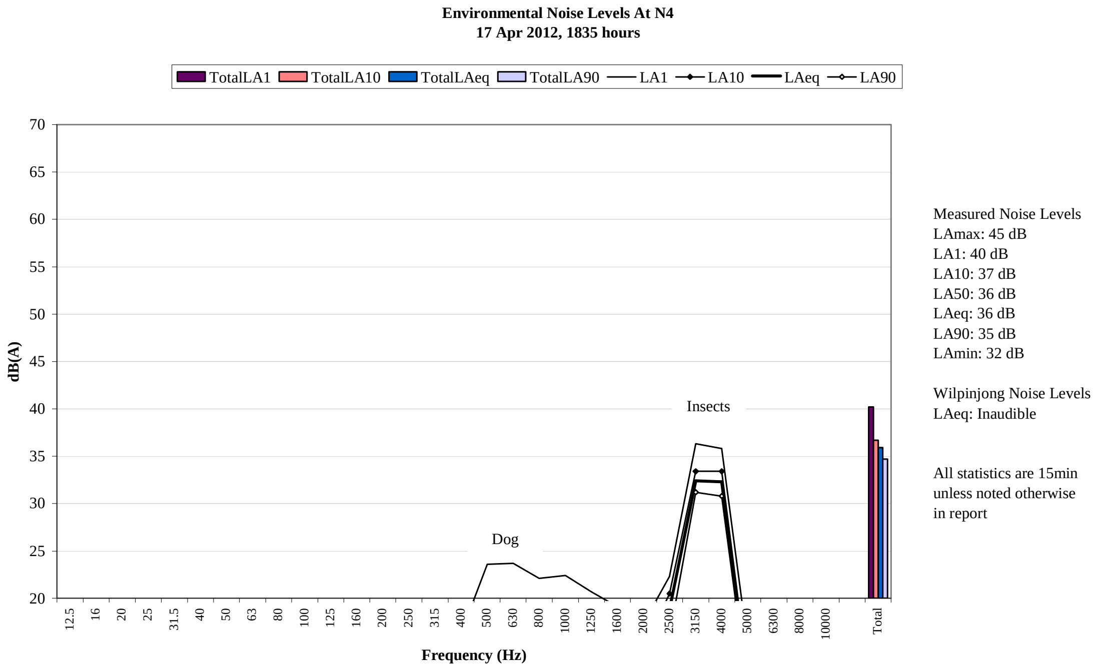


Figure 3 Environmental Noise Levels, N4 – Cumbo Road

WCP was inaudible.

Insects were responsible for measured levels.

A dog, breeze in foliage and noise from running water was also noted.

5.1.2 N6, 17 April 2012, Evening

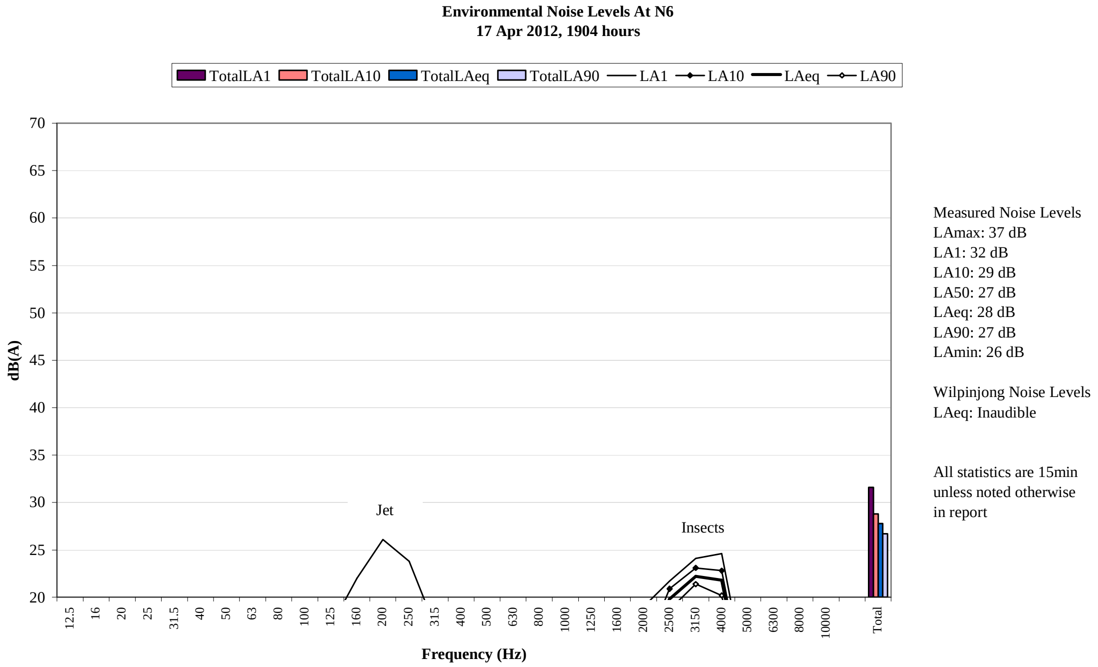


Figure 4 Environmental Noise Levels, N6 – Wollar Church

WCP was inaudible.

A dog generated the measured L_{Amax}. A jet and insects generated the measured L_{A1}. Insects generated all other measured levels.

A phone ringing and a fence banging at nearby residence was also noted.

5.1.3 N7, 17 April 2012, Evening

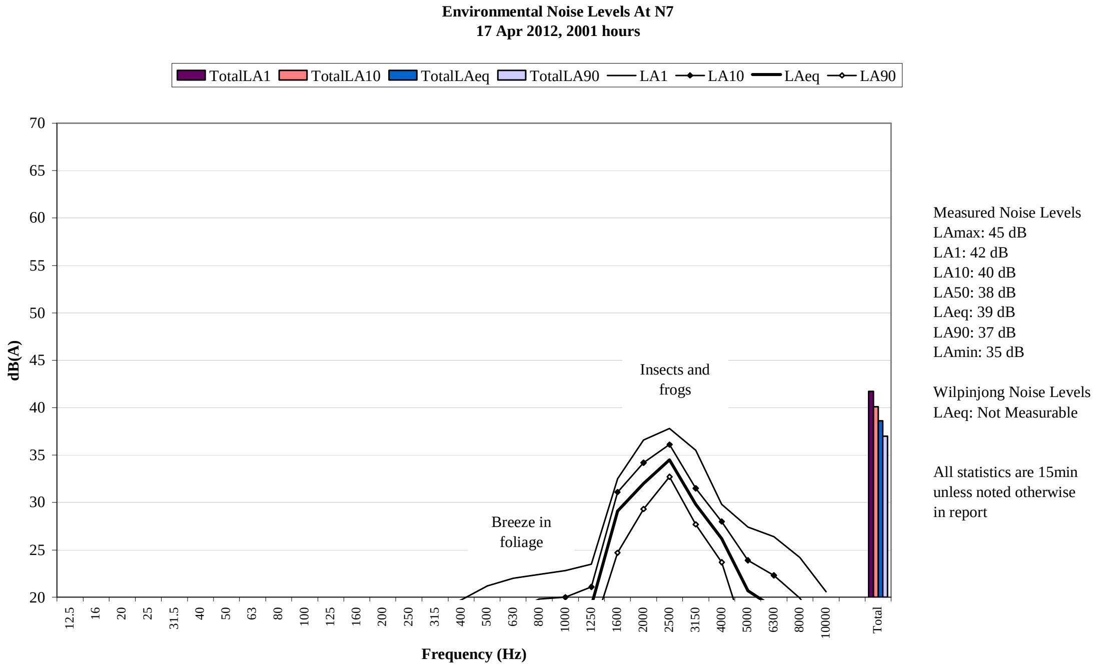


Figure 5 Environmental Noise Levels, N7 – Ulan-Wollar Road (East)

A continuum from WCP was audible at very low levels, but was not measurable.

Insects and frogs generated all measured levels.

Breeze in foliage was also noted.

5.1.4 N9, 17 April 2012, Evening

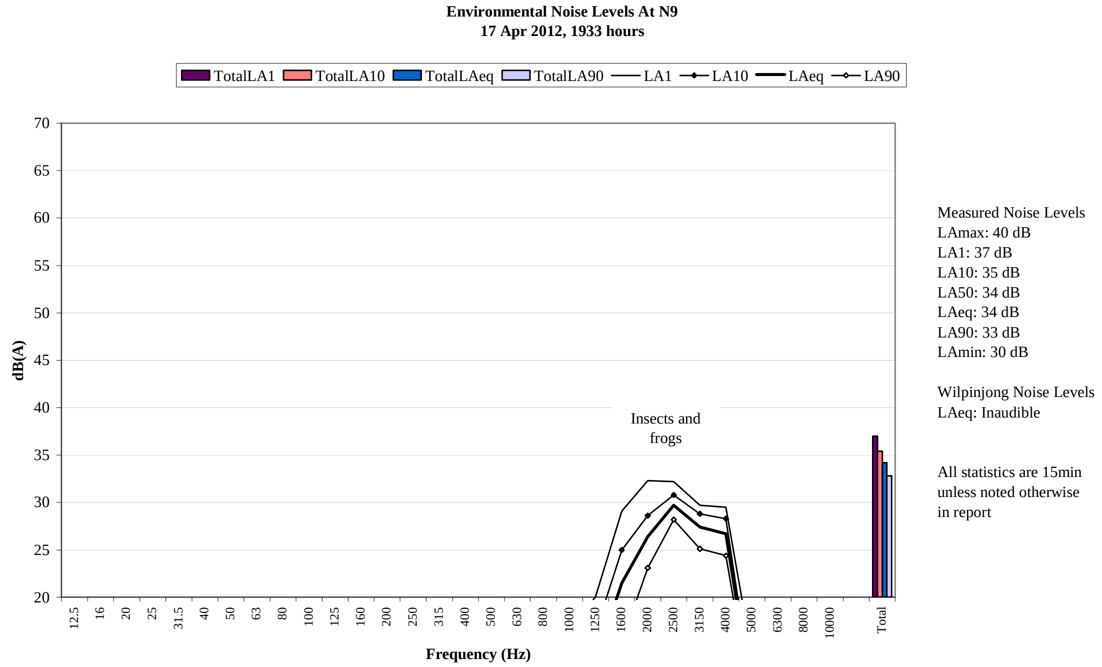


Figure 6 Environmental Noise Levels, N9 – Slate Gully Road

WCP was inaudible.

Insects and frogs generated all measured levels.

A jet was also noted at low levels.

5.1.5 N12, 17 April 2012, Evening

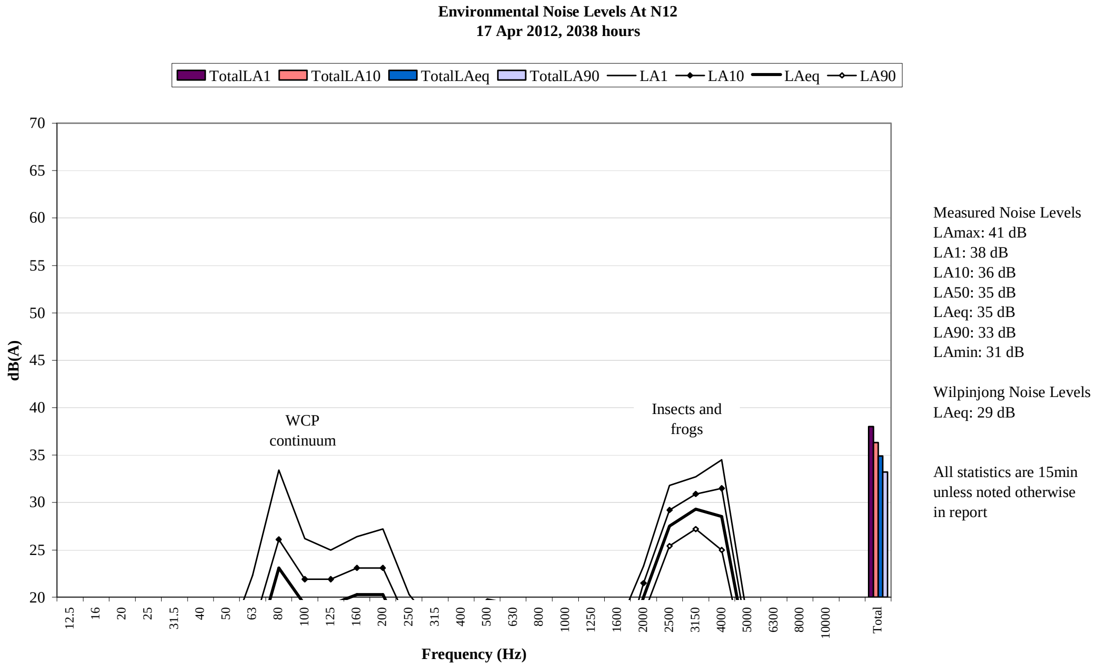


Figure 7 Environmental Noise Levels, N12 – Ulan-Wollar Road (West)

WCP was audible throughout the measurement as a continuum resulting in a WCP only L_{Aeq} of 29 dB. Excavator horns and dozer tracks were also noted at low levels.

WCP, insects and frogs generated the measured L_{A1}. Insects and frogs were primarily responsible for all other measured levels. WCP continuum was a minor contributor to the measured L_{A10} and L_{Aeq}.

Breeze in foliage was also noted.

5.1.6 N4, 18 April 2012, Night-time

A graph was not available for this measurement due to technical difficulties, however, fieldsheets indicate that an engine continuum from WCP was audible at very low levels, but was not measurable.

Insects were audible throughout the measurement and were responsible for measured levels.

5.1.7 N6, 17 April 2012, Night-time

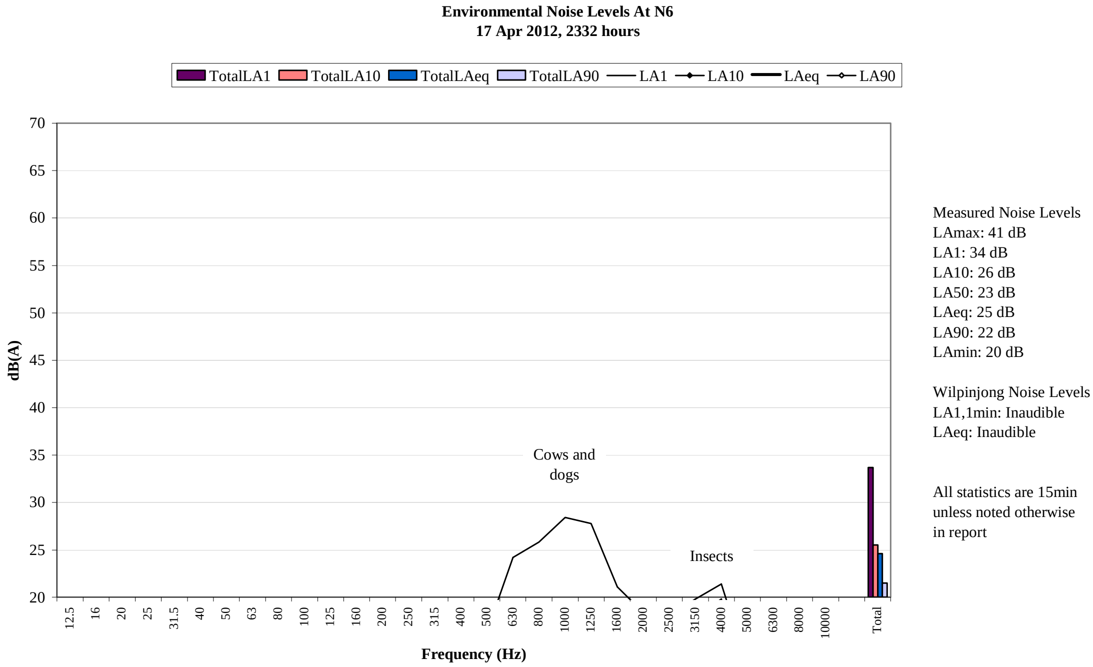


Figure 8 Environmental Noise Levels, N6 – Wollar Church

WCP was inaudible.

Cows generated the measured L_{A1}. Cows, dogs and insects generated the measured L_{A10}. Insects were responsible for the measured L_{Aeq}.

Movement of foliage, a phone ringing at nearby residence, and noise from power lines were also noted.

5.1.8 N7, 17 April 2012, Night-time

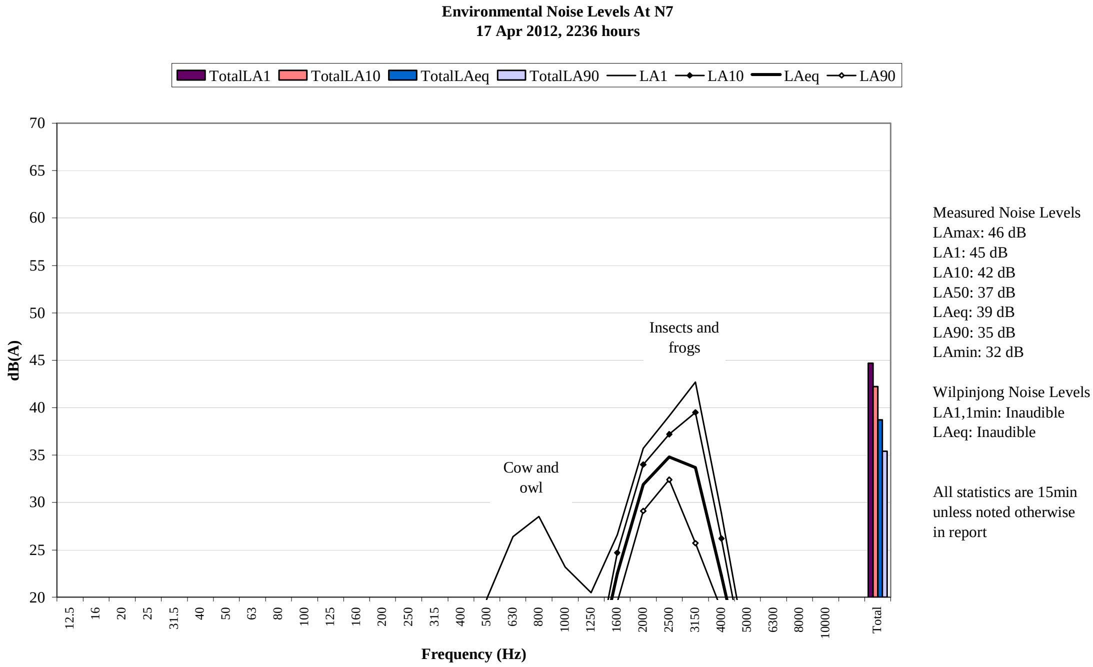


Figure 9 Environmental Noise Levels, N7 – Ulan Wollar Road (East)

WCP was inaudible.

Insects and frogs generated measured levels.

Cows and an owl were also noted.

5.1.9 N9, 17 April 2012, Night-time

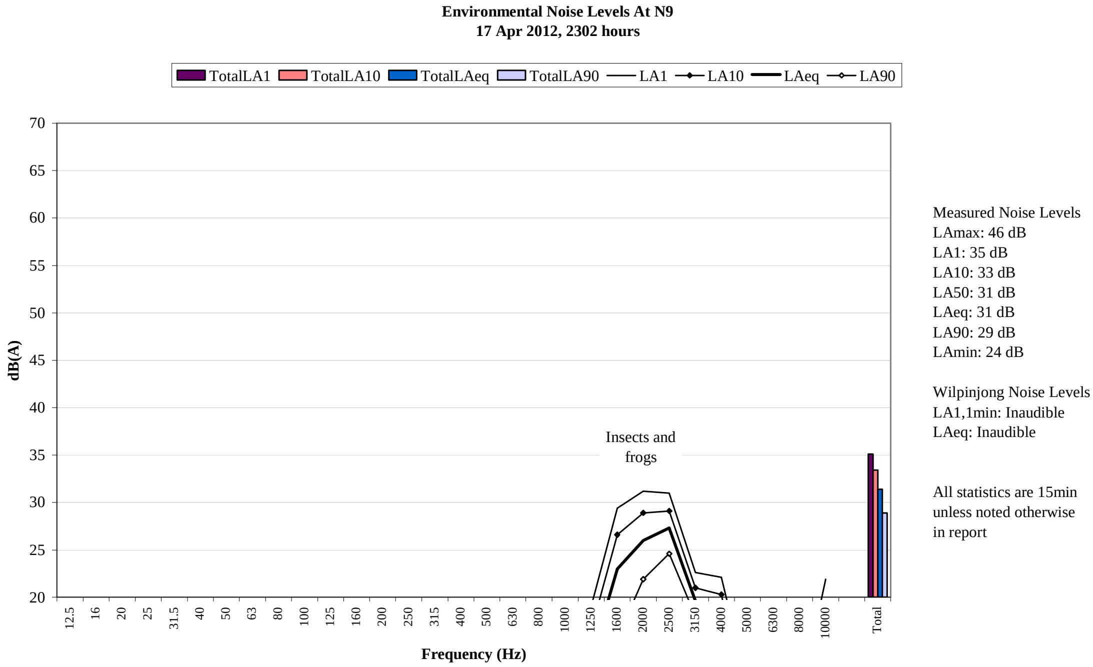


Figure 10 Environmental Noise Levels, N9 – Slate Gully Road

WCP was inaudible.

Bats generated the measured L_{Amax}. Frogs and insects were responsible for all other measured levels.

5.1.10 N12, 17 April 2012, Night-time

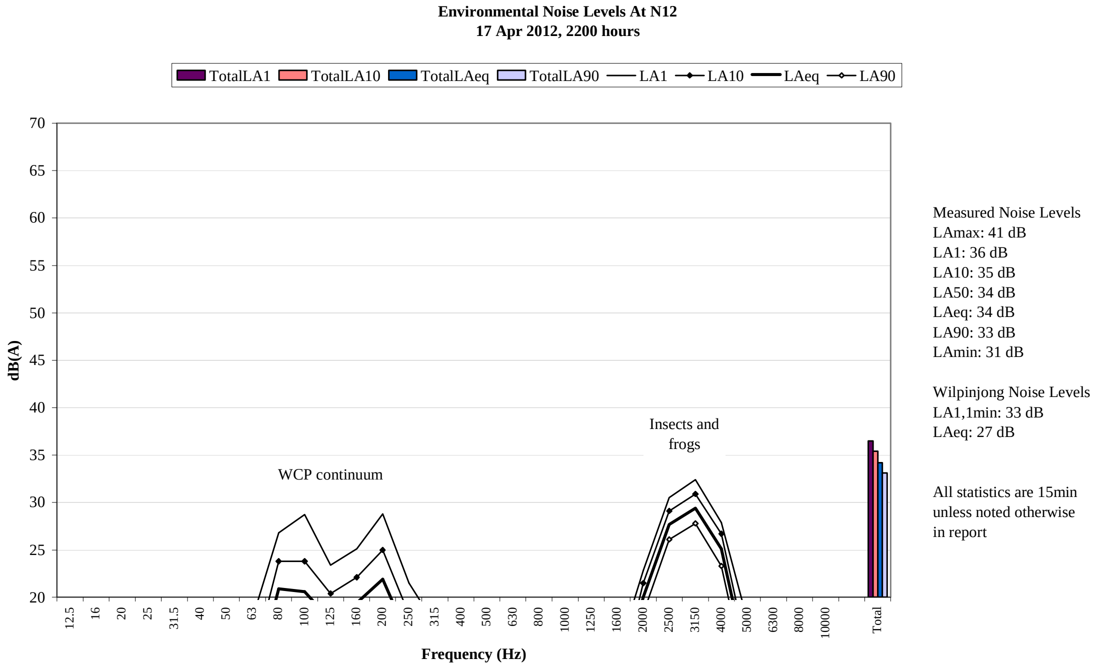


Figure 11 Environmental Noise Levels, N12 – Ulan Wollar Road (West)

A continuum from WCP was audible throughout the measurement, resulting in a WCP only L_{Aeq} of 27 dB. A surge in the continuum generated the $L_{A1,1minute}$ of 33 dB. Dozer tracks and horns were also noted at low levels.

Insects were primarily responsible for measured levels. The WCP continuum was a minor contributor to the measured L_{A10} and L_{Aeq}.

Bats and cows were also noted.

5.1.11 N4, 18 April 2012, Evening

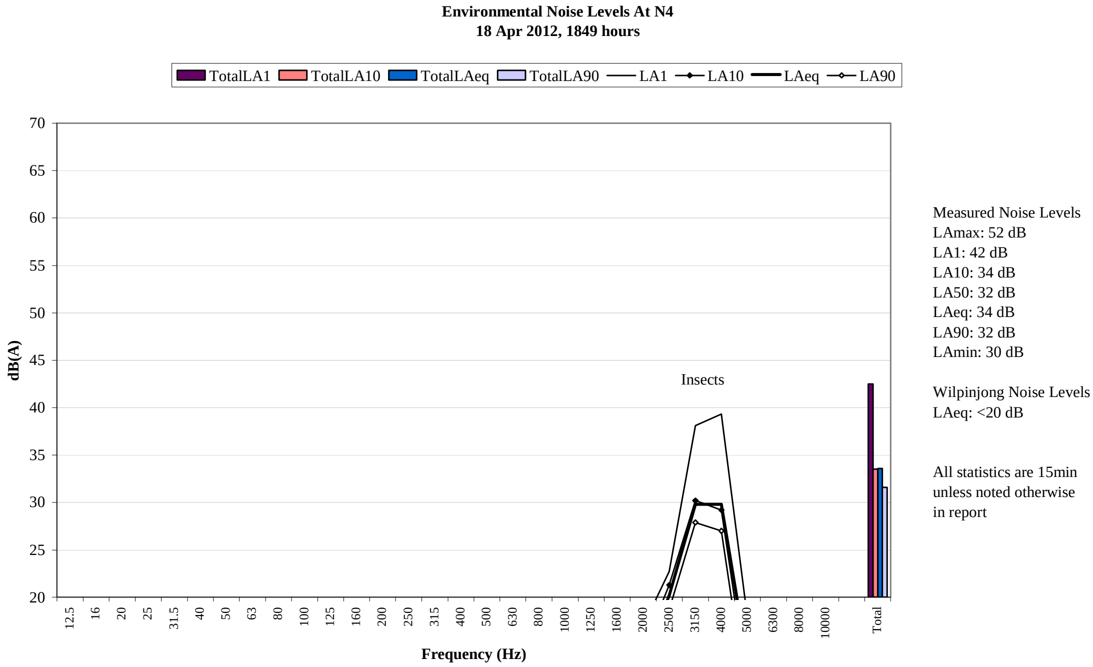


Figure 12 Environmental Noise Levels, N4 – Cumbo Road

A low-level engine and fan continuum from WCP was audible briefly during the measurement. These sources resulted in a WCP only L_{Aeq} of <20 dB. Horns were also noted at very low levels.

Insects were audible throughout the measurement and generated measured levels.

A distant jet was also noted.

5.1.12 N6, 18 April 2012, Evening

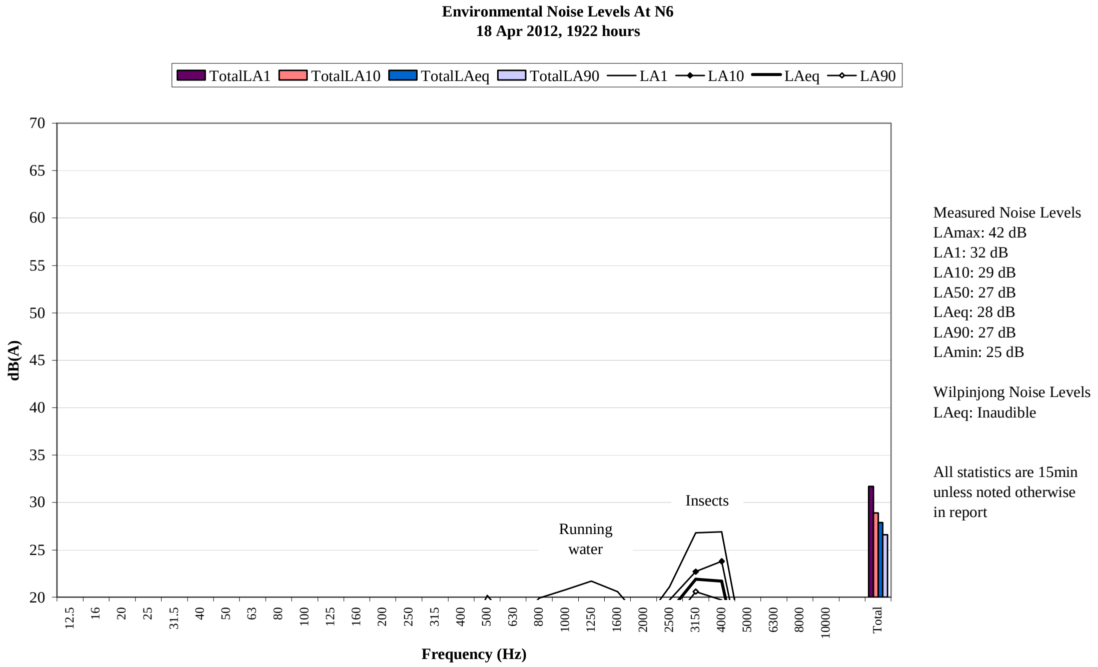


Figure 13 Environmental Noise Levels, N6 – Wollar Church

WCP was inaudible.

Insects were audible during the measurement and were primarily responsible for measured levels.

Running water, dogs and a distant jet were also noted.

5.1.13 N7, 18 April 2012, Evening

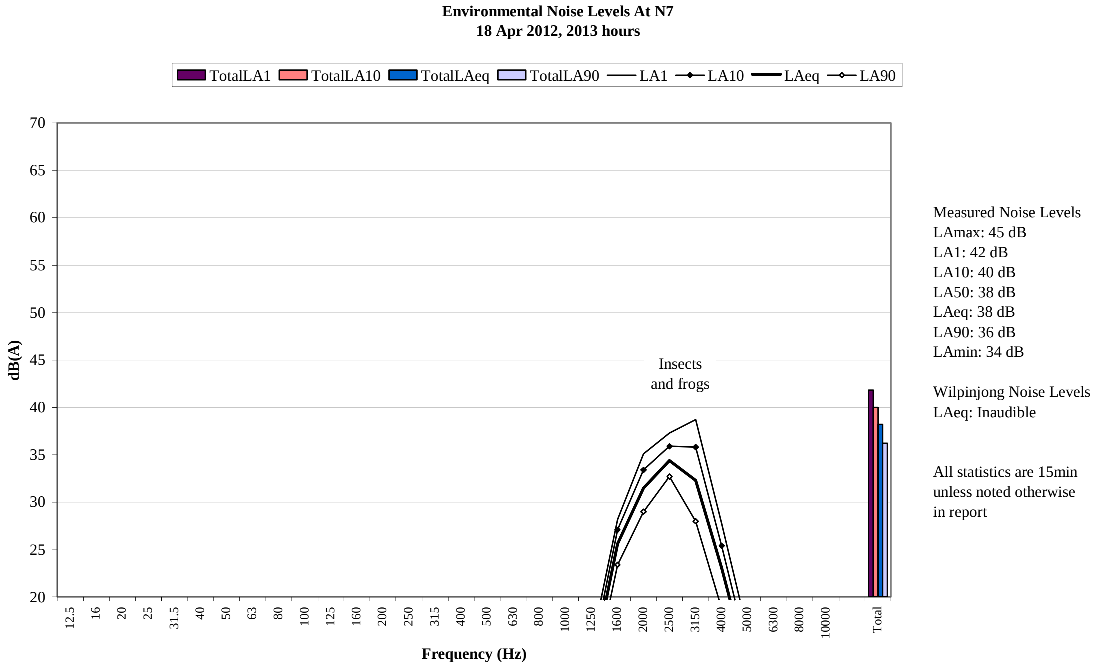


Figure 14 Environmental Noise Levels, N7 – Ulan-Wollar Road (East)

WCP was inaudible.

Frogs and insects were responsible for measured levels.

Breeze in foliage and a jet were also noted.

5.1.14 N9, 18 April 2012, Evening

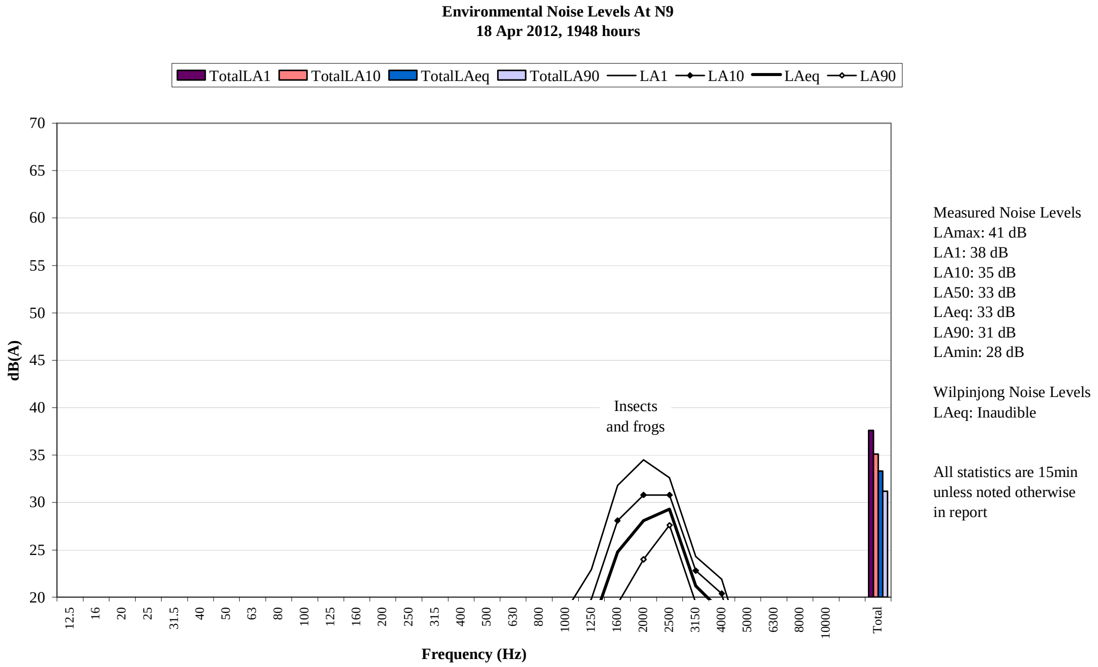


Figure 15 Environmental Noise Levels, N9 – Slate Gully Road

WCP was inaudible.

Insects and frogs were responsible for measured levels.

Breeze in foliage and a horse were also noted.

5.1.15 N12, 18 April 2012, Evening

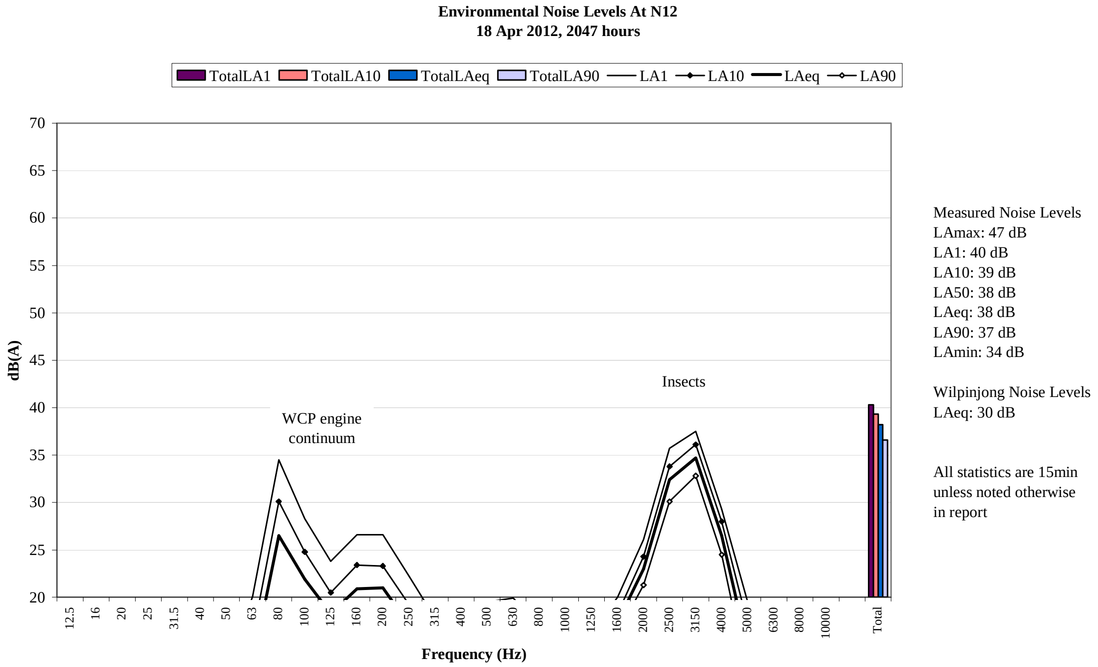


Figure 16 Environmental Noise Levels, N12 – Ulan-Wollar Road (West)

An engine continuum from WCP was audible throughout the measurement. Engine surges were noted at times in the range L_A 33 to 37dB. Dozer tracks and horns were also noted at low levels. These sources generated the WCP only L_{Aeq} of 30 dB.

Insects were primarily responsible for measured levels. WCP was a minor contributor to the measured L_{A10} and L_{Aeq}.

Breeze in foliage was also noted.

5.1.16 N4, 18 April 2012, Night-time

A graph was not available for this measurement due to technical difficulties, however, the fieldsheet indicates that an engine continuum and horns from WCP were audible at very low levels, but were not measurable.

Insects and frogs were audible throughout the measurement and were responsible for measured levels.

Breeze in foliage was also noted briefly.

5.1.17 N6, 18 April 2012, Night-time

A graph was not available for this measurement due to technical difficulties, however, the fieldsheet indicates that WCP was inaudible.

Insects were audible throughout the measurement and were responsible for measured levels. Running water was also audible and was minor contributor to the measured levels.

5.1.18 N7, 18 April 2012, Night-time

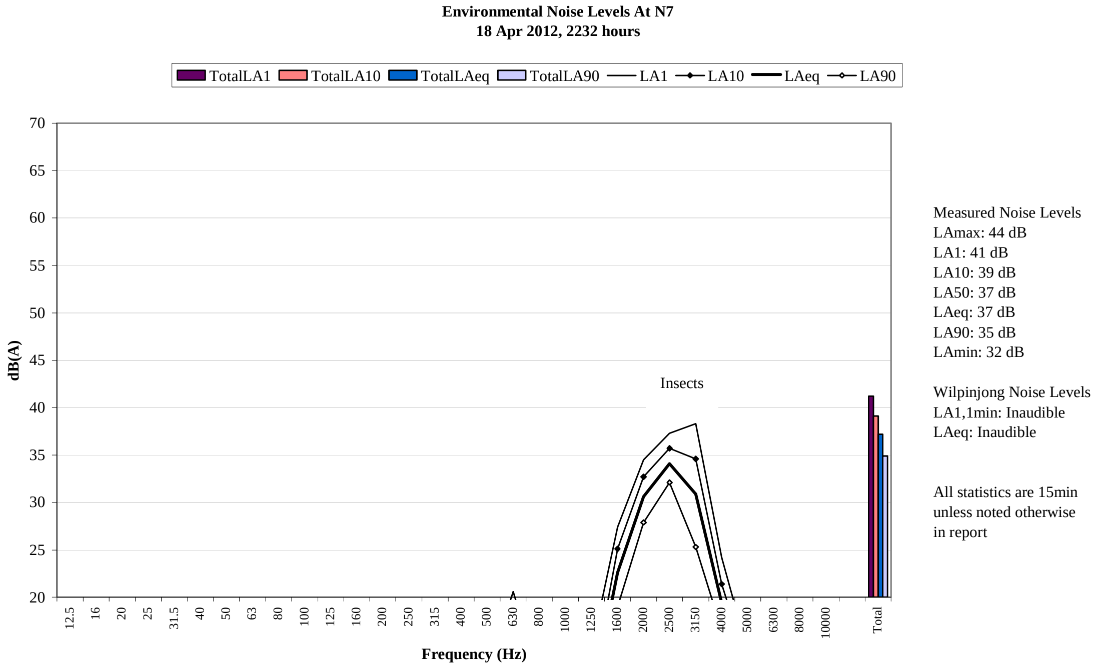


Figure 17 Environmental Noise Levels, N7 – Ulan Wollar Road (East)

WCP was inaudible.

Insects were responsible for the measured levels.

An owl was also noted briefly. Frogs were also noted.

5.1.19 N9, 18 April 2012, Night-time

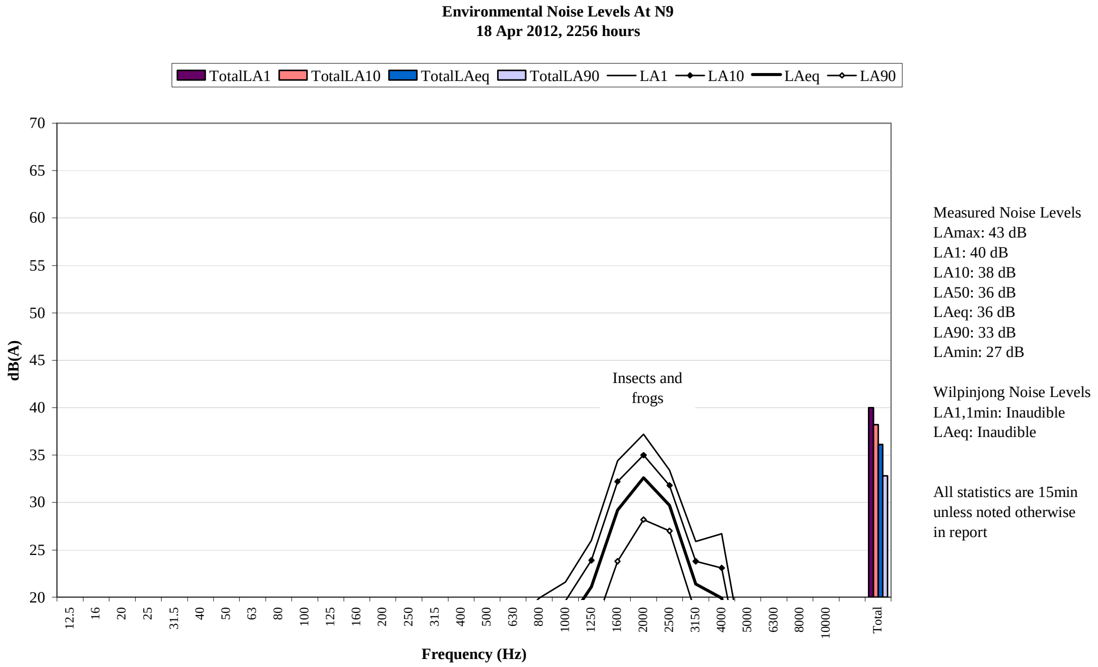


Figure 18 Environmental Noise Levels, N9 – Slate Gully Road

WCP was inaudible.

Insects and frogs were responsible for the measured levels.

A train was noted once at low levels.

5.1.20 N12, 18 April 2012, Night-time

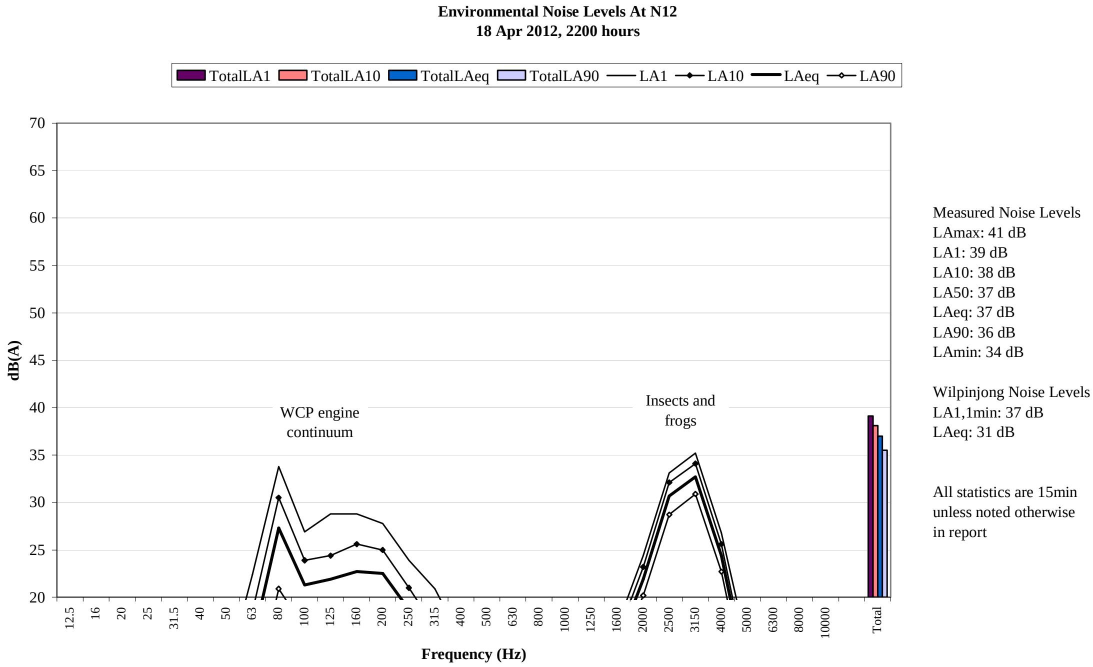


Figure 19 Environmental Noise Levels, N12 – Ulan Wollar Road (West)

An engine continuum from WCP was audible throughout the measurement. Horns were also noted. These sources generated the WCP-only L_{Aeq} of 31 dB. Surges in the continuum generated the WCP $L_{A1,1min}$ of 37 dB.

Insects, frogs and surges in the WCP continuum generated the measured L_{A1}. Insects and frogs were primarily responsible for the measured L_{A10}, L_{Aeq} and L_{A90}. WCP was a minor contributor to the measured L_{A10} and L_{Aeq}.

Bats and breeze in foliage were also noted.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the evening and nights of the 17, 18 and 19 April 2012. Attended noise monitoring was conducted at five sites. The duration of all measurements was 15 minutes.

Wind speed and/or estimated temperature inversion conditions resulted in development consent criteria not always being applicable, as indicated in Table 4.2 and Table 4.3.

Wilpinjong Coal Project (WCP) complied with noise consent limits at all monitoring locations during the March / April 2012 monitoring period.

Global Acoustics Pty Ltd

A. DEVELOPMENT CONSENT

Several documents specifying noise criteria apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Project Development Consent

Wilpinjong Coal Project was given approval on 1 February 2006. A modification to the consent was approved in August 2010.

The relevant noise conditions from Section 3 - Specific Environmental Conditions of the modified consent is reproduced below.

ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Proponent shall acquire the land in accordance with the procedures in conditions 6 – 7 of schedule 4.

Table 1: Land subject to acquisition upon request

30 – Gaffney	45 – Smith
48 – Evans	50 – Thompson & Hopper
94 – McKenzie	

Note:

- *To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.*

Noise Impact Assessment Criteria

2. Except for the land referred to in Table 1, the Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land, or on more than 25 per cent of any privately-owned land.

Table 2: Noise Impact assessment criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{A1(1\ minute)}$
58 – Maher 52A – Long 52B – Long 53 – Reynolds	35	39	39	45
23B – Bishop	35	39	37	45
25 – Pettit	35	39	36	45
31A – Conradt	35	37	37	45
31B – Conradt	35	36	36	45
100 – Rheinberger 125 – Roberts	35	37	35	45
Wollar Village – Residential	36	35	35	45
All other privately owned land	35	35	35	45
901 – Wollar School		*35(internal) 45 (external) When in use*		-
150A – St Luke's Anglican Church 900 – St Laurence O'Toole Catholic Church		*40 (internal) When in use*		-
Goulburn River National Park/Munghorn Gap Nature Reserve		*50 When in use*		-

However, the criteria in Table 2 do not apply if the Proponent has an agreement with the relevant owner/s to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:
- To interpret the locations referred to in Table 2, see the applicable figures in Appendix 7.
- Noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.
- For the Goulburn River National Park/Munghorn Nature Reserve noise levels are to be assessed at the most affected point at the boundary of the Goulburn River National Park/Munghorn Nature Reserve.

Noise Acquisition Criteria

3. If the noise generated by the project exceeds the criteria in Table 3 at any residence on privately-owned land or on more than 25 per cent of any privately-owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 6 – 7 of schedule 4.

Table 3: Land acquisition criteria dB(A)

Day/Evening/Night $L_{Aeq(15 minute)}$	Land
40	All privately owned land, excluding the land listed in Table 1

Note:
- Noise generated by the project is to be measured in accordance with the notes presented below Table 2. For the condition to apply, the exceedances must be systemic.

Additional Noise Mitigation Measures

4. Upon receiving a written request from the owner of any residence:
   (a) on the land listed in Table 1; or
   (b) on the land listed 23B, 25, 52A, 52B, 53, or 58 in the applicable figures in Appendix 7; or
   (c) where subsequent noise monitoring shows that the noise generated by the project is greater than, or equal to, $L_{Aeq(15 minute)}$ 38 dB(A),

   the Proponent shall implement reasonable and feasible noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the landowner.

   If within 3 months of receiving this request from the landowner, the Proponent and the landowner 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.

5. By 30 November 2010, or within 1 month of obtaining monitoring results showing an exceedance of the relevant criteria listed in condition 4(c) above, the Proponent shall notify all applicable owners that they are entitled to ask for additional noise mitigation measures to be installed at their residence.

Operating Conditions

6. The Proponent shall:
   (a) implement all reasonable and feasible noise mitigation measures;
   (b) ensure that the real-time noise monitoring and meteorological forecasting data are assessed regularly, and that operations on site are relocated, modified, and/or stopped to ensure compliance with the relevant criteria in conditions 2 to 4 of this schedule; and
   (c) regularly investigate ways to reduce the operational, low frequency, rail, and road traffic noise generated by the project; and report on these investigations in the annual review (see condition 2 of schedule 5),

   to the satisfaction of the Director-General.

Noise Management Plan

7. The Proponent shall prepare and implement a Noise Management Plan for the project, in consultation with DECCW, and to the satisfaction of the Director-General. This plan must:
   (a) describe the noise mitigation measures that would be implemented to ensure compliance with the relevant noise impact assessment criteria in this approval, including the proposed real-time noise management system and associated meteorological forecasting; and
   (b) include a noise monitoring program, that uses a combination of real-time and supplementary attended monitoring measures to evaluate the performance of the project, and includes a protocol for determining exceedances with the relevant conditions of this approval.

A.2 Environment Protection Licence

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in December 2011.

The relevant section reproduced below.

L5 Noise limits

L5.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The locations referred to in the table below are indicated by the property identification numbers on Figure 4A Relevant Land Ownership Plan Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment 17 May 2010. The property identification numbers are indicated on Figure 4B Relevant Land Ownership List Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment 17 May 2010.

Location	Day	Evening	Night	Night
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
25 Pettit - Lot 16 DP250053	35	39	36	45
52A Long - Lot 8 DP250053	35	39	39	45
52B Long - Lot 8 DP250053	35	39	39	45
51 Bailey - Lot 5, 6 & 7 DP250053	35	39	39	45
58 Maher	35	39	39	45
31A Conradt - Lot 10, 11 & 12 DP250053 & Lot 160 DP723767	35	37	37	45
31B Conradt - Lot 10, 11 & 12 DP250053 & Lot 160 DP723767	35	36	36	45
Wollar village	35	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
125 E & K Roberts	35	37	35	45

L5.2 For the purpose of condition L5.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L5.3 The noise limits set out in condition L5.1 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 3ºC/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
c) Temperature inversion conditions greater than 3ºC/100m.

L5.4 For the purpose of condition L5.3:
a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station identified as EPA identification Point 21 in condition P1.1; and
b) Temperature inversion conditions (vertical temperature gradient in degrees C) are to be determined by direct measurement over a minimum 50m height interval as referred to in Part E2 of Appendix E to the NSW Industrial Noise Policy.

L5.5 To determine compliance:
a) With the Leq(15 minute) noise limits in condition L5.1, 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 3 metres 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 Nature Reserve

b) With the LA1(1 minute) noise limits in condition L5.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.

c) With the noise limits in condition L5.1, 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 conditions L5.5(a) or L5.5(b).

L5.6 A non-compliance of condition L5.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:

a) at a location other than an area prescribed by conditions L5.5(a) and L5.5(b); and/or
b) at a point other than the most affected point at a location.

L5.7 For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

A.3 Noise Monitoring Programme

The noise monitoring program for WCP was revised in September 2011 and the relevant sections are reproduced below.

5 MONITORING AND INTERPRETATION

The noise monitoring programme comprises both attended and real-time monitoring (Sections 5.1 and 5.2, respectively). Integrated protocols for both monitoring methodologies are outlined in Sections 5.1.4 and 5.2.4, respectively. Meteorological monitoring will also be conducted as described in Section 5.3.

Attended monitoring will be used for demonstrating compliance with noise criteria (Section 3.3), whilst real-time monitoring will be used as a management tool to assist WCPL to take pre-emptive management actions to avoid potential non-compliances.

5.1 ATTENDED NOISE MONITORING

5.1.1 Purpose

The main aim of attended noise monitoring is to determine compliance with Project Approval and EPL noise criteria.

Results from the attended monitoring programme will be used to verify data collected from the real-time noise monitors. This will be undertaken where attended monitoring is conducted directly adjacent to real-time monitors. The attended monitoring data will also be used to determine whether there is a consistent relationship between real-time continuous noise levels and long-term attended monitoring data. For example if there is a consistent correlation between a real-time monitor and an attended monitoring site, then the real-time monitoring results could reasonably be used to predict noise levels at the attended site when attended monitoring is not being undertaken. This will be done annually to complement the regular maintenance and calibration of the real-time monitors.

5.1.2 Monitoring Locations

The attended noise monitoring programme will be conducted at sites adjacent to the Mine on non-Mine owned land to measure noise levels at nearby residences. Operational experience and investigations (Section 7.1) have shown that the Mine noise effects are experienced predominantly to the south and east of the Mine. Attended noise monitoring is presently concentrated in these areas, however this does not exclude monitoring to the west of the Mine.

Attended noise monitoring locations are shown on Figures 4. These locations provide good coverage in all directions from the Mine and are a combination of compliance sites and population centres. These locations include:

- N4 – W&V Langshaw dwelling 'Hillview';
- N6 – St Laurence O'Toole Catholic Church;
- N7 – Road reserve adjacent the Smith property;
- N9 – Maher dwelling; and
- N12 – Ulan Coal Mine Limited-owned dwelling.

5.1.3 Methodology

Attended noise monitoring will be carried out by an independent expert (i.e. not by mine staff) and will be conducted every 2 months. Monitoring will be conducted in accordance with Australian Standard (AS) 1055:1997 *Acoustics – Description and Measurement of Environmental Noise* and the INP (EPA, 2000). These operator-attended noise measurements will be conducted during normal operations to quantify the intrusive noise emissions from the Mine as well as the overall level of ambient noise.

Following the completion of the attended noise monitoring by the independent expert, the two monthly monitoring reports will be submitted to OEH and DP&I and will be made publically available on the Peabody website (Section 8.2).

Timing

Attended noise monitoring will be conducted for 15 minute periods day, evening and night. Day is defined as between 7am and 6pm, evening is described as being between 6pm and 10pm and night is between 10pm and 7am.

The monitoring will be carried out on two consecutive nights resulting in 2 x 15 minute samples for each location every two months. By sampling two consecutive nights, it is likely that different meteorological conditions are sampled for each site, providing more useful information.

Particular attention will be given to monitoring between 7pm and 2am (i.e. evening/night-time periods). Experience has shown that it is during these periods that noise can be at its most intrusive and results in more complaints. This is due to the very low background noise levels experienced during these periods and the presence of temperature inversions that are a relatively common phenomenon in this area, particularly during winter months.

Measurement

Acoustic instrumentation used in attended monitoring will comply with AS 1259.2:1990 *Sound Level Meters*.

The intrusive noise level (L_{Amax}, L_{A1}, L_{A10} and L_{Aeq}) contribution from mine operation activities will be quantified over a 15 minute measurement period. In addition, the overall levels of ambient noise (i.e. L_{Amax}, L_{A1}, L_{A10}, L_{A50}, L_{A90}, L_{Amin} and L_{Aeq}) over the 15 minute period will be quantified and characterised.

A measurement of $L_{A1(1\ minute)}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from the Mine during the entire measurement period (i.e. the highest level of the maximum minute during the 15 minute measurement).

The L_{A1} measurement should be undertaken at 1 m from the dwelling façade and the L_{Aeq} measurement within 30 m of the dwelling. However, the direct measurement of noise at 1 m from the façade is not always practical. In most cases monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In these cases measurements are undertaken at a suitable and representative location as close to the dwelling as practicable. Modifying factors from section 4 of the INP are used where applicable. Tonality and low frequency are assessed by analysis of the measured L_{Aeq} spectrum.

Recording

An example of an attended monitoring recording sheet is provided in Attachment 5. During attended monitoring, the following information will be recorded:

- operator's name;
- locations of attended and unattended noise instruments;
- recording intervals;
- meteorological conditions (i.e. temperature, humidity, cloud cover, and wind speed and direction);
- statistical noise level descriptors together with notes identifying the principle noise sources; and
- instrument calibration details.

The meteorological conditions listed above will be recorded local to the noise measurement as well as on-site at the Mine Automatic Weather Station (AWS) (Section 5.3). Prevailing weather conditions determined from the AWS (in the first instance) to be outside of the meteorological constraints stipulated in the Project Approval will be excluded from further analysis.

Additional information (such as general mobile and fixed plant locations) will be collected at the time of (or soon after) monitoring to enable correlation between Mine noise, meteorological conditions, general plant locations, plant operating conditions and topography.

5.1.4 Compliance Assessment

As discussed in Section 5.1.1, the results of attended noise monitoring will be compared against the relevant noise criteria set out in Section 3.3 of this NMP. The comparison will be undertaken following the exclusion of data using meteorological conditions described as part of Table 2 as well as observations of non-Mine noise by the person undertaking the attended noise monitoring programme.

In the event of an exceedance of the noise criteria, an assessment will be conducted to determine:

- Timing of the exceedance.
- Location of the exceedance.
- Exclusion of non-mine related noise and noise from non-WCPL mining activities (e.g. can the exceedance be attributed directly to the Mine). This will include consideration of:
  - the methods and type of equipment being used by WCPL at the time of the exceedance and proximity to the locations at which the exceedance was recorded; and
  - the location of non-WCPL mining activities or agricultural activities and proximity to the locations at which the exceedance was recorded.
- Meteorological conditions at the time of the exceedance – including confirmation that meteorological conditions are in accordance with Condition 2, Schedule 3 of the Project Approval.

If the above assessment determines that an exceedance is due to Mine noise then management strategies detailed in Sections 6 and 7 to help prevent recurrence will be implemented in an effort to reduce noise levels below those set out in Table 2.

Exceedances of criteria will be determined in consideration of Table 2 of the Project Approval (e.g. the meteorological conditions under which they apply) and the INP. Section 11.1.3 of the INP states the following in relation to when a development is in non-compliance with a noise condition:

> *A development will be deemed to be in non-compliance with a noise consent or licence condition if the monitored noise level is more than 2 dB above the statutory noise limit specified in the consent or licence condition. This may occur for two reasons:*
>
> - *The noise from the development is excessive, in which case the development is truly not complying with its consent or licence condition.*
> - *The noise was increased by extreme, nonstandard weather effects—in which case the development is not considered to be in noncompliance with its consent or licence condition. Non-standard weather effects can be considered to be present during monitoring if the cloud cover is less than 40 per cent and the wind speed (at 10 m height) is less than 1.0 m/s (represents an extremely adverse weather condition for noise)—during the period from 6 pm to 7 am in non-arid areas (see Section 9.2).*
>
> *In this latter case, further monitoring at a later date is required to determine compliance under the meteorological conditions specified in the consent/licence condition.*

For the purposes of the NMP, the monitored noise level is the attended noise monitoring results at the locations listed in Section 5.1.2.

In accordance with Condition 7, Schedule 5 of the Project Approval, The Proponent shall notify the Director-General and any other relevant agencies of any incident associated with the project 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.

In accordance with Condition 2, Schedule 4 of the Project Approval, the proponent shall notify the Director-General, the affected landowners and tenants (including tenants of mine-owned properties) accordingly, and provide monitoring results to each of these parties until the results show that the project is complying with the criteria in schedule 3.

APPENDIX

B. CALIBRATION CERTIFICATES

Acoustic Research Laboratories
Proprietary Limited A.B.N. 47 050 100 804
Noise and Vibration Monitoring Instrumentation for Industry and the Environment

Sound Level Meter Test Report

Report Number : C11193

Date of Test :	27/04/2011
Report Issue Date :	12/05/2011
Equipment Tested/ Model Number:	**Rion NA-28 Sound Level Meter**
Instrument Serial Number:	00701424
Microphone Serial Number:	01916
Preamplifier Serial Number:	01463
Client Name :	Global Acoustics Pty Ltd
	12/16 Huntingdale Drive
	Thornton NSW 2322
Contact Name :	Tony Welbourne
Tested by :	Aaron Skeates-Udy
Approved Signatory :	
Date :	**12 May 2011**

NATA
WORLD RECOGNISED ACCREDITATION

Acoustic Research Laboratories Pty Ltd is NATA Accredited Laboratory Number. 14172.

This document is issued in accordance with NATA's accreditation requirements.

Accredited for compliance with ISO/IEC 17025

This document shall not be reproduced except in full.

Level 7 ♦ Building 2 ♦ 423 Pennant Hills Rd ♦ Pennant Hills ♦ NSW 2120 ♦ AUSTRALIA
Telephone +61 2 9484 0800 ♦ Facsimile +61 2 9484 0884
www.acousticresearch.com.au

Acoustic Research Laboratories
Proprietary Limited A.B.N. 47 050 100 804
Noise and Vibration Monitoring Instrumentation for Industry and the Environment

Acoustic Calibrator Test Report

Report Number : C11526

Date of Test : 21/09/2011

Report Issue Date : 21/09/2011

Equipment Tested: **Pulsar Acoustic Calibrator**

Model Number: Model 106

Serial Number: 57413

Client Name : Global Acoustics Pty Ltd

12/16 Huntingdale Drive

Thornton NSW 2322

Contact Name : Tony Welbourne

Tested by : Michael Wastell

Approved Signatory :

Ken Williams

Date : 21/09/2011

NATA
WORLD RECOGNISED ACCREDITATION

Acoustic Research Laboratories Pty Ltd is NATA Accredited Laboratory Number 14172.

This document is issued in accordance with NATA's accreditation requirements.

Accredited for compliance with ISO/IEC 17025

This document shall not be reproduced except in full.

Level 7 ♦ Building 2 ♦ 423 Pennant Hills Rd ♦ Pennant Hills ♦ NSW 2120 ♦ AUSTRALIA
Telephone +61 2 9484 0800 ♦ Facsimile +61 2 9484 0884
www.acousticresearch.com.au

Wilpinjong Coal

May / June 2012

Environmental Noise Monitoring

Prepared for

ALS Environmental Division

Global Acoustics

Noise and Vibration Analysis and Solutions

Global Acoustics Pty Ltd
PO Box 3115 | Thornton NSW 2322
Telephone +61 2 4966 4333 | Facsimile +61 2 4966 4330
Email global@globalacoustics.com.au
ABN 94 094 985 734

Wilpinjong Coal

May / June 2012
Environmental Noise Monitoring

Reference: 12247_R01_Draft01

Report date: 21 September 2012

Prepared for

ALS Environmental Division
PO Box 1034
Mudgee NSW 2850

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322

Prepared:	Jonathan Erasmus	QA Review:	Katie Weekes
	Acoustics Technician		Environmental Scientist

Global Acoustics Pty Ltd ~ Environmental noise modeling and impact assessment ~ Sound power testing ~ Noise control advice ~ Noise and vibration monitoring ~ OHS noise monitoring and advice ~ Expert evidence in Land and Environment and Compensation Courts ~ Architectural acoustics ~ Blasting assessments and monitoring ~ Noise management plans (NMP) ~ Sound level meter and noise logger sales and hire

EXECUTIVE SUMMARY

Global Acoustics was engaged by ALS Environmental Division to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine operated by Wilpinjong Coal. WCP was given approval on 1 February 2006. A modification to the consent was approved in August 2010.

An environment protection licence (EPL) was issued in early 2006 with subsequent variations approved. A revised noise-monitoring program (NMP) for WCP was approved in September 2011. Results of two-monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at five locations on 20 and 21 June 2012. The survey purpose is to quantify and describe the acoustic environment around the site and compare results with specified limits.

Attended monitoring was conducted in accordance with the NSW Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. The duration of each evening and night measurement was 15 minutes.

WCP complied with noise consent limits at the monitoring locations during the May / June 2012 monitoring period. Wind speed and/or estimated temperature inversion conditions resulted in development consent criteria not always being applicable, as indicated in Table 4.2 and Table 4.3.

Table of Contents

Appendices

1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by ALS Environmental Division to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine operated by Wilpinjong Coal.

Environmental noise monitoring described in this report was undertaken at five locations on 20 and 21 June 2012. Figure 1 shows the regular monitoring locations.

The purpose of the survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were five regular monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the Noise Monitoring Program (NMP).

Table 1.1 NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location	Owner
N4	'Hillview' Cumbo Road, Wollar	Wilpinjong Coal Mine
N6	St Laurence O'Toole Catholic Church, representative of Wollar - Residential	NA
N7	Ulan-Wollar Road (East)	Smith
N9	Slate Gully Road, Wollar	Wilpinjong Coal Mine
N12	Ulan-Wollar Road (West)	Ulan Coal Mines

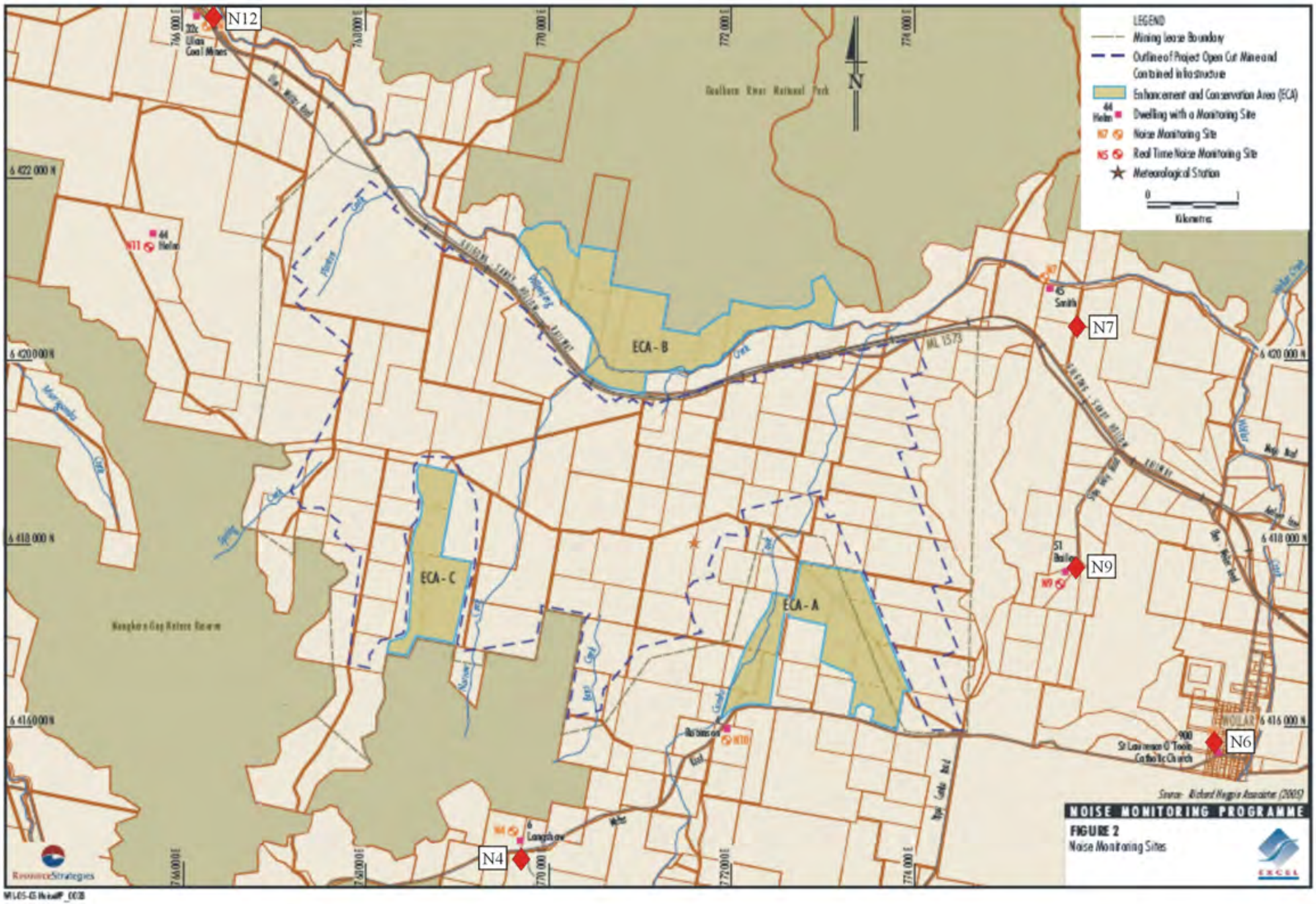


Figure 1 Monitoring Sites

1.3 Terminology

Some definitions of terminology, which may be used in this report, are provided in Table 1.2.

Table 1.2 TERMINOLOGY

Descriptor	Definition
L_A	The A-weighted root mean squared (RMS) noise level at any instant
L_{Amax}	The maximum A-weighted noise level over a time period or for an event
L_{A1}	The noise level which is exceeded for 1 per cent of the time
L_{A10}	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L_{A50}	The noise level which is exceeded for 50 per cent of the time
L_{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes
L_{Amin}	The minimum A-weighted noise level over a time period or for an event
L_{Aeq}	The average noise energy during a measurement period
$L_{A1,1minute}$	The highest noise level generated for 0.6 second during one minute
L_{pk}	The unweighted peak noise level at any instant
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
SEL	Sound exposure level (SEL), the A-weighted noise energy during a measurement period normalised to one second
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
ABL	Assessment background level (ABL), the 10th percentile background noise level for a single period (day, evening or night) of a 24 hour monitoring period
RBL	Rating background level (RBL), the background noise level for a period (day, evening or night) determined from ABL data

2 CONSENTS AND CRITERIA

2.1 Development Consent

WCP was given approval on 1 February 2006. A modification to the consent was approved in August 2010. The relevant noise conditions from Section 3 - Specific Environmental Conditions of the consent are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in December 2011.

Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise-monitoring program for WCP was revised in September 2011. Section 5.1 details attended monitoring locations and methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Specific Criteria

Day, evening and night criteria are detailed in Table 2.1. These have been selected as the most appropriate for each monitoring location and are based on the consolidated consent or environment protection licence associated with Wilpinjong Coal Project operations.

Table 2.1 WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident number[1]	Monitoring Location	Day $L_{Aeq(15\ minute)}$	Evening $L_{Aeq(15\ minute)}$	Night $L_{Aeq(15\ minute)}$/ $L_{A1(1\ minute)}$
N4	'Hillview' Cumbo Road, Wollar[4]	NA	NA	NA/NA
N6 / Wollar	Catholic Church representative of Wollar – Residential	35[2]	35[2]	35[2]/45[2]
N7 / 45	Ulan-Wollar Road (East)	35[2]	40[2]	47[2]/45[2]
N9 / 58	Slate Gully Road, Wollar[4]	NA	NA	NA/NA
N12 / All	Ulan-Wollar Road (West)[3]	NA	NA	NA/NA

Notes: 1. "All" indicates location is not mentioned specifically in Section 2 of the 2010 Modification and therefore has criteria applied to "all other privately owned land";

2. From Environment Protection Licence No. 12425;

3. Property is designated as a non-WPL mining interest in the 2010 Modification, so criteria are NA, 'not applicable'; and

4. These properties are owned by WCP, so criteria are NA, 'not applicable'.

Condition L5.3 in the EPL states:

The noise limits set out in condition 5.1 apply under all meteorological conditions except for the following:

a) Wind speeds greater than 3 metres per second at 10 metres above ground level; or

b) Temperature inversion conditions of up to 3°C per 100 m and wind speeds greater than 2 metres per second at 10 metres above the ground level; or

c) Temperature inversion conditions greater than 3°C per 100 m.

2.5 Acquisition Criteria

As detailed in condition 3 of Schedule 3 of the consent, acquisition criteria for WCP are to consider noise in respect to the criteria detailed in Table 2.2 for all privately owned land (excluding land owned by Gaffney – 30, Smith – 45, Evans – 48, Thomson & Hopper - 50 and McKenzie – 94).

Table 2.2 WILPINJONG COAL ACQUISITION CRITERIA, dB

Property	L_{Aeq} (15 minute)
All privately owned land	40

2.6 Additional Mitigation Criteria

As detailed in condition 4 of Schedule 3 of the consent, additional mitigation criteria for WCP are to consider noise in respect to the criteria detailed in Table 2.3 for most privately owned land.

Table 2.3 WILPINJONG COAL ADDITIONAL MITIGATION CRITERIA, dB

Property	L_{Aeq} (15 minute)
All other privately owned land, excluding those listed below	38

Land listed in Table 1 of the consent, or property numbers 23B, 25, 52A, 52B, 53 or 58 will receive mitigation upon request.

2.7 INP Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). Chapter 4 of the INP deals specifically with modifying factors that may apply to industrial noise. The most common modifying factors are addressed in detail below.

2.7.1 Tonality, Intermittent and Impulsive Noise

As defined in the Industrial Noise Policy:

> *Tonal noise contains a prominent frequency and is characterised by a definite pitch.*
>
> *Impulsive noise has high peaks of short duration or a sequence of such peaks.*
>
> *Intermittent noise is characterised by the level suddenly dropping to the background noise levels several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only.*

Years of monitoring have indicated that noise levels from mining operations, particularly those levels measured at significant distances from the source are relatively continuous. Given this, noise levels at the monitoring locations are unlikely to be intermittent. In addition, there is no equipment on site that is likely to generate tonal or impulsive noise as defined in the INP.

2.7.2 Low Frequency Noise

As defined in the Industrial Noise Policy:

> *Low frequency noise contains major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum.*

As detailed in Chapter 4 of the INP, low frequency noise should be assessed by measuring the C-weighted and A-weighted level over the same time period. The correction/penalty of 5 dB is to applied *if the difference between the two levels is 15 dB or more.*

Low frequency noise can also be assessed against criteria specified in the paper "A Simple Method for Low Frequency Noise Emission Assessment "(Broner JLFNV Vol29-1 pp1-14 2010). If the total predicted C – weighted noise level at a receptor exceeds the relevant criterion, a 5 dB penalty (modifying factor) is added to predicted levels.

2.8 Low Frequency Criteria

Low frequency criteria are detailed in Table 2.4.

Table 2.4 $L_{Ceq,15minute}$ CRITERIA (dBC)

Method	Calculation Method	Night-time Criterion	Daytime Criterion
Broner, 2010	L_{Ceq} to 250 Hz	60	65
INP, total	Total L_{Ceq} minus L_{Aeq}	15	15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a practice note is not yet available, low frequency noise results from WCP have been compared to both criteria presented above.

3 METHODOLOGY

3.1 Assessment Method

Attended monitoring was conducted in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken. The duration of each evening and night measurement was 15 minutes.

The terms "Inaudible" (IA), "Not measurable" (NM) or "Less than 20 dB" (<20 dB) are used in this report. When site noise is noted as IA then there was no site noise at the monitoring location.

However, if site noise is noted as NM or <20 dB, this means some noise was audible but could not be quantified. This means that noise from the site was either very low, or, being masked by other noise that was relatively loud. In the former case (very low site levels) we consider it not necessary to attempt to accurately quantify site noise as it would be significantly less than any criterion and most unlikely to cause annoyance (and in many cases, to be even noticed).

If site noise were NM or <20 dB due to masking then we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting if deemed necessary. All sites NM or <20 dB in this report are due to low absolute values.

A measurement of $L_{A1,1minute}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from the Wilpinjong Coal Project (WCP) noise source during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

As indicated in note (a) and (b) below Table 2 of the consent conditions, the L_{A1} measurement should be undertaken at 1 metre from the dwelling façade and the L_{Aeq} measurement within 30 metres of the dwelling. However, the direct measurement of noise at 1 metre from the façade is not practical during monitoring for this project. In most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements for this survey were undertaken at a suitable and representative location.

As indicated in note (a) of Table 2 of the consent, modifying factors from Section 4 of the INP should be implemented where applicable. Low frequency from WCP was assessed by analysis of the measured L_{Aeq} spectrum.

3.2 Attended Monitoring

The equipment used to measure environmental noise levels are listed in Table 3.1. Calibration certificates are included as Appendix B.

Table 3.1 MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	00701424	27/04/2013
Larson Davis CAL 150 acoustic calibrator	3333	25/07/2014

4 RESULTS

4.1 Attended Noise Monitoring

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. Table 4.2 and Table 4.3 detail $L_{Aeq\ (15\ minute)}$ and $L_{A1\ (1\ minute)}$ noise levels from WCP in the absence of other noise sources with impact assessment criteria. Criteria are then applied if weather conditions are in accordance with the mine's development consent. There were no modifying factors applicable to measured noise levels during this survey.

Discussion as to the noise sources responsible for these measured levels is provided in Chapter 5 of this report.

Table 4.1 MEASURED NOISE LEVELS – MAY / JUNE 2012

Location	Date And Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{A50} dB	L_{Aeq} dB	L_{A90} dB	L_{Amin} dB
	Evening							
N4	20/06/2012 19:27	44	36	34	29	30	24	22
N6	20/06/2012 19:52	51	46	40	28	35	26	25
N7	20/06/2012 20:37	48	45	42	38	39	35	32
N9	20/06/2012 20:15	47	44	42	39	39	37	35
N12	20/06/2012 21:16	42	39	38	36	36	35	33
	Night-Time							
N4	20/06/2012 23:41	41	32	29	27	27	24	22
N6	20/06/2012 23:17	38	34	30	27	28	26	24
N7	20/06/2012 22:32	41	37	35	34	34	32	30
N9	20/06/2012 22:54	40	36	34	32	33	31	30
N12	20/06/2012 22:01	43	37	35	33	34	32	30
	Evening							
N4	21/06/2012 19:34	49	45	42	40	40	37	35
N6	21/06/2012 20:01	58	47	30	28	34	27	26
N7	21/06/2012 21:00	38	37	35	33	33	31	29
N9	21/06/2012 20:29	38	35	33	31	31	29	26
N12	21/06/2012 21:38	38	36	36	34	34	33	32
	Night-Time							
N4	21/06/2012 23:46	47	45	43	40	41	38	36
N6	21/06/2012 23:23	54	42	27	26	30	25	23
N7	21/06/2012 22:40	40	37	35	34	34	32	30
N9	21/06/2012 23:01	40	36	33	31	31	29	27
N12	21/06/2012 22:11	88	77	73	38	66	35	32

Note: Noise levels in this table are not necessarily the result of activities at WCP.

Table 4.2 $L_{Aeq\ (15\ minute)}$ dB GENERATED BY WCP AGAINST IMPACT ASSESSMENT CRITERIA – MAY / JUNE 2012

Location	Date And Time	Wind Speed m/s [8]	VTG °C per 100m [6,8]	Criterion dB [,7]	Criterion Applies?[1,5]	WCP L_{Aeq} (15min) dB [2,3]	Exceedance[4,5,7]
	Evening						
N4	20/06/2012 19:27	0.0	5.5	NA	N	NM	NA
N6	20/06/2012 19:52	0.3	6.2	35	N	22	NA
N7	20/06/2012 20:37	0.1	4.0	40	N	39	NA
N9	20/06/2012 20:15	0.1	4.7	NA	N	39	NA
N12	20/06/2012 21:16	0.0	5.2	NA	N	35	NA
	Night-Time						
N4	20/06/2012 23:41	0.0	3.8	NA	N	27	NA
N6	20/06/2012 23:17	0.0	3.6	35	N	28	NA
N7	20/06/2012 22:32	0.5	3.8	47	N	34	NA
N9	20/06/2012 22:54	0.4	3.3	NA	N	33	NA
N12	20/06/2012 22:01	0.0	4.7	NA	N	32	NA
	Evening						
N4	21/06/2012 19:34	0.0	8.6	NA	N	39	NA
N6	21/06/2012 20:01	0.1	8.3	35	N	<30	NA
N7	21/06/2012 21:00	0.1	7.9	40	N	31	NA
N9	21/06/2012 20:29	0.0	7.4	NA	N	31	NA
N12	21/06/2012 21:38	0.0	6.0	NA	N	<30	NA
	Night-Time						
N4	21/06/2012 23:46	0.0	3.6	NA	N	41	NA
N6	21/06/2012 23:23	0.0	3.3	35	N	<30	NA
N7	21/06/2012 22:40	0.1	4.3	47	N	33	NA
N9	21/06/2012 23:01	0.1	4.7	NA	N	31	NA
N12	21/06/2012 22:11	0.3	4.8	NA	N	NM	NA

Notes:

1. *Noise emission limits apply for winds up to 3 metres per second (at a height of 10 metres, or, vertical temperature gradients of up to 3 degrees/100m with wind speed up to 2 m/s;*
2. *These are results for WCP in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;*

2\. *NA in criterion column means the criteria are not applicable at this location, NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified; and*

7\. *Atmospheric data is sourced from the WCP weather station and inversion tower.*

Table 4.3 $L_{A1\,(1\,minute)}$ dB GENRATED BY WCP AGAINST IMPACT ASSESSMENT CRITERIA – MAY / JUNE 2012

Location	Date And Time	Wind Speed m/s [8]	VTG °C per 100m [6,8]	Criterion dB [,7]	Criterion Applies? [1,5]	WCP L_{A1} (1 min) dB [2,3]	Exceedance [4,5,7]
	Night-Time						
N4	20/06/2012 23:41	0.0	3.8	NA	N	36	NA
N6	20/06/2012 23:17	0.0	3.6	45	N	38	NA
N7	20/06/2012 22:32	0.5	3.8	45	N	41	NA
N9	20/06/2012 22:54	0.4	3.3	NA	N	40	NA
N12	20/06/2012 22:01	0.0	4.7	NA	N	43	NA
	Night-Time						
N4	21/06/2012 23:46	0.0	3.6	NA	N	46	NA
N6	21/06/2012 23:23	0.0	3.3	45	N	30	NA
N7	21/06/2012 22:40	0.1	4.3	45	N	40	NA
N9	21/06/2012 23:01	0.1	4.7	NA	N	39	NA
N12	21/06/2012 22:11	0.3	4.8	NA	N	25	NA

Notes:
1. *Noise emission limits apply for winds up to 3 metres per second (at a height of 10 metres, and, vertical temperature gradients of up to 3 degrees/100m with wind speed up to 2 m/s;*
2. *These are results for WCP in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;*
7. *NA in criterion column means the criteria are not applicable at this location, NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified; and*
8. *Atmospheric data is sourced from the WCP weather station and inversion tower.*

Where WCP only noise levels are within the impact assessment criteria, it is not necessary to compare these noise levels to acquisition or mitigation criteria as these levels are higher. Compliance with impact assessment indicates compliance with acquisition or mitigation criteria.

4.2 Low Frequency Assessment

Table 4.4 provides statistics for attended noise monitoring undertaken around WCP during July and August 2012 monitoring. None of the 20 measurements occurred during which WCP was directly measurable (not "inaudible", "not measurable" or less than a maximum cut-off value "<30 dB") and where meteorological conditions resulted in criteria applying (in accordance with the consent).

Table 4.4 ATTENDED MEASUREMENT STATISTICS FOR WCP – MAY / JUNE 2012

	May / June 2012
No. of measurements	20
Measurements where met applies	0
WCP is measurable and criteria and met applies	0

As there are no identified low frequency exceedences as detailed in Table 4.4, no further action is required.

4.3 Atmospheric Conditions

Atmospheric condition data measured at each location are shown in Table 4.5. Data obtained concurrently by the WCP meteorological station is provided in Table 4.6.

Table 4.5 MEASURED ATMOSPHERIC CONDITIONS

Location	Date And Time	Temperature (° C)	Wind Speed (m/s)	Wind Direction (° MN)	Cloud Cover (eighths)
	Evening				
N4	20/06/2012 19:27	3	0.1	250	0
N6	20/06/2012 19:52	4	0.3	240	0
N7	20/06/2012 20:37	3	0.0	-	0
N9	20/06/2012 20:15	2	0.5	120	0
N12	20/06/2012 21:16	0	0.3	260	0
	Night-Time				
N4	20/06/2012 23:41	-1	0.1	220	0
N6	20/06/2012 23:17	0	0.0	-	0
N7	20/06/2012 22:32	3	0.0	-	0
N9	20/06/2012 22:54	3	0.0	-	0
N12	20/06/2012 22:01	0	0.0	-	0
	Evening				
N4	21/06/2012 19:34	7	0.5	210	2
N6	21/06/2012 20:01	10	0.0	-	1
N7	21/06/2012 21:00	5	0.1	140	0
N9	21/06/2012 20:29	7	0.3	120	0
N12	21/06/2012 21:38	10	0.1	260	0
	Night-Time				
N4	21/06/2012 23:46	5	0.3	250	0
N6	21/06/2012 23:23	6	0.0	-	0
N7	21/06/2012 22:40	6	0.0	-	0
N9	21/06/2012 23:01	6	0.3	240	0
N12	21/06/2012 22:11	6	0.3	250	0

Notes: 1. Wind speed and direction measured at 1.8 metres.

Table 4.6 WCP METEOROLOGICAL STATION DATA

Date and Time	Wind Speed (m/s)	Rainfall (mm)	Sigma Theta	WCP Lapse Rate
20/06/2012 19:00	0.8	0	13.5	4.5
20/06/2012 19:15	0.0	0	7.6	5.7
20/06/2012 19:30	0.4	0	19.4	5.3
20/06/2012 19:45	0.0	0	8.5	5.5
20/06/2012 20:00	0.3	0	11.7	6.2
20/06/2012 20:15	0.0	0	16.4	5.3
20/06/2012 20:30	0.1	0	8.4	4.7
20/06/2012 20:45	0.1	0	6.5	4.0
20/06/2012 21:00	0.2	0	4.9	4.7
20/06/2012 21:15	0.1	0	8.9	4.7
20/06/2012 21:30	0.0	0	16.7	5.2
20/06/2012 21:45	0.2	0	14.9	4.5
20/06/2012 22:00	0.0	0	0.0	4.3
20/06/2012 22:15	0.0	0	0.0	4.7
20/06/2012 22:30	0.2	0	11.8	3.6
20/06/2012 22:45	0.5	0	13.4	3.8
20/06/2012 23:00	0.5	0	21.2	3.3
20/06/2012 23:15	0.4	0	18.5	3.3
20/06/2012 23:30	0.0	0	0.0	3.6
20/06/2012 23:45	0.1	0	14.0	3.3
21/06/2012 00:00	0.0	0	30.1	3.8
21/06/2012 00:15	0.1	0	21.0	3.6
21/06/2012 00:30	0.1	0	18.0	3.8
21/06/2012 19:00	0.0	0	78.9	7.9
21/06/2012 19:15	0.1	0	26.1	8.3
21/06/2012 19:30	0.1	0	5.5	8.1
21/06/2012 19:45	0.0	0	0.0	8.6
21/06/2012 20:00	0.2	0	14.2	9.1
21/06/2012 20:15	0.0	0	0.0	7.1
21/06/2012 20:30	0.1	0	1.4	6.0
21/06/2012 20:45	0.0	0	0.0	7.4
21/06/2012 21:00	0.2	0	9.2	8.3
21/06/2012 21:15	0.1	0	14.9	7.9
21/06/2012 21:30	0.1	0	14.9	7.4
21/06/2012 21:45	0.0	0	5.3	6.0
21/06/2012 22:00	0.0	0	0.0	5.0

Table 4.6 WCP METEOROLOGICAL STATION DATA

Date and Time	Wind Speed (m/s)	Rainfall (mm)	Sigma Theta	WCP Lapse Rate
21/06/2012 22:15	0.2	0	25.5	5.5
21/06/2012 22:30	0.3	0	7.9	4.8
21/06/2012 22:45	0.3	0	30.8	4.5
21/06/2012 23:00	0.1	0	13.1	4.3
21/06/2012 23:15	0.1	0	34.1	4.7
21/06/2012 23:30	0.0	0	0.0	3.3
21/06/2012 23:45	0.0	0	0.0	2.9
22/06/2012 00:00	0.0	0	8.9	3.6
22/06/2012 00:15	0.0	0	11.1	3.6
22/06/2012 00:30	0.1	0	4.2	3.1

Notes: 1. Data supplied by WCP.

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 and Table 4.2 present data gathered during attended monitoring. These noise levels are the result of many sounds reaching the sound level meter microphone during monitoring. Received levels from various noise sources were noted during attended monitoring and particular attention was paid to the extent of WCP's contribution, if any, to measured levels. At each receptor location, WCP's $L_{Aeq,15\ minute}$ and $L_{A1,1\ minute}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis.

From these observations summaries have been derived for each location. The following chapter sections provide these summaries. Statistical 1/3 octave band analysis of environmental noise was undertaken, and Figures 3 to 22 display the frequency ranges for various noise sources at each location for L_{A1}, L_{A10}, L_{A90}, and L_{Aeq}. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 2 where it can be seen that frogs and insects are generating noise at frequencies above 1000 Hz; mining noise is at frequencies less than 1000 Hz (this is typical). Adding levels at frequencies that relate to mining only allows separate statistical results to be calculated. This analysis cannot always be performed if there are significant levels of other noise at the same frequencies as mining; this can be dogs, cows, or, most commonly, road traffic.

It should be noted that the method of summing statistical values up to a cutoff frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq}.

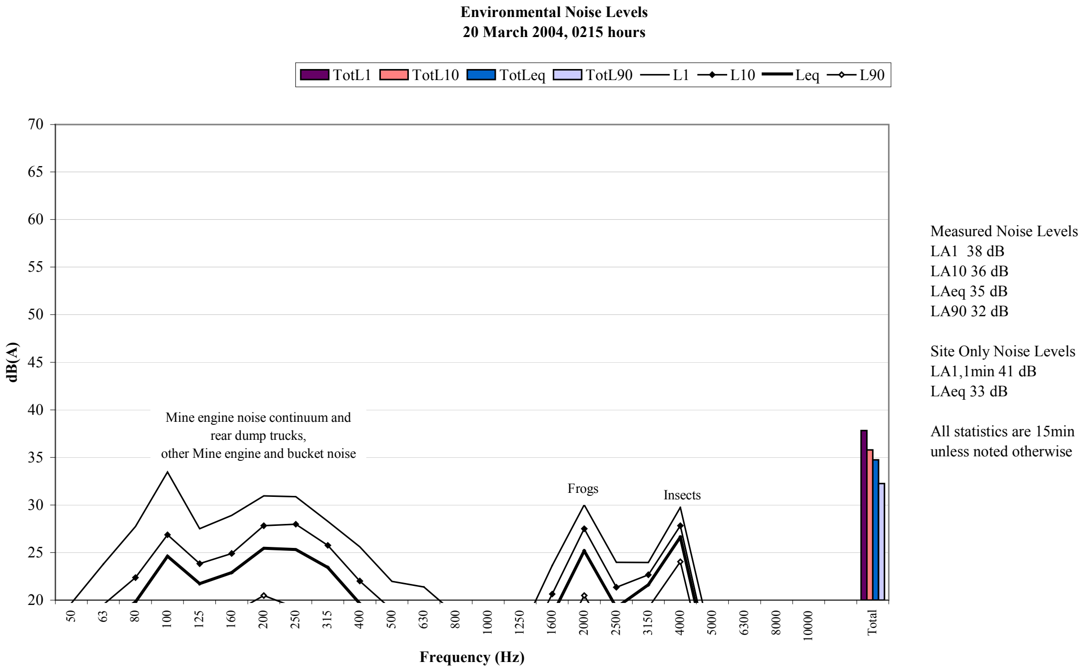


Figure 2 Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N4, 20 June 2012, Evening

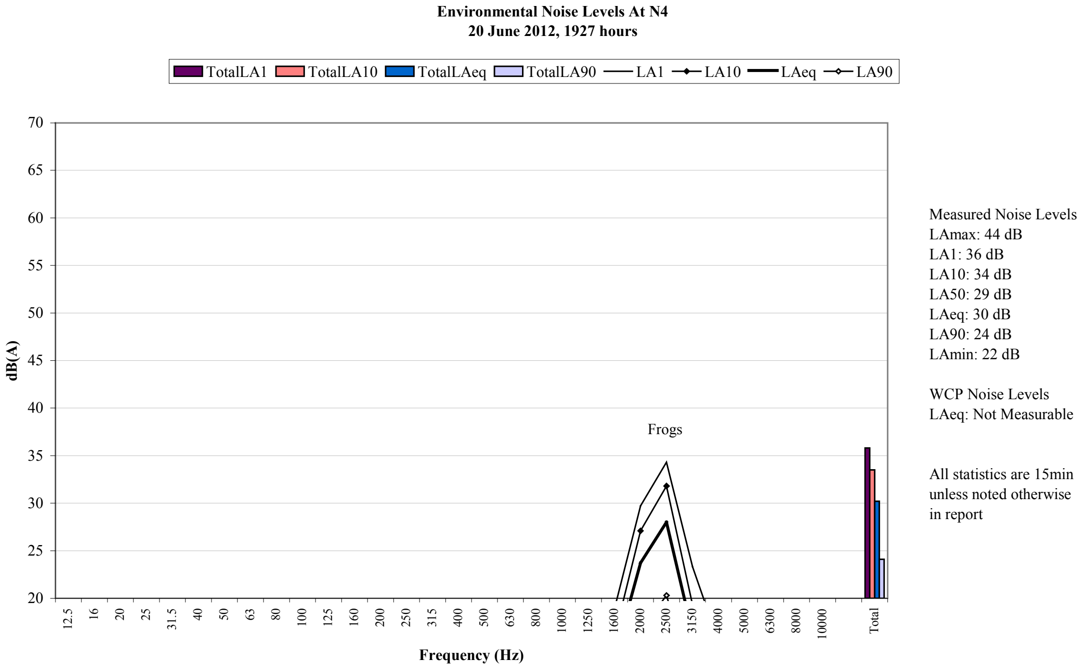


Figure 3 Environmental Noise Levels, N4 – Cumbo Road

Frogs were responsible for measured levels.

An aircraft was also noted.

5.1.2 N6, 20 June 2012, Evening

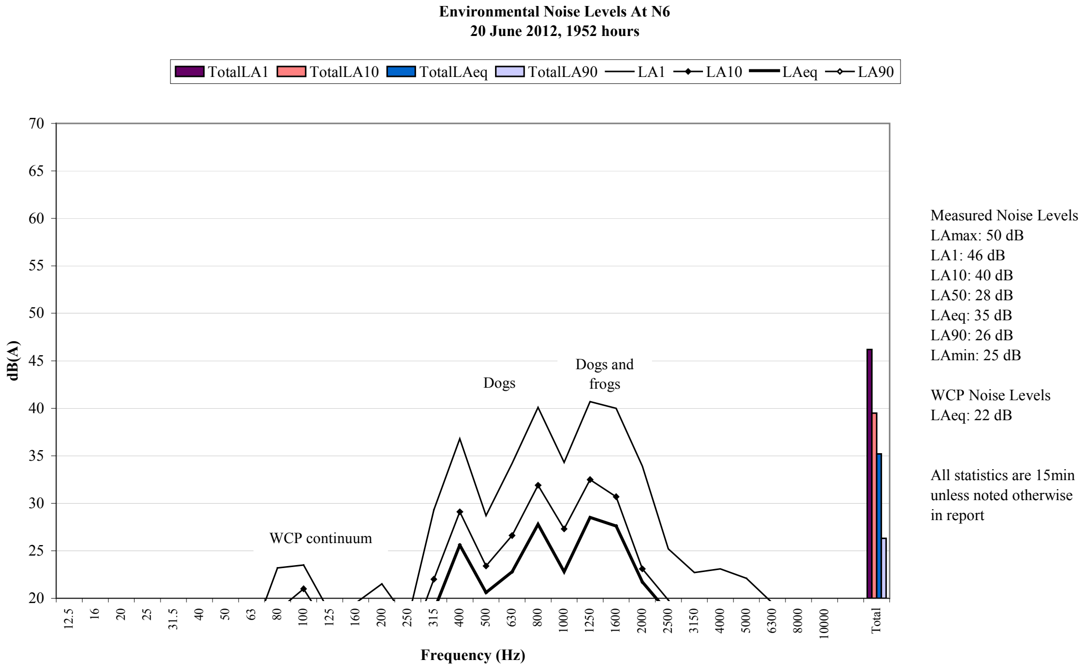


Figure 4 Environmental Noise Levels, N6 – Wollar Church

A low-level continuum from WCP was noted and was responsible for the site only L_{Aeq} of 22 dB. Track noise was also noted.

Dogs were responsible for the measured L_{A1}, L_{A10} and L_{Aeq}.

A train, train horn and frogs were also noted.

5.1.3 N7, 20 June 2012, Evening

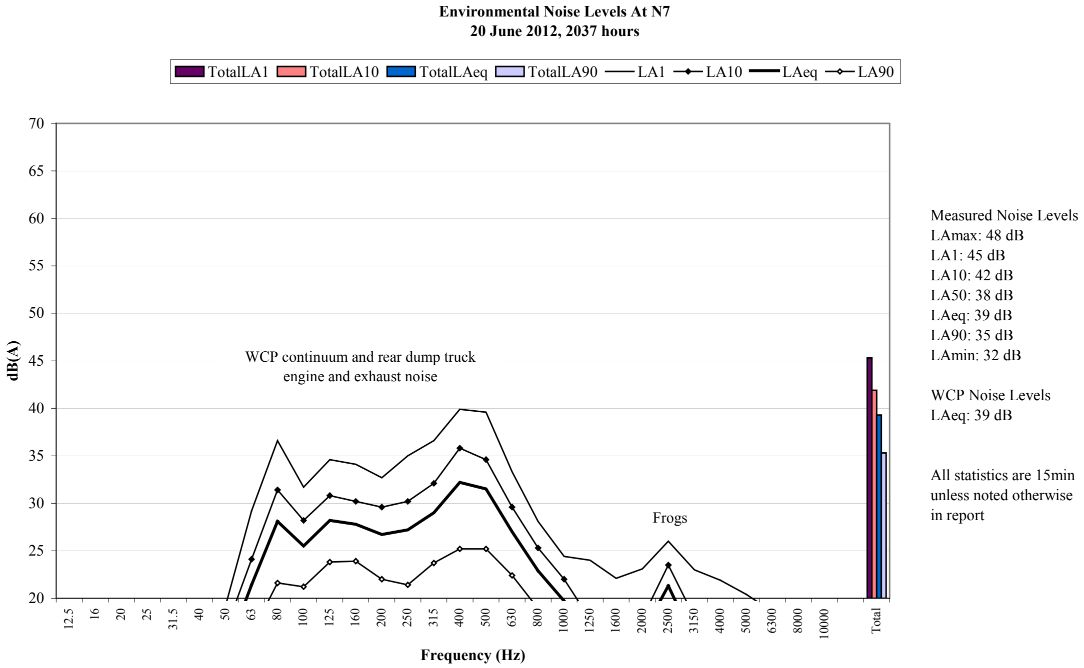


Figure 5 Environmental Noise Levels, N7 – Ulan-Wollar Road (East)

A continuum and rear dump truck engine and exhaust noise from WCP were audible during the measurement and generated the site only L_{Aeq} of 39 dB. Reverse alarms (three times), an impact noise (once), horns (twice) and dozer track noise (three times) were also noted. WCP was responsible for measured levels.

Frogs were audible at low levels but did not contribute to measured levels.

5.1.4 N9, 20 June 2012, Evening

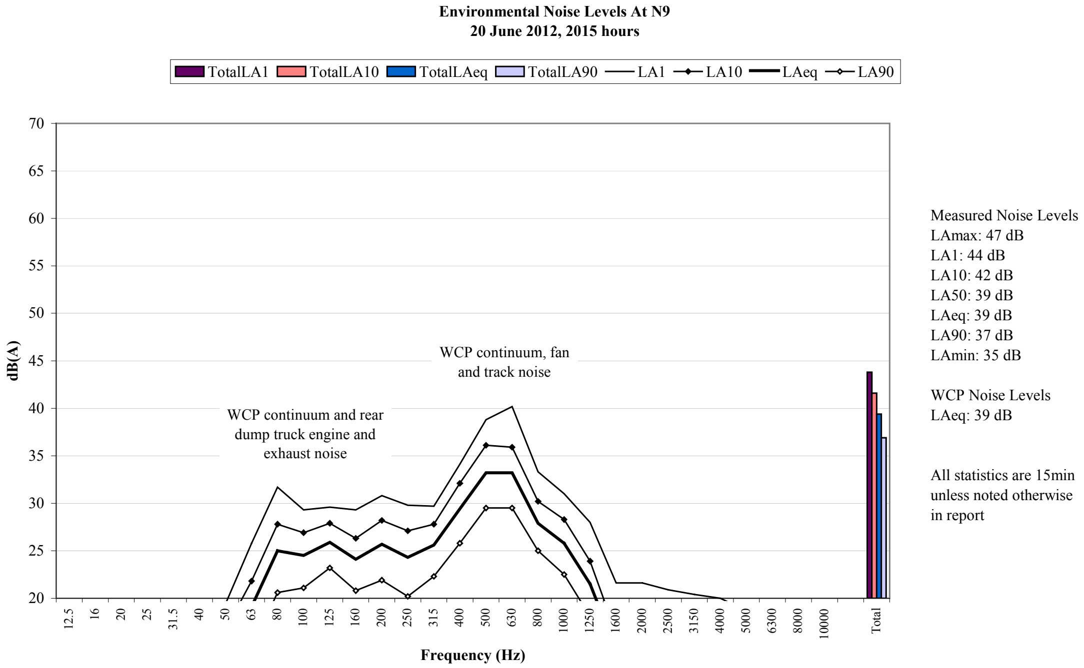


Figure 6 Environmental Noise Levels, N9 – Slate Gully Road

A continuum, track and fan noise and rear dump truck engine and exhaust noise from WCP generated the site only L_{Aeq} of 39 dB and were responsible for measured levels. Horns (twice) and reverse alarms (three times) were also noted.

Frogs, a bird and a dog were also audible but did not contribute to measured levels.

5.1.5 N12, 20 June 2012, Evening

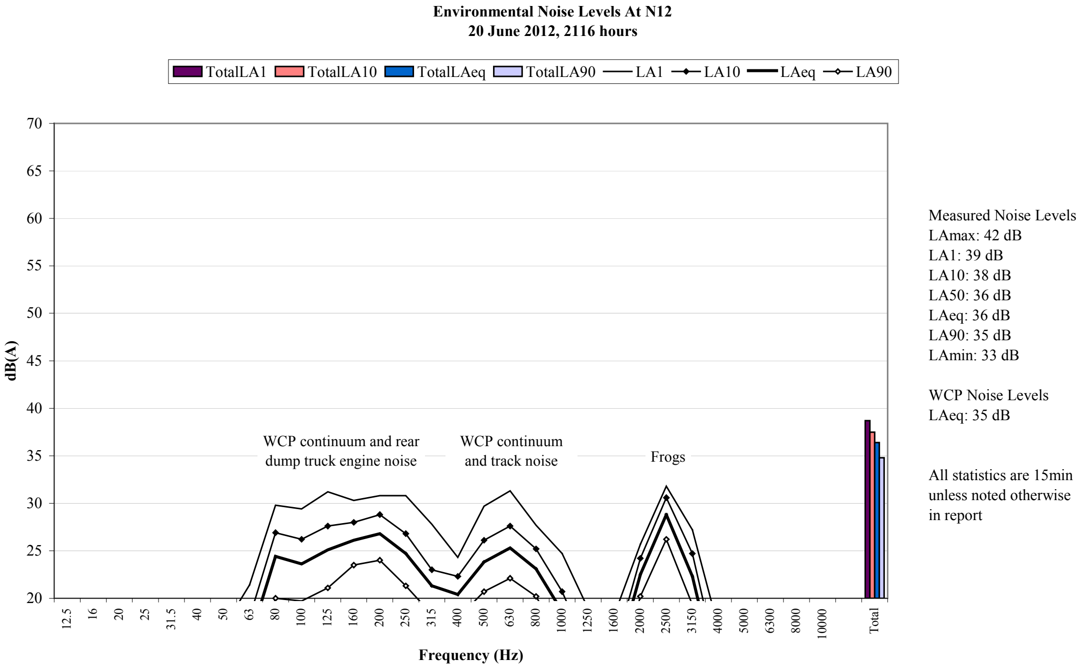


Figure 7 Environmental Noise Levels, N12 – Ulan-Wollar Road (West)

A continuum, rear dump truck engine noise and dozer tracks from WCP were responsible for an L_{Aeq} of 35 dB.

Frogs were a minor contributor to measured levels.

A low-level continuum and track noise (three times) from another mine, birds and bats were also noted.

5.1.6 N4, 20 June 2012, Night-time

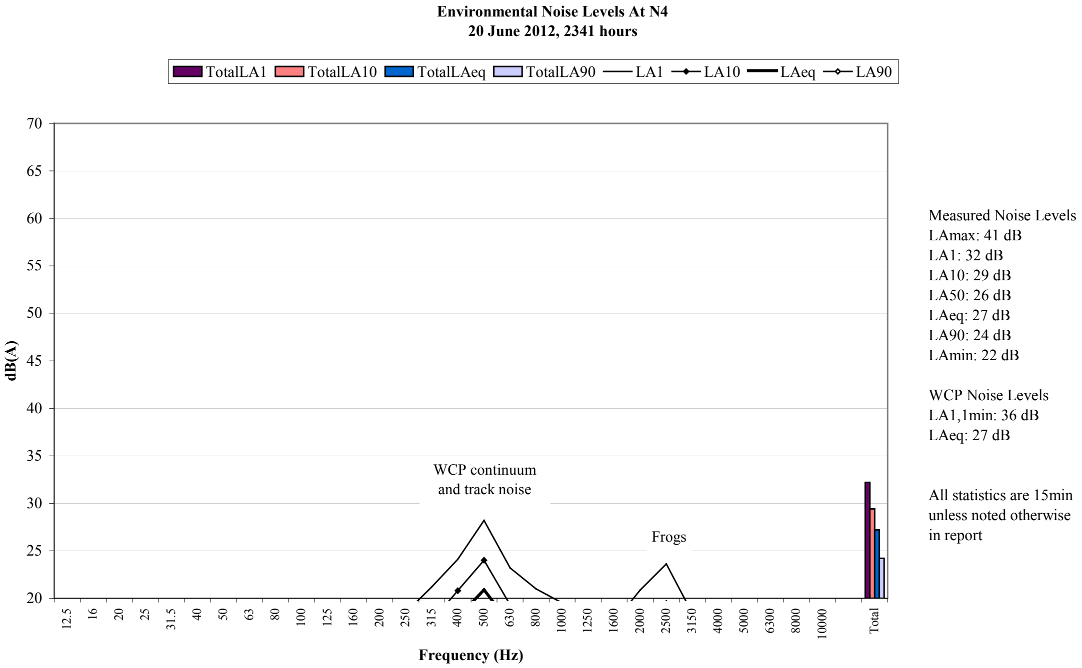


Figure 8 Environmental Noise Levels, N4 – Cumbo Road

A continuum and track noise from WCP was audible throughout the measurement and generated a site only L_{Aeq} of 27 dB. Impact noise generated the WCP only $L_{A1,1min}$ of 36 dB. A horn from WCP sounded once briefly during the measurement. WCP was responsible for measured levels.

Frogs, a bird, livestock and a train horn were also noted.

5.1.7 N6, 20 June 2012, Night-time

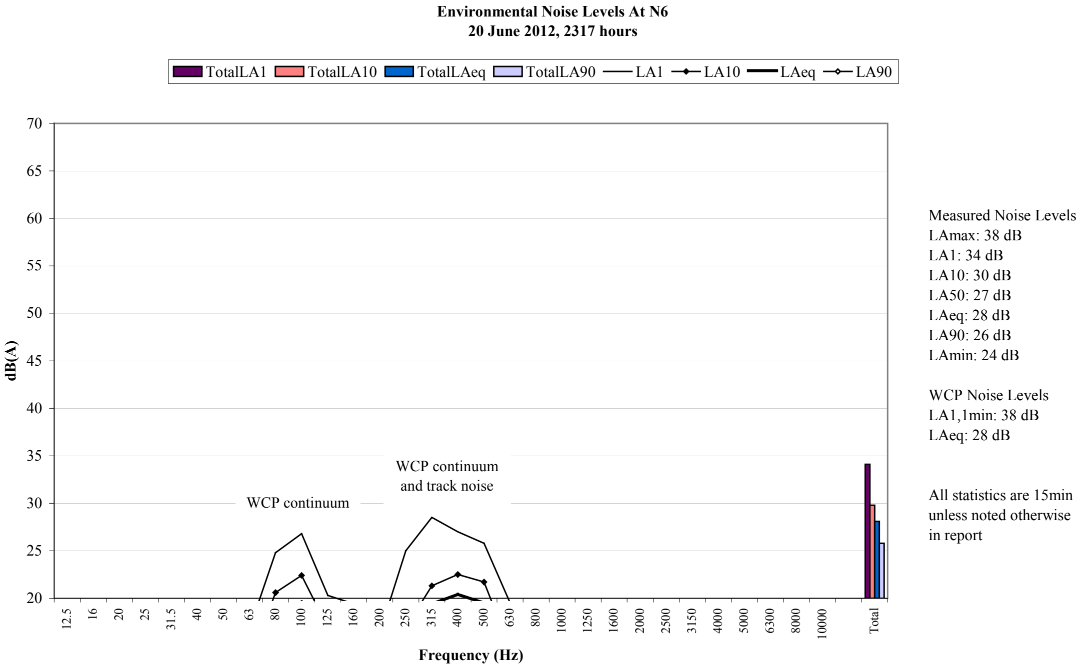


Figure 9 Environmental Noise Levels, N6 – Wollar Church

A continuum and track noise from WCP generated the site only L_{Aeq} of 28 dB. An engine surge generated the WCP only $L_{A1,1min}$ of 38 dB.

Running water, frogs and dogs were also noted.

5.1.8 N7, 20 June 2012, Night-time

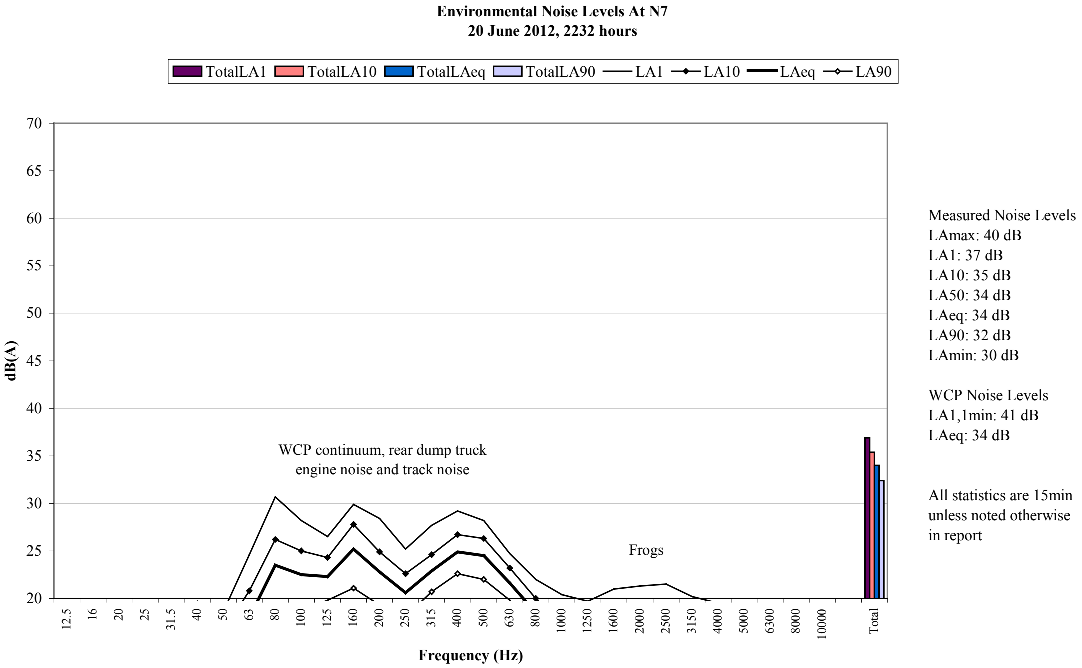


Figure 10 Environmental Noise Levels, N7 – Ulan Wollar Road (East)

A continuum, rear dump truck engine noise and dozer track noise from WCP were responsible for measured levels. These sources generated the site only L_{Aeq} of 34 dB. A horn generated the site only $L_{A1,1min}$ of 41 dB.

Frogs, livestock and distant road traffic were also noted.

5.1.9 N9, 20 June 2012, Night-time

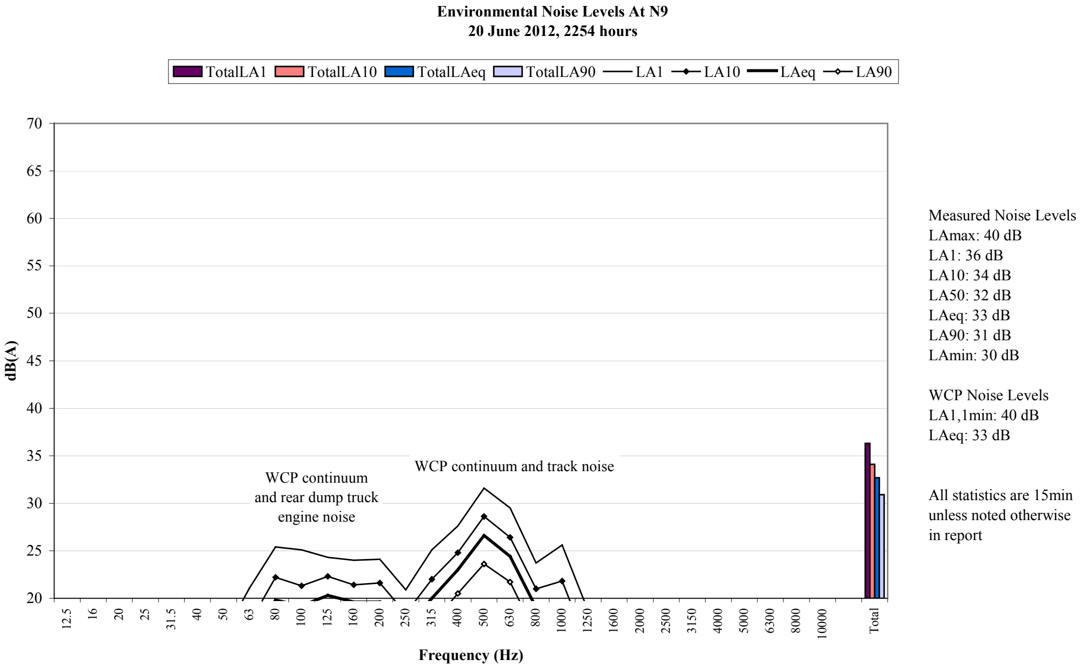


Figure 11 Environmental Noise Levels, N9 – Slate Gully Road

A continuum, rear dump truck engine noise and dozer tracks from WCP were responsible for measured levels. These sources generated the site only L_{Aeq} of 33 dB. Track noise was responsible for the $L_{A1,1min}$ of 40 dB.

Frog were also audible at low levels.

5.1.10 N12, 20 June 2012, Night-time

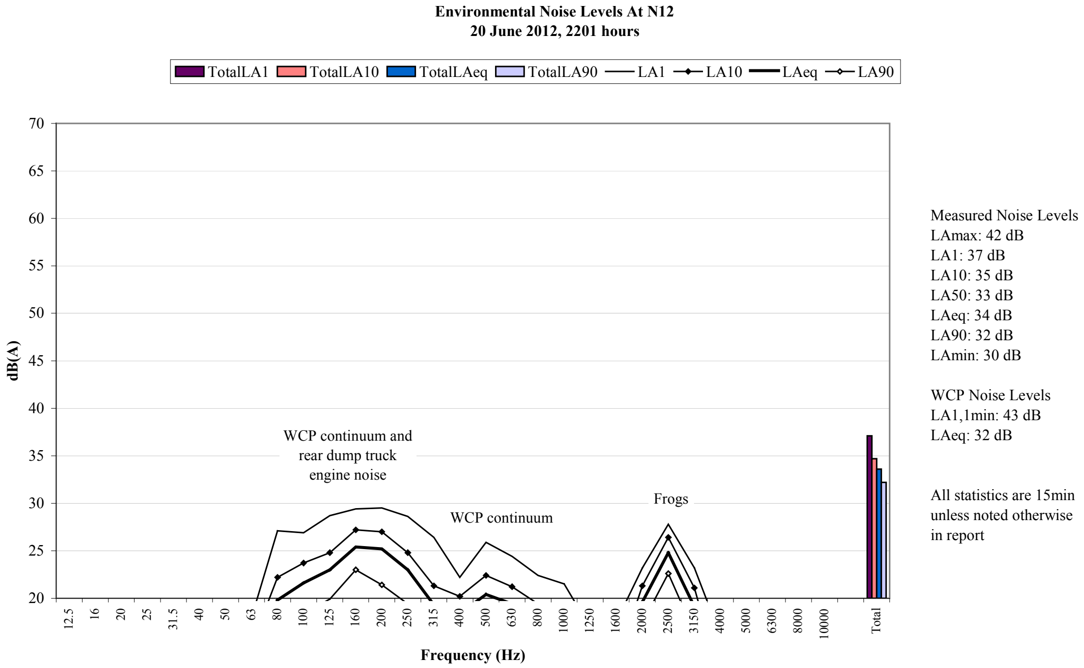


Figure 12 Environmental Noise Levels, N12 – Ulan Wollar Road (West)

A continuum, track noise and rear dump truck engine noise from WCP were responsible for the site only L_{Aeq} of 32 dB. Rear dump truck engine noise generated the $L_{A1,1min}$ of 43 dB. WCP was primarily responsible for measured levels.

Frogs and a continuum and track noise from another mine were a minor contributor to the measured L_{A10}, L_{Aeq} and L_{A90}.

5.1.11 N4, 21 June 2012, Evening

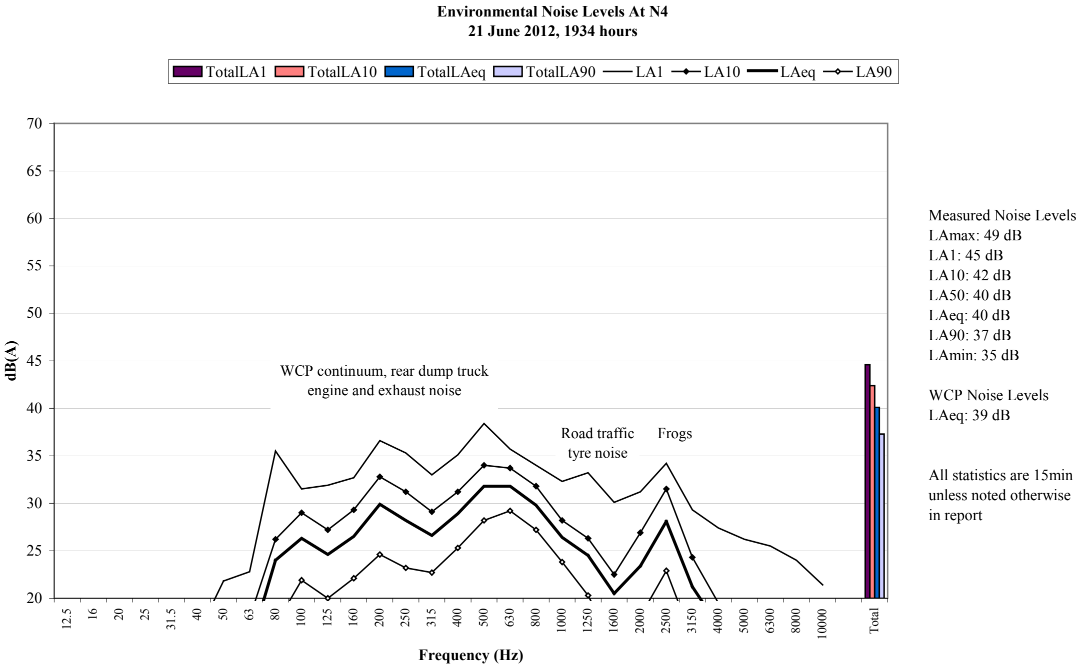


Figure 13 Environmental Noise Levels, N4 – Cumbo Road

A continuum and rear dump truck engine and exhaust noise from WCP was audible throughout the measurement, generating the WCP only L_{Aeq} of 39 dB. Dozer tracks (four times), impact noise (once) and a horn (three times) were also noted. WCP was primarily responsible for measured levels.

Frogs were a minor contributor to the measured L_{A10}, L_{Aeq} and L_{A90}.

Road traffic tyre noise was also noted.

5.1.12 N6, 21 June 2012, Evening

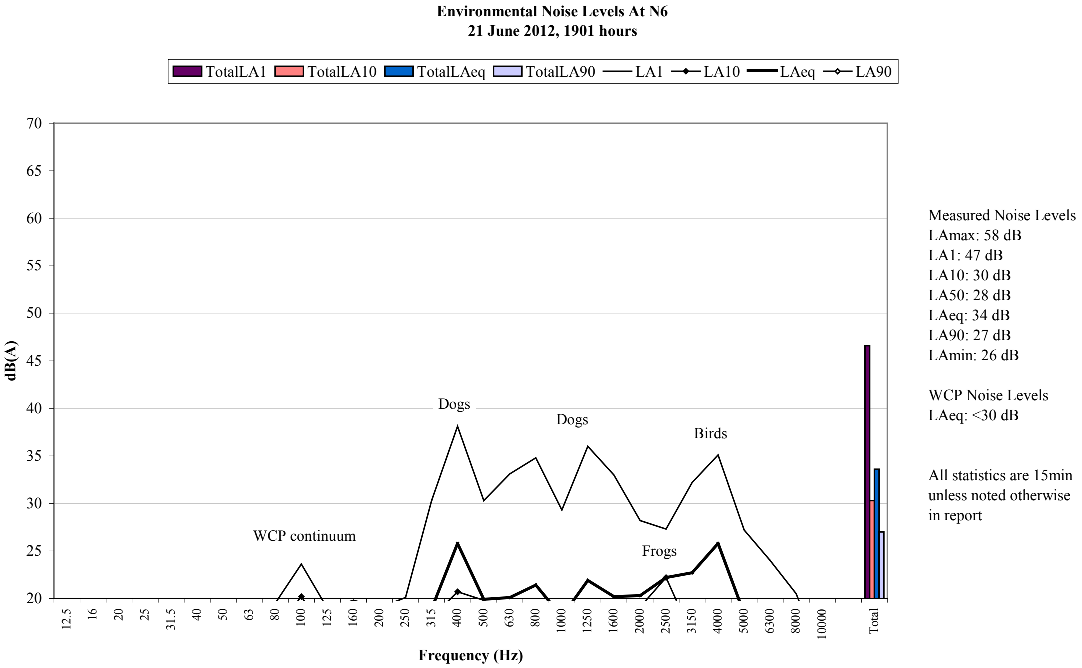


Figure 14 Environmental Noise Levels, N6 – Wollar Church

A low-level engine continuum from WCP was audible during the measurement, resulting in a site only L_{Aeq} of less than 30 dB. Track noise, a horn (once) and rear dump truck engine noise (three times) were also noted.

Dogs were responsible for them measured L_{A1} and contributed to the measured L_{A10} and L_{Aeq}. Birds and frogs also contributed to the measured L_{A10} and L_{Aeq}.

Distant road traffic tyre noise and a nearby continuum were also noted.

5.1.13 N7, 21 June 2012, Evening

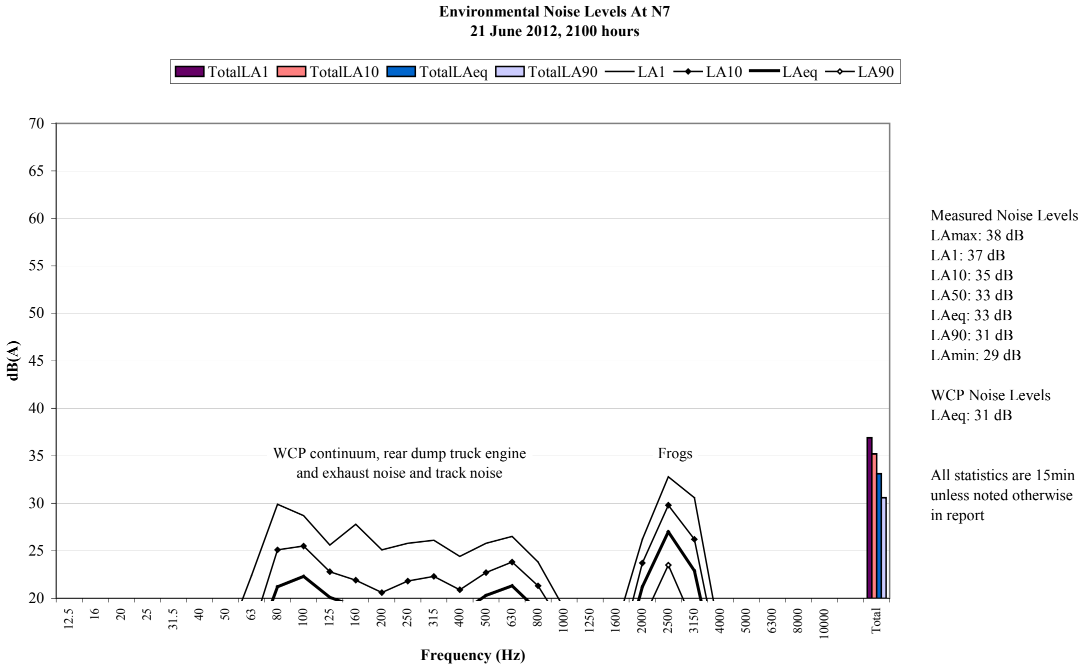


Figure 15 Environmental Noise Levels, N7 – Ulan-Wollar Road (East)

A continuum, rear dump truck engine and exhaust noise and track noise from WCP was responsible for the site only L_{Aeq} of 33 dB. Impact noise (twice) and a horn (three times) were also noted. WCP contributed to the measured L_{A10}, L_{Aeq} and L_{A90}.

Frogs generated the measured L_{A1} and contributed to the measured L_{A10}, L_{Aeq} and L_{A90}.

5.1.14 N9, 21 June 2012, Evening

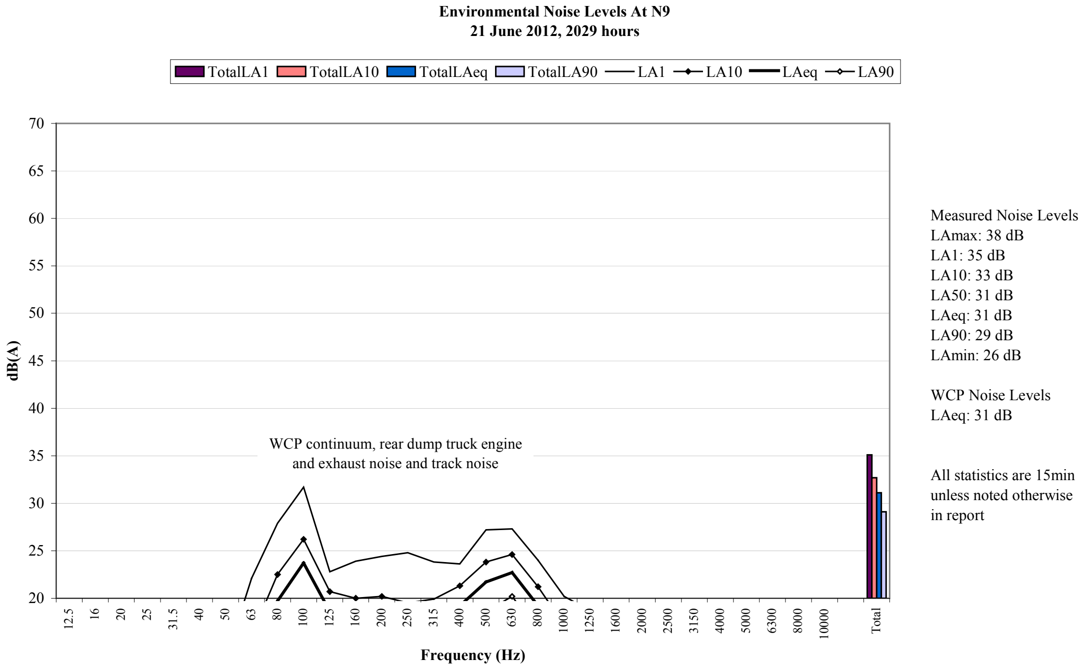


Figure 16 Environmental Noise Levels, N9 – Slate Gully Road

A continuum, rear dump truck engine and exhaust noise and dozer tracks from WCP generated the site only L_{Aeq} of 31 dB. These sources were responsible for measured levels. Impact noise (once) and a horn (three times) were also noted.

Frogs and a kangaroo were also audible.

5.1.15 N12, 21 June 2012, Evening

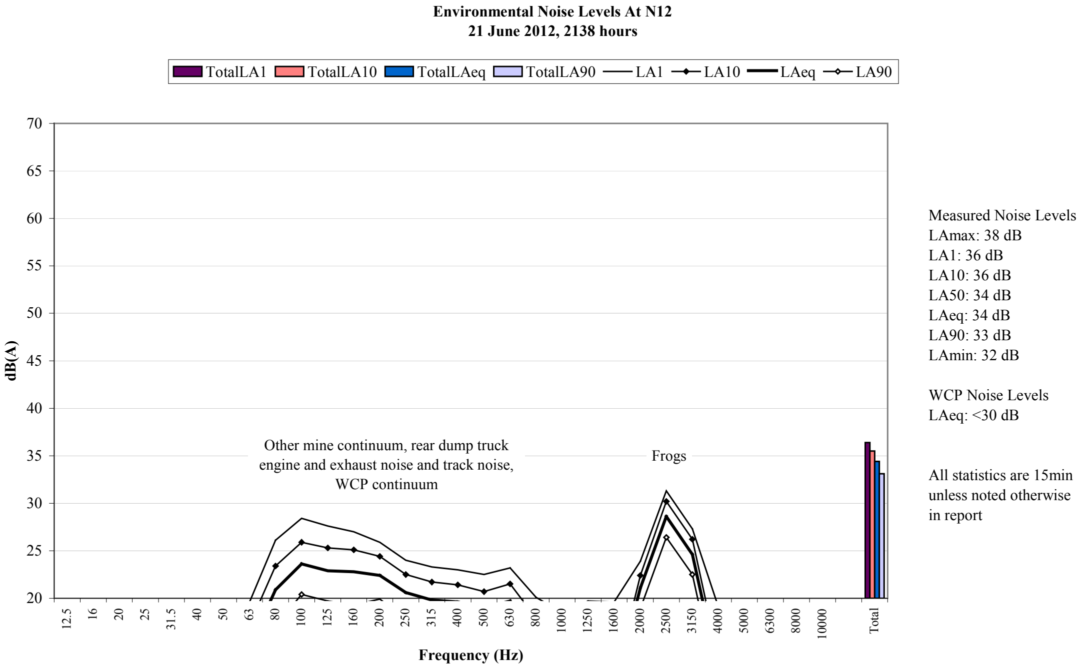


Figure 17 Environmental Noise Levels, N12 – Ulan-Wollar Road (West)

A low-level engine continuum from WCP was audible throughout the measurement and generated the site only L_{Aeq} of less than 30 dB. Track noise was also noted once.

A continuum, track noise and rear dump truck engine and exhaust noise from another mine contributed to the L_{A10}, L_{Aeq} and L_{A90}. Frogs generated the measured L_{A1} and contributed to the measured L_{A10}, L_{Aeq} and L_{A90}.

5.1.16 N4, 21 June 2012, Night-time

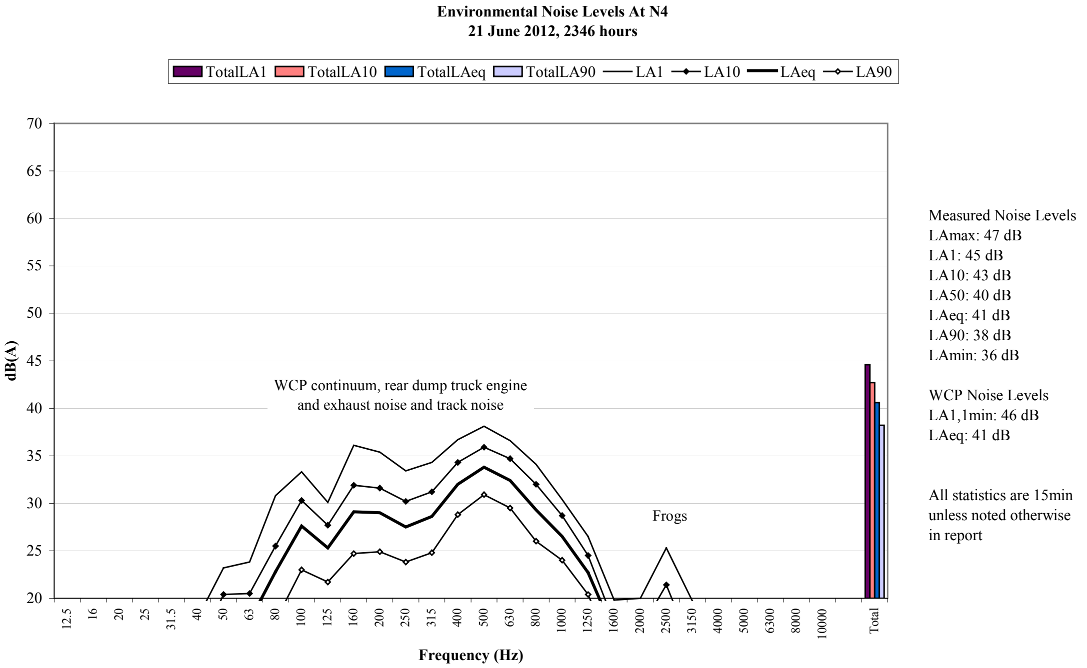


Figure 18 Environmental Noise Levels, N4 – Cumbo Road

A general continuum, rear dump truck engine and exhaust noise and tracks noise from WCP were audible throughout most of the measurement. Horns (four times), impact noise (twice) and reverse alarms (twice) were also noted. These sources generated the WCP only L_{Aeq} of 41 dB and $L_{A1,1min}$ of 46 dB. WCP was responsible for measured levels.

Frogs were also noted.

5.1.17 N6, 21 June 2012, Night-time

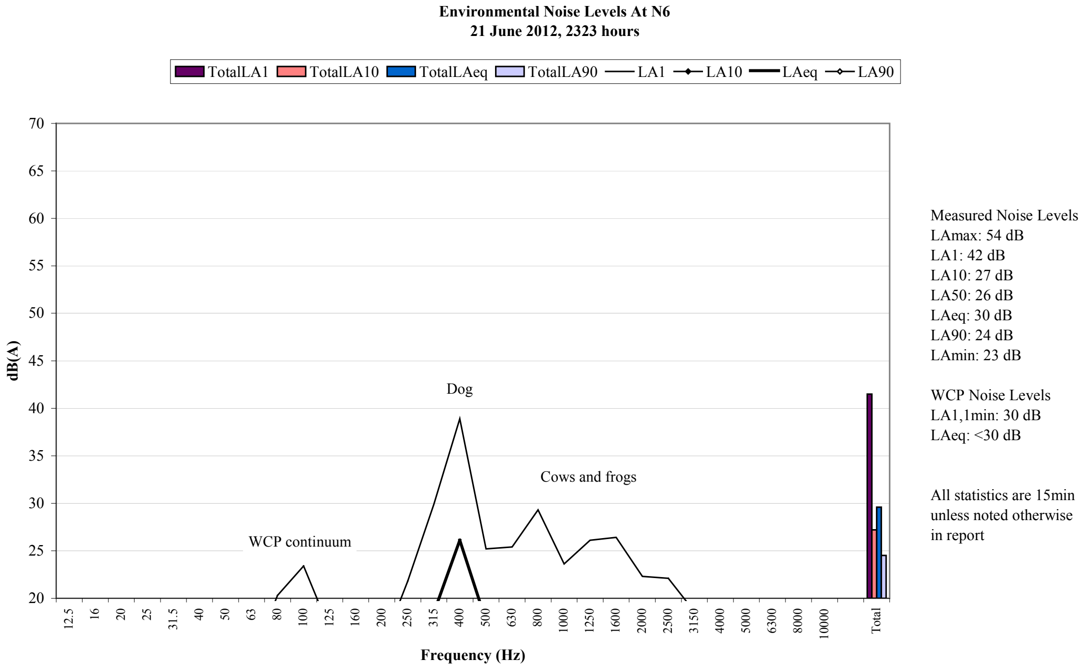


Figure 19 Environmental Noise Levels, N6 – Wollar Church

A continuum from WCP was audible and generated the site only L_{Aeq} of less than 30 dB and $L_{A1,1min}$ of 30 dB.

A dog was primarily responsible for measured levels.

Frogs, cows and a nearby continuum were also noted.

5.1.18 N7, 21 June 2012, Night-time

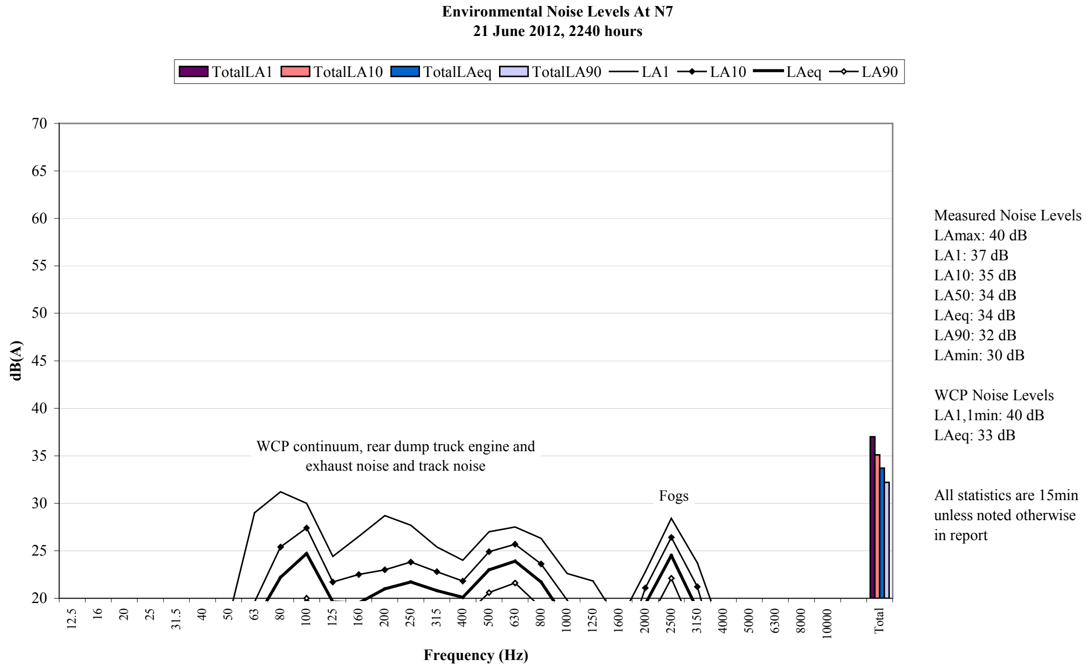


Figure 20 Environmental Noise Levels, N7 – Ulan Wollar Road (East)

A continuum, rear dump truck engine noise and track noise from WCP generated site only L_{Aeq} of 33 dB. Track noise generated the site only $L_{A1,1min}$ of 40 dB. Horns (four times) and impact noise (four times) were also noted.

Frog, cows and an aircraft were also noted.

5.1.19 N9, 21 June 2012, Night-time

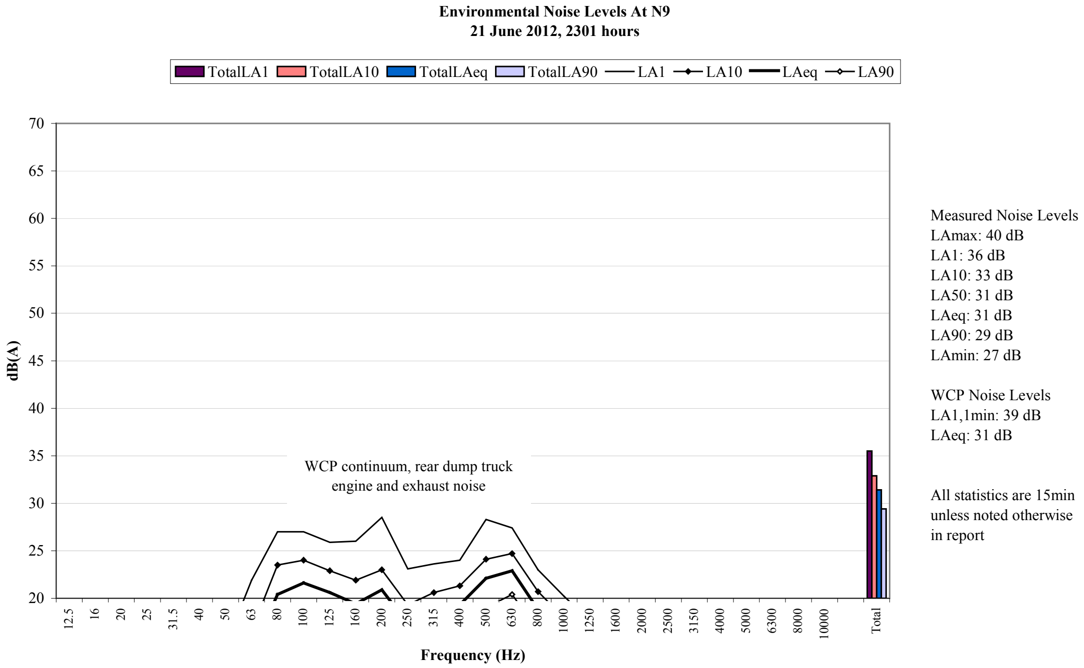


Figure 21 Environmental Noise Levels, N9 – Slate Gully Road

A continuum, rear dump truck engine and exhaust noise from WCP generated a site only L_{Aeq} of 31 dB. An impact noise generated the site only $L_{A1,\ 1min}$ of 39 dB. Horns were also noted.

Frogs and cows were also noted.

5.1.20 N12, 21 June 2012, Night-time

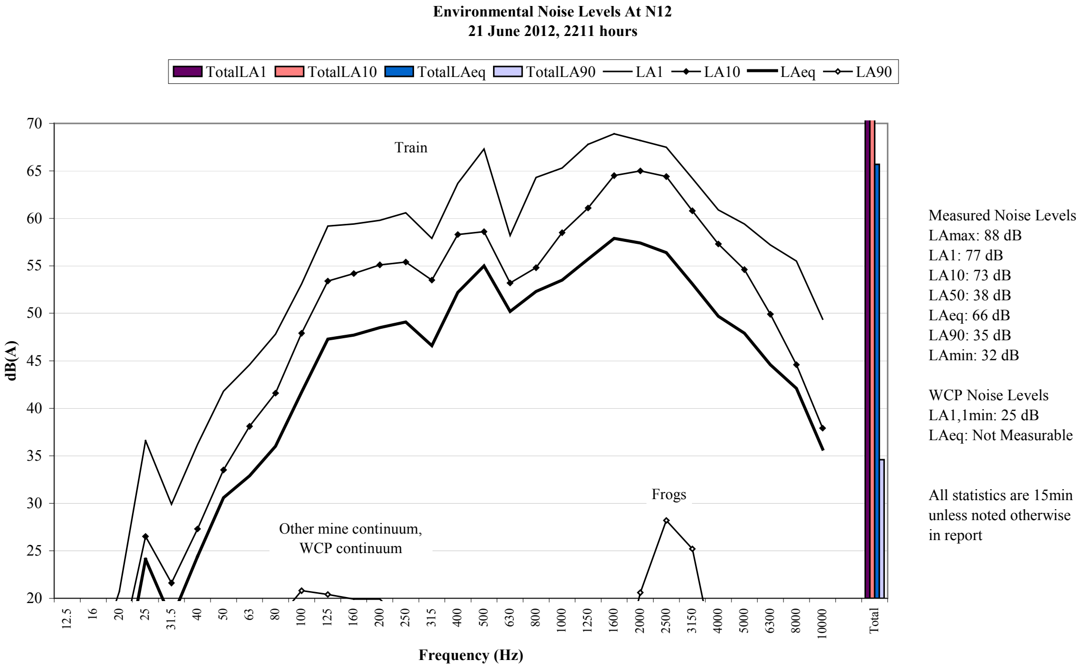


Figure 22 Environmental Noise Levels, N12 – Ulan Wollar Road (West)

A continuum from WCP was just perceptible in the beginning of the measurement. The site only L_{Aeq} was not measurable and the $L_{A1,1min}$ was 25 dB.

A train was responsible for most the measured L_{A1}, L_{A10} and L_{Aeq}. Frogs were primarily responsible for the measured L_{A90}. A continuum from another mine was also noted and was a minor contributor to the measured L_{A90}.

Road traffic tyre noise and a train horn were also noted.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the evening and nights of the 20 and 21 June 2012. Attended noise monitoring was conducted at five sites. The duration of all measurements was 15 minutes.

Wind speed and/or estimated temperature inversion conditions resulted in development consent criteria not always being applicable, as indicated in Table 4.2 and Table 4.3.

Wilpinjong Coal Project (WCP) complied with noise consent limits at the monitoring locations during the May / June 2012 monitoring period.

Global Acoustics Pty Ltd

APPENDIX

A. DEVELOPMENT CONSENT

Several documents specifying noise criteria apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Project Development Consent

Wilpinjong Coal Project was given approval on 1 February 2006. A modification to the consent was approved in August 2010.

The relevant noise conditions from Section 3 - Specific Environmental Conditions of the modified consent is reproduced below.

ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Proponent shall acquire the land in accordance with the procedures in conditions 6 – 7 of schedule 4.

Table 1: Land subject to acquisition upon request

30 – Gaffney	45 – Smith
48 – Evans	50 – Thompson & Hopper
94 – McKenzie	

Note:

- *To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.*

Noise Impact Assessment Criteria

2. Except for the land referred to in Table 1, the Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land, or on more than 25 per cent of any privately-owned land.

Table 2: Noise impact assessment criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{A1(1\ minute)}$
58 – Maher *52A – Long* *52B – Long* *53 – Reynolds*	35	39	39	45
23B – Bishop	35	39	37	45
25 – Pettit	35	39	36	45
31A – Conradt	35	37	37	45
31B – Conradt	35	36	36	45
100 – Rheinberger *125 – Roberts*	35	37	35	45
Wollar Village – Residential	36	35	35	45
All other privately owned land	35	35	35	45
901 – Wollar School		*35(internal)* *45 (external)* *When in use*		-
150A – St Luke's Anglican Church *900 – St Laurence O'Toole Catholic Church*		*40 (internal)* *When in use*		-
Goulburn River National Park/Munghorn Gap Nature Reserve		*50* *When in use*		-

However, the criteria in Table 2 do not apply if the Proponent has an agreement with the relevant owner/s to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:

- *To interpret the locations referred to in Table 2, see the applicable figures in Appendix 7.*
- *Noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.*
- *For the Goulburn River National Park/Munghorn Nature Reserve noise levels are to be assessed at the most affected point at the boundary of the Goulburn River National Park/Munghorn Nature Reserve.*

Noise Acquisition Criteria

3. If the noise generated by the project exceeds the criteria in Table 3 at any residence on privately-owned land or on more than 25 per cent of any privately-owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 6 – 7 of schedule 4.

Table 3: Land acquisition criteria dB(A)

Day/Evening/Night $L_{Aeq(15\ minute)}$	Land
40	All privately owned land, excluding the land listed in Table 1

Note:

- *Noise generated by the project is to be measured in accordance with the notes presented below Table 2. For the condition to apply, the exceedances must be systemic.*

Additional Noise Mitigation Measures

4. Upon receiving a written request from the owner of any residence:
   (a) on the land listed in Table 1; or
   (b) on the land listed 23B, 25, 52A, 52B, 53, or 58 in the applicable figures in Appendix 7; or
   (c) where subsequent noise monitoring shows that the noise generated by the project is greater than, or equal to, $L_{Aeq(15\ minute)}$ 38 dB(A),

   the Proponent shall implement reasonable and feasible noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the landowner.

   If within 3 months of receiving this request from the landowner, the Proponent and the landowner 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.

5. By 30 November 2010, or within 1 month of obtaining monitoring results showing an exceedance of the relevant criteria listed in condition 4(c) above, the Proponent shall notify all applicable owners that they are entitled to ask for additional noise mitigation measures to be installed at their residence.

Operating Conditions

6. The Proponent shall:
   (a) implement all reasonable and feasible noise mitigation measures;
   (b) ensure that the real-time noise monitoring and meteorological forecasting data are assessed regularly, and that operations on site are relocated, modified, and/or stopped to ensure compliance with the relevant criteria in conditions 2 to 4 of this schedule; and
   (c) regularly investigate ways to reduce the operational, low frequency, rail, and road traffic noise generated by the project; and report on these investigations in the annual review (see condition 2 of schedule 5),

   to the satisfaction of the Director-General.

Noise Management Plan

7. The Proponent shall prepare and implement a Noise Management Plan for the project, in consultation with DECCW, and to the satisfaction of the Director-General. This plan must:
   (a) describe the noise mitigation measures that would be implemented to ensure compliance with the relevant noise impact assessment criteria in this approval, including the proposed real-time noise management system and associated meteorological forecasting; and
   (b) include a noise monitoring program, that uses a combination of real-time and supplementary attended monitoring measures to evaluate the performance of the project, and includes a protocol for determining exceedances with the relevant conditions of this approval.

A.2 Environment Protection Licence

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in December 2011.

The relevant section reproduced below.

L5 Noise limits

L5.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The locations referred to in the table below are indicated by the property identification numbers on Figure 4A Relevant Land Ownership Plan Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment 17 May 2010. The property identification numbers are indicated on Figure 4B Relevant Land Ownership List Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment 17 May 2010.

Location	Day	Evening	Night	Night
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
25 Pettit - Lot 16 DP250053	35	39	36	45
52A Long - Lot 8 DP250053	35	39	39	45
52B Long - Lot 8 DP250053	35	39	39	45
51 Bailey - Lot 5, 6 & 7 DP250053	35	39	39	45
58 Maher	35	39	39	45
31A Conradt - Lot 10, 11 & 12 DP250053 & Lot 160 DP723767	35	37	37	45
31B Conradt - Lot 10, 11 & 12 DP250053 & Lot 160 DP723767	35	36	36	45
Wollar village	35	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
125 E & K Roberts	35	37	35	45

L5.2 For the purpose of condition L5.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L5.3 The noise limits set out in condition L5.1 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 3ºC/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
c) Temperature inversion conditions greater than 3ºC/100m.

L5.4 For the purpose of condition L5.3:
a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station identified as EPA identification Point 21 in condition P1.1; and
b) Temperature inversion conditions (vertical temperature gradient in degrees C) are to be determined by direct measurement over a minimum 50m height interval as referred to in Part E2 of Appendix E to the NSW Industrial Noise Policy.

L5.5 To determine compliance:
a) With the Leq(15 minute) noise limits in condition L5.1, 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 3 metres 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 Nature Reserve

b) With the LA1(1 minute) noise limits in condition L5.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.

c) With the noise limits in condition L5.1, 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 conditions L5.5(a) or L5.5(b).

L5.6 A non-compliance of condition L5.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:

a) at a location other than an area prescribed by conditions L5.5(a) and L5.5(b); and/or
b) at a point other than the most affected point at a location.

L5.7 For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

A.3 Noise Monitoring Programme

The noise monitoring program for WCP was revised in September 2011 and the relevant sections are reproduced below.

5 MONITORING AND INTERPRETATION

The noise monitoring programme comprises both attended and real-time monitoring (Sections 5.1 and 5.2, respectively). Integrated protocols for both monitoring methodologies are outlined in Sections 5.1.4 and 5.2.4, respectively. Meteorological monitoring will also be conducted as described in Section 5.3.

Attended monitoring will be used for demonstrating compliance with noise criteria (Section 3.3), whilst real-time monitoring will be used as a management tool to assist WCPL to take pre-emptive management actions to avoid potential non-compliances.

5.1 ATTENDED NOISE MONITORING

5.1.1 Purpose

The main aim of attended noise monitoring is to determine compliance with Project Approval and EPL noise criteria.

Results from the attended monitoring programme will be used to verify data collected from the real-time noise monitors. This will be undertaken where attended monitoring is conducted directly adjacent to real-time monitors. The attended monitoring data will also be used to determine whether there is a consistent relationship between real-time continuous noise levels and long-term attended monitoring data. For example if there is a consistent correlation between a real-time monitor and an attended monitoring site, then the real-time monitoring results could reasonably be used to predict noise levels at the attended site when attended monitoring is not being undertaken. This will be done annually to complement the regular maintenance and calibration of the real-time monitors.

5.1.2 Monitoring Locations

The attended noise monitoring programme will be conducted at sites adjacent to the Mine on non-Mine owned land to measure noise levels at nearby residences. Operational experience and investigations (Section 7.1) have shown that the Mine noise effects are experienced predominantly to the south and east of the Mine. Attended noise monitoring is presently concentrated in these areas, however this does not exclude monitoring to the west of the Mine.

Attended noise monitoring locations are shown on Figures 4. These locations provide good coverage in all directions from the Mine and are a combination of compliance sites and population centres. These locations include:

- N4 – W&V Langshaw dwelling 'Hillview';
- N6 – St Laurence O'Toole Catholic Church;
- N7 – Road reserve adjacent the Smith property;
- N9 – Maher dwelling; and
- N12 – Ulan Coal Mine Limited-owned dwelling.

5.1.3 Methodology

Attended noise monitoring will be carried out by an independent expert (i.e. not by mine staff) and will be conducted every 2 months. Monitoring will be conducted in accordance with Australian Standard (AS) 1055:1997 *Acoustics – Description and Measurement of Environmental Noise* and the INP (EPA, 2000). These operator-attended noise measurements will be conducted during normal operations to quantify the intrusive noise emissions from the Mine as well as the overall level of ambient noise.

Following the completion of the attended noise monitoring by the independent expert, the two monthly monitoring reports will be submitted to OEH and DP&I and will be made publically available on the Peabody website (Section 8.2).

Timing

Attended noise monitoring will be conducted for 15 minute periods day, evening and night. Day is defined as between 7am and 6pm, evening is described as being between 6pm and 10pm and night is between 10pm and 7am.

The monitoring will be carried out on two consecutive nights resulting in 2 x 15 minute samples for each location every two months. By sampling two consecutive nights, it is likely that different meteorological conditions are sampled for each site, providing more useful information.

Particular attention will be given to monitoring between 7pm and 2am (i.e. evening/night-time periods). Experience has shown that it is during these periods that noise can be at its most intrusive and results in more complaints. This is due to the very low background noise levels experienced during these periods and the presence of temperature inversions that are a relatively common phenomenon in this area, particularly during winter months.

Measurement

Acoustic instrumentation used in attended monitoring will comply with AS 1259.2:1990 *Sound Level Meters*.

The intrusive noise level (L_{Amax}, L_{A1}, L_{A10} and L_{Aeq}) contribution from mine operation activities will be quantified over a 15 minute measurement period. In addition, the overall levels of ambient noise (i.e. L_{Amax}, L_{A1}, L_{A10}, L_{A50}, L_{A90}, L_{Amin} and L_{Aeq}) over the 15 minute period will be quantified and characterised.

A measurement of $L_{A1(1\ minute)}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from the Mine during the entire measurement period (i.e. the highest level of the maximum minute during the 15 minute measurement).

The L_{A1} measurement should be undertaken at 1 m from the dwelling façade and the L_{Aeq} measurement within 30 m of the dwelling. However, the direct measurement of noise at 1 m from the façade is not always practical. In most cases monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In these cases measurements are undertaken at a suitable and representative location as close to the dwelling as practicable. Modifying factors from section 4 of the INP are used where applicable. Tonality and low frequency are assessed by analysis of the measured L_{Aeq} spectrum.

Recording

An example of an attended monitoring recording sheet is provided in Attachment 5. During attended monitoring, the following information will be recorded:

- operator's name;
- locations of attended and unattended noise instruments;
- recording intervals;
- meteorological conditions (i.e. temperature, humidity, cloud cover, and wind speed and direction);
- statistical noise level descriptors together with notes identifying the principle noise sources; and
- instrument calibration details.

The meteorological conditions listed above will be recorded local to the noise measurement as well as on-site at the Mine Automatic Weather Station (AWS) (Section 5.3). Prevailing weather conditions determined from the AWS (in the first instance) to be outside of the meteorological constraints stipulated in the Project Approval will be excluded from further analysis.

Additional information (such as general mobile and fixed plant locations) will be collected at the time of (or soon after) monitoring to enable correlation between Mine noise, meteorological conditions, general plant locations, plant operating conditions and topography.

5.1.4 Compliance Assessment

As discussed in Section 5.1.1, the results of attended noise monitoring will be compared against the relevant noise criteria set out in Section 3.3 of this NMP. The comparison will be undertaken following the exclusion of data using meteorological conditions described as part of Table 2 as well as observations of non-Mine noise by the person undertaking the attended noise monitoring programme.

In the event of an exceedance of the noise criteria, an assessment will be conducted to determine:

- Timing of the exceedance.
- Location of the exceedance.
- Exclusion of non-mine related noise and noise from non-WCPL mining activities (e.g. can the exceedance be attributed directly to the Mine). This will include consideration of:
  - the methods and type of equipment being used by WCPL at the time of the exceedance and proximity to the locations at which the exceedance was recorded; and
  - the location of non-WCPL mining activities or agricultural activities and proximity to the locations at which the exceedance was recorded.
- Meteorological conditions at the time of the exceedance – including confirmation that meteorological conditions are in accordance with Condition 2, Schedule 3 of the Project Approval.

If the above assessment determines that an exceedance is due to Mine noise then management strategies detailed in Sections 6 and 7 to help prevent recurrence will be implemented in an effort to reduce noise levels below those set out in Table 2.

Exceedances of criteria will be determined in consideration of Table 2 of the Project Approval (e.g. the meteorological conditions under which they apply) and the INP. Section 11.1.3 of the INP states the following in relation to when a development is in non-compliance with a noise condition:

> *A development will be deemed to be in non-compliance with a noise consent or licence condition if the monitored noise level is more than 2 dB above the statutory noise limit specified in the consent or licence condition. This may occur for two reasons:*
>
> - *The noise from the development is excessive, in which case the development is truly not complying with its consent or licence condition.*
> - *The noise was increased by extreme, nonstandard weather effects—in which case the development is not considered to be in noncompliance with its consent or licence condition. Non-standard weather effects can be considered to be present during monitoring if the cloud cover is less than 40 per cent and the wind speed (at 10 m height) is less than 1.0 m/s (represents an extremely adverse weather condition for noise)—during the period from 6 pm to 7 am in non-arid areas (see Section 9.2).*
>
> *In this latter case, further monitoring at a later date is required to determine compliance under the meteorological conditions specified in the consent/licence condition.*

For the purposes of the NMP, the monitored noise level is the attended noise monitoring results at the locations listed in Section 5.1.2.

In accordance with Condition 7, Schedule 5 of the Project Approval, The Proponent shall notify the Director-General and any other relevant agencies of any incident associated with the project 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.

In accordance with Condition 2, Schedule 4 of the Project Approval, the proponent shall notify the Director-General, the affected landowners and tenants (including tenants of mine-owned properties) accordingly, and provide monitoring results to each of these parties until the results show that the project is complying with the criteria in schedule 3.

B. CALIBRATION CERTIFICATES

Acoustic Research Laboratories
Proprietary Limited A.B.N. 47 050 100 804
Noise and Vibration Monitoring Instrumentation for Industry and the Environment

Sound Level Meter Test Report

Report Number : C11193

Date of Test :	27/04/2011
Report Issue Date :	12/05/2011
Equipment Tested/ Model Number:	**Rion NA-28 Sound Level Meter**
Instrument Serial Number:	00701424
Microphone Serial Number:	01916
Preamplifier Serial Number:	01463
Client Name :	Global Acoustics Pty Ltd
	12/16 Huntingdale Drive
	Thornton NSW 2322
Contact Name :	Tony Welbourne
Tested by :	Aaron Skeates-Udy
Approved Signatory :	
Date :	**12 May 2011**

NATA
WORLD RECOGNISED ACCREDITATION

Acoustic Research Laboratories Pty Ltd is NATA Accredited Laboratory Number 14172

This document is issued in accordance with NATA's accreditation requirements.

Accredited for compliance with ISO/IEC 17025

This document shall not be reproduced except in full.

Level 7 ♦ Building 2 ♦ 423 Pennant Hills Rd ♦ Pennant Hills ♦ NSW 2120 ♦ AUSTRALIA
Telephone +61 2 9484 0800 ♦ Facsimile +61 2 9484 0884
www.acousticresearch.com.au

Acoustic Research Laboratories
Proprietary Limited A.B.N. 47 050 100 804
Noise and Vibration Monitoring Instrumentation for Industry and the Environment

Acoustic Calibrator Test Report

Report Number : C12464

Date of Test : 25/07/2012

Report Issue Date : 26/07/2012

Equipment Tested: **Acoustic Calibrator**

Model Number: Larson Davis CAL150

Serial Number: 3333

Client Name : Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Contact Name : Jodi Higginbottom

Tested by : Brianna Sparre

Approved Signatory :

Ken Williams

Date : **26th July 2012**

NATA
WORLD RECOGNISED ACCREDITATION

Acoustic Research Laboratories Pty Ltd is NATA Accredited Laboratory Number. 14172.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Accredited for compliance with ISO/IEC 17025

This document shall not be reproduced except in full

Level 7 ♦ Building 2 ♦ 423 Pennant Hills Rd ♦ Pennant Hills ♦ NSW 2120 ♦ AUSTRALIA
Telephone +61 2 9484 0800 ♦ Facsimile +61 2 9484 0884
www.acousticresearch.com.au

Wilpinjong Coal

July / August 2012

Environmental Noise Monitoring

Prepared for

ALS Environmental Division

Global Acoustics

Noise and Vibration Analysis and Solutions

Global Acoustics Pty Ltd
PO Box 3115 | Thornton NSW 2322
Telephone +61 2 4966 4333 | Facsimile +61 2 4966 4330
Email global@globalacoustics.com.au
ABN 94 094 985 734

Wilpinjong Coal

July / August 2012
Environmental Noise Monitoring

Reference: 12409_R02.doc

Report date: 24 September 2012

Prepared for

ALS Environmental Division
PO Box 1034
Mudgee NSW 2850

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322

Prepared:	Amanda Borserio Environmental Scientist	QA Review:	Katie Weekes Environmental Scientist

Global Acoustics Pty Ltd ~ Environmental noise modeling and impact assessment ~ Sound power testing ~ Noise control advice ~ Noise and vibration monitoring ~ OHS noise monitoring and advice ~ Expert evidence in Land and Environment and Compensation Courts ~ Architectural acoustics ~ Blasting assessments and monitoring ~ Noise management plans (NMP) ~ Sound level meter and noise logger sales and hire

EXECUTIVE SUMMARY

Global Acoustics was engaged by ALS Environmental Division to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine operated by Wilpinjong Coal. WCP was given approval on 1 February 2006. A modification to the consent was approved in August 2010.

An environment protection licence (EPL) was issued in early 2006 with subsequent variations approved. A revised noise-monitoring program (NMP) for WCP was approved in September 2011.

Attended monitoring was conducted in accordance with the documents detailed above, the NSW Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. The duration of each evening and night measurement was 15 minutes. Results of two-monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at five locations on 20 and 21 August 2012. The survey purpose is to quantify and describe the acoustic environment around the site and compare results with specified limits.

WCP complied with relevant noise limits at the monitoring locations during the July / August 2012 monitoring period. Wind speed and/or estimated temperature inversion conditions resulted in development consent criteria not always being applicable, as indicated in Table 4.2 and Table 4.3.

Table of Contents

Appendices

1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by ALS Environmental Division to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine operated by Wilpinjong Coal.

Environmental noise monitoring described in this report was undertaken at five locations on 20 and 21 August 2012. Figure 1 shows the regular monitoring locations.

The purpose of the survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were five regular monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the Noise Monitoring Program (NMP).

Table 1.1 NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location	Owner
N4	'Hillview' Cumbo Road, Wollar	Wilpinjong Coal Mine
N6	St Laurence O'Toole Catholic Church, representative of Wollar - Residential	NA
N7	Ulan-Wollar Road (East)	Smith
N9	Slate Gully Road, Wollar	Wilpinjong Coal Mine
N12	Ulan-Wollar Road (West)	Ulan Coal Mines

Figure 1 **Monitoring Sites**

1.3 Terminology

Some definitions of terminology, which may be used in this report, are provided in Table 1.2.

Table 1.2 TERMINOLOGY

Descriptor	Definition
L_A	The A-weighted root mean squared (RMS) noise level at any instant
L_{Amax}	The maximum A-weighted noise level over a time period or for an event
L_{A1}	The noise level which is exceeded for 1 per cent of the time
L_{A10}	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L_{A50}	The noise level which is exceeded for 50 per cent of the time
L_{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes
L_{Amin}	The minimum A-weighted noise level over a time period or for an event
L_{Aeq}	The average noise energy during a measurement period
$L_{A1,1minute}$	The highest noise level generated for 0.6 second during one minute
L_{pk}	The unweighted peak noise level at any instant
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
SEL	Sound exposure level (SEL), the A-weighted noise energy during a measurement period normalised to one second
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
ABL	Assessment background level (ABL), the 10th percentile background noise level for a single period (day, evening or night) of a 24 hour monitoring period
RBL	Rating background level (RBL), the background noise level for a period (day, evening or night) determined from ABL data

2 CONSENTS AND CRITERIA

2.1 Development Consent

WCP was given approval on 1 February 2006. A modification to the consent was approved in August 2010. The relevant noise conditions from Section 3 - Specific Environmental Conditions of the consent are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in December 2011.

Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise-monitoring program for WCP was revised in September 2011. Section 5.1 details attended monitoring locations and methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Specific Criteria

Day, evening and night criteria are detailed in Table 2.1. These have been selected as the most appropriate for each monitoring location and are based on the consolidated consent or environment protection licence associated with Wilpinjong Coal Project operations.

Table 2.1 WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident number[1]	Monitoring Location	Day $L_{Aeq(15\ minute)}$	Evening $L_{Aeq(15\ minute)}$	Night $L_{Aeq(15\ minute)}$/ $L_{A1(1\ minute)}$
N4	'Hillview' Cumbo Road, Wollar[4]	NA	NA	NA/NA
N6 / Wollar	Catholic Church representative of Wollar – Residential	35[2]	35[2]	35[2]/45[2]
N7 / 45	Ulan-Wollar Road (East)	35[2]	40[2]	47[2]/45[2]
N9 / 58	Slate Gully Road, Wollar[4]	NA	NA	NA/NA
N12 / All	Ulan-Wollar Road (West)[3]	NA	NA	NA/NA

Notes:
1. *"Äll" indicates location is not mentioned specifically in Section 2 of the 2010 Modification and therefore has criteria applied to "all other privately owned land";*
2. *Limits from Environment Protection Licence No. 12425 and 2010 Modification;*
3. *Property is designated as a non-WPL mining interest in the 2010 Modification, so criteria are NA, 'not applicable'; and*
4. *These properties are owned by WCP, so criteria are NA, 'not applicable'.*

Condition L5.3 in the EPL states:

The noise limits set out in condition 5.1 apply under all meteorological conditions except for the following:

a) Wind speeds greater than 3 metres per second at 10 metres above ground level; or

b) Temperature inversion conditions of up to 3°C per 100 metres and wind speeds greater than 2 metres per second at 10 metres above the ground level; or

c) Temperature inversion conditions greater than 3°C per 100 metres.

2.5 Acquisition Criteria

As detailed in condition 3 of Schedule 3 of the consent, acquisition criteria for WCP are to consider noise in respect to the criteria detailed in Table 2.2 for all privately owned land (excluding land owned by Gaffney – 30, Smith – 45, Evans – 48, Thomson & Hopper - 50 and McKenzie – 94).

Table 2.2 WILPINJONG COAL ACQUISITION CRITERIA, dB

Property	L_{Aeq} (15 minute)
All privately owned land	40

2.6 Additional Mitigation Criteria

As detailed in condition 4 of Schedule 3 of the consent, additional mitigation criteria for WCP are to consider noise in respect to the criteria detailed in Table 2.3 for most privately owned land.

Table 2.3 WILPINJONG COAL ADDITIONAL MITIGATION CRITERIA, dB

Property	L_{Aeq} (15 minute)
All other privately owned land, excluding those listed below	38

Land listed in Table 1 of the consent, or property numbers 23B, 25, 52A, 52B, 53 or 58 will receive mitigation upon request.

2.7 INP Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). Chapter 4 of the INP deals specifically with modifying factors that may apply to industrial noise. The most common modifying factors are addressed in detail below.

2.7.1 Tonality, Intermittent and Impulsive Noise

As defined in the Industrial Noise Policy:

> *Tonal noise contains a prominent frequency and is characterised by a definite pitch.*
>
> *Impulsive noise has high peaks of short duration or a sequence of such peaks.*
>
> *Intermittent noise is characterised by the level suddenly dropping to the background noise levels several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only.*

Years of monitoring have indicated that noise levels from mining operations, particularly those levels measured at significant distances from the source are relatively continuous. Given this, noise levels at the monitoring locations are unlikely to be intermittent. In addition, there is no equipment on site that is likely to generate tonal or impulsive noise as defined in the INP.

2.7.2 Low Frequency Noise

As defined in the Industrial Noise Policy:

> *Low frequency noise contains major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum.*

As detailed in Chapter 4 of the INP, low frequency noise should be assessed by measuring the C-weighted and A-weighted level over the same time period. The correction/penalty of 5 dB is to applied *if the difference between the two levels is 15 dB or more*.

Low frequency noise can also be assessed against criteria specified in the paper "A Simple Method for Low Frequency Noise Emission Assessment "(Broner JLFNV Vol29-1 pp1-14 2010). If the total predicted C – weighted noise level at a receptor exceeds the relevant criterion, a 5 dB penalty (modifying factor) is added to predicted levels.

2.8 Low Frequency Criteria

Low frequency criteria are detailed in Table 2.4.

Table 2.4 $L_{Ceq,15minute}$ CRITERIA (dBC)

Method	Calculation Method	Night-time Criterion	Daytime Criterion
Broner, 2010	L_{Ceq} to 250 Hz	60	65
INP, total	Total L_{Ceq} minus L_{Aeq}	15	15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a practice note is not yet available, low frequency noise results from WCP have been compared to both criteria presented above.

3 METHODOLOGY

3.1 Assessment Method

Attended monitoring was conducted in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken. The duration of each evening and night measurement was 15 minutes.

The terms "Inaudible" (IA), "Not measurable" (NM) or "Less than 20 dB" (<20 dB) are used in this report. When site noise is noted as IA then there was no site noise at the monitoring location.

However, if site noise is noted as NM or <20 dB, this means some noise was audible but could not be quantified. This means that noise from the site was either very low, or, being masked by other noise that was relatively loud. In the former case (very low site levels) we consider it not necessary to attempt to accurately quantify site noise as it would be significantly less than any criterion and most unlikely to cause annoyance (and in many cases, to be even noticed).

If site noise were NM or <20 dB due to masking then we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting if deemed necessary. All sites NM or <20 dB in this report are due to low absolute values.

A measurement of $L_{A1,1minute}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from the Wilpinjong Coal Project (WCP) noise source during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

As indicated in L5.5 (a) and (b) of the EPL, the $L_{A1,1minute}$ measurement should be undertaken at one (1) metre from the dwelling façade and the L_{Aeq} measurement within 30 metres of the dwelling. However, the direct measurement of noise at 1 metre from the façade is not practical during monitoring for this project. In most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements for this survey were undertaken at a suitable and representative location.

As indicated in L5.7 of the EPL, modifying factors from Section 4 of the INP should be implemented where applicable. Low frequency from WCP was assessed by analysis of the measured L_{Aeq} spectrum.

3.2 Attended Monitoring

The equipment used to measure environmental noise levels are listed in Table 3.1. Calibration certificates are included as Appendix B.

Table 3.1 MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	01070590	09/11/2013
Pulsar 106 acoustic calibrator	57413	21/09/2013

4 RESULTS

4.1 Attended Noise Monitoring

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. Table 4.2 and Table 4.3 detail $L_{Aeq\ (15\ minute)}$ and $L_{A1\ (1\ minute)}$ noise levels from WCP in the absence of other noise sources with impact assessment criteria. Criteria are then applied if weather conditions are in accordance with the mine's development consent. There were no modifying factors applicable to measured noise levels during this survey.

Discussion as to the noise sources responsible for these measured levels is provided in Chapter 5 of this report.

Table 4.1 MEASURED NOISE LEVELS – JULY / AUGUST 2012

Location	Date And Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB	L_{Aeq} dB
	Evening							
N4	20/08/2012 21:41	42	37	35	30	28	24	32
N6	20/08/2012 21:15	41	36	35	31	30	28	32
N7	20/08/2012 20:28	43	41	40	39	38	36	39
N9	20/08/2012 20:51	38	33	32	30	28	26	30
N12	20/08/2012 19:55	65	61	44	42	41	39	47
	Night-Time							
N4	20/08/2012 22:02	46	39	33	28	26	24	30
N6	20/08/2012 22:28	41	31	29	28	27	26	28
N7	20/08/2012 23:15	47	41	39	36	34	32	36
N9	20/08/2012 22:51	40	39	36	34	32	29	34
N12	20/08/2012 23:46	53	40	38	37	36	35	37
	Evening							
N4	21/08/2012 21:36	48	42	39	38	36	34	38
N6	21/08/2012 21:06	61	53	49	37	31	30	45
N7	21/08/2012 20:18	52	40	39	37	36	33	38
N9	21/08/2012 20:43	40	37	35	32	29	25	33
N12	21/08/2012 19:47	50	44	44	42	41	39	42
	Night-Time							
N4	21/08/2012 22:02	48	43	41	40	38	36	40
N6	21/08/2012 22:25	50	44	38	34	32	31	36
N7	21/08/2012 23:18	42	40	38	37	36	34	37
N9	21/08/2012 22:50	46	39	37	35	33	30	35
N12	21/08/2012 23:48	44	40	39	38	37	36	38

Note: Noise levels in this table are not necessarily the result of activities at WCP.

Table 4.2 $L_{Aeq\ (15\ minute)}$ dB GENERATED BY WCP AGAINST IMPACT ASSESSMENT CRITERIA – JULY / AUGUST 2012

Location	Date And Time	Wind Speed m/s [8]	VTG °C per 100m [6,8]	Criterion dB [,7]	Criterion Applies?[1,5]	WCP L_{Aeq} (15min) dB [2,3]	Exceedance[4,5,7]
	Evening						
N4	20/08/2012 21:41	0.1	5.2	NA	N	24	NA
N6	20/08/2012 21:15	0.3	3.8	35	N	<20	NA
N7	20/08/2012 20:28	0.6	3.4	40	N	36	NA
N9	20/08/2012 20:51	0.1	3.8	NA	N	30	NA
N12	20/08/2012 19:55	0.1	4.3	NA	N	33	NA
	Night-Time						
N4	20/08/2012 22:02	0.1	5.2	NA	N	21	NA
N6	20/08/2012 22:28	0.0	3.6	35	N	20	NA
N7	20/08/2012 23:15	0.2	4.1	47	N	35	NA
N9	20/08/2012 22:51	0.0	3.6	NA	N	33	NA
N12	20/08/2012 23:46	0.3	4.5	NA	N	33	NA
	Evening						
N4	21/08/2012 21:36	0.0	6.9	NA	N	37	NA
N6	21/08/2012 21:06	0.2	8.3	35	N	<25	NA
N7	21/08/2012 20:18	0.2	8.6	40	N	30	NA
N9	21/08/2012 20:43	0.2	8.8	NA	N	32	NA
N12	21/08/2012 19:47	0.6	6.2	NA	N	31	NA
	Night-Time						
N4	21/08/2012 22:02	0.0	5.7	NA	N	39	NA
N6	21/08/2012 22:25	0.0	4.3	35	N	26	NA
N7	21/08/2012 23:18	0.0	5.0	47	N	35	NA
N9	21/08/2012 22:50	0.0	4.3	NA	N	35	NA
N12	21/08/2012 23:48	0.0	4.1	NA	N	<30	NA

Notes:

1. *Noise emission limits apply for winds up to 3 metres per second (at a height of 10 metres, or, vertical temperature gradients of up to 3 degrees/100m with wind speed up to 2 m/s;*
2. *These are results for WCP in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;*
7. *NA in criterion column means the criteria are not applicable at this location, NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified; and*
8. *Atmospheric data is sourced from the WCP weather station.*

Table 4.3 $L_{A1\ (1\ minute)}$ dB GENRATED BY WCP AGAINST IMPACT ASSESSMENT CRITERIA – JULY / AUGUST 2012

Location	Date And Time	Wind Speed m/s [8]	VTG °C per 100m [6,8]	Criterion dB [,7]	Criterion Applies?[1,5]	WCP L_{A1} (1 min) dB [2,3]	Exceedance[4,5,7]
	Night-Time						
N4	20/08/2012 22:02	0.1	5.2	NA	N	25	NA
N6	20/08/2012 22:28	0.0	3.6	45	N	30	NA
N7	20/08/2012 23:15	0.2	4.1	45	N	45	NA
N9	20/08/2012 22:51	0.0	3.6	NA	N	40	NA
N12	20/08/2012 23:46	0.3	4.5	NA	N	39	NA
	Night-Time						
N4	21/08/2012 22:02	0.0	5.7	NA	N	48	NA
N6	21/08/2012 22:25	0.0	4.3	45	N	30	NA
N7	21/08/2012 23:18	0.0	5.0	45	N	42	NA
N9	21/08/2012 22:50	0.0	4.3	NA	N	41	NA
N12	21/08/2012 23:48	0.0	4.1	NA	N	32	NA

Notes:
1. *Noise emission limits apply for winds up to 3 metres per second (at a height of 10 metres, and, vertical temperature gradients of up to 3 degrees/100m with wind speed up to 2 m/s;*
2. *These are results for WCP in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;*
7. *NA in criterion column means the criteria are not applicable at this location, NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified; and*
8. *Atmospheric data is sourced from the WCP weather station.*

Where WCP only noise levels are within the impact assessment criteria, it is not necessary to compare these noise levels to acquisition or mitigation criteria as these levels are higher. Compliance with impact assessment indicates compliance with acquisition or mitigation criteria.

4.2 Low Frequency Assessment

Table 4.4 provides statistics for attended noise monitoring undertaken around WCP during July and August 2012 monitoring. None of the 20 measurements occurred during which WCP was directly measurable (not "inaudible", "not measurable" or less than a maximum cut-off value "<30 dB") and where meteorological conditions resulted in criteria applying (in accordance with the consent).

Table 4.4 ATTENDED MEASUREMENT STATISTICS FOR WCP – JULY / AUGUST 2012

	July / August 2012
No. of measurements	20
Measurements where met applies	0
WCP is measurable and criteria and met applies	0

As there are no identified low frequency exceedences as detailed in Table 4.4, no further action is required.

4.3 Atmospheric Conditions

Atmospheric condition data measured at each location are shown in Table 4.5. Data obtained concurrently by the WCP meteorological station is provided in Table 4.6.

Table 4.5 MEASURED ATMOSPHERIC CONDITIONS

Location	Date And Time	Temperature (° C)	Wind Speed (m/s)	Wind Direction (° MN)	Cloud Cover (eighths)
	Evening				
N4	20/08/2012 21:41	6	0.0	-	0
N6	20/08/2012 21:15	6	0.0	-	0
N7	20/08/2012 20:28	6	0.0	-	0
N9	20/08/2012 20:51	7	0.0	-	0
N12	20/08/2012 19:55	7	0.5	200	0
	Night-Time				
N4	20/08/2012 22:02	6	0.0	-	0
N6	20/08/2012 22:28	7	0.0	-	0
N7	20/08/2012 23:15	3	0.0	-	0
N9	20/08/2012 22:51	3	0.0	-	0
N12	20/08/2012 23:46	5	0.3	200	0
	Evening				
N4	21/08/2012 21:36	9	0.5	240	0
N6	21/08/2012 21:06	8	0.5	220	0
N7	21/08/2012 20:18	9	0.5	140	0
N9	21/08/2012 20:43	11	0.1	80	0
N12	21/08/2012 19:47	13	0.1	250	0
	Night-Time				
N4	21/08/2012 22:02	7	0.3	240	0
N6	21/08/2012 22:25	7	0.0	-	0
N7	21/08/2012 23:18	6	0.0	-	0
N9	21/08/2012 22:50	7	0.0	-	0
N12	21/08/2012 23:48	7	0.0	-	0

Notes: 1. Wind speed and direction measured at 1.8 metres.

Table 4.6 WCP METEOROLOGICAL STATION DATA

Date and Time	Wind Speed (m/s)	Wind Direction (Degrees)	Lapse Rate (Degrees / 100 metres)
20/08/2012 19:30	0.1	347	4.0.
20/08/2012 19:45	0.1	19	4.7
20/08/2012 20:00	0.2	350	4.0
20/08/2012 20:15	0.1	114	4.3
20/08/2012 20:30	0.6	350	3.4
20/08/2012 20:45	0.2	351	3.3
20/08/2012 21:00	0.1	1	3.8
20/08/2012 21:15	0.3	319	3.8
20/08/2012 21:30	0.6	307	3.8
20/08/2012 21:45	0.7	329	4.3
20/08/2012 22:00	0.1	157	5.2
20/08/2012 22:15	0.1	208	4.7
20/08/2012 22:30	0.0	219	3.4
20/08/2012 22:45	0.0	-99	3.6
20/08/2012 23:00	0.3	136	3.8
20/08/2012 23:15	0.6	2	4.0
20/08/2012 23:30	0.2	318	4.1
20/08/2012 23:45	0.0	125	4.1
21/08/2012 00:00	0.3	21	4.5
21/08/2012 00:15	0.2	11	3.8
21/08/2012 00:30	0.0	-99	2.9
21/08/2012 19:30	0.3	354	5.2
21/08/2012 19:45	0.6	1	6.2
21/08/2012 20:00	0.4	20	6.2
21/08/2012 20:15	0.0	-99	6.9
21/08/2012 20:30	0.2	313	8.6
21/08/2012 20:45	0.6	353	9.0
21/08/2012 21:00	0.2	338	8.8
21/08/2012 21:15	0.2	343	8.3
21/08/2012 21:30	0.1	330	7.2
21/08/2012 21:45	0.0	-99	6.9
21/08/2012 22:00	0.0	290	5.7
21/08/2012 22:15	0.5	20	4.7
21/08/2012 22:30	0.0	-99	4.7
21/08/2012 22:45	0.0	-99	4.3
21/08/2012 23:00	0.0	-99	5.3

Table 4.6 WCP METEOROLOGICAL STATION DATA

Date and Time	Wind Speed (m/s)	Wind Direction (Degrees)	Lapse Rate (Degrees / 100 metres)
21/08/2012 23:15	0.0	-99	5.2
21/08/2012 23:30	0.0	-99	5.0
21/08/2012 23:45	0.0	-99	4.3
22/08/2012 00:00	0.0	-99	4.1
22/08/2012 00:15	0.1	11	4.3
22/08/2012 00:30	0.1	328	3.8

Notes: 1. Data supplied by WCP.

5 DISCUSSION

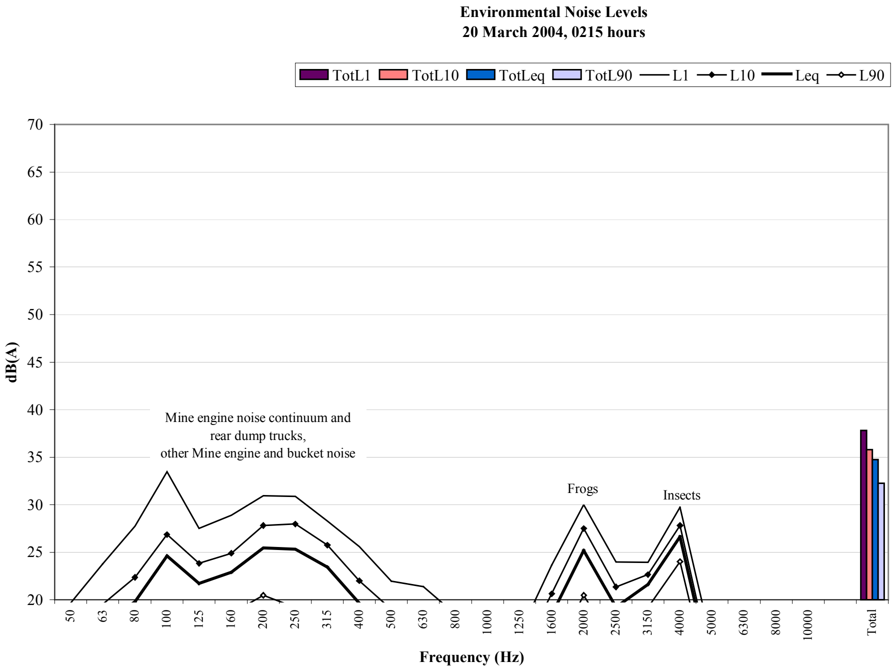
5.1 Noted Noise Sources

Table 4.1 and Table 4.2 present data gathered during attended monitoring. These noise levels are the result of many sounds reaching the sound level meter microphone during monitoring. Received levels from various noise sources were noted during attended monitoring and particular attention was paid to the extent of WCP's contribution, if any, to measured levels. At each receptor location, WCP's $L_{Aeq,15 \text{ minute}}$ and $L_{A1,1 \text{ minute}}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis.

From these observations summaries have been derived for each location. The following chapter sections provide these summaries. Statistical 1/3 octave band analysis of environmental noise was undertaken, and Figures 3 to 22 display the frequency ranges for various noise sources at each location for L_{A1}, L_{A10}, L_{A90}, and L_{Aeq}. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 2 where it can be seen that frogs and insects are generating noise at frequencies above 1000 Hz; mining noise is at frequencies less than 1000 Hz (this is typical). Adding levels at frequencies that relate to mining only allows separate statistical results to be calculated. This analysis cannot always be performed if there are significant levels of other noise at the same frequencies as mining; this can be dogs, cows, or, most commonly, road traffic.

It should be noted that the method of summing statistical values up to a cutoff frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq}.



Measured Noise Levels
LA1 38 dB
LA10 36 dB
LAeq 35 dB
LA90 32 dB

Site Only Noise Levels
LA1,1min 41 dB
LAeq 33 dB

All statistics are 15min unless noted otherwise

Figure 2 Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N4, 20 August 2012, Evening

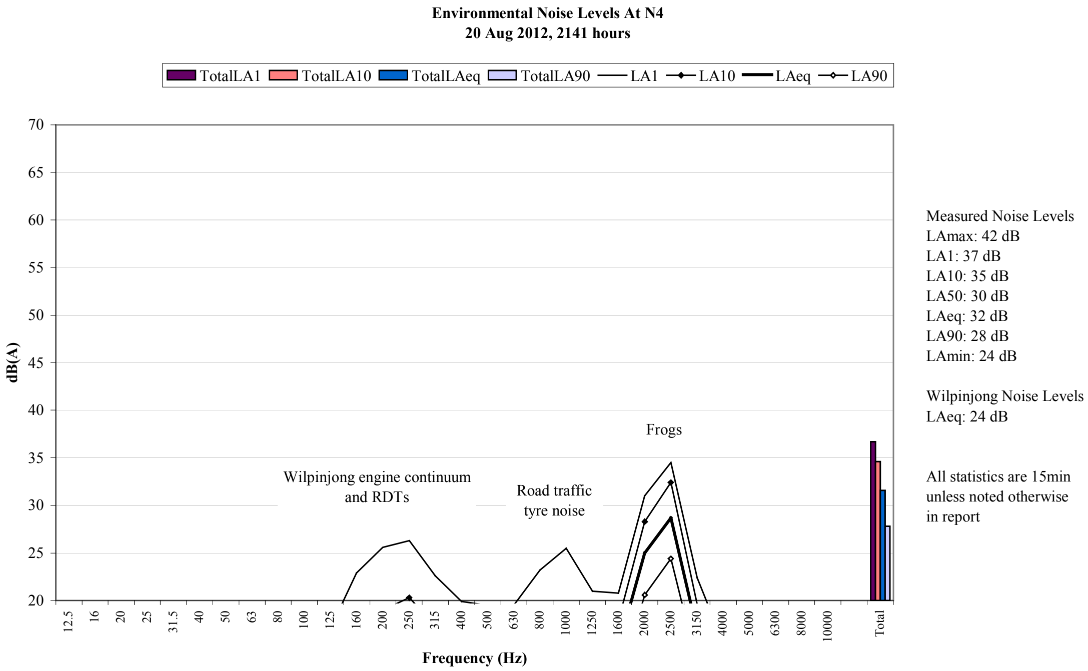


Figure 3 Environmental Noise Levels, N4 – Cumbo Road

WCP was audible as engine continuum and rear dump trucks during the measurement. These sources resulted in a WCP only L_{Aeq} of 24 dB.

Frogs were responsible for measured levels.

Road traffic noise and a train horn were also noted.

5.1.2 N6, 20 August 2012, Evening

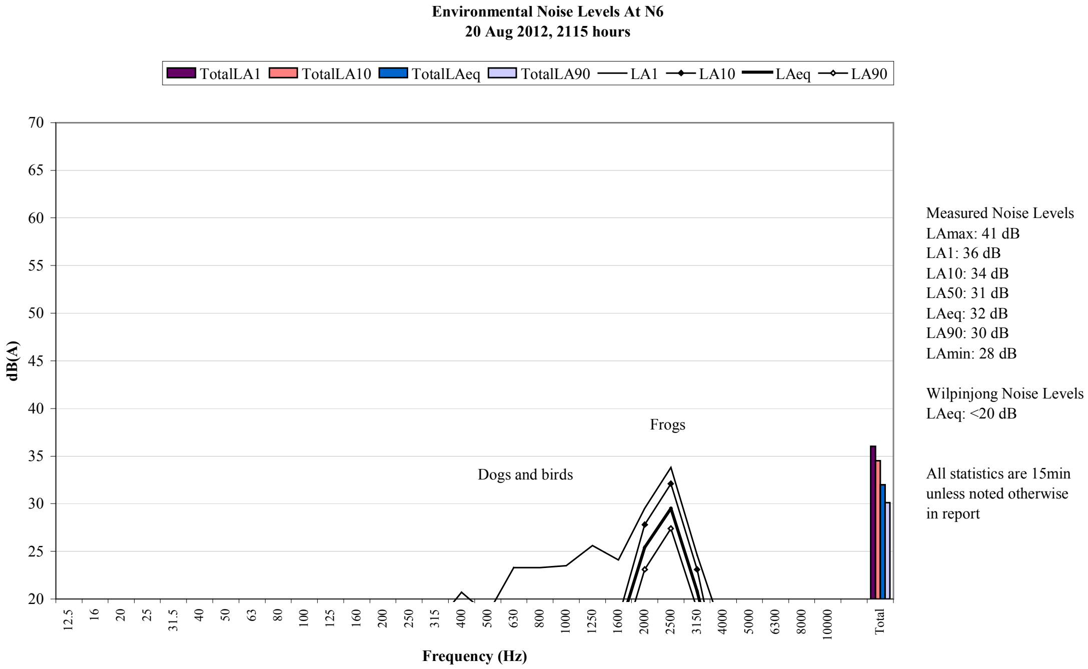


Figure 4 Environmental Noise Levels, N6 – Wollar Church

WCP was audible as engine continuum and rear dump trucks throughout most of the measurement. Impact noise and track noise were also noted. These sources combined to generate the WCP only L_{Aeq} of <20 dB.

Frogs were responsible for all measured levels.

Dogs, birds, bats, distant road traffic tyre noise and an air conditioner continuum from a residence in Wollar were also noted.

5.1.3 N7, 20 August 2012, Evening

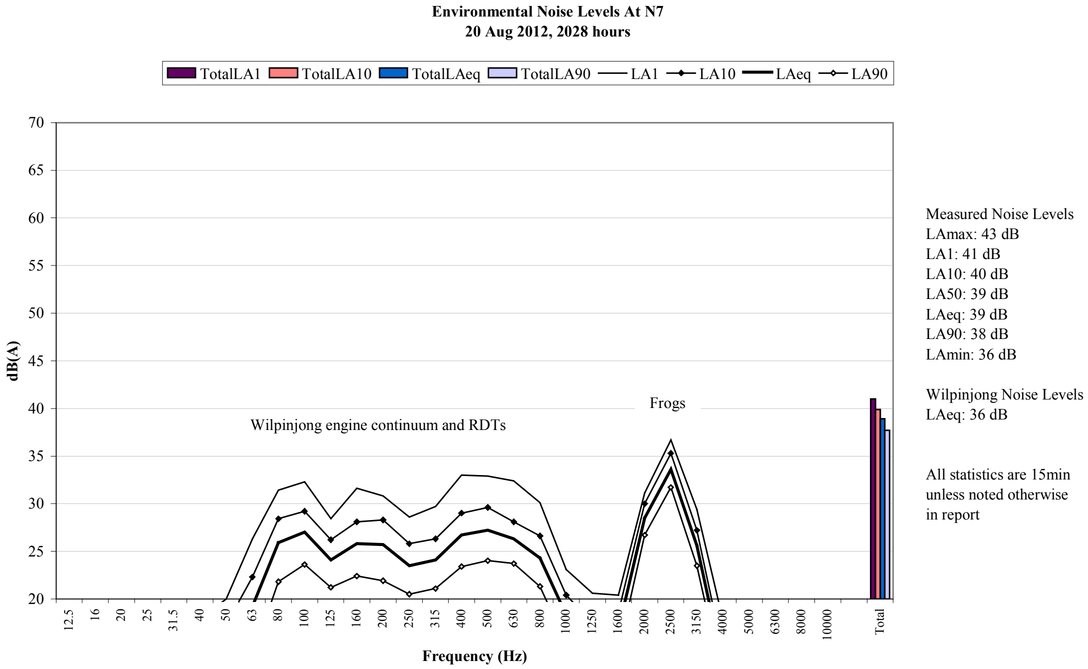


Figure 5 Environmental Noise Levels, N7 – Ulan-Wollar Road (East)

WCP was audible as engine continuum and rear dump trucks throughout the measurement. Impact noise, track noise, horns and quackers were also noted. These sources combined to generate the WCP only L_{Aeq} of 36 dB.

Frogs were responsible for the measured L_{A1}. A combination of WCP and frogs generated the measured L_{A10}, L_{Aeq} and L_{A90}.

Horses and a distant train were also noted.

5.1.4 N9, 20 August 2012, Evening

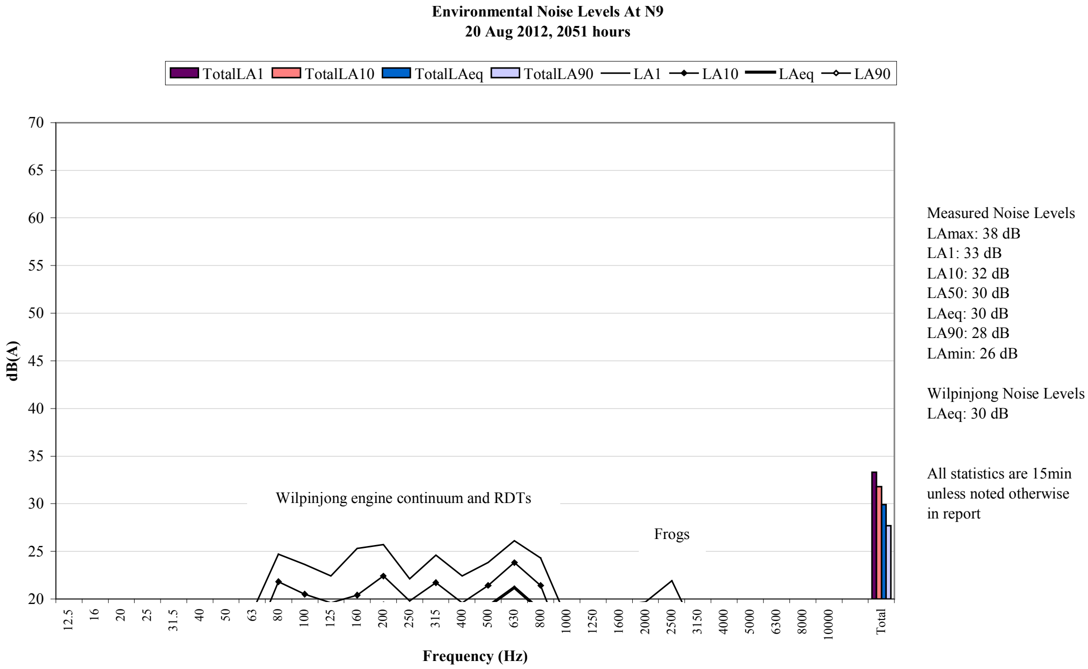


Figure 6 Environmental Noise Levels, N9 – Slate Gully Road

WCP was audible as engine continuum and rear dump trucks throughout the measurement. Track noise and horns were also noted. These sources combined to generate the WCP only L_{Aeq} of 30 dB.

WCP was responsible for most measured levels.

Frogs and birds were also noted.

5.1.5 N12, 20 August 2012, Evening

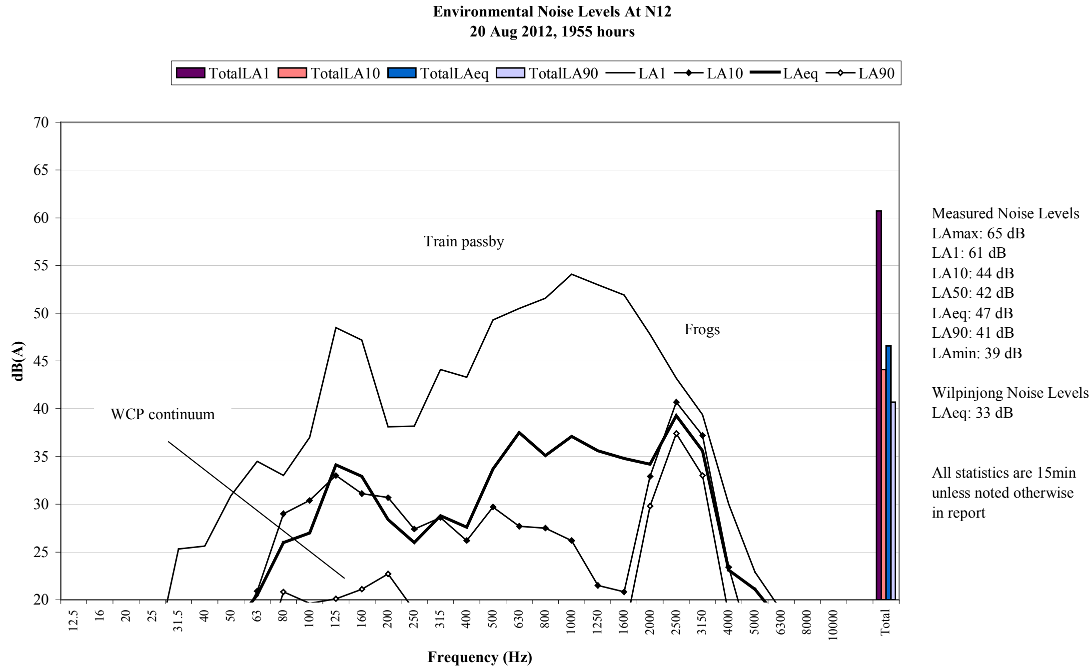


Figure 7 Environmental Noise Levels, N12 – Ulan-Wollar Road (West)

WCP was audible as engine continuum and rear dump trucks throughout the measurement. These sources combined to generate the WCP only L_{Aeq} of 33 dB. A horn was also noted.

A train passby generated the measured L_{A1} and contributed to the measured L_{Aeq}. Frogs were responsible for the measured L_{A10} and L_{A90}.

Birds and owls were also noted. An impact noise from another mine was audible once.

5.1.6 N4, 20 August 2012, Night-time

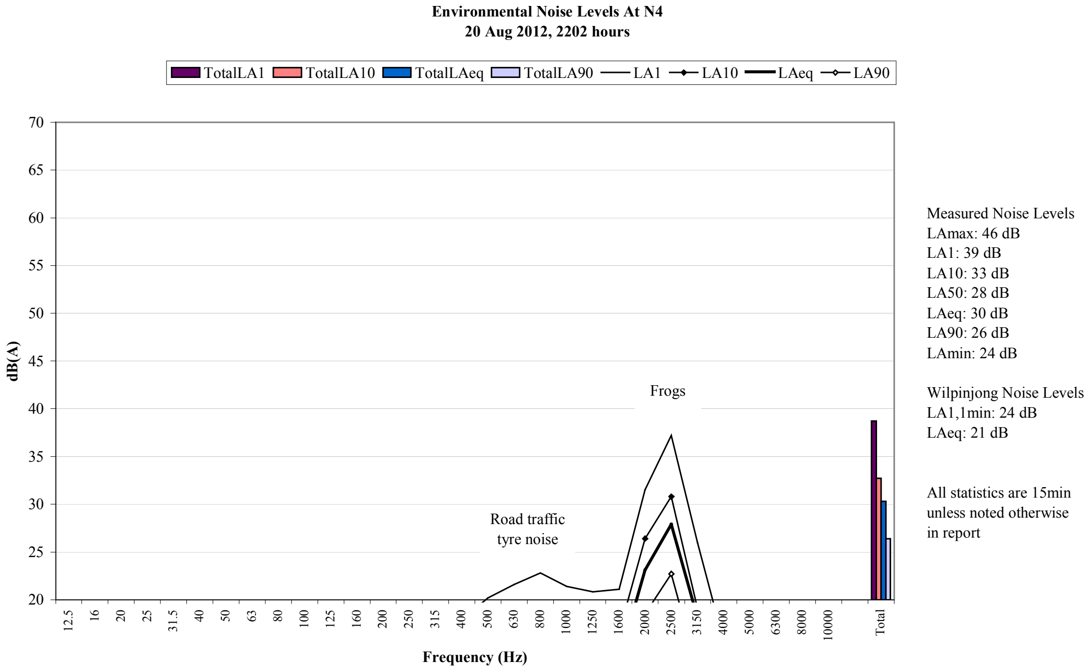


Figure 8 Environmental Noise Levels, N4 – Cumbo Road

WCP was audible throughout the measurement as a low-level engine continuum and rear dump trucks. These sources resulted in a WCP only L_{Aeq} of 21 dB. An engine continuum surge generated the WCP only $L_{A1,1minute}$ of 24 dB. Track noise (three times) was also noted.

Frogs were responsible for most measured levels. Birds generated the L_{Amax}.

Owls, road traffic noise and other animals were also noted.

5.1.7 N6, 20 August 2012, Night-time

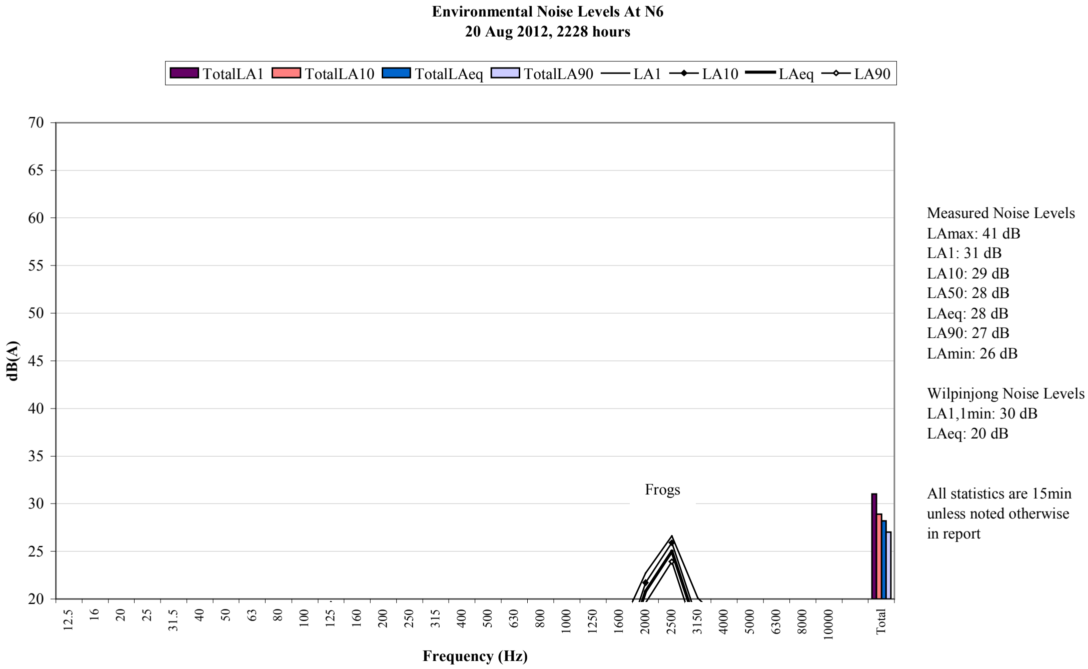


Figure 9 Environmental Noise Levels, N6 – Wollar Church

WCP was audible throughout most of the measurement as a low-level engine continuum and rear dump trucks. These sources resulted in a WCP only L_{Aeq} of 20 dB. An impact noise generated the WCP only $L_{A1,1minute}$ of 30 dB. Track noise (three times) and impact noises (twice) were also noted.

Frogs were primarily responsible for measured levels.

An air conditioning continuum in Wollar, an aircraft, owls, dogs and other animals were also noted.

5.1.8 N7, 20 August 2012, Night-time

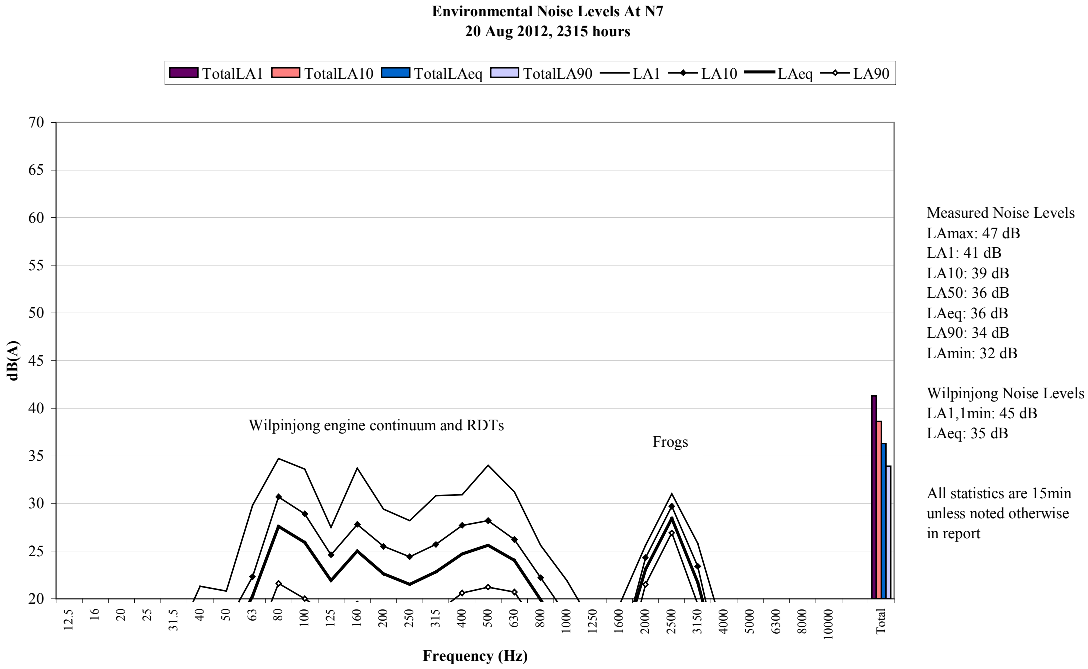


Figure 10 Environmental Noise Levels, N7 – Ulan Wollar Road (East)

WCP was audible throughout the measurement as an engine continuum and rear dump truck engine, exhaust and fan noise. Track noise, scraping noise and dumping impact noises were also noted. These sources resulted in a WCP only L_{Aeq} of 35 dB. A surge in rear dump truck engine and exhaust noise generated the WCP only $L_{A1,1minute}$ of 45 dB. WCP generated the measured L_{A1} and was primarily responsible for the measured L_{A10} and L_{Aeq} and contributed to the measured L_{A90}.

Frogs were audible throughout the measurement and contributed to the measured L_{A1}, L_{A10} and L_{Aeq}.

A possum was also noted.

5.1.9 N9, 20 August 2012, Night-time

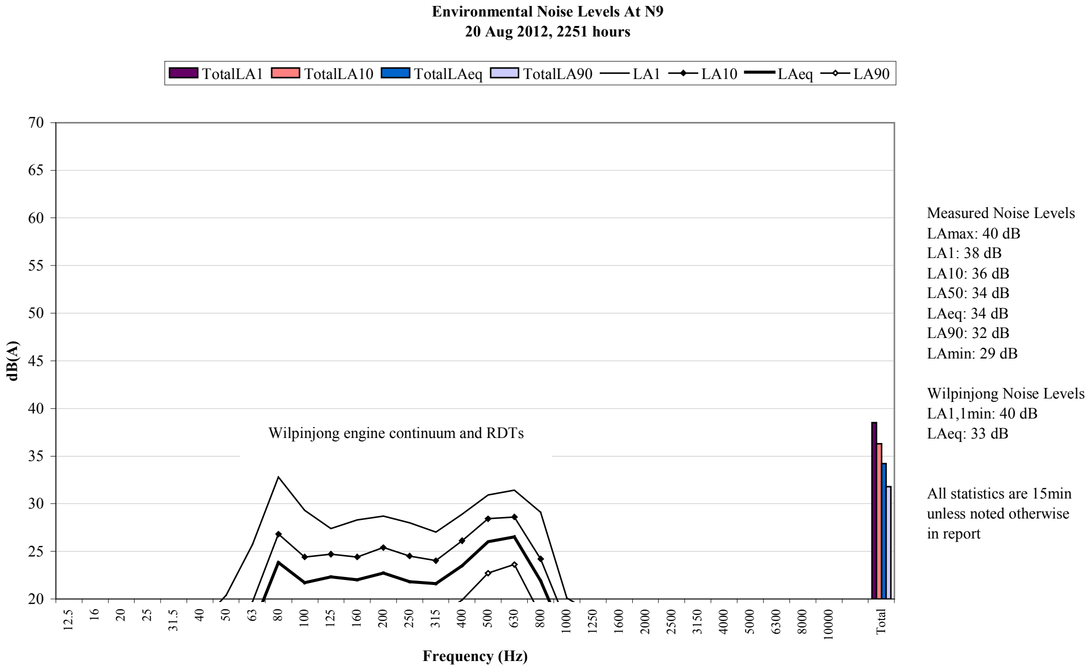


Figure 11 Environmental Noise Levels, N9 – Slate Gully Road

WCP was audible throughout the measurement as an engine continuum and rear dump trucks. Track noise, impact noise and horns were also noted. These sources resulted in a WCP only L_{Aeq} of 33 dB and track noise generated the WCP only $L_{A1,1minute}$ of 40 dB.

Frogs and livestock were also noted.

5.1.10 N12, 20 August 2012, Night-time

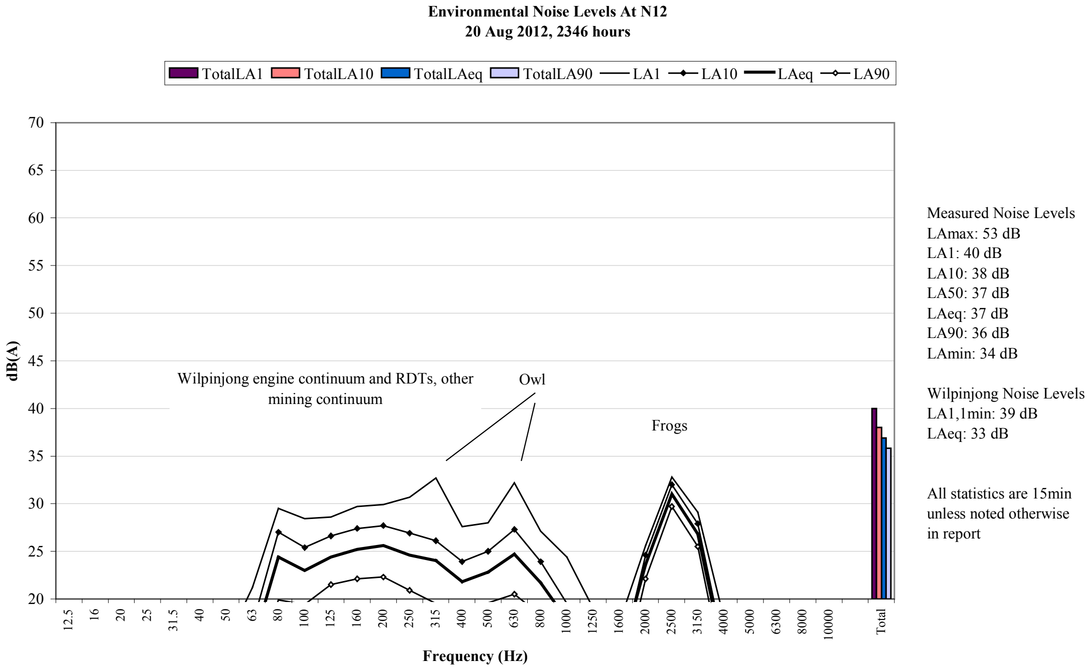


Figure 12 Environmental Noise Levels, N12 – Ulan Wollar Road (West)

WCP was audible throughout the measurement as an engine continuum and rear dump trucks. Reverse alarms and track noise were also noted. These sources resulted in a WCP only L_{Aeq} of 33 dB and a WCP only $L_{A1,1minute}$ of 39 dB.

A continuum from another mine was audible throughout the measurement. Occasional impact noises were also noted.

A combination of mining noise and frogs were responsible for measured levels.

Owls and birds were also noted.

5.1.11 N4, 21 August 2012, Evening

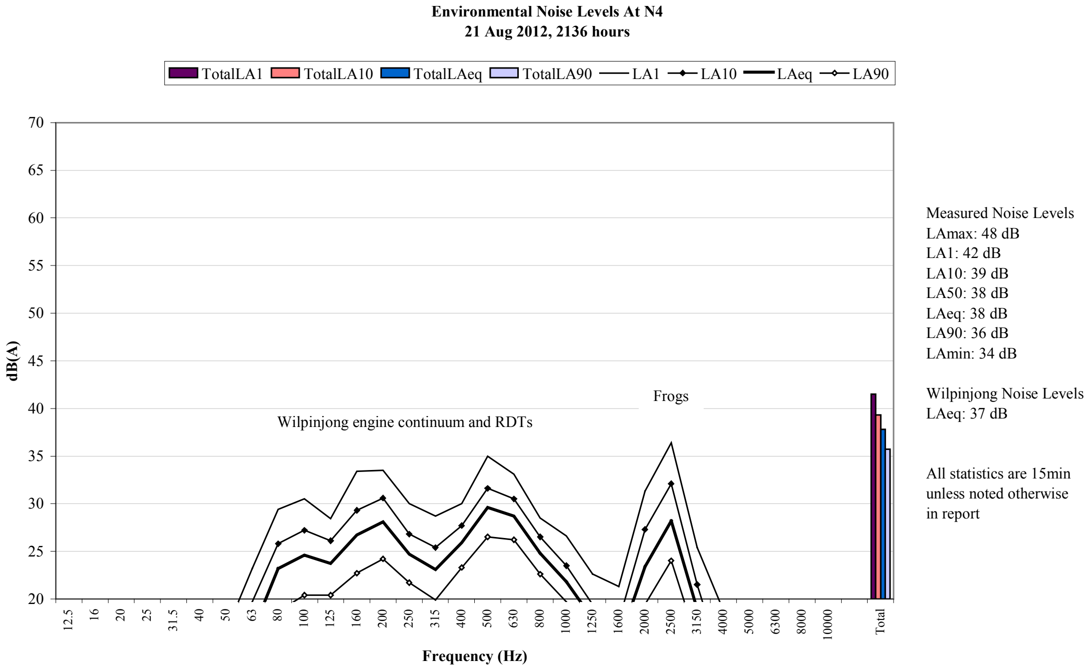


Figure 13 Environmental Noise Levels, N4 – Cumbo Road

WCP was audible throughout the measurement as an engine continuum and rear dump trucks. Horns, track noise, reverse alarms and dumping and impact noise were also noted. These sources generated the WCP only L_{Aeq} of 37 dB. WCP was primarily responsible for measured levels.

Frogs were minor contributors to measured levels.

An aircraft, birds, a train and train horn were also noted.

5.1.12 N6, 21 August 2012, Evening

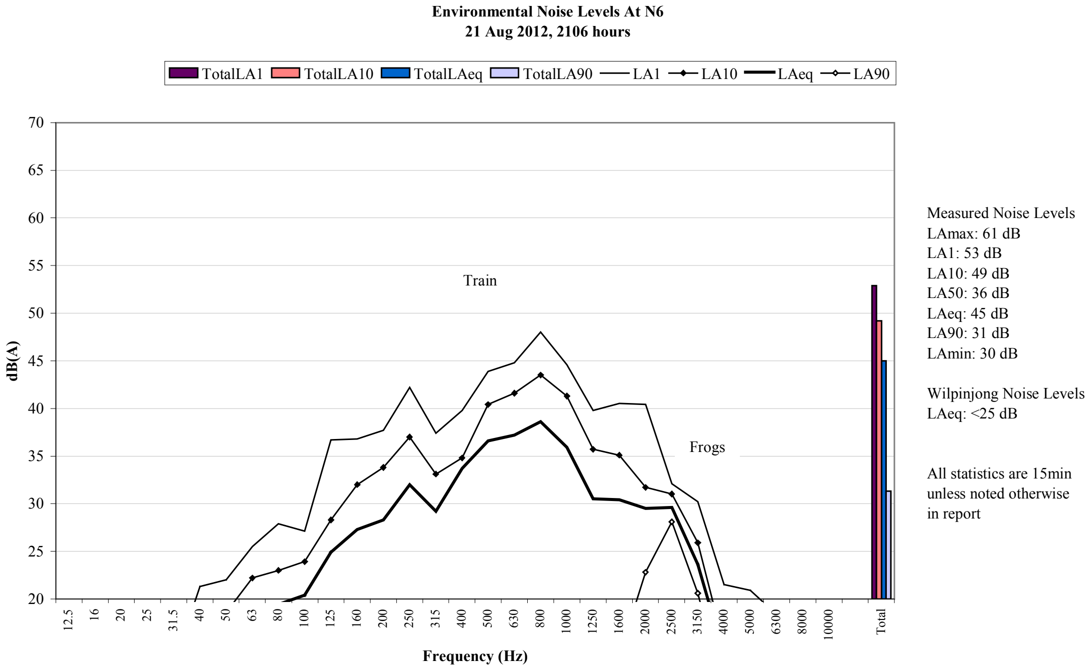


Figure 14 Environmental Noise Levels, N6 – Wollar Church

A low-level engine continuum, rear dump trucks and track noise were audible during the measurement. These sources resulted in a WCP only L_{Aeq} of <25 dB.

A train passby and frogs generated most measured levels.

An air conditioner in Wollar, breeze in foliage, grazing animals and dogs were also noted.

5.1.13 N7, 21 August 2012, Evening

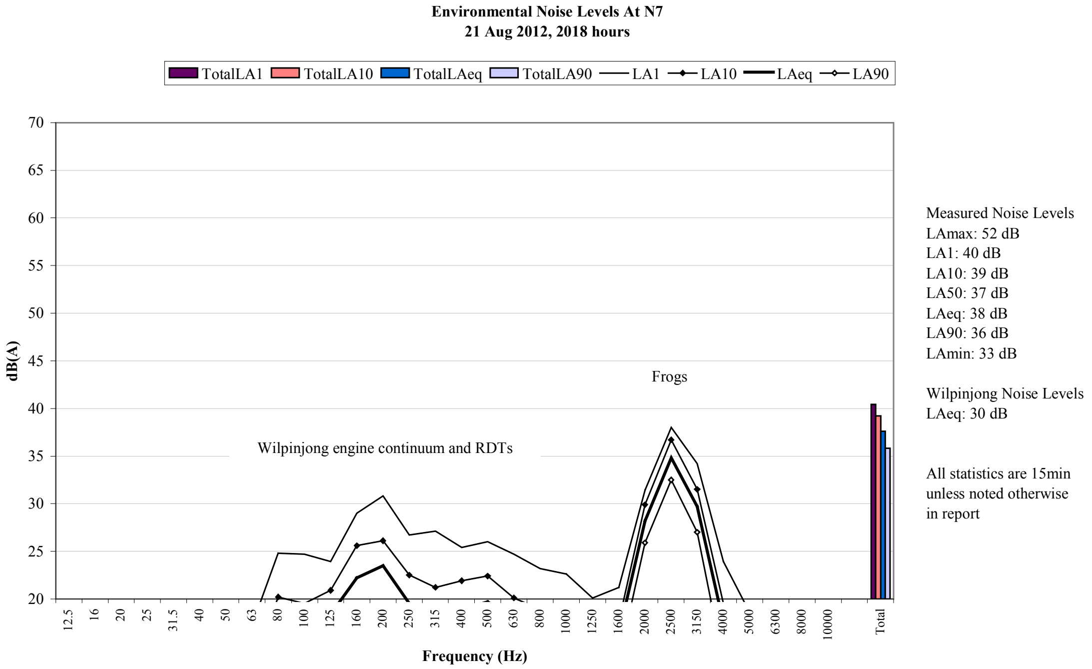


Figure 15 Environmental Noise Levels, N7 – Ulan-Wollar Road (East)

WCP was audible throughout the measurement as an engine continuum and rear dump trucks. Track noise, reverse alarms and impact noises were also noted. These sources resulted in a WCP only L_{Aeq} of 30 dB.

Frogs were responsible for measured levels.

Bats were also noted.

5.1.14 N9, 21 August 2012, Evening

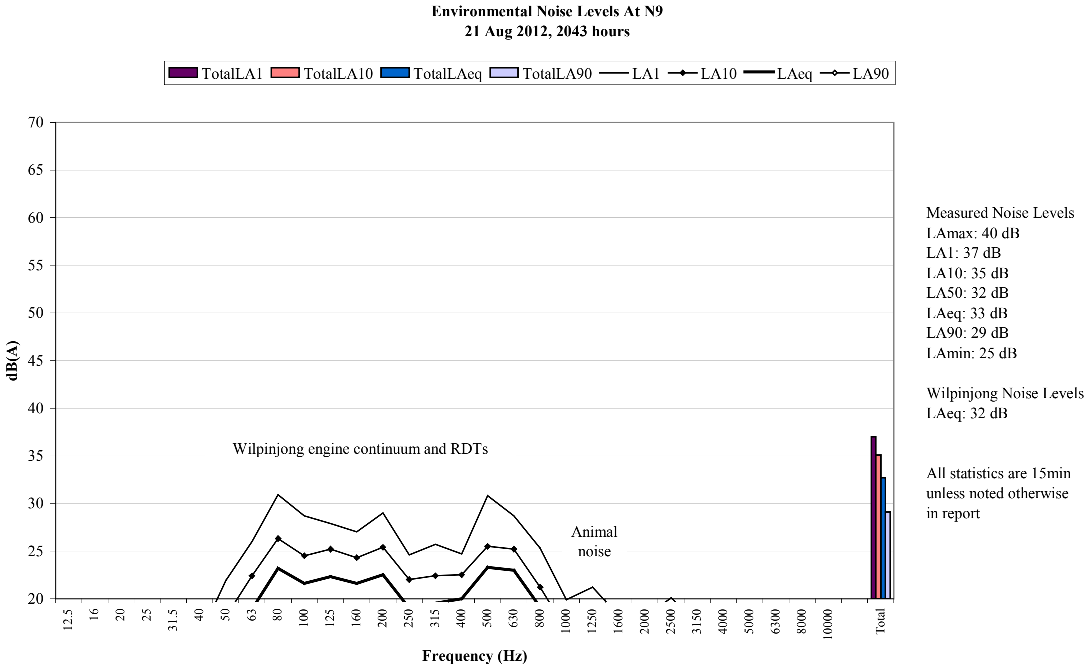


Figure 16 Environmental Noise Levels, N9 – Slate Gully Road

WCP was audible throughout the measurement as an engine continuum and rear dump trucks. Track noise and impact noises were also noted. These sources resulted in a WCP only L_{Aeq} of 32 dB.

WCP was primarily responsible for measured levels.

Frogs, an aircraft, birds and other animals were also noted.

5.1.15 N12, 21 August 2012, Evening

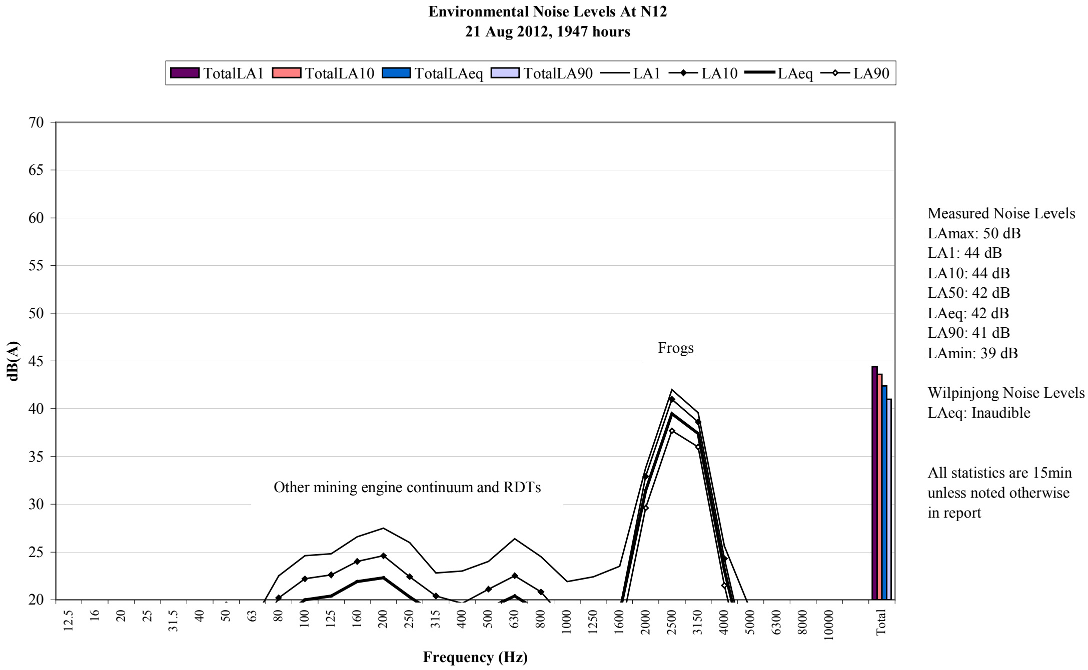


Figure 17 Environmental Noise Levels, N12 – Ulan-Wollar Road (West)

WCP was inaudible.

Frogs were responsible for the measured levels.

Another mine engine continuum, rear dump trucks and impact noises were also noted.

Owls, road traffic tyre noise and an aircraft were also noted.

5.1.16 N4, 21 August 2012, Night-time

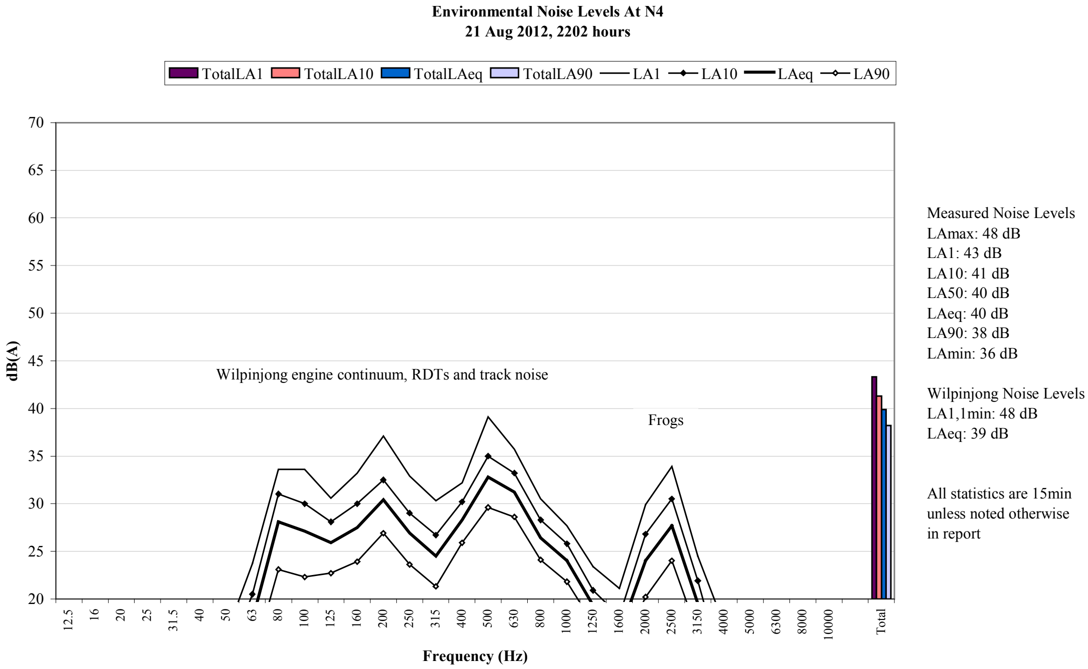


Figure 18 Environmental Noise Levels, N4 – Cumbo Road

WCP was audible throughout the measurement as an engine continuum and rear dump trucks. Track noise, horns and impact noises were also noted. These sources generated the WCP only L_{Aeq} of 39 dB. Track noise was responsible for the WCP only $L_{A1,1min}$ of 48 dB. WCP was primarily responsible for measured levels.

Frogs were minor contributors to measured levels.

5.1.17 N6, 21 August 2012, Night-time

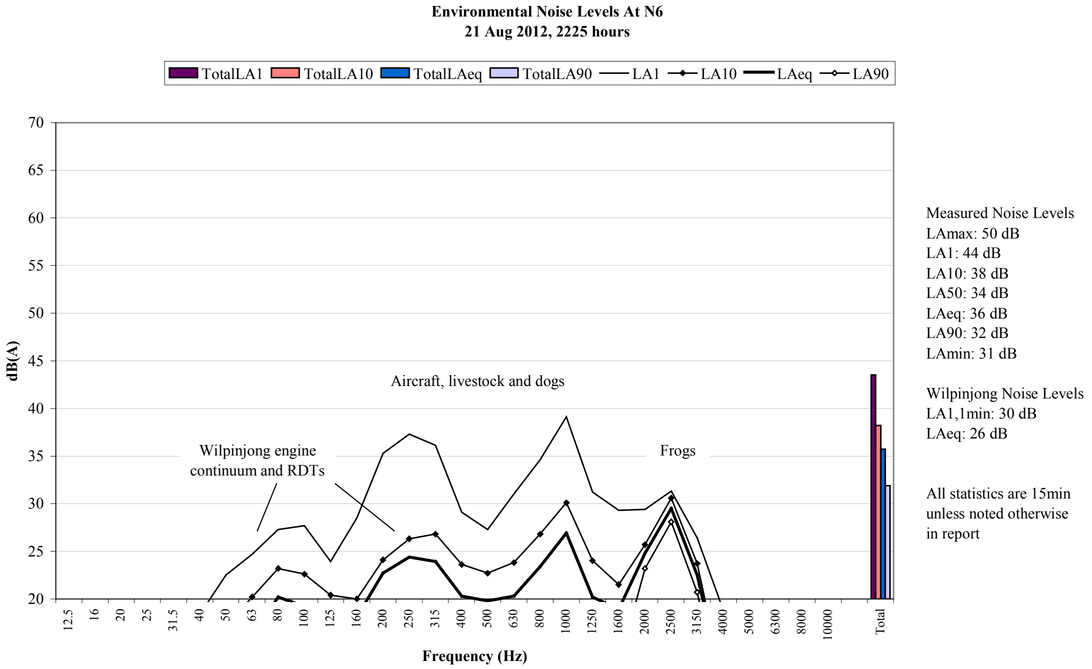


Figure 19 Environmental Noise Levels, N6 – Wollar Church

WCP was audible throughout the measurement as an engine continuum and rear dump trucks. Track noise, dumping and impact noises were also noted. These sources generated the WCP only L_{Aeq} of 26 dB and a surge in engine continuum was responsible for the WCP only $L_{A1,1min}$ of 30 dB.

Frogs, dogs and livestock were largely responsible for measured levels.

An aircraft and horses were also noted.

5.1.18 N7, 21 August 2012, Night-time

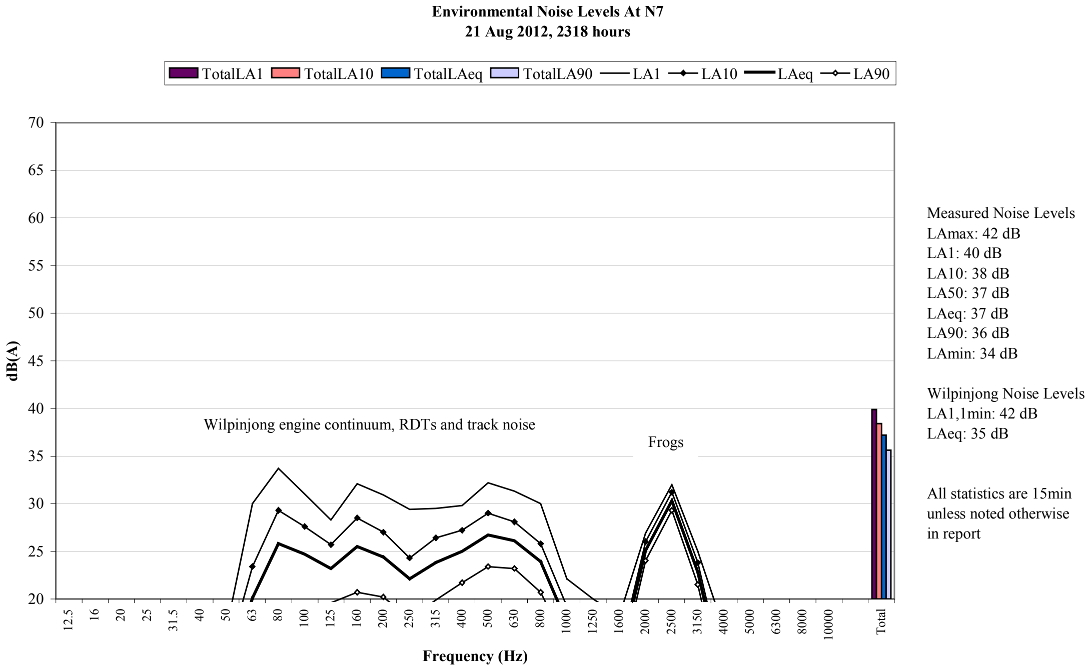


Figure 20 Environmental Noise Levels, N7 – Ulan Wollar Road (East)

WCP was audible throughout the measurement as an engine continuum and rear dump trucks. Track noise, dumping, scraping, reverse alarms, quackers, horns and impact noises were also noted. These sources generated the WCP only L_{Aeq} of 35 dB. A surge in engine continuum was responsible for the WCP only $L_{A1,1min}$ of 42 dB. WCP contributed to measured levels.

Frogs also contributed to the measured L_{A1}, L_{A10} and L_{Aeq} and were largely responsible for the measured L_{A90}.

Cows, kangaroos and birds were also noted.

5.1.19 N9, 21 August 2012, Night-time

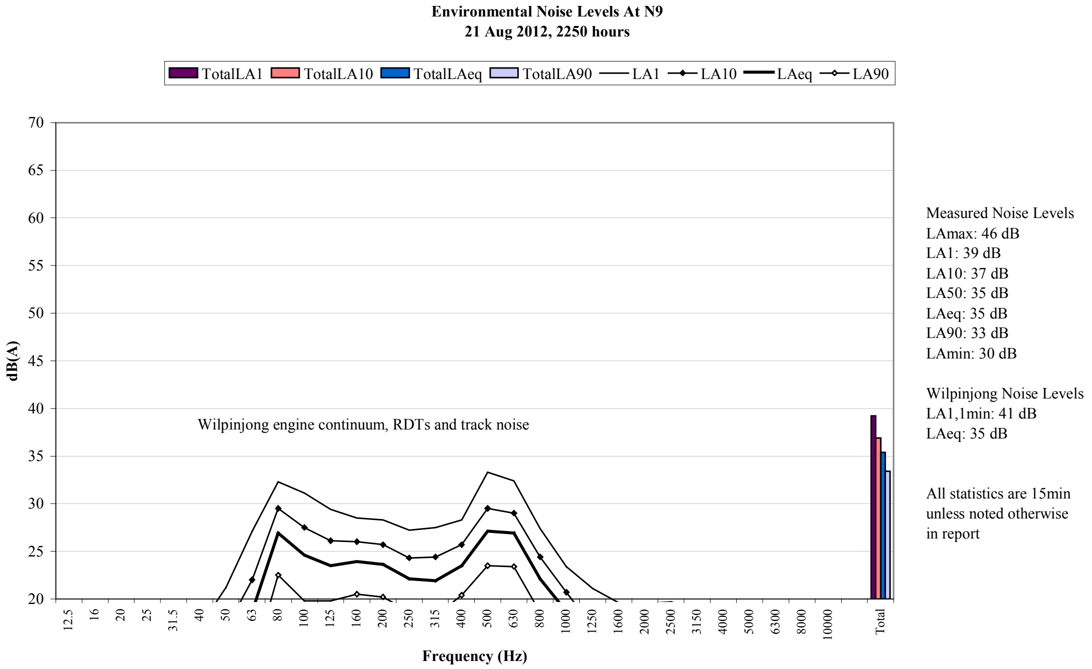


Figure 21 Environmental Noise Levels, N9 – Slate Gully Road

WCP was audible throughout the measurement as an engine continuum and rear dump trucks. Track noise, dumping, reverse alarms and impact noises were also noted. These sources generated the WCP only L_{Aeq} of 35 dB. A surge in engine continuum was responsible for the WCP only $L_{A1,1min}$ of 41 dB. WCP was responsible for measured levels.

Frogs, kangaroos, birds and livestock were also noted.

5.1.20 N12, 21 August 2012, Night-time

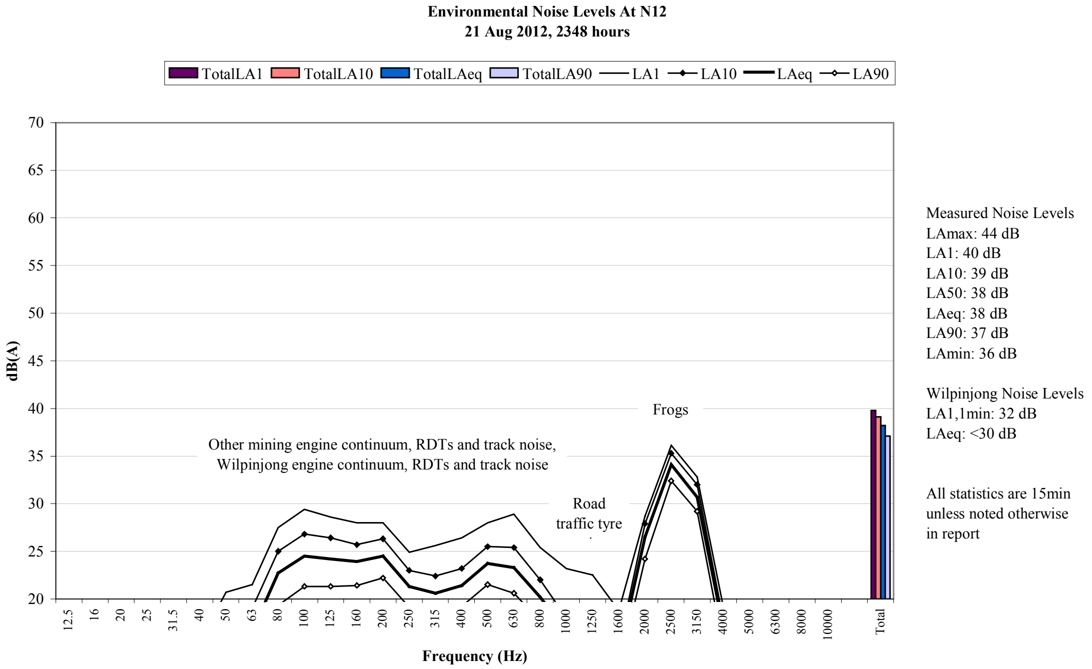


Figure 22 Environmental Noise Levels, N12 – Ulan Wollar Road (West)

WCP was audible throughout the measurement as a low-level engine continuum and rear dump trucks. Track noise and horns were also noted. These sources generated the WCP only L_{Aeq} of less than 30 dB. An impact noise was responsible for the WCP only $L_{A1,1min}$ of 32 dB.

Another mine engine continuum, rear dump trucks, track noise and impact noises were audible during the measurement. This was the dominant mining noise source during the measurement and was a minor contributor to measured L_{A10}, L_{Aeq} and L_{A90}.

Frogs were primarily responsible for measured levels.

Road traffic noise and a bird were also noted.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the evening and nights of the 20 and 21 August 2012. Attended noise monitoring was conducted at five sites. The duration of all measurements was 15 minutes.

Wind speed and/or estimated temperature inversion conditions resulted in development consent criteria not always being applicable, as indicated in Table 4.2 and Table 4.3.

Wilpinjong Coal Project (WCP) complied with noise consent limits at the monitoring locations during the July / August 2012 monitoring period.

Global Acoustics Pty Ltd

A. DEVELOPMENT CONSENT

Several documents specifying noise criteria apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Project Development Consent

Wilpinjong Coal Project was given approval on 1 February 2006. A modification to the consent was approved in August 2010.

The relevant noise conditions from Section 3 - Specific Environmental Conditions of the modified consent is reproduced below.

ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Proponent shall acquire the land in accordance with the procedures in conditions 6 – 7 of schedule 4.

Table 1: Land subject to acquisition upon request

30 – Gaffney	45 – Smith
48 – Evans	50 – Thompson & Hopper
94 – McKenzie	

Note:

- *To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.*

Noise Impact Assessment Criteria

2. Except for the land referred to in Table 1, the Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land, or on more than 25 per cent of any privately-owned land.

Table 2: Noise Impact assessment criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{A1(1\ minute)}$
58 – Maher *52A – Long* *52B – Long* *53 – Reynolds*	35	39	39	45
23B – Bishop	35	39	37	45
25 – Pettit	35	39	36	45
31A – Conradt	35	37	37	45
31B – Conradt	35	36	36	45
100 – Rheinberger *125 – Roberts*	35	37	35	45
Wollar Village – Residential	36	35	35	45
All other privately owned land	35	35	35	45
901 – Wollar School	*35(internal)* *45 (external)* *When in use*			-
150A – St Luke's Anglican Church *900 – St Laurence O'Toole Catholic Church*	*40 (internal)* *When in use*			-
Goulburn River National Park/Munghorn Gap Nature Reserve	*50* *When in use*			-

However, the criteria in Table 2 do not apply if the Proponent has an agreement with the relevant owner/s to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:

- *To interpret the locations referred to in Table 2, see the applicable figures in Appendix 7.*
- *Noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.*
- *For the Goulburn River National Park/Munghorn Nature Reserve noise levels are to be assessed at the most affected point at the boundary of the Goulburn River National Park/Munghorn Nature Reserve.*

Noise Acquisition Criteria

3. If the noise generated by the project exceeds the criteria in Table 3 at any residence on privately-owned land or on more than 25 per cent of any privately-owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 6 – 7 of schedule 4.

Table 3: Land acquisition criteria dB(A)

Day/Evening/Night $L_{Aeq(15\,minute)}$	Land
40	All privately owned land, excluding the land listed in Table 1

Note:

- *Noise generated by the project is to be measured in accordance with the notes presented below Table 2. For the condition to apply, the exceedances must be systemic.*

Additional Noise Mitigation Measures

4. Upon receiving a written request from the owner of any residence:
   (a) on the land listed in Table 1; or
   (b) on the land listed 23B, 25, 52A, 52B, 53, or 58 in the applicable figures in Appendix 7; or
   (c) where subsequent noise monitoring shows that the noise generated by the project is greater than, or equal to, $L_{Aeq(15\,minute)}$ 38 dB(A),

   the Proponent shall implement reasonable and feasible noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the landowner.

   If within 3 months of receiving this request from the landowner, the Proponent and the landowner 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.

5. By 30 November 2010, or within 1 month of obtaining monitoring results showing an exceedance of the relevant criteria listed in condition 4(c) above, the Proponent shall notify all applicable owners that they are entitled to ask for additional noise mitigation measures to be installed at their residence.

Operating Conditions

6. The Proponent shall:
   (a) implement all reasonable and feasible noise mitigation measures;
   (b) ensure that the real-time noise monitoring and meteorological forecasting data are assessed regularly, and that operations on site are relocated, modified, and/or stopped to ensure compliance with the relevant criteria in conditions 2 to 4 of this schedule; and
   (c) regularly investigate ways to reduce the operational, low frequency, rail, and road traffic noise generated by the project; and report on these investigations in the annual review (see condition 2 of schedule 5),

   to the satisfaction of the Director-General.

Noise Management Plan

7. The Proponent shall prepare and implement a Noise Management Plan for the project, in consultation with DECCW, and to the satisfaction of the Director-General. This plan must:
   (a) describe the noise mitigation measures that would be implemented to ensure compliance with the relevant noise impact assessment criteria in this approval, including the proposed real-time noise management system and associated meteorological forecasting; and
   (b) include a noise monitoring program, that uses a combination of real-time and supplementary attended monitoring measures to evaluate the performance of the project, and includes a protocol for determining exceedances with the relevant conditions of this approval.

A.2 Environment Protection Licence

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in December 2011.

The relevant section reproduced below.

L5 Noise limits

L5.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The locations referred to in the table below are indicated by the property identification numbers on Figure 4A Relevant Land Ownership Plan Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment 17 May 2010. The property identification numbers are indicated on Figure 4B Relevant Land Ownership List Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment 17 May 2010.

Location	Day	Evening	Night	Night
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
25 Pettit - Lot 18 DP250053	35	36	36	45
52A Long - Lot 8 DP250053	35	38	39	45
52B Long - Lot 8 DP250053	35	39	39	45
51 Bailey - Lot 5, 6 & 7 DP250053	35	39	39	45
58 Maher	35	38	38	45
31A Conradt - Lot 10, 11 & 12 DP250053 & Lot 160 DP723767	35	37	37	45
31B Conradt - Lot 10, 11 & 12 DP250053 & Lot 160 DP723767	35	36	36	45
Wollar village	35	36	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	
125 E & K Roberts	35	37	35	45

L5.2 For the purpose of condition L5.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L5.3 The noise limits set out in condition L5.1 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 3ºC/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
c) Temperature inversion conditions greater than 3ºC/100m.

L5.4 For the purpose of condition L5.3:
a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorplogical weather station identified as EPA identification Point 21 in condition P1.1; and
b) Temperature inversion conditions (vertical temperature gradient in degrees C) are to be determined by direct measurement over a minimum 50m height interval as referred to in Part E2 of Appendix E to the NSW Industrial Noise Policy.

L5.5 To determine compliance:
a) With the Leq(15 minute) noise limits in condition L5.1, 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 3 metres 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 Nature Reserve

b) With the LA1(1 minute) noise limits in condition L5.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.

c) With the noise limits in condition L5.1, 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 conditions L5.5(a) or L5.5(b).

L5.6 A non-compliance of condition L5.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:

a) at a location other than an area prescribed by conditions L5.5(a) and L5.5(b); and/or
b) at a point other than the most affected point at a location.

L5.7 For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

A.3 Noise Monitoring Programme

The noise monitoring program for WCP was revised in September 2011 and the relevant sections are reproduced below.

5 MONITORING AND INTERPRETATION

The noise monitoring programme comprises both attended and real-time monitoring (Sections 5.1 and 5.2, respectively). Integrated protocols for both monitoring methodologies are outlined in Sections 5.1.4 and 5.2.4, respectively. Meteorological monitoring will also be conducted as described in Section 5.3.

Attended monitoring will be used for demonstrating compliance with noise criteria (Section 3.3), whilst real-time monitoring will be used as a management tool to assist WCPL to take pre-emptive management actions to avoid potential non-compliances.

5.1 ATTENDED NOISE MONITORING

5.1.1 Purpose

The main aim of attended noise monitoring is to determine compliance with Project Approval and EPL noise criteria.

Results from the attended monitoring programme will be used to verify data collected from the real-time noise monitors. This will be undertaken where attended monitoring is conducted directly adjacent to real-time monitors. The attended monitoring data will also be used to determine whether there is a consistent relationship between real-time continuous noise levels and long-term attended monitoring data. For example if there is a consistent correlation between a real-time monitor and an attended monitoring site, then the real-time monitoring results could reasonably be used to predict noise levels at the attended site when attended monitoring is not being undertaken. This will be done annually to complement the regular maintenance and calibration of the real-time monitors.

5.1.2 Monitoring Locations

The attended noise monitoring programme will be conducted at sites adjacent to the Mine on non-Mine owned land to measure noise levels at nearby residences. Operational experience and investigations (Section 7.1) have shown that the Mine noise effects are experienced predominantly to the south and east of the Mine. Attended noise monitoring is presently concentrated in these areas, however this does not exclude monitoring to the west of the Mine.

Attended noise monitoring locations are shown on Figures 4. These locations provide good coverage in all directions from the Mine and are a combination of compliance sites and population centres. These locations include:

- N4 – W&V Langshaw dwelling 'Hillview';
- N6 – St Laurence O'Toole Catholic Church;
- N7 – Road reserve adjacent the Smith property;
- N9 – Maher dwelling; and
- N12 – Ulan Coal Mine Limited-owned dwelling.

5.1.3 Methodology

Attended noise monitoring will be carried out by an independent expert (i.e. not by mine staff) and will be conducted every 2 months. Monitoring will be conducted in accordance with Australian Standard (AS) 1055:1997 *Acoustics – Description and Measurement of Environmental Noise* and the INP (EPA, 2000). These operator-attended noise measurements will be conducted during normal operations to quantify the intrusive noise emissions from the Mine as well as the overall level of ambient noise.

Following the completion of the attended noise monitoring by the independent expert, the two monthly monitoring reports will be submitted to OEH and DP&I and will be made publically available on the Peabody website (Section 8.2).

Timing

Attended noise monitoring will be conducted for 15 minute periods day, evening and night. Day is defined as between 7am and 6pm, evening is described as being between 6pm and 10pm and night is between 10pm and 7am.

The monitoring will be carried out on two consecutive nights resulting in 2 x 15 minute samples for each location every two months. By sampling two consecutive nights, it is likely that different meteorological conditions are sampled for each site, providing more useful information.

Particular attention will be given to monitoring between 7pm and 2am (i.e. evening/night-time periods). Experience has shown that it is during these periods that noise can be at its most intrusive and results in more complaints. This is due to the very low background noise levels experienced during these periods and the presence of temperature inversions that are a relatively common phenomenon in this area, particularly during winter months.

Measurement

Acoustic instrumentation used in attended monitoring will comply with AS 1259.2:1990 *Sound Level Meters*.

The intrusive noise level (L_{Amax}, L_{A1}, L_{A10} and L_{Aeq}) contribution from mine operation activities will be quantified over a 15 minute measurement period. In addition, the overall levels of ambient noise (i.e. L_{Amax}, L_{A1}, L_{A10}, L_{A50}, L_{A90}, L_{Amin} and L_{Aeq}) over the 15 minute period will be quantified and characterised.

A measurement of $L_{A1(1\ minute)}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from the Mine during the entire measurement period (i.e. the highest level of the maximum minute during the 15 minute measurement).

The L_{A1} measurement should be undertaken at 1 m from the dwelling façade and the L_{Aeq} measurement within 30 m of the dwelling. However, the direct measurement of noise at 1 m from the façade is not always practical. In most cases monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In these cases measurements are undertaken at a suitable and representative location as close to the dwelling as practicable. Modifying factors from section 4 of the INP are used where applicable. Tonality and low frequency are assessed by analysis of the measured L_{Aeq} spectrum.

Recording

An example of an attended monitoring recording sheet is provided in Attachment 5. During attended monitoring, the following information will be recorded:

- operator's name;
- locations of attended and unattended noise instruments;
- recording intervals;
- meteorological conditions (i.e. temperature, humidity, cloud cover, and wind speed and direction);
- statistical noise level descriptors together with notes identifying the principle noise sources; and
- instrument calibration details.

The meteorological conditions listed above will be recorded local to the noise measurement as well as on-site at the Mine Automatic Weather Station (AWS) (Section 5.3). Prevailing weather conditions determined from the AWS (in the first instance) to be outside of the meteorological constraints stipulated in the Project Approval will be excluded from further analysis.

Additional information (such as general mobile and fixed plant locations) will be collected at the time of (or soon after) monitoring to enable correlation between Mine noise, meteorological conditions, general plant locations, plant operating conditions and topography.

5.1.4 Compliance Assessment

As discussed in Section 5.1.1, the results of attended noise monitoring will be compared against the relevant noise criteria set out in Section 3.3 of this NMP. The comparison will be undertaken following the exclusion of data using meteorological conditions described as part of Table 2 as well as observations of non-Mine noise by the person undertaking the attended noise monitoring programme.

In the event of an exceedance of the noise criteria, an assessment will be conducted to determine:

- Timing of the exceedance.
- Location of the exceedance.
- Exclusion of non-mine related noise and noise from non-WCPL mining activities (e.g. can the exceedance be attributed directly to the Mine). This will include consideration of:
  - the methods and type of equipment being used by WCPL at the time of the exceedance and proximity to the locations at which the exceedance was recorded; and
  - the location of non-WCPL mining activities or agricultural activities and proximity to the locations at which the exceedance was recorded.
- Meteorological conditions at the time of the exceedance – including confirmation that meteorological conditions are in accordance with Condition 2, Schedule 3 of the Project Approval.

If the above assessment determines that an exceedance is due to Mine noise then management strategies detailed in Sections 6 and 7 to help prevent recurrence will be implemented in an effort to reduce noise levels below those set out in Table 2.

Exceedances of criteria will be determined in consideration of Table 2 of the Project Approval (e.g. the meteorological conditions under which they apply) and the INP. Section 11.1.3 of the INP states the following in relation to when a development is in non-compliance with a noise condition:

> *A development will be deemed to be in non-compliance with a noise consent or licence condition if the monitored noise level is more than 2 dB above the statutory noise limit specified in the consent or licence condition. This may occur for two reasons:*
>
> - *The noise from the development is excessive, in which case the development is truly not complying with its consent or licence condition.*
> - *The noise was increased by extreme, nonstandard weather effects—in which case the development is not considered to be in noncompliance with its consent or licence condition. Non-standard weather effects can be considered to be present during monitoring if the cloud cover is less than 40 per cent and the wind speed (at 10 m height) is less than 1.0 m/s (represents an extremely adverse weather condition for noise)—during the period from 6 pm to 7 am in non-arid areas (see Section 9.2).*
>
> *In this latter case, further monitoring at a later date is required to determine compliance under the meteorological conditions specified in the consent/licence condition.*

For the purposes of the NMP, the monitored noise level is the attended noise monitoring results at the locations listed in Section 5.1.2.

In accordance with Condition 7, Schedule 5 of the Project Approval, The Proponent shall notify the Director-General and any other relevant agencies of any incident associated with the project 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.

In accordance with Condition 2, Schedule 4 of the Project Approval, the proponent shall notify the Director-General, the affected landowners and tenants (including tenants of mine-owned properties) accordingly, and provide monitoring results to each of these parties until the results show that the project is complying with the criteria in schedule 3.

B. CALIBRATION CERTIFICATES

Global Acoustics Pty Ltd | PO Box 3115 | Thornton NSW 2322
Telephone +61 2 4966 4333 | Facsimile +61 2 4966 4330 | Email global@globalacoustics.com.au
ABN 94 094 985 734

Acoustic Research Laboratories
Proprietary Limited
A.B.N. 47 050 100 804
Noise and Vibration Monitoring Instrumentation for Industry and the Environment

Sound Level Meter Test Report

Report Number : C11616

Date of Test :	09/11/2011
Report Issue Date :	10/11/2011
Equipment Tested/ Model Number:	**Rion NA-28 Sound Level Meter**
Instrument Serial Number:	01070590
Microphone Serial Number:	00533
Preamplifier Serial Number:	70607
Client Name :	Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thornton NSW 2322
Contact Name :	Tony Welbourne
Tested by :	Brianna Sparre
Approved Signatory :	
Date :	**10 November 2011**

NATA
WORLD RECOGNISED ACCREDITATION

Acoustic Research Laboratories Pty Ltd is NATA Accredited Laboratory Number. 14172.

This document is issued in accordance with NATA's accreditation requirements.

Accredited for compliance with ISO/IEC 17025

Level 7 • Building 2 • 423 Pennant Hills Rd • Pennant Hills • NSW 2120 • AUSTRALIA
Telephone +61 2 9484 0800 • Facsimile +61 2 9484 0884
www.acousticresearch.com.au

Acoustic Calibrator Test Report

Report Number : C11526

Date of Test : 21/09/2011

Report Issue Date : 21/09/2011

Equipment Tested: **Pulsar Acoustic Calibrator**

Model Number: Model 106

Serial Number: 57413

Client Name : Global Acoustics Pty Ltd

12/16 Huntingdale Drive

Thornton NSW 2322

Contact Name : Tony Welbourne

Tested by : Michael Westell

Approved Signatory :

Ken Williams

Date : 21/09/2011

NATA
WORLD RECOGNISED ACCREDITATION

Acoustic Research Laboratories Pty Ltd is NATA Accredited Laboratory Number 14172.

This document is issued in accordance with NATA's accreditation requirements.

Accredited for compliance with ISO/IEC 17025

This document shall not be reproduced except in full.

Wilpinjong Coal

September / October 2012

Environmental Noise Monitoring

Prepared for

ALS Environmental Division

Global Acoustics

Noise and Vibration Analysis and Solutions

Global Acoustics Pty Ltd
PO Box 3115 | Thornton NSW 2322
Telephone +61 2 4966 4333 | Facsimile +61 2 4966 4330
Email global@globalacoustics.com.au
ABN 94 094 985 734

Wilpinjong Coal

September / October 2012
Environmental Noise Monitoring

Reference: 12530_R01.doc

Report date: 26 November 2012

Prepared for

ALS Environmental Division
PO Box 1034
Mudgee NSW 2850

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322

Prepared:	Joel Curran Chemical Engineer (Acoustics)	QA Review:	Katie Weekes Environmental Scientist

Global Acoustics Pty Ltd ~ Environmental noise modeling and impact assessment ~ Sound power testing ~ Noise control advice ~ Noise and vibration monitoring ~ OHS noise monitoring and advice ~ Expert evidence in Land and Environment and Compensation Courts ~ Architectural acoustics ~ Blasting assessments and monitoring ~ Noise management plans (NMP) ~ Sound level meter and noise logger sales and hire

EXECUTIVE SUMMARY

Global Acoustics was engaged by ALS Environmental Division to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine operated by Wilpinjong Coal. WCP was given approval on 1 February 2006. A modification to the consent was approved in August 2010.

An environment protection licence (EPL) was issued in early 2006 with subsequent variations approved. A revised noise-monitoring program (NMP) for WCP was approved in September 2011.

Attended monitoring was conducted in accordance with the documents detailed above, the NSW Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. The duration of each evening and night measurement was 15 minutes. Results of two-monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at five locations on 23 and 24 October 2012. The survey purpose is to quantify and describe the acoustic environment around the site and compare results with specified limits.

WCP complied with relevant noise limits at the monitoring locations during the September / October 2012 monitoring period. Wind speed and/or estimated temperature inversion conditions resulted in development consent criteria not always being applicable, as indicated in Table 4.2 and Table 4.3.

Table of Contents

Appendices

1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by ALS Environmental Division to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine operated by Wilpinjong Coal.

Environmental noise monitoring described in this report was undertaken at five locations on 23 and 24 October 2012. Figure 1 shows the regular monitoring locations.

The purpose of the survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were five regular monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the Noise Monitoring Program (NMP).

Table 1.1 NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location	Owner
N4	'Hillview' Cumbo Road, Wollar	Wilpinjong Coal Mine
N6	St Laurence O'Toole Catholic Church, representative of Wollar - Residential	NA
N7	Ulan-Wollar Road (East)	Smith
N9	Slate Gully Road, Wollar	Wilpinjong Coal Mine
N12	Ulan-Wollar Road (West)	Ulan Coal Mines

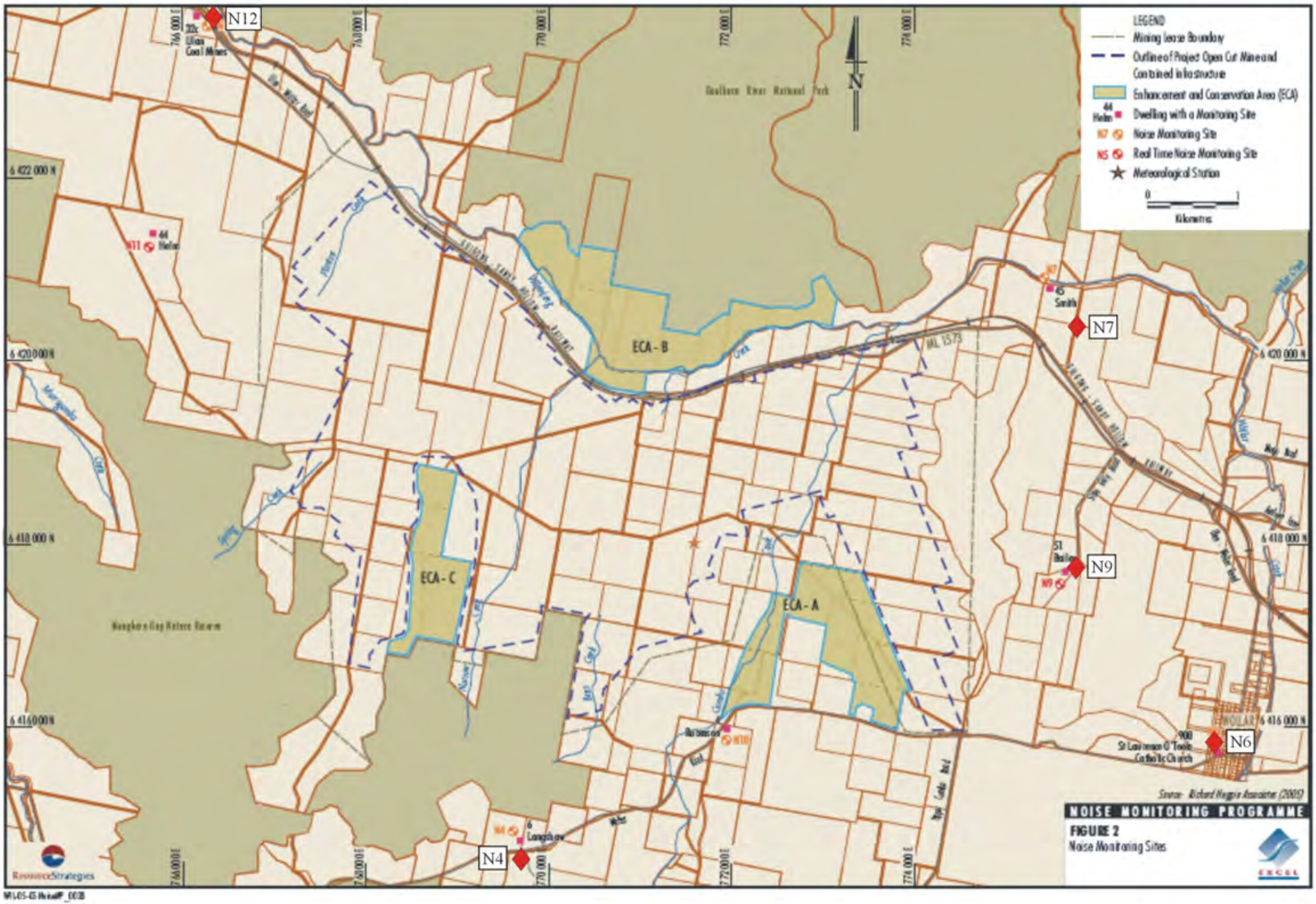


Figure 1 Monitoring Sites

1.3 Terminology

Some definitions of terminology, which may be used in this report, are provided in Table 1.2.

Table 1.2 TERMINOLOGY

Descriptor	Definition
L_A	The A-weighted root mean squared (RMS) noise level at any instant
L_{Amax}	The maximum A-weighted noise level over a time period or for an event
L_{A1}	The noise level which is exceeded for 1 per cent of the time
L_{A10}	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L_{A50}	The noise level which is exceeded for 50 per cent of the time
L_{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes
L_{Amin}	The minimum A-weighted noise level over a time period or for an event
L_{Aeq}	The average noise energy during a measurement period
$L_{A1,1minute}$	The highest noise level generated for 0.6 second during one minute
L_{pk}	The unweighted peak noise level at any instant
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
SEL	Sound exposure level (SEL), the A-weighted noise energy during a measurement period normalised to one second
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
ABL	Assessment background level (ABL), the 10th percentile background noise level for a single period (day, evening or night) of a 24 hour monitoring period
RBL	Rating background level (RBL), the background noise level for a period (day, evening or night) determined from ABL data

2 CONSENTS AND CRITERIA

2.1 Development Consent

WCP was given approval on 1 February 2006. A modification to the consent was approved in August 2010. The relevant noise conditions from Section 3 - Specific Environmental Conditions of the consent are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in December 2011.

Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise-monitoring program for WCP was revised in September 2011. Section 5.1 details attended monitoring locations and methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Specific Criteria

Day, evening and night criteria are detailed in Table 2.1. These have been selected as the most appropriate for each monitoring location and are based on the consolidated consent or environment protection licence associated with Wilpinjong Coal Project operations.

Table 2.1 WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident number[1]	Monitoring Location	Day $L_{Aeq(15 minute)}$	Evening $L_{Aeq(15 minute)}$	Night $L_{Aeq(15 minute)}$/ $L_{A1(1 minute)}$
N4	'Hillview' Cumbo Road, Wollar[4]	NA	NA	NA/NA
N6 / Wollar	Catholic Church representative of Wollar – Residential	35[2]	35[2]	35[2]/45[2]
N7 / 45	Ulan-Wollar Road (East)	35[2]	40[2]	47[2]/45[2]
N9 / 58	Slate Gully Road, Wollar[4]	NA	NA	NA/NA
N12 / All	Ulan-Wollar Road (West)[3]	NA	NA	NA/NA

Notes:
1. *"All" indicates location is not mentioned specifically in Section 2 of the 2010 Modification and therefore has criteria applied to "all other privately owned land";*
2. *Limits from Environment Protection Licence No. 12425 and 2010 Modification;*
3. *Property is designated as a non-WPL mining interest in the 2010 Modification, so criteria are NA, 'not applicable'; and*
4. *These properties are owned by WCP, so criteria are NA, 'not applicable'.*

Condition L5.3 in the EPL states:

The noise limits set out in condition 5.1 apply under all meteorological conditions except for the following:

a) Wind speeds greater than 3 metres per second at 10 metres above ground level; or

b) Temperature inversion conditions of up to 3°C per 100 metres and wind speeds greater than 2 metres per second at 10 metres above the ground level; or

c) Temperature inversion conditions greater than 3°C per 100 metres.

2.5 Acquisition Criteria

As detailed in condition 3 of Schedule 3 of the consent, acquisition criteria for WCP are to consider noise in respect to the criteria detailed in Table 2.2 for all privately owned land (excluding land owned by Gaffney – 30, Smith – 45, Evans – 48, Thomson & Hopper - 50 and McKenzie – 94).

Table 2.2 WILPINJONG COAL ACQUISITION CRITERIA, dB

Property	L_{Aeq} (15 minute)
All privately owned land	40

2.6 Additional Mitigation Criteria

As detailed in condition 4 of Schedule 3 of the consent, additional mitigation criteria for WCP are to consider noise in respect to the criteria detailed in Table 2.3 for most privately owned land.

Table 2.3 WILPINJONG COAL ADDITIONAL MITIGATION CRITERIA, dB

Property	L_{Aeq} (15 minute)
All other privately owned land, excluding those listed below	38

Land listed in Table 1 of the consent, or property numbers 23B, 25, 52A, 52B, 53 or 58 will receive mitigation upon request.

2.7 INP Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). Chapter 4 of the INP deals specifically with modifying factors that may apply to industrial noise. The most common modifying factors are addressed in detail below.

2.7.1 Tonality, Intermittent and Impulsive Noise

As defined in the Industrial Noise Policy:

> *Tonal noise contains a prominent frequency and is characterised by a definite pitch.*
>
> *Impulsive noise has high peaks of short duration or a sequence of such peaks.*
>
> *Intermittent noise is characterised by the level suddenly dropping to the background noise levels several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only.*

Years of monitoring have indicated that noise levels from mining operations, particularly those levels measured at significant distances from the source are relatively continuous. Given this, noise levels at the monitoring locations are unlikely to be intermittent. In addition, there is no equipment on site that is likely to generate tonal or impulsive noise as defined in the INP.

2.7.2 Low Frequency Noise

As defined in the Industrial Noise Policy:

> *Low frequency noise contains major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum.*

As detailed in Chapter 4 of the INP, low frequency noise should be assessed by measuring the C-weighted and A-weighted level over the same time period. The correction/penalty of 5 dB is to applied *if the difference between the two levels is 15 dB or more*.

Low frequency noise can also be assessed against criteria specified in the paper "A Simple Method for Low Frequency Noise Emission Assessment "(Broner JLFNV Vol29-1 pp1-14 2010). If the total predicted C – weighted noise level at a receptor exceeds the relevant criterion, a 5 dB penalty (modifying factor) is added to predicted levels.

2.8 Low Frequency Criteria

Low frequency criteria are detailed in Table 2.4.

Table 2.4 $L_{Ceq,15minute}$ CRITERIA (dBC)

Method	Calculation Method	Night-time Criterion	Daytime Criterion
Broner, 2010	L_{Ceq} to 250 Hz	60	65
INP, total	Total L_{Ceq} minus L_{Aeq}	15	15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a practice note is not yet available, low frequency noise results from WCP have been compared to both criteria presented above.

3 METHODOLOGY

3.1 Assessment Method

Attended monitoring was conducted in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken. The duration of each evening and night measurement was 15 minutes.

The terms "Inaudible" (IA), "Not measurable" (NM) or "Less than 20 dB" (<20 dB) are used in this report. When site noise is noted as IA then there was no site noise at the monitoring location.

However, if site noise is noted as NM or <20 dB, this means some noise was audible but could not be quantified. This means that noise from the site was either very low, or, being masked by other noise that was relatively loud. In the former case (very low site levels) we consider it not necessary to attempt to accurately quantify site noise as it would be significantly less than any criterion and most unlikely to cause annoyance (and in many cases, to be even noticed).

If site noise were NM or <20 dB due to masking then we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting if deemed necessary. All sites NM or <20 dB in this report are due to low absolute values.

A measurement of $L_{A1,1minute}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from the Wilpinjong Coal Project (WCP) noise source during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

As indicated in L5.5 (a) and (b) of the EPL, the $L_{A1,1minute}$ measurement should be undertaken at one (1) metre from the dwelling façade and the L_{Aeq} measurement within 30 metres of the dwelling. However, the direct measurement of noise at 1 metre from the façade is not practical during monitoring for this project. In most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements for this survey were undertaken at a suitable and representative location.

As indicated in L5.7 of the EPL, modifying factors from Section 4 of the INP should be implemented where applicable. Low frequency from WCP was assessed by analysis of the measured L_{Aeq} spectrum.

3.2 Attended Monitoring

The equipment used to measure environmental noise levels are listed in Table 3.1. Calibration certificates are included as Appendix B.

Table 3.1 MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	00701424	27/04/2013
Rion NC-73 acoustic calibrator	11248306	09/02/2014

4 RESULTS

4.1 Attended Noise Monitoring

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. Table 4.2 and Table 4.3 detail $L_{Aeq,15\ minute}$ and $L_{A1,1\ minute}$ noise levels from WCP in the absence of other noise sources with impact assessment criteria. Criteria are then applied if weather conditions are in accordance with the mine's development consent. There were no modifying factors applicable to measured noise levels during this survey.

Discussion as to the noise sources responsible for these measured levels is provided in Chapter 5 of this report.

Table 4.1 MEASURED NOISE LEVELS – SEPTEMBER / OCTOBER 2012

Location	Date And Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{A50} dB	L_{Aeq} dB	L_{A90} dB	L_{Amin} dB
	Evening							
N4	23/10/2012 20:42	56	53	47	42	44	38	36
N6	23/10/2012 20:16	52	48	44	39	41	35	34
N7	23/10/2012 19:12	54	46	42	36	38	32	28
N9	23/10/2012 19:42	52	44	37	29	34	26	23
N12	23/10/2012 18:32	60	51	44	37	41	35	33
	Night-Time							
N4	23/10/2012 22:01	48	42	38	35	36	32	31
N6	23/10/2012 22:24	46	39	36	33	33	29	27
N7	23/10/2012 23:20	41	39	31	25	28	22	20
N9	23/10/2012 22:52	58	46	32	28	33	27	25
N12	23/10/2012 23:56	51	42	39	36	37	34	31
	Evening							
N4	24/10/2012 18:42	57	44	39	37	38	36	31
N6	24/10/2012 19:06	72	50	41	30	45	26	23
N7	24/10/2012 20:08	52	48	43	36	39	30	28
N9	24/10/2012 19:36	47	34	30	26	28	24	22
N12	24/10/2012 20:47	48	42	41	39	40	38	37
	Night-Time							
N4	24/10/2012 23:54	47	35	30	28	29	26	23
N6	24/10/2012 23:29	48	35	29	23	26	21	19
N7	24/10/2012 22:35	55	50	42	27	38	25	22
N9	24/10/2012 23:01	48	37	31	21	27	17	16
N12	24/10/2012 22:00	41	39	37	36	36	35	33

Note: Noise levels in this table are not necessarily the result of activities at WCP.

Table 4.2 $L_{Aeq,15\ minute}$ dB GENERATED BY WCP AGAINST IMPACT ASSESSMENT CRITERIA – SEPTEMBER / OCTOBER 2012

Location	Date And Time	Wind Speed m/s [8,9]	VTG °C per 100m [6,8,9]	Criterion dB [7]	Criterion Applies? [1,5]	WCP $L_{Aeq,\ 15min}$ dB [2,3]	Exceedance [4,5,7]
	Evening						
N4	23/10/2012 20:42	4.8	-0.9	NA	N	IA	NA
N6	23/10/2012 20:16	4.0	-0.7	35	N	IA	NA
N7	23/10/2012 19:12	3.5	-0.9	40	N	IA	NA
N9	23/10/2012 19:42	3.2	-0.7	NA	N	IA	NA
N12	23/10/2012 18:32	4.6	-1.0	35	N	IA	NA
	Night-Time						
N4	23/10/2012 22:01	3.9	-0.9	NA	N	IA	NA
N6	23/10/2012 22:24	3.8	-0.7	35	N	IA	NA
N7	23/10/2012 23:20	3.7	-0.9	47	N	IA	NA
N9	23/10/2012 22:52	3.8	-0.7	NA	N	IA	NA
N12	23/10/2012 23:56	3.1	-0.9	35	N	23	NA
	Evening						
N4	24/10/2012 18:42	2.0	0.7	NA	N	IA	NA
N6	24/10/2012 19:06	2.0	0.7	35	N	IA	NA
N7	24/10/2012 20:08	0.8	5.5	40	N	<20	NA
N9	24/10/2012 19:36	0.3	3.8	NA	N	<20	NA
N12	24/10/2012 20:47	0.4	4.7	35	N	32	NA
	Night-Time						
N4	24/10/2012 23:54	0.3	5.7	NA	N	29	NA
N6	24/10/2012 23:29	0.3	6.6	35	N	IA	NA
N7	24/10/2012 22:35	0.2	5.3	47	N	25	NA
N9	24/10/2012 23:01	0.3	6.0	NA	N	NM	NA
N12	24/10/2012 22:00	0.3	4.3	35	N	33	NA

Notes:
1. *Noise emission limits apply for winds up to 3 metres per second (at a height of 10 metres, or, vertical temperature gradients of up to 3 degrees/100m with wind speed up to 2 m/s;*
2. *These are results for WCP in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;*
7. *NA in criterion column means the criteria are not applicable at this location, NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified;*
8. *Atmospheric data is sourced from the WCP weather station; and*
9. *Criterion may or may not apply due to rounding of meteorological data values.*

Table 4.3 $L_{A1,1 minute}$ dB GENRATED BY WCP AGAINST IMPACT ASSESSMENT CRITERIA – SEPTEMBER / OCTOBER 2012

Location	Date And Time	Wind Speed m/s [8,9]	VTG °C per 100m [6,8,9]	Criterion dB [,7]	Criterion Applies? [1,5]	WCP $L_{A1, 1 min}$ dB [2,3]	Exceedance [4, 5,7]
	Night-Time						
N4	23/10/2012 22:01	3.9	-0.9	NA	N	IA	NA
N6	23/10/2012 22:24	3.8	-0.7	45	N	IA	NA
N7	23/10/2012 23:20	3.7	-0.9	45	N	IA	NA
N9	23/10/2012 22:52	3.8	-0.7	NA	N	IA	NA
N12	23/10/2012 23:56	3.1	-0.9	45	N	33	NA
	Night-Time						
N4	24/10/2012 23:54	0.3	5.7	NA	N	30	NA
N6	24/10/2012 23:29	0.3	6.6	45	N	IA	NA
N7	24/10/2012 22:35	0.2	5.3	45	N	30	NA
N9	24/10/2012 23:01	0.3	6.0	NA	N	NM	NA
N12	24/10/2012 22:00	0.3	4.3	45	N	35	NA

Notes: 1. *Noise emission limits apply for winds up to 3 metres per second (at a height of 10 metres, and, vertical temperature gradients of up to 3 degrees/100m with wind speed up to 2 m/s;*

2. *These are results for WCP in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;*
7. *NA in criterion column means the criteria are not applicable at this location, NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified;*
8. *Atmospheric data is sourced from the WCP weather station; and*
9. *Criterion may or may not apply due to rounding of meteorological data values.*

Where WCP only noise levels are within the impact assessment criteria, it is not necessary to compare these noise levels to acquisition or mitigation criteria, as these levels are higher. Compliance with impact assessment indicates compliance with acquisition or mitigation criteria.

4.2 Low Frequency Assessment

Table 4.4 provides statistics for attended noise monitoring undertaken around WCP during the September/October 2012 survey.

Table 4.4 ATTENDED MEASUREMENT STATISTICS FOR WCP – SEPTEMBER / OCTOBER 2012

	September / October 2012
No. of measurements	20
Measurements where met applies	0
WCP is measurable and criteria and met applies	0

None of the 20 measurements occurred during which Wilpinjong Coal was measurable (not "inaudible" or "not measurable") and where meteorological conditions resulted in criteria applying (in accordance with the project approval). No further assessment is required.

4.3 Atmospheric Conditions

Atmospheric condition data measured at each location are shown in Table 4.5. Data obtained concurrently by the WCP meteorological station is provided in Table 4.6.

Table 4.5 MEASURED ATMOSPHERIC CONDITIONS

Location	Date And Time	Temperature (° C)	Wind Speed (m/s)	Wind Direction (° MN)	Cloud Cover (eighths)
	Evening				
N4	23/10/2012 20:42	14	1.0	140	0
N6	23/10/2012 20:16	15	1.0	10	0
N7	23/10/2012 19:12	16	2.0	70	0
N9	23/10/2012 19:42	16	1.1	10	0
N12	23/10/2012 18:32	18	1.2	110	0
	Night-Time				
N4	23/10/2012 22:01	15	0.9	140	0
N6	23/10/2012 22:24	13	0.9	60	0
N7	23/10/2012 23:20	12	0.8	80	0
N9	23/10/2012 22:52	13	1.4	150	0
N12	23/10/2012 23:56	12	2.7	110	0
	Evening				
N4	24/10/2012 18:42	25	0.0	-	0
N6	24/10/2012 19:06	18	0.5	240	0
N7	24/10/2012 20:08	13	0.5	175	0
N9	24/10/2012 19:36	17	0.6	110	0
N12	24/10/2012 20:47	14	0.6	240	0
	Night-Time				
N4	24/10/2012 23:54	13	0.0	-	0
N6	24/10/2012 23:29	9	0.0	-	0
N7	24/10/2012 22:35	9	0.7	150	0
N9	24/10/2012 23:01	10	0.4	130	0
N12	24/10/2012 22:00	11	0.6	280	0

Notes: 1. Wind speed and direction measured at 1.8 metres.

Table 4.6 WCP METEOROLOGICAL STATION DATA

Date and Time	Wind Speed (m/s)	Wind Direction (Degrees)	Lapse Rate (Degrees / 100 metres)
23/10/2012 18:00	4.1	86	-2.1
23/10/2012 18:15	4.5	94	-1.7
23/10/2012 18:30	4.2	96	-1.2
23/10/2012 18:45	4.6	93	-1.0
23/10/2012 19:00	3.8	97	-0.9
23/10/2012 19:15	2.9	81	-0.7
23/10/2012 19:30	3.5	95	-0.9
23/10/2012 19:45	3.2	99	-0.7
23/10/2012 20:00	3.5	103	-0.9
23/10/2012 20:15	3.9	93	-0.7
23/10/2012 20:30	4.0	92	-0.7
23/10/2012 20:45	4.6	92	-0.7
23/10/2012 21:00	4.8	97	-0.9
23/10/2012 21:15	4.7	97	-0.7
23/10/2012 21:30	3.8	95	-0.9
23/10/2012 21:45	3.6	95	-0.7
23/10/2012 22:00	3.9	98	-0.9
23/10/2012 22:15	3.9	98	-0.9
23/10/2012 22:30	4.2	96	-0.7
23/10/2012 22:45	3.8	96	-0.7
23/10/2012 23:00	3.6	95	-0.7
23/10/2012 23:15	4.6	101	-0.9
23/10/2012 23:30	3.7	97	-0.9
23/10/2012 23:45	3.3	99	-0.9
24/10/2012 00:00	2.9	105	-0.9
24/10/2012 00:15	3.1	107	-0.9
24/10/2012 00:30	3.9	108	-0.9
24/10/2012 00:45	2.9	114	-0.9
24/10/2012 01:00	2.7	115	-0.7
24/10/2012 18:00	0.7	64	-2.2
24/10/2012 18:15	1.0	69	-1.6
24/10/2012 18:30	1.2	82	-1.2
24/10/2012 18:45	0.9	125	-0.5
24/10/2012 19:00	2.0	186	0.7
24/10/2012 19:15	1.6	212	1.4
24/10/2012 19:30	0.7	226	2.8

Table 4.6 WCP METEOROLOGICAL STATION DATA

Date and Time	Wind Speed (m/s)	Wind Direction (Degrees)	Lapse Rate (Degrees / 100 metres)
24/10/2012 19:45	0.3	191	3.8
24/10/2012 20:00	0.5	18	5.2
24/10/2012 20:15	0.8	8	5.5
24/10/2012 20:30	1.2	356	6.4
24/10/2012 20:45	0.6	340	6.4
24/10/2012 21:00	0.4	302	4.7
24/10/2012 21:15	0.3	5	3.8
24/10/2012 21:30	0.5	346	4.3
24/10/2012 21:45	0.0	11	6.0
24/10/2012 22:00	0.3	7	4.3
24/10/2012 22:15	0.3	316	4.5
24/10/2012 22:30	0.1	341	4.5
24/10/2012 22:45	0.2	359	5.3
24/10/2012 23:00	0.1	3	4.3
24/10/2012 23:15	0.3	17	6.0
24/10/2012 23:30	0.3	17	6.6
24/10/2012 23:45	0.5	0	5.3
25/10/2012 00:00	0.0	287	5.9
25/10/2012 00:15	0.3	10	5.7
25/10/2012 00:30	0.2	5	4.8
25/10/2012 00:45	0.1	18	5.2

Notes: 1. Data supplied by WCP.

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 and Table 4.2 present data gathered during attended monitoring. These noise levels are the result of many sounds reaching the sound level meter microphone during monitoring. Received levels from various noise sources were noted during attended monitoring and particular attention was paid to the extent of WCP's contribution, if any, to measured levels. At each receptor location, WCP's $L_{Aeq,15\ minute}$ and $L_{A1,1\ minute}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis.

From these observations summaries have been derived for each location. The following chapter sections provide these summaries. Statistical 1/3 octave band analysis of environmental noise was undertaken, and Figures 3 to 22 display the frequency ranges for various noise sources at each location for L_{A1}, L_{A10}, L_{A90}, and L_{Aeq}. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 2 where it can be seen that frogs and insects are generating noise at frequencies above 1000 Hz; mining noise is at frequencies less than 1000 Hz (this is typical). Adding levels at frequencies that relate to mining only allows separate statistical results to be calculated. This analysis cannot always be performed if there are significant levels of other noise at the same frequencies as mining; this can be dogs, cows, or, most commonly, road traffic.

It should be noted that the method of summing statistical values up to a cutoff frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq}.

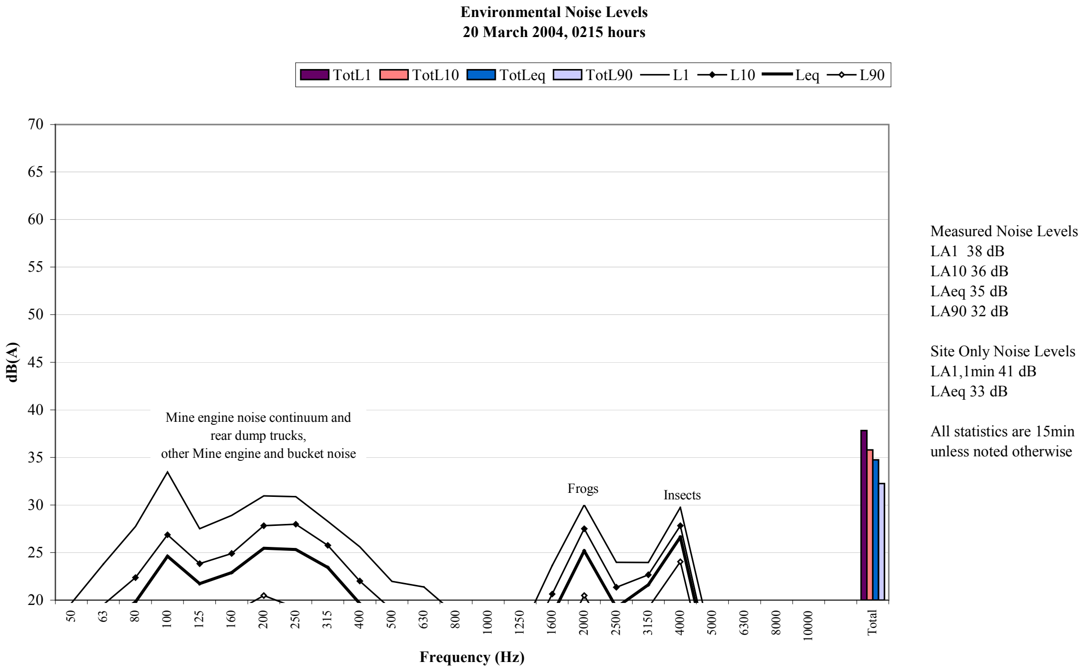


Figure 2 Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N4, 23 October 2012, Evening

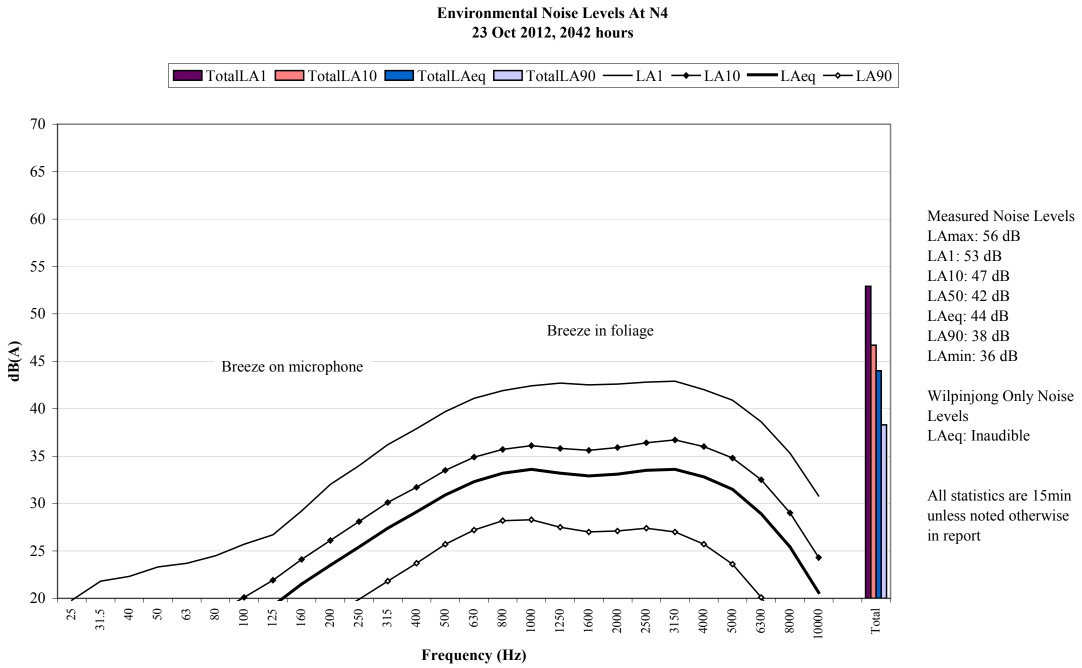


Figure 3 Environmental Noise Levels, N4 – Cumbo Road

WCP inaudible.

Breeze on the microphone and breeze in foliage were responsible for all measured levels.

5.1.2 N6, 23 October 2012, Evening

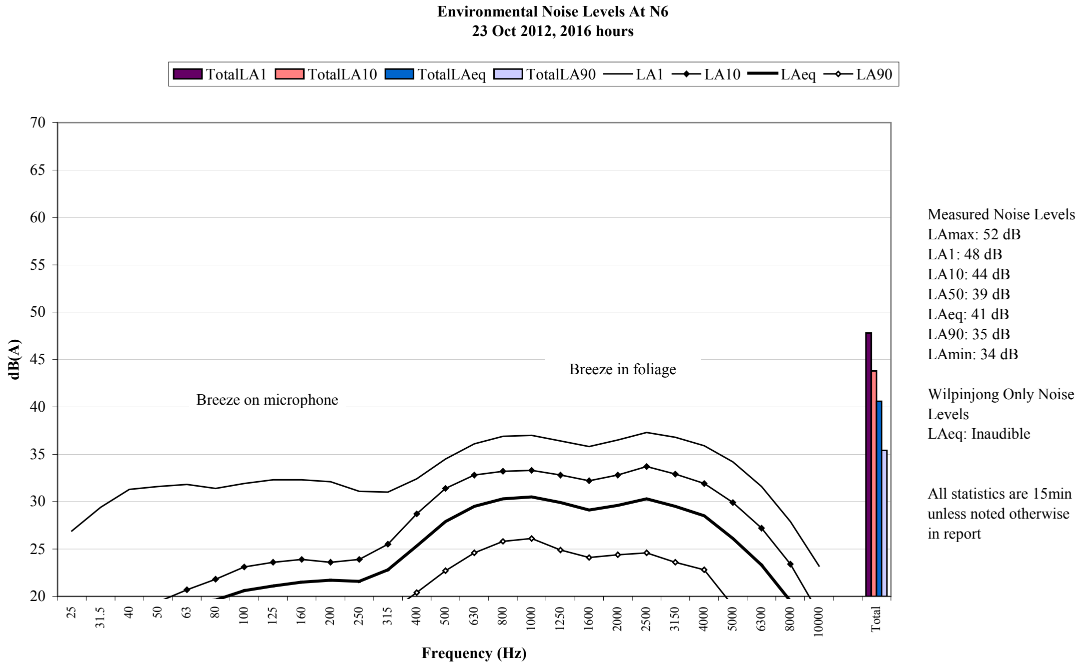


Figure 4 Environmental Noise Levels, N6 – Wollar Church

WCP was inaudible.

Breeze on the microphone and breeze in foliage were responsible for all measured levels.

Dogs and cats were also noted at low levels.

5.1.3 N7, 23 October 2012, Evening

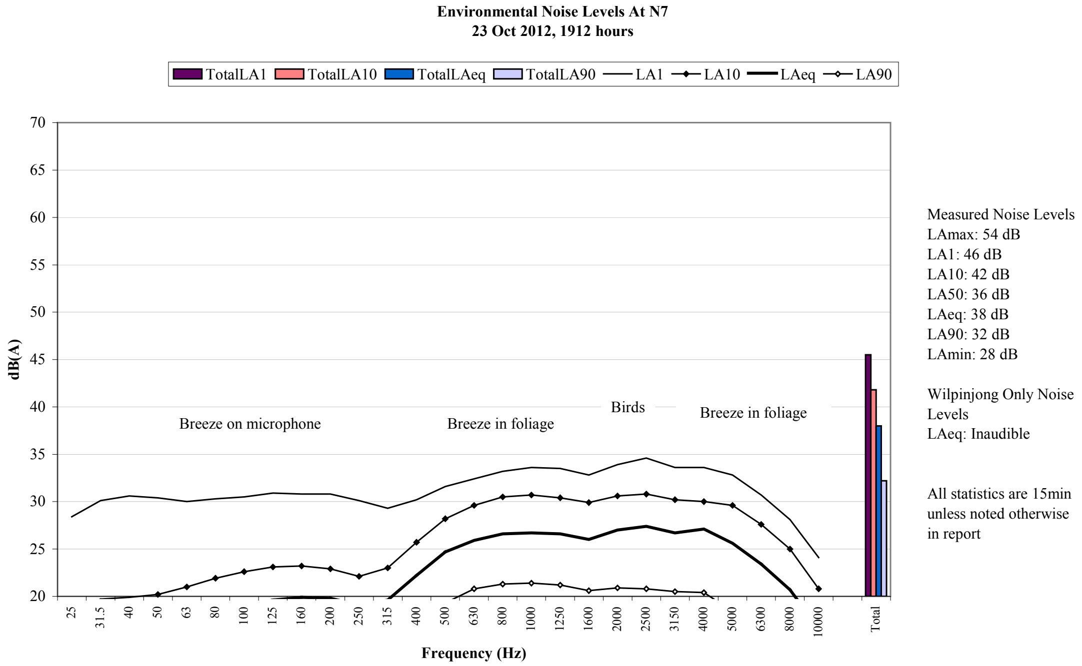


Figure 5 Environmental Noise Levels, N7 – Ulan-Wollar Road (East)

WCP was inaudible.

Breeze on the microphone, breeze in foliage and birds were responsible for measured levels.

5.1.4 N9, 23 October 2012, Evening

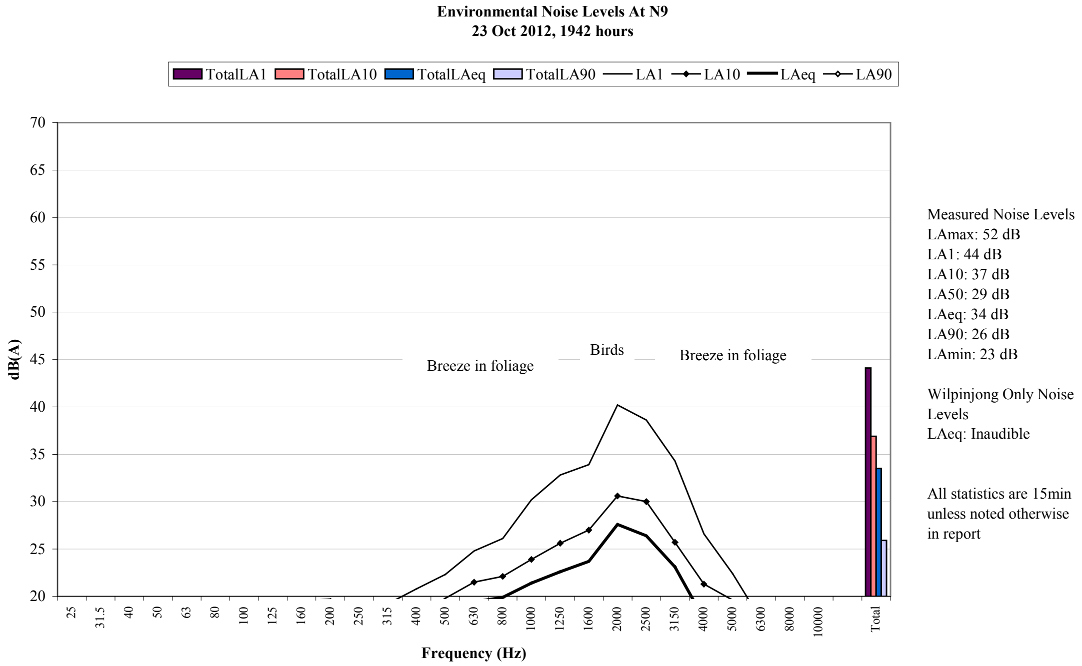


Figure 6 Environmental Noise Levels, N9 – Slate Gully Road

WCP was inaudible.

Breeze in foliage and birds were responsible for measured levels.

An aircraft, nearby residents and kangaroos were also noted at low levels.

5.1.5 N12, 23 October 2012, Evening

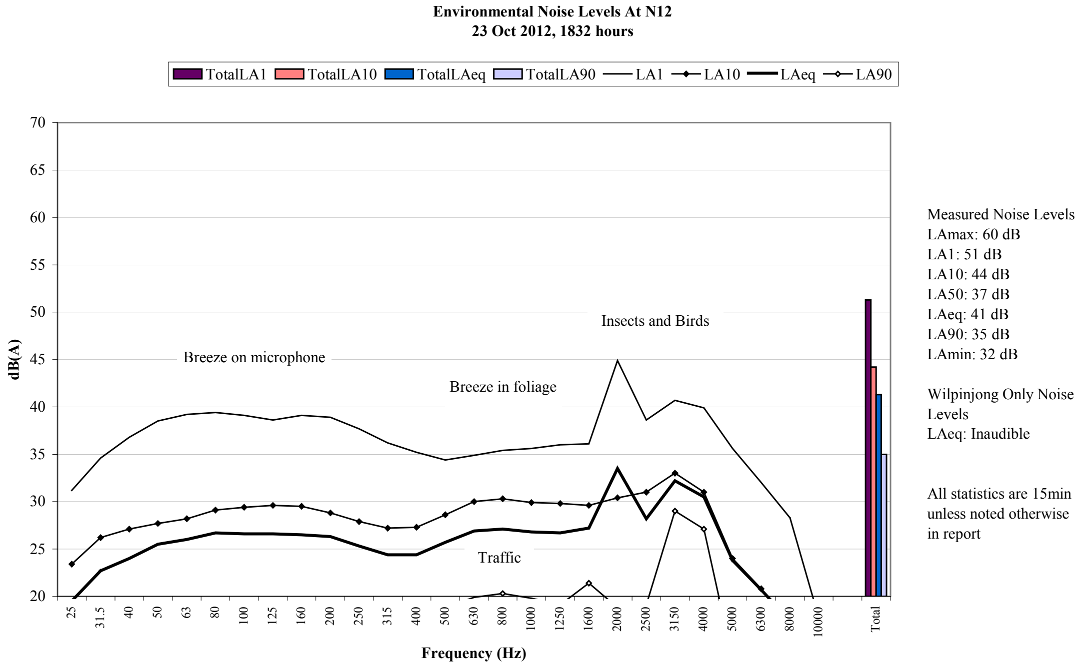


Figure 7 Environmental Noise Levels, N12 – Ulan-Wollar Road (West)

WCP was inaudible.

Birds were responsible for the measured L_{A1}. Breeze on the microphone and breeze in foliage combined with insects and birds to generate the measured L_{A10} and L_{Aeq}. Insects were primarily responsible for the measured L_{A90}. Distant road traffic noise was a minor contributor.

5.1.6 N4, 23 October 2012, Night-time

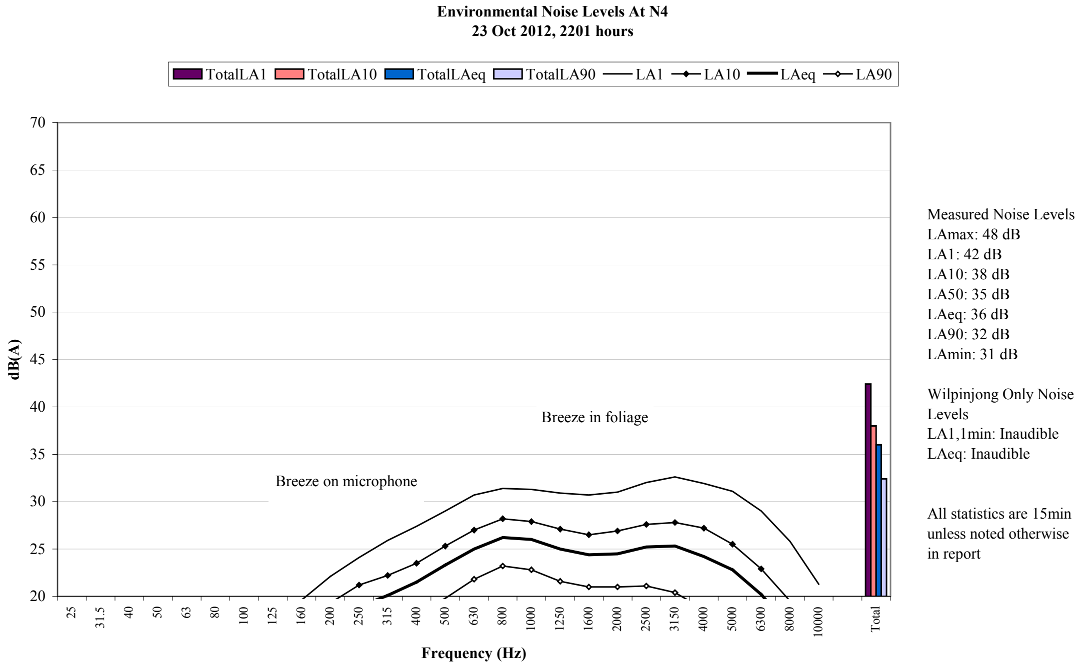


Figure 8 Environmental Noise Levels, N4 – Cumbo Road

WCP was inaudible.

Breeze on the microphone and breeze in foliage were responsible for all measured levels.

5.1.7 N6, 23 October 2012, Night-time

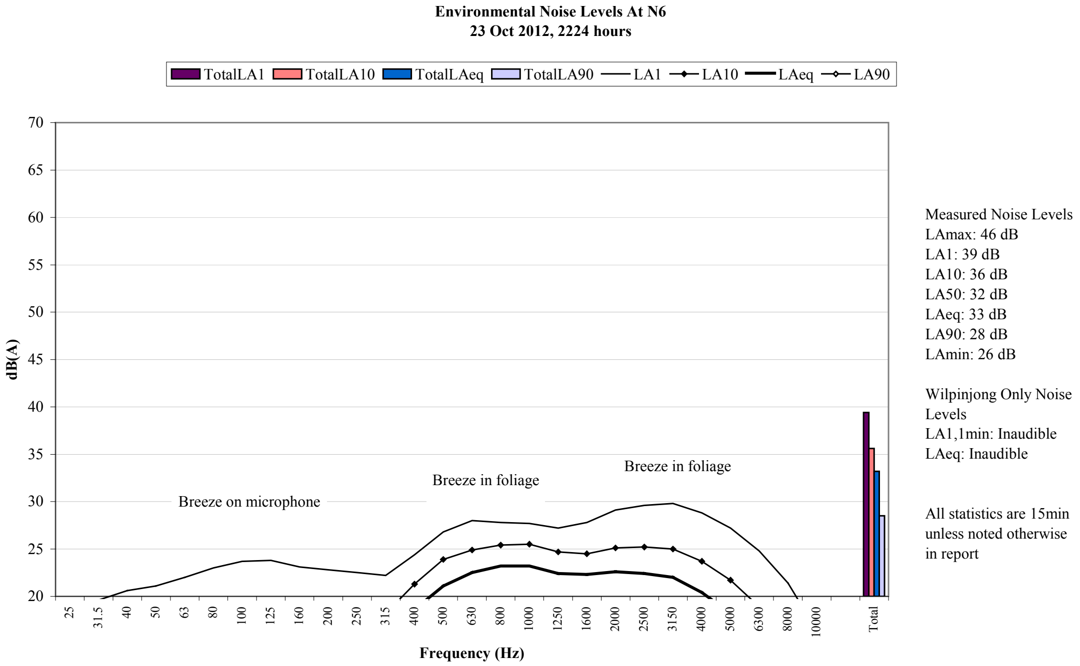


Figure 9 Environmental Noise Levels, N6 – Wollar Church

WCP was inaudible.

Breeze on the microphone and breeze in foliage generated all measured levels.

Dogs, insects and frogs were also noted.

5.1.8 N7, 23 October 2012, Night-time

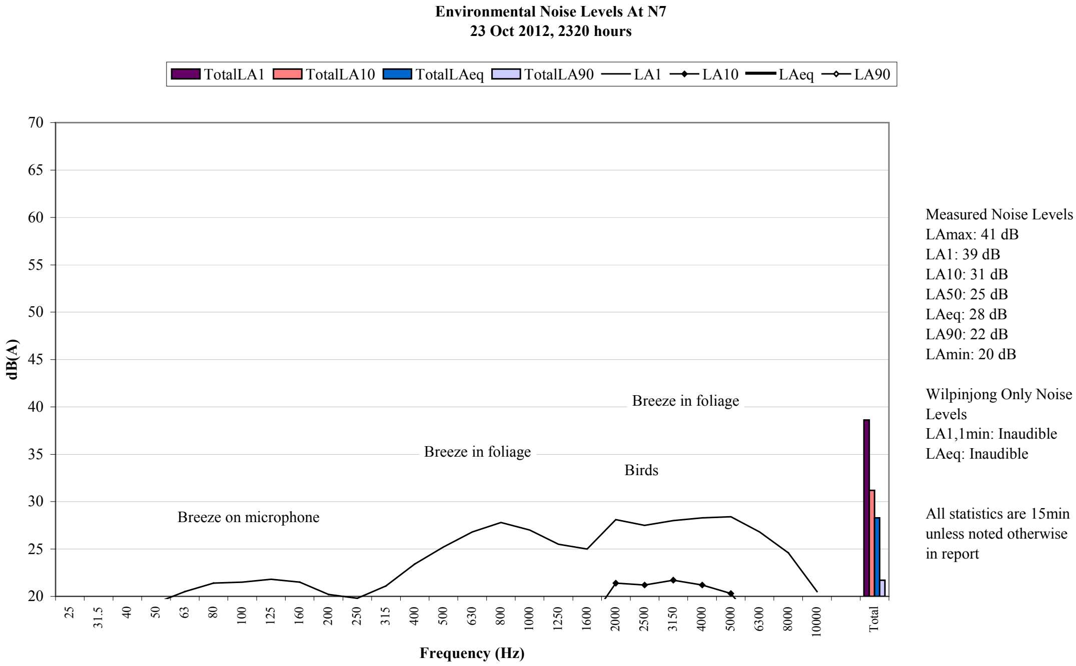


Figure 10 Environmental Noise Levels, N7 – Ulan Wollar Road (East)

WCP was inaudible.

Breeze in foliage and breeze on the microphone combined with birds to generate all measured levels.

An aircraft was also noted at low levels.

5.1.9 N9, 23 October 2012, Night-time

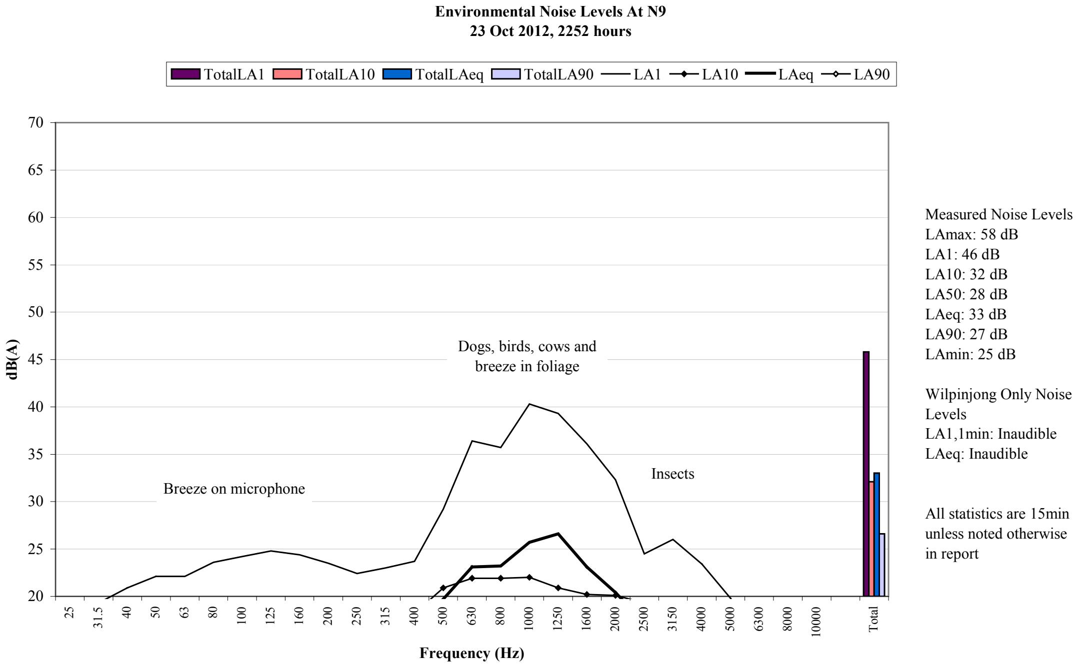


Figure 11 Environmental Noise Levels, N9 – Slate Gully Road

WCP was inaudible.

Dogs, birds and cows were responsible for the measured L_{Amax}, L_{Aeq} and contributed to the measured L_{A10}. Insects contributed to the measured L_{Aeq}. Breeze in the foliage was primarily responsible for the measured L_{A10}, L_{A50} and L_{A90}.

5.1.10 N12, 23 October 2012, Night-time

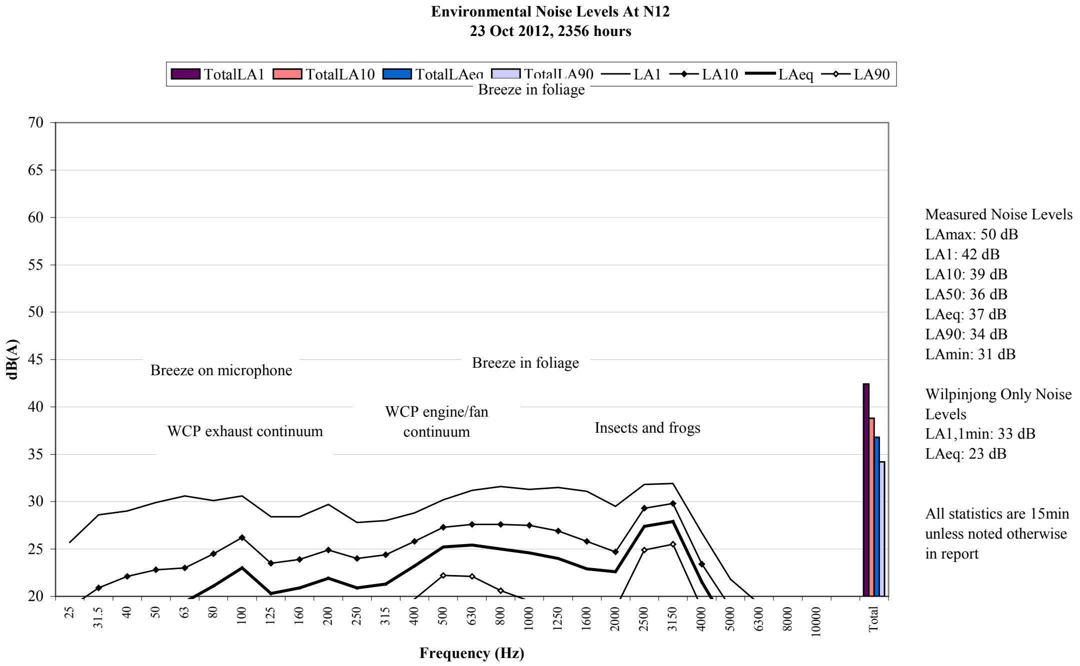


Figure 12 Environmental Noise Levels, N12 – Ulan Wollar Road (West)

WCP was audible throughout the measurement as an engine, fan and exhaust continuum. This resulted in a site only L_{Aeq} of 23 dB and $L_{A1,1minute}$ of 33 dB. A horn was noted once at low level.

Breeze in foliage, breeze on the microphone, along with insects and frogs were primarily responsible for measured levels.

5.1.11 N4, 24 October 2012, Evening

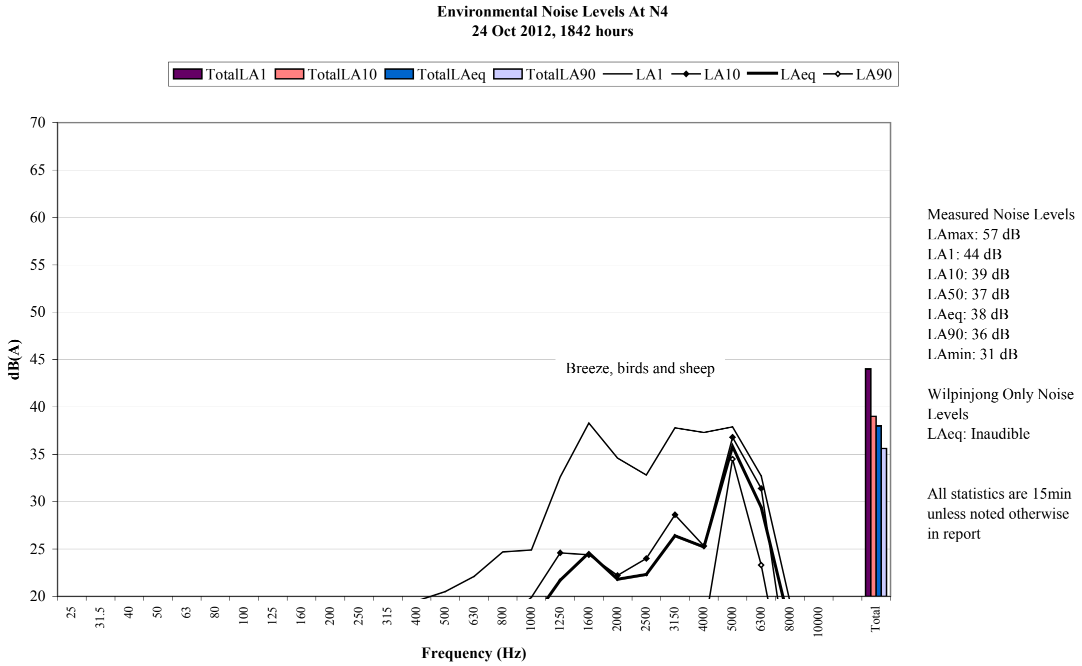


Figure 13 Environmental Noise Levels, N4 – Cumbo Road

WCP was inaudible.

Birds, insects and sheep were responsible for measured levels.

5.1.12 N6, 24 October 2012, Evening

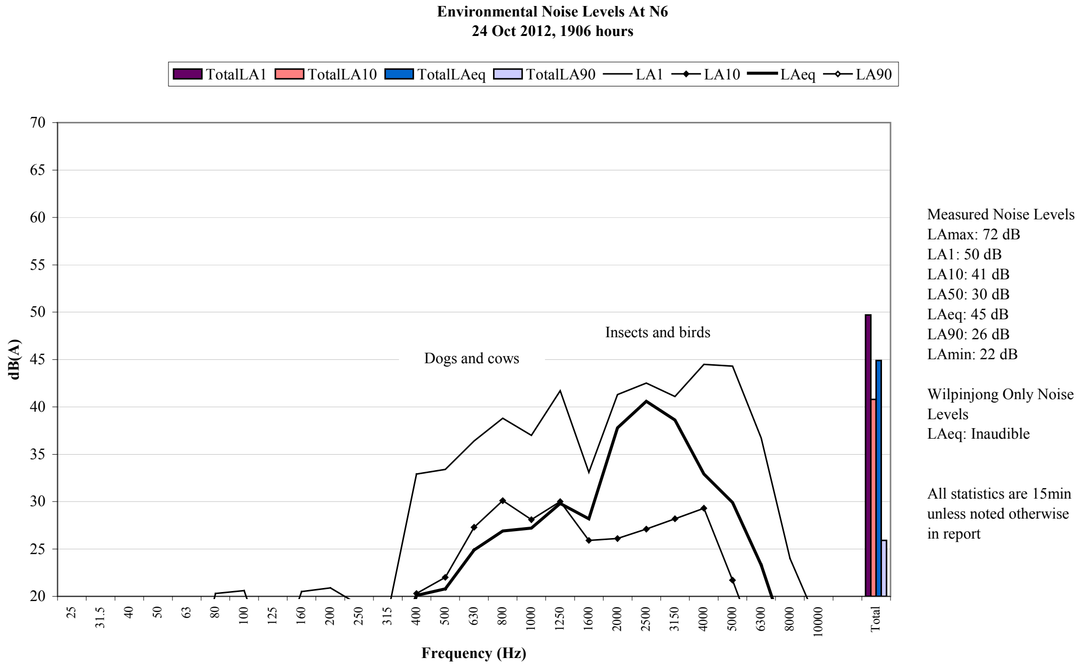


Figure 14 Environmental Noise Levels, N6 – Wollar Church

WCP was inaudible.

Birds were primarily responsible for the measured L_{A1} and L_{Aeq}. Dogs, cows, insects and birds generated the measured L_{A10}.

Breeze in foliage was also noted.

5.1.13 N7, 24 October 2012, Evening

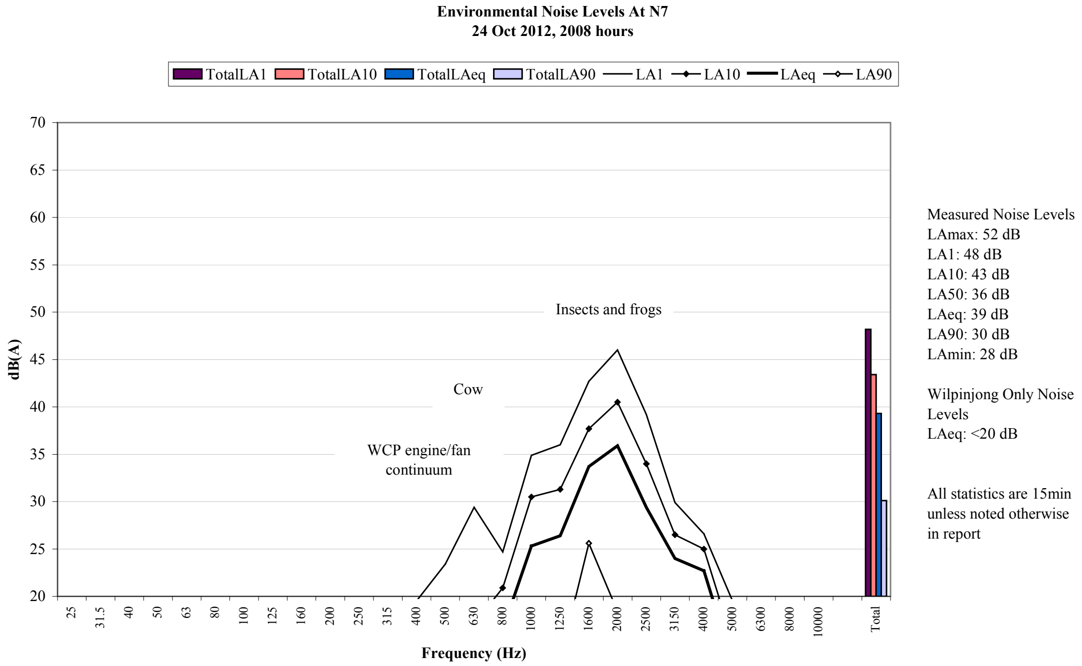


Figure 15 Environmental Noise Levels, N7 – Ulan-Wollar Road (East)

WCP was audible throughout the measurement as a low-level engine and fan continuum. Dozer track noise and horns were also noted. These sources resulted in a site only L_{Aeq} of less than 20 dB.

Insects and frogs were responsible for measured levels.

Bats and a cow were also noted.

5.1.14 N9, 24 October 2012, Evening

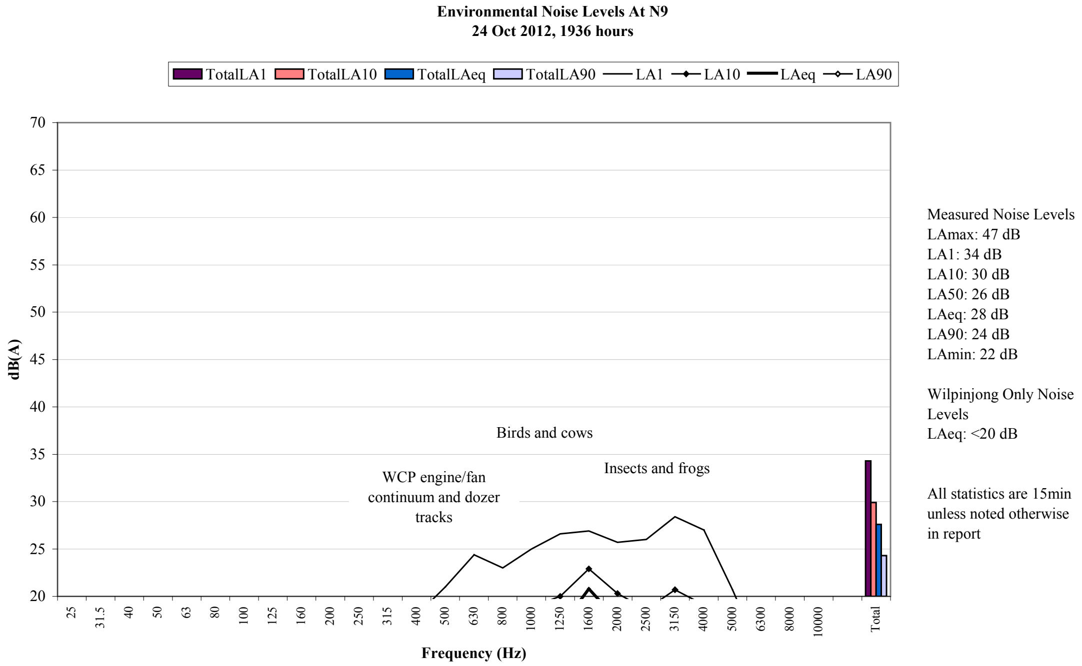


Figure 16 Environmental Noise Levels, N9 – Slate Gully Road

WCP was audible throughout the measurement for a low-level engine and fan continuum. Dozer tacks and engine surges were noted on several occasions. These sources resulted in a site only L_{Aeq} of less than 20 dB.

Birds generated the measured L_{A1}. Frogs and insects were primarily responsible for the measured L_{A10}, L_{Aeq} and L_{A90}. WCP was a minor contributor to the measured L_{A90}.

Low-level voices nearby were also noted twice. A cow was also audible.

5.1.15 N12, 24 October 2012, Evening

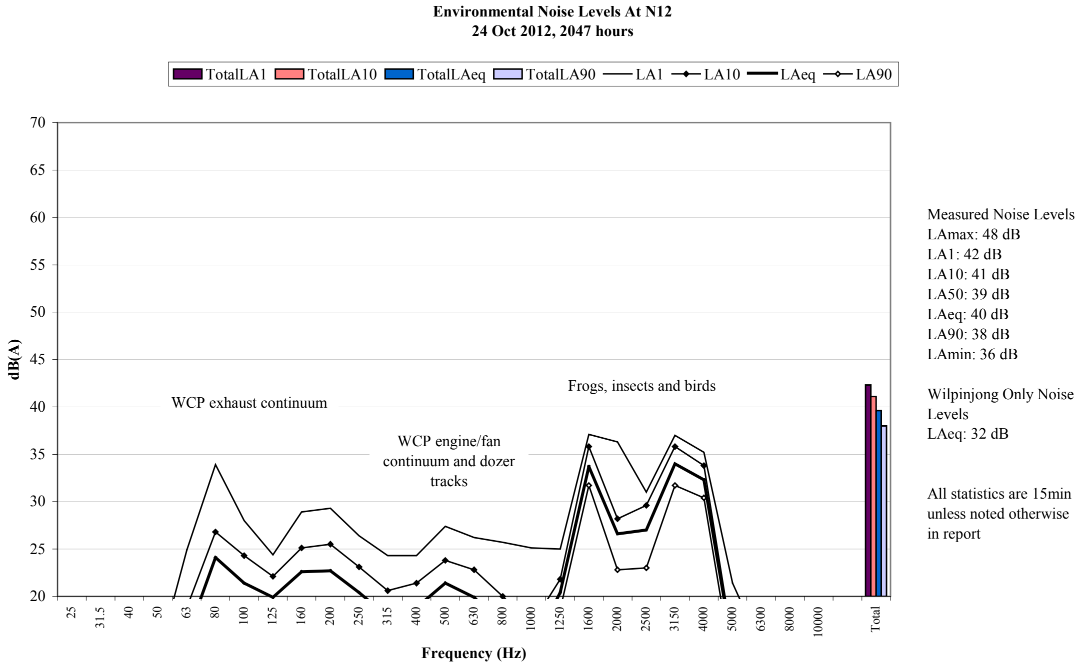


Figure 17 Environmental Noise Levels, N12 – Ulan-Wollar Road (West)

WCP was audible throughout the measurement as an engine, fan and exhaust continuum. Dozer tack noise was also noted. These sources resulted in a WCP only L_{Aeq} of 32 dB.

Insects and frogs were primarily responsible for measured levels. WCP was a minor contributor to the measured L_{A10}, L_{Aeq} and L_{A90}.

Birds were also noted.

5.1.16 N4, 24 October 2012, Night-time

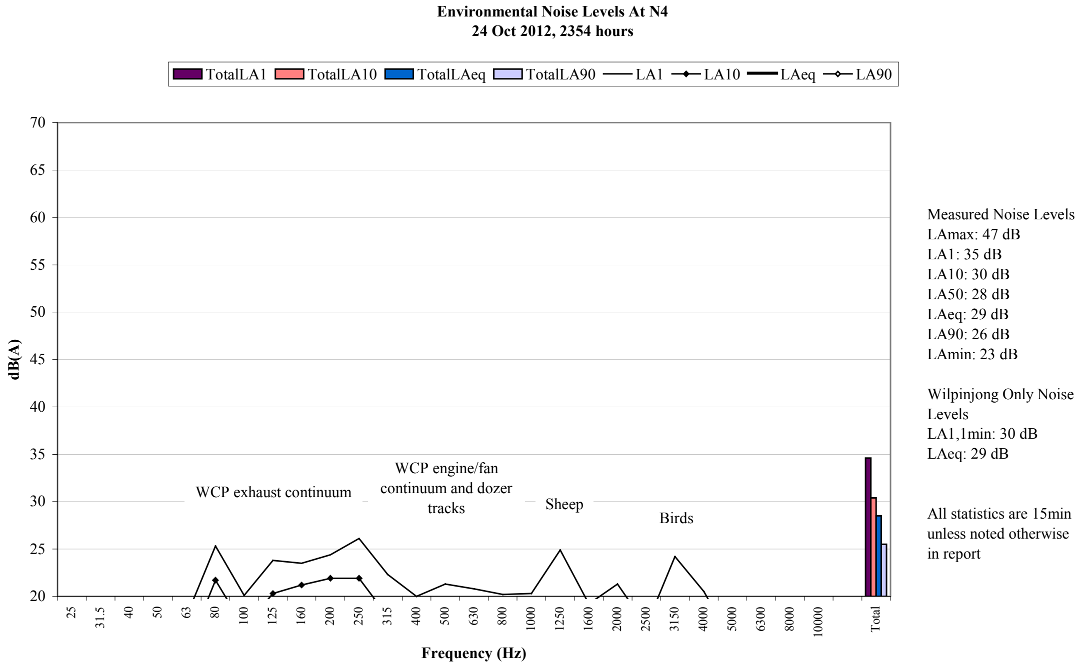


Figure 18 Environmental Noise Levels, N4 – Cumbo Road

WCP was audible throughout the measurement as an engine, fan and exhaust continuum with dozer tracks and horn noise also noted. These sources generated the WCP only L_{Aeq} of 29 dB. The continuum was responsible for the WCP only $L_{A1,1min}$ of 30 dB. WCP was primarily responsible for measured levels.

Sheep and birds were minor contributors to measured levels.

A bat, dog and distant train were also noted.

5.1.17 N6, 24 October 2012, Night-time

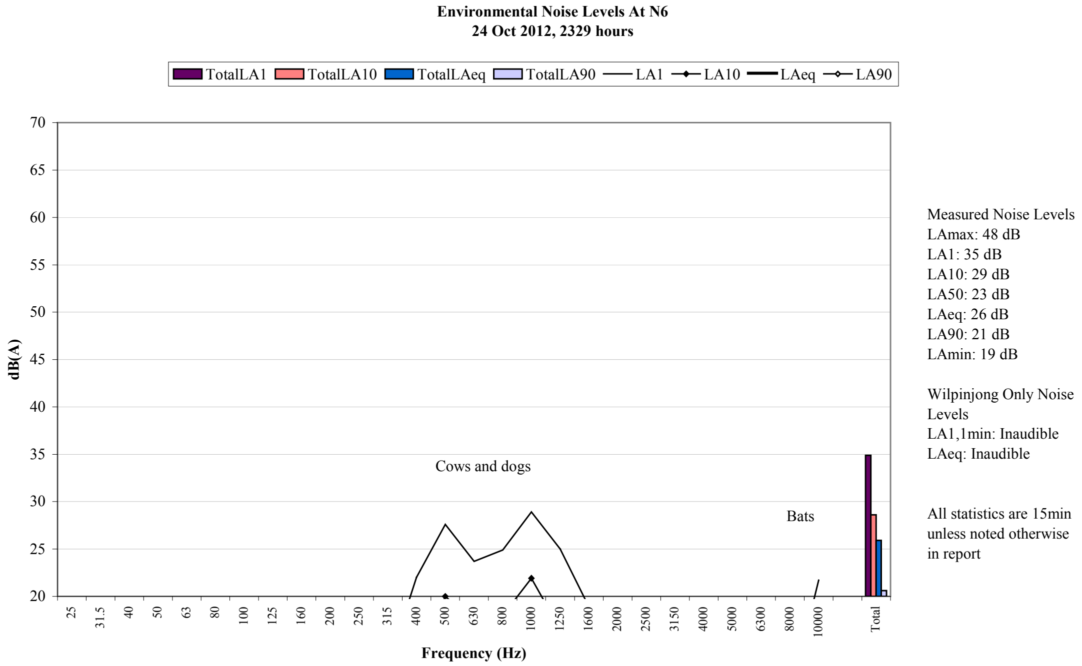


Figure 19 Environmental Noise Levels, N6 – Wollar Church

WCP was inaudible.

Cows and dogs were responsible for measured levels.

Insects, bats and frogs were also noted at low levels.

5.1.18 N7, 24 October 2012, Night-time

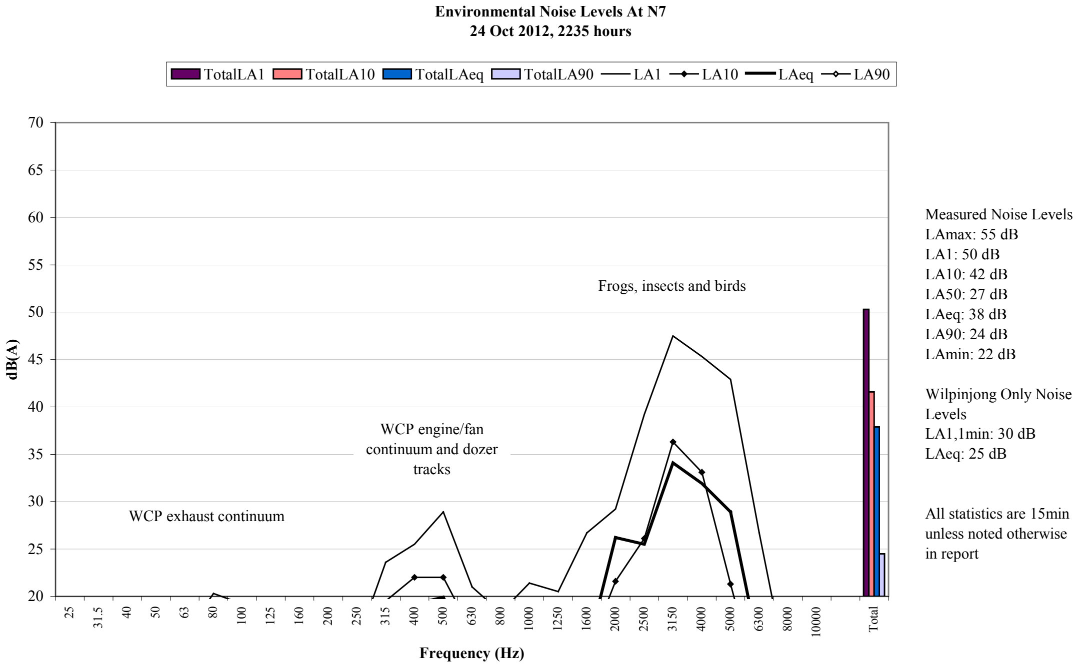


Figure 20 Environmental Noise Levels, N7 – Ulan Wollar Road (East)

WCP was audible throughout the measurement as an engine, fan and exhaust continuum, along with dozer track and horn noise. These sources generated the WCP only L_{Aeq} of 25 dB. Horn noise was responsible for the WCP only $L_{A1,1minute}$ of 30 dB.

Frogs, insects and birds were responsible for measured levels.

A cow was also noted.

5.1.19 N9, 24 October 2012, Night-time

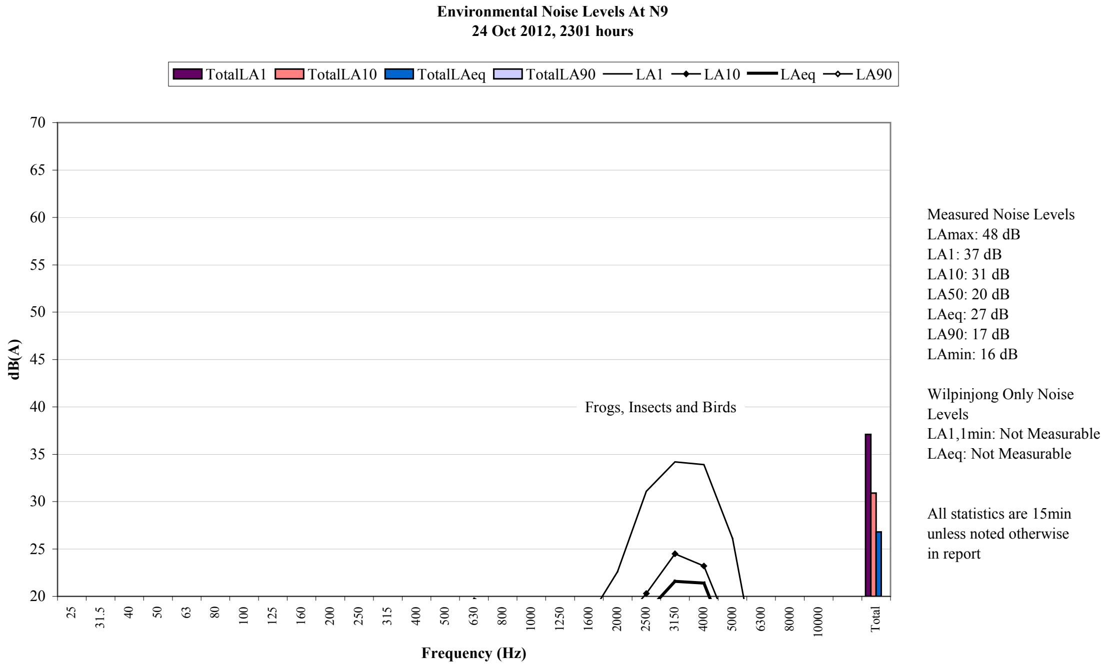


Figure 21 Environmental Noise Levels, N9 – Slate Gully Road

A very low-level exhaust continuum from WCP was audible but was not measurable.

Frogs, insects and birds were responsible for measured levels.

A dog and a bat were also noted.

5.1.20 N12, 24 October 2012, Night-time

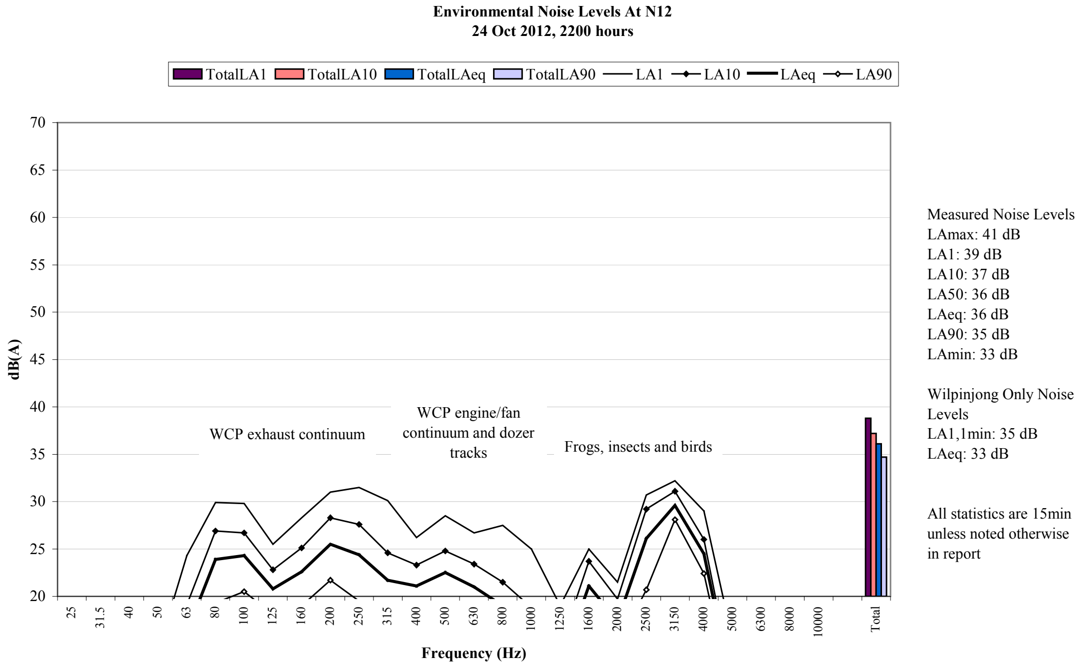


Figure 22 Environmental Noise Levels, N12 – Ulan Wollar Road (West)

WCP was audible throughout the measurement as an engine, fan and exhaust continuum, along with dozer track noise. These sources generated the WCP only L_{Aeq} of 33 dB. Engine noise was responsible for the WCP only $L_{A1,1minute}$ of 35 dB. WCP contributed to all measured levels.

Frogs, insects and birds contributed to measured levels.

Bats were also noted.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the evening and nights of the 23 and 24 October 2012. Attended noise monitoring was conducted at five sites. The duration of all measurements was 15 minutes.

Wind speed and/or estimated temperature inversion conditions resulted in development consent criteria not always being applicable, as indicated in Table 4.2 and Table 4.3.

Wilpinjong Coal Project (WCP) complied with noise consent limits at the monitoring locations during the September / October 2012 monitoring period.

Global Acoustics Pty Ltd

APPENDIX

A. DEVELOPMENT CONSENT

Several documents specifying noise criteria apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Project Development Consent

Wilpinjong Coal Project was given approval on 1 February 2006. A modification to the consent was approved in August 2010.

The relevant noise conditions from Section 3 - Specific Environmental Conditions of the modified consent is reproduced below.

ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Proponent shall acquire the land in accordance with the procedures in conditions 6 – 7 of schedule 4.

Table 1: Land subject to acquisition upon request

30 – Gaffney	45 – Smith
48 – Evans	50 – Thompson & Hopper
94 – McKenzie	

Note:

- *To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.*

Noise Impact Assessment Criteria

2. Except for the land referred to in Table 1, the Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land, or on more than 25 per cent of any privately-owned land.

Table 2: Noise Impact assessment criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{A1(1\ minute)}$
58 – Maher 52A – Long 52B – Long 53 – Reynolds	35	39	39	45
23B – Bishop	35	39	37	45
25 – Pettit	35	39	36	45
31A – Conradt	35	37	37	45
31B – Conradt	35	36	36	45
100 – Rheinberger 125 – Roberts	35	37	35	45
Wollar Village – Residential	36	35	35	45
All other privately owned land	35	35	35	45
901 – Wollar School	35(internal) 45 (external) When in use			-
150A – St Luke's Anglican Church 900 – St Laurence O'Toole Catholic Church	40 (internal) When in use			-
Goulburn River National Park/Munghorn Gap Nature Reserve	50 When in use			-

However, the criteria in Table 2 do not apply if the Proponent has an agreement with the relevant owner/s to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:

- *To interpret the locations referred to in Table 2, see the applicable figures in Appendix 7.*
- *Noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.*
- *For the Goulburn River National Park/Munghorn Nature Reserve noise levels are to be assessed at the most affected point at the boundary of the Goulburn River National Park/Munghorn Nature Reserve.*

Noise Acquisition Criteria

3. If the noise generated by the project exceeds the criteria in Table 3 at any residence on privately-owned land or on more than 25 per cent of any privately-owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 6 – 7 of schedule 4.

Table 3: Land acquisition criteria dB(A)

Day/Evening/Night $L_{Aeq(15\ minute)}$	Land
40	All privately owned land, excluding the land listed in Table 1

Note:

- *Noise generated by the project is to be measured in accordance with the notes presented below Table 2. For the condition to apply, the exceedances must be systemic.*

Additional Noise Mitigation Measures

4. Upon receiving a written request from the owner of any residence:
   (a) on the land listed in Table 1; or
   (b) on the land listed 23B, 25, 52A, 52B, 53, or 58 in the applicable figures in Appendix 7; or
   (c) where subsequent noise monitoring shows that the noise generated by the project is greater than, or equal to, $L_{Aeq(15\ minute)}$ 38 dB(A),

   the Proponent shall implement reasonable and feasible noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the landowner.

   If within 3 months of receiving this request from the landowner, the Proponent and the landowner 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.

5. By 30 November 2010, or within 1 month of obtaining monitoring results showing an exceedance of the relevant criteria listed in condition 4(c) above, the Proponent shall notify all applicable owners that they are entitled to ask for additional noise mitigation measures to be installed at their residence.

Operating Conditions

6. The Proponent shall:
   (a) implement all reasonable and feasible noise mitigation measures;
   (b) ensure that the real-time noise monitoring and meteorological forecasting data are assessed regularly, and that operations on site are relocated, modified, and/or stopped to ensure compliance with the relevant criteria in conditions 2 to 4 of this schedule; and
   (c) regularly investigate ways to reduce the operational, low frequency, rail, and road traffic noise generated by the project; and report on these investigations in the annual review (see condition 2 of schedule 5),

   to the satisfaction of the Director-General.

Noise Management Plan

7. The Proponent shall prepare and implement a Noise Management Plan for the project, in consultation with DECCW, and to the satisfaction of the Director-General. This plan must:
   (a) describe the noise mitigation measures that would be implemented to ensure compliance with the relevant noise impact assessment criteria in this approval, including the proposed real-time noise management system and associated meteorological forecasting; and
   (b) include a noise monitoring program, that uses a combination of real-time and supplementary attended monitoring measures to evaluate the performance of the project, and includes a protocol for determining exceedances with the relevant conditions of this approval.

A.2 Environment Protection Licence

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in December 2011.

The relevant section reproduced below.

L5 Noise limits

L5.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The locations referred to in the table below are indicated by the property identification numbers on Figure 4A Relevant Land Ownership Plan Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment 17 May 2010. The property identification numbers are indicated on Figure 4B Relevant Land Ownership List Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment 17 May 2010.

Location	Day	Evening	Night	Night
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
25 Pettit - Lot 16 DP250053	35	39	36	45
52A Long - Lot 8 DP250053	35	39	39	45
52B Long - Lot 8 DP250053	35	39	39	45
51 Bailey - Lot 5, 6 & 7 DP250053	35	39	39	45
58 Maher	35	39	39	45
31A Conradt - Lot 10, 11 & 12 DP250053 & Lot 160 DP723767	35	37	37	45
31B Conradt - Lot 10, 11 & 12 DP250053 & Lot 160 DP723767	35	36	36	45
Wollar village	35	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
125 E & K Roberts	35	37	35	45

L5.2 For the purpose of condition L5.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L5.3 The noise limits set out in condition L5.1 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 3ºC/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
c) Temperature inversion conditions greater than 3ºC/100m.

L5.4 For the purpose of condition L5.3:
a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station identified as EPA identification Point 21 in condition P1.1; and
b) Temperature inversion conditions (vertical temperature gradient in degrees C) are to be determined by direct measurement over a minimum 50m height interval as referred to in Part E2 of Appendix E to the NSW Industrial Noise Policy.

L5.5 To determine compliance:
a) With the Leq(15 minute) noise limits in condition L5.1, 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 3 metres 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 Nature Reserve

b) With the LA1(1 minute) noise limits in condition L5.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.

c) With the noise limits in condition L5.1, 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 conditions L5.5(a) or L5.5(b).

L5.6 A non-compliance of condition L5.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:

a) at a location other than an area prescribed by conditions L5.5(a) and L5.5(b); and/or
b) at a point other than the most affected point at a location.

L5.7 For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

A.3 Noise Monitoring Programme

The noise monitoring program for WCP was revised in September 2011 and the relevant sections are reproduced below.

5 MONITORING AND INTERPRETATION

The noise monitoring programme comprises both attended and real-time monitoring (Sections 5.1 and 5.2, respectively). Integrated protocols for both monitoring methodologies are outlined in Sections 5.1.4 and 5.2.4, respectively. Meteorological monitoring will also be conducted as described in Section 5.3.

Attended monitoring will be used for demonstrating compliance with noise criteria (Section 3.3), whilst real-time monitoring will be used as a management tool to assist WCPL to take pre-emptive management actions to avoid potential non-compliances.

5.1 ATTENDED NOISE MONITORING

5.1.1 Purpose

The main aim of attended noise monitoring is to determine compliance with Project Approval and EPL noise criteria.

Results from the attended monitoring programme will be used to verify data collected from the real-time noise monitors. This will be undertaken where attended monitoring is conducted directly adjacent to real-time monitors. The attended monitoring data will also be used to determine whether there is a consistent relationship between real-time continuous noise levels and long-term attended monitoring data. For example if there is a consistent correlation between a real-time monitor and an attended monitoring site, then the real-time monitoring results could reasonably be used to predict noise levels at the attended site when attended monitoring is not being undertaken. This will be done annually to complement the regular maintenance and calibration of the real-time monitors.

5.1.2 Monitoring Locations

The attended noise monitoring programme will be conducted at sites adjacent to the Mine on non-Mine owned land to measure noise levels at nearby residences. Operational experience and investigations (Section 7.1) have shown that the Mine noise effects are experienced predominantly to the south and east of the Mine. Attended noise monitoring is presently concentrated in these areas, however this does not exclude monitoring to the west of the Mine.

Attended noise monitoring locations are shown on Figures 4. These locations provide good coverage in all directions from the Mine and are a combination of compliance sites and population centres. These locations include:

- N4 – W&V Langshaw dwelling 'Hillview';
- N6 – St Laurence O'Toole Catholic Church;
- N7 – Road reserve adjacent the Smith property;
- N9 – Maher dwelling; and
- N12 – Ulan Coal Mine Limited-owned dwelling.

5.1.3 Methodology

Attended noise monitoring will be carried out by an independent expert (i.e. not by mine staff) and will be conducted every 2 months. Monitoring will be conducted in accordance with Australian Standard (AS) 1055:1997 *Acoustics – Description and Measurement of Environmental Noise* and the INP (EPA, 2000). These operator-attended noise measurements will be conducted during normal operations to quantify the intrusive noise emissions from the Mine as well as the overall level of ambient noise.

Following the completion of the attended noise monitoring by the independent expert, the two monthly monitoring reports will be submitted to OEH and DP&I and will be made publically available on the Peabody website (Section 8.2).

Timing

Attended noise monitoring will be conducted for 15 minute periods day, evening and night. Day is defined as between 7am and 6pm, evening is described as being between 6pm and 10pm and night is between 10pm and 7am.

The monitoring will be carried out on two consecutive nights resulting in 2 x 15 minute samples for each location every two months. By sampling two consecutive nights, it is likely that different meteorological conditions are sampled for each site, providing more useful information.

Particular attention will be given to monitoring between 7pm and 2am (i.e. evening/night-time periods). Experience has shown that it is during these periods that noise can be at its most intrusive and results in more complaints. This is due to the very low background noise levels experienced during these periods and the presence of temperature inversions that are a relatively common phenomenon in this area, particularly during winter months.

Measurement

Acoustic instrumentation used in attended monitoring will comply with AS 1259.2:1990 *Sound Level Meters*.

The intrusive noise level (L_{Amax}, L_{A1}, L_{A10} and L_{Aeq}) contribution from mine operation activities will be quantified over a 15 minute measurement period. In addition, the overall levels of ambient noise (i.e. L_{Amax}, L_{A1}, L_{A10}, L_{A50}, L_{A90}, L_{Amin} and L_{Aeq}) over the 15 minute period will be quantified and characterised.

A measurement of $L_{A1(1\ minute)}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from the Mine during the entire measurement period (i.e. the highest level of the maximum minute during the 15 minute measurement).

The L_{A1} measurement should be undertaken at 1 m from the dwelling façade and the L_{Aeq} measurement within 30 m of the dwelling. However, the direct measurement of noise at 1 m from the façade is not always practical. In most cases monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In these cases measurements are undertaken at a suitable and representative location as close to the dwelling as practicable. Modifying factors from section 4 of the INP are used where applicable. Tonality and low frequency are assessed by analysis of the measured L_{Aeq} spectrum.

Recording

An example of an attended monitoring recording sheet is provided in Attachment 5. During attended monitoring, the following information will be recorded:

- operator's name;
- locations of attended and unattended noise instruments;
- recording intervals;
- meteorological conditions (i.e. temperature, humidity, cloud cover, and wind speed and direction);
- statistical noise level descriptors together with notes identifying the principle noise sources; and
- instrument calibration details.

The meteorological conditions listed above will be recorded local to the noise measurement as well as on-site at the Mine Automatic Weather Station (AWS) (Section 5.3). Prevailing weather conditions determined from the AWS (in the first instance) to be outside of the meteorological constraints stipulated in the Project Approval will be excluded from further analysis.

Additional information (such as general mobile and fixed plant locations) will be collected at the time of (or soon after) monitoring to enable correlation between Mine noise, meteorological conditions, general plant locations, plant operating conditions and topography.

5.1.4 Compliance Assessment

As discussed in Section 5.1.1, the results of attended noise monitoring will be compared against the relevant noise criteria set out in Section 3.3 of this NMP. The comparison will be undertaken following the exclusion of data using meteorological conditions described as part of Table 2 as well as observations of non-Mine noise by the person undertaking the attended noise monitoring programme.

In the event of an exceedance of the noise criteria, an assessment will be conducted to determine:

- Timing of the exceedance.
- Location of the exceedance.
- Exclusion of non-mine related noise and noise from non-WCPL mining activities (e.g. can the exceedance be attributed directly to the Mine). This will include consideration of:
  - the methods and type of equipment being used by WCPL at the time of the exceedance and proximity to the locations at which the exceedance was recorded; and
  - the location of non-WCPL mining activities or agricultural activities and proximity to the locations at which the exceedance was recorded.
- Meteorological conditions at the time of the exceedance – including confirmation that meteorological conditions are in accordance with Condition 2, Schedule 3 of the Project Approval.

If the above assessment determines that an exceedance is due to Mine noise then management strategies detailed in Sections 6 and 7 to help prevent recurrence will be implemented in an effort to reduce noise levels below those set out in Table 2.

Exceedances of criteria will be determined in consideration of Table 2 of the Project Approval (e.g. the meteorological conditions under which they apply) and the INP. Section 11.1.3 of the INP states the following in relation to when a development is in non-compliance with a noise condition:

> *A development will be deemed to be in non-compliance with a noise consent or licence condition if the monitored noise level is more than 2 dB above the statutory noise limit specified in the consent or licence condition. This may occur for two reasons:*
>
> - *The noise from the development is excessive, in which case the development is truly not complying with its consent or licence condition.*
> - *The noise was increased by extreme, nonstandard weather effects—in which case the development is not considered to be in noncompliance with its consent or licence condition. Non-standard weather effects can be considered to be present during monitoring if the cloud cover is less than 40 per cent and the wind speed (at 10 m height) is less than 1.0 m/s (represents an extremely adverse weather condition for noise)—during the period from 6 pm to 7 am in non-arid areas (see Section 9.2).*
>
> *In this latter case, further monitoring at a later date is required to determine compliance under the meteorological conditions specified in the consent/licence condition.*

For the purposes of the NMP, the monitored noise level is the attended noise monitoring results at the locations listed in Section 5.1.2.

In accordance with Condition 7, Schedule 5 of the Project Approval, The Proponent shall notify the Director-General and any other relevant agencies of any incident associated with the project 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.

In accordance with Condition 2, Schedule 4 of the Project Approval, the proponent shall notify the Director-General, the affected landowners and tenants (including tenants of mine-owned properties) accordingly, and provide monitoring results to each of these parties until the results show that the project is complying with the criteria in schedule 3.

B. CALIBRATION CERTIFICATES

Global Acoustics Pty Ltd | PO Box 3115 | Thornton NSW 2322
Telephone +61 2 4966 4333 | Facsimile +61 2 4966 4330 | Email global@globalacoustics.com.au
ABN 94 094 985 734

Acoustic Research Laboratories
Proprietary Limited A.B.N. 47 050 100 804
Noise and Vibration Monitoring Instrumentation for Industry and the Environment

Sound Level Meter Test Report

Report Number : C11193

Date of Test :	27/04/2011
Report Issue Date :	12/05/2011
Equipment Tested/ Model Number:	**Rion NA-28 Sound Level Meter**
Instrument Serial Number:	00701424
Microphone Serial Number:	01916
Preamplifier Serial Number:	01463
Client Name :	Global Acoustics Pty Ltd
	12/16 Huntingdale Drive
	Thornton NSW 2322
Contact Name :	Tony Welbourne
Tested by :	Aaron Skeates-Udy
Approved Signatory :	
Date :	**12 May 2011**

NATA
WORLD RECOGNISED ACCREDITATION

Acoustic Research Laboratories Pty Ltd is NATA Accredited Laboratory Number. 14172.

This document is issued in accordance with NATA's accreditation requirements.

Accredited for compliance with ISO/IEC 17025

This document shall not be reproduced except in full.

Level 7 ♦ Building 2 ♦ 423 Pennant Hills Rd ♦ Pennant Hills ♦ NSW 2120 ♦ AUSTRALIA
Telephone +61 2 9484 0800 ♦ Facsimile +61 2 9484 0884
www.acousticresearch.com.au

Acoustic Research Laboratories
Proprietary Limited A.B.N. 47 050 100 804
Noise and Vibration Monitoring Instrumentation for Industry and the Environment

Acoustic Calibrator Test Report

Report Number : C12074

Date of Test : 09/02/2012

Report Issue Date : 09/02/2012

Equipment Tested: **Rion Acoustic Calibrator**

Model Number: NC-73

Serial Number: 11248306

Client Name : Global Acoustics Pty Ltd

12/16 Huntingdale Drive

Thornton NSW 2322

Contact Name : Jodi Higginbottom

Tested by : Adrian Walker

Approved Signatory :

Ken Williams

Date : 9 February 2012

NATA
WORLD RECOGNISED ACCREDITATION

Acoustic Research Laboratories Pty Ltd is NATA Accredited Laboratory Number. 14172.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Accredited for compliance with ISO/IEC 17025

This document shall not be reproduced except in full.

Level 7 • Building 2 • 423 Pennant Hills Rd • Pennant Hills • NSW 2120 • AUSTRALIA
Telephone +61 2 9484 0800 • Facsimile +61 2 9484 0884
www.acousticresearch.com.au

Wilpinjong Coal

November / December 2012

Environmental Noise Monitoring

Prepared for

ALS Environmental Division

Global Acoustics

Noise and Vibration Analysis and Solutions

Global Acoustics Pty Ltd
PO Box 3115 | Thornton NSW 2322
Telephone +61 2 4966 4333 | Facsimile +61 2 4966 4330
Email global@globalacoustics.com.au
ABN 94 094 985 734

Wilpinjong Coal

November / December 2012
Environmental Noise Monitoring

Reference: 12542_R01.doc

Report date: 7 February 2013

Prepared for

ALS Environmental Division
PO Box 1034
Mudgee NSW 2850

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322

Prepared:	Jesse Tribby Acoustics Technician	QA Review:	Katie Weekes Environmental Scientist

EXECUTIVE SUMMARY

Global Acoustics was engaged by ALS Environmental Division to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine operated by Wilpinjong Coal. WCP was given approval on 1 February 2006. A modification to the consent was approved in August 2010.

An environment protection licence (EPL) was issued in early 2006 with subsequent variations approved. A revised noise-monitoring program (NMP) for WCP was approved in September 2011.

Attended monitoring was conducted in accordance with the documents detailed above, the NSW Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. The duration of each evening and night measurement was 15 minutes. Results of two-monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at five locations on 5/6 and 6/7 December 2012. The survey purpose is to quantify and describe the acoustic environment around the site and compare results with specified limits.

WCP complied with relevant noise limits at the monitoring locations during the November / December 2012 monitoring period. Wind speed and/or estimated temperature inversion conditions resulted in criteria not always being applicable, as indicated in Table 4.2 and Table 4.3.

Table of Contents

Appendices

1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by ALS Environmental Division to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine operated by Wilpinjong Coal.

Environmental noise monitoring described in this report was undertaken at five locations on 5/6 and 6/7 December 2012. Figure 1 shows the regular monitoring locations.

The purpose of the survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were five regular monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the Noise Monitoring Program (NMP).

Table 1.1 NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location	Owner
N4	'Hillview' Cumbo Road, Wollar	Wilpinjong Coal Mine
N6	St Laurence O'Toole Catholic Church, representative of Wollar - Residential	NA
N7	Ulan-Wollar Road (East)	Smith
N9	Slate Gully Road, Wollar	Wilpinjong Coal Mine
N12	Ulan-Wollar Road (West)	Ulan Coal Mines

Figure 1 **Monitoring Locations**

1.3 Terminology

Some definitions of terminology, which may be used in this report, are provided in Table 1.2.

Table 1.2 TERMINOLOGY

Descriptor	Definition
L_A	The A-weighted root mean squared (RMS) noise level at any instant
L_{Amax}	The maximum A-weighted noise level over a time period or for an event
L_{A1}	The noise level which is exceeded for 1 per cent of the time
L_{A10}	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L_{A50}	The noise level which is exceeded for 50 per cent of the time
L_{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes
L_{Amin}	The minimum A-weighted noise level over a time period or for an event
L_{Aeq}	The average noise energy during a measurement period
$L_{A1,1minute}$	The highest noise level generated for 0.6 second during one minute
L_{pk}	The unweighted peak noise level at any instant
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
SEL	Sound exposure level (SEL), the A-weighted noise energy during a measurement period normalised to one second
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
ABL	Assessment background level (ABL), the 10th percentile background noise level for a single period (day, evening or night) of a 24 hour monitoring period
RBL	Rating background level (RBL), the background noise level for a period (day, evening or night) determined from ABL data

2 PROJECT APPROVAL AND CRITERIA

2.1 Project Approval

WCP was given approval on 1 February 2006. A modification to the project was approved in August 2010. The relevant noise conditions from Section 3 - Specific Environmental Conditions of the project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in December 2011. Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise-monitoring program for WCP was revised in September 2011. Section 5.1 details attended monitoring locations and methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Specific Criteria

Day, evening and night criteria are detailed in Table 2.1. These have been selected as the most appropriate for each monitoring location and are based on the consolidated consent or environment protection licence associated with Wilpinjong Coal Project operations.

Table 2.1 WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident number	Monitoring Location	Day $L_{Aeq,15\ minute}$	Evening $L_{Aeq,15\ minute}$	Night $L_{Aeq,15\ minute}$/ $L_{A1,1\ minute}$
N4	'Hillview' Cumbo Road, Wollar[4]	NA	NA	NA/NA
N6 / Wollar	Catholic Church representative of Wollar – Residential	35[2]	35[2]	35[2]/45[2]
N7 / 45	Ulan-Wollar Road (East)	35[2]	40[2]	47[2]/45[2]
N9 / 58	Slate Gully Road, Wollar[4]	NA	NA	NA/NA
N12 / All[1]	Ulan-Wollar Road (West)[3]	NA	NA	NA/NA

Notes:
1. *"Äll" indicates location is not mentioned specifically in Section 2 of the 2010 Modification and therefore has criteria applied to "all other privately owned land";*
2. *Limits from Environment Protection Licence No. 12425 and 2010 Modification;*
3. *Property is designated as a non-WPL mining interest in the 2010 Modification, so criteria are NA, 'not applicable'; and*
4. *These properties are owned by WCP, so criteria are NA, 'not applicable'.*

Condition L5.3 in the EPL states:

The noise limits set out in condition 5.1 apply under all meteorological conditions except for the following:

a) Wind speeds greater than 3 metres per second at 10 metres above ground level; or

b) Temperature inversion conditions of up to 3°C per 100 metres and wind speeds greater than 2 metres per second at 10 metres above the ground level; or

c) Temperature inversion conditions greater than 3°C per 100 metres.

2.5 Acquisition Criteria

As detailed in condition 3 of Schedule 3 of the project approval, acquisition criteria for WCP are to consider noise in respect to the criteria detailed in Table 2.2 for all privately owned land (excluding land owned by Gaffney – 30, Smith – 45, Evans – 48, Thomson & Hopper - 50 and McKenzie – 94).

Table 2.2 WILPINJONG COAL ACQUISITION CRITERIA, dB

Property	$L_{Aeq,15\ minute}$
All privately owned land	40

2.6 Additional Mitigation Criteria

As detailed in condition 4 of Schedule 3 of the project, additional mitigation criteria for WCP are to consider noise in respect to the criteria detailed in Table 2.3 for most privately owned land.

Table 2.3 WILPINJONG COAL ADDITIONAL MITIGATION CRITERIA, dB

Property	$L_{Aeq,15\ minute}$
All other privately owned land, excluding those listed below	38

Land listed in Table 1 of the consent, or property numbers 23B, 25, 52A, 52B, 53 or 58 will receive mitigation upon request.

2.7 INP Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). Chapter 4 of the INP deals specifically with modifying factors that may apply to industrial noise. The most common modifying factors are addressed in detail below.

2.7.1 Tonality, Intermittent and Impulsive Noise

As defined in the Industrial Noise Policy:

> *Tonal noise contains a prominent frequency and is characterised by a definite pitch.*
>
> *Impulsive noise has high peaks of short duration or a sequence of such peaks.*
>
> *Intermittent noise is characterised by the level suddenly dropping to the background noise levels several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only.*

Years of monitoring have indicated that noise levels from mining operations, particularly those levels measured at significant distances from the source are relatively continuous. Given this, noise levels at the monitoring locations are unlikely to be intermittent. In addition, there is no equipment on site that is likely to generate tonal or impulsive noise as defined in the INP.

2.7.2 Low Frequency Noise

As defined in the Industrial Noise Policy:

> *Low frequency noise contains major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum.*

As detailed in Chapter 4 of the INP, low frequency noise should be assessed by measuring the C-weighted and A-weighted level over the same time period. The correction/penalty of 5 dB is to applied *if the difference between the two levels is 15 dB or more*.

Low frequency noise can also be assessed against criteria specified in the paper "A Simple Method for Low Frequency Noise Emission Assessment "(Broner JLFNV Vol29-1 pp1-14 2010). If the total predicted C – weighted noise level at a receptor exceeds the relevant criterion, a 5 dB penalty (modifying factor) is added to predicted levels.

2.8 Low Frequency Criteria

Low frequency criteria are detailed in Table 2.4.

Table 2.4 $L_{Ceq,15minute}$ CRITERIA (dBC)

Method	Calculation Method	Night-time Criterion	Daytime Criterion
Broner, 2010	L_{Ceq} to 250 Hz	60	65
INP, total	Total L_{Ceq} minus L_{Aeq}	15	15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a practice note is not yet available, low frequency noise results from WCP have been compared to both criteria presented above.

3 METHODOLOGY

3.1 Assessment Method

Attended monitoring was conducted in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken. The duration of each evening and night measurement was 15 minutes.

The terms "Inaudible" (IA), "Not measurable" (NM) or "Less than 20 dB" (<20 dB) are used in this report. When site noise is noted as IA then there was no site noise at the monitoring location.

However, if site noise is noted as NM or <20 dB, this means some noise was audible but could not be quantified. This means that noise from the site was either very low, or, being masked by other noise that was relatively loud. In the former case (very low site levels) we consider it not necessary to attempt to accurately quantify site noise as it would be significantly less than any criterion and most unlikely to cause annoyance (and in many cases, to be even noticed).

If site noise were NM or <20 dB due to masking then we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting if deemed necessary. All sites NM or <20 dB in this report are due to low absolute values.

A measurement of $L_{A1,1minute}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from the Wilpinjong Coal Project (WCP) noise source during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

As indicated in L5.5 (a) and (b) of the EPL, the $L_{A1,1minute}$ measurement should be undertaken at one (1) metre from the dwelling façade and the L_{Aeq} measurement within 30 metres of the dwelling. However, the direct measurement of noise at 1 metre from the façade is not practical during monitoring for this project. In most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements for this survey were undertaken at a suitable and representative location.

As indicated in L5.7 of the EPL, modifying factors from Section 4 of the INP should be implemented where applicable. Low frequency from WCP was assessed by analysis of the measured L_{Aeq} spectrum.

3.2 Attended Monitoring

The equipment used to measure environmental noise levels are listed in Table 3.1. Calibration certificates are included as Appendix B.

Table 3.1 MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	01070590	9/11/2013
Pulsar-106 acoustic calibrator	57413	9/10/2014

4 RESULTS

4.1 Attended Noise Monitoring

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. Table 4.2 and Table 4.3 detail $L_{Aeq,15\ minute}$ and $L_{A1,1\ minute}$ noise levels from WCP in the absence of other noise sources with impact assessment criteria. Criteria are then applied if weather conditions are in accordance with the mine's development consent. There were no modifying factors applicable to measured noise levels during this survey.

Discussion as to the noise sources responsible for these measured levels is provided in Chapter 5 of this report.

Table 4.1 MEASURED NOISE LEVELS – DECEMBER 2012

Location	Date and Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{A50} dB	L_{Aeq} dB	L_{A90} dB	L_{Amin} dB
	Evening							
N4	05/12/2012 21:44	40	36	34	32	32	30	28
N6	05/12/2012 21:08	50	37	30	28	29	26	23
N7	05/12/2012 20:12	51	43	36	32	34	30	28
N9	05/12/2012 20:41	42	38	35	32	33	30	28
N12	05/12/2012 19:35	56	47	40	34	37	32	30
	Night							
N4	05/12/2012 22:01	41	36	34	31	32	30	27
N6	05/12/2012 22:25	40	34	32	26	28	23	20
N7	05/12/2012 23:20	49	39	37	35	35	33	29
N9	05/12/2012 22:52	49	39	34	31	33	30	27
N12	05/12/2012 23:56	44	33	30	28	28	25	23
	Evening							
N4	06/12/2012 19:24	46	43	41	40	40	39	36
N6	06/12/2012 19:48	66	58	47	36	45	31	26
N7	06/12/2012 20:48	61	53	46	40	43	36	32
N9	06/12/2012 20:17	50	45	37	30	34	27	25
N12	06/12/2012 21:26	46	40	35	33	34	32	30
	Night							
N4	06/12/2012 23:55	39	35	34	31	31	26	23
N6	06/12/2012 23:32	49	42	35	28	32	26	24
N7	06/12/2012 22:36	46	42	37	32	34	28	26
N9	06/12/2012 23:05	48	35	28	26	28	25	23
N12	06/12/2012 22:00	37	34	33	31	32	30	28

Note: Noise levels in this table are not necessarily the result of activities at WCP.

Table 4.2 $L_{Aeq,15\,minute}$ dB GENERATED BY WCP AGAINST IMPACT ASSESSMENT CRITERIA - DECEMBER 2012

Location	Date and Time	Wind Speed m/s [8,9]	VTG °C per 100m [6,8,9]	Criterion dB [,7]	Criterion Applies? [1,5]	WCP $L_{Aeq, 15min}$ dB [2,3]	Exceedance [4,5,7]
	Evening						
N4	05/12/2012 21:44	1.5	-0.3	NA	N	32	NA
N6	05/12/2012 21:08	3.3	-0.7	35	N	NM	NA
N7	05/12/2012 20:12	3.3	-0.7	40	N	30	NA
N9	05/12/2012 20:41	2.0	-0.5	NA	N	33	NA
N12	05/12/2012 19:35	5.0	-0.9	NA	N	NM	NA
	Night						
N4	05/12/2012 22:01	1.7	-0.2	NA	N	32	NA
N6	05/12/2012 22:25	1.2	0.2	35	Y	<20	N
N7	05/12/2012 23:20	1.5	0.5	47	Y	35	N
N9	05/12/2012 22:52	1.9	0.0	NA	N	33	NA
N12	05/12/2012 23:56	1.3	2.2	NA	N	25	NA
	Evening						
N4	06/12/2012 19:24	1.4	-0.2	NA	N	26	NA
N6	06/12/2012 19:48	2.1	0.0	35	Y	IA	N
N7	06/12/2012 20:48	3.7	-0.7	40	N	NM	NA
N9	06/12/2012 20:17	2.5	0.0	NA	N	25	NA
N12	06/12/2012 21:26	2.7	-0.5	NA	N	27	NA
	Night						
N4	06/12/2012 23:55	2.5	-0.9	NA	N	IA	NA
N6	06/12/2012 23:32	1.9	-0.3	35	Y	IA	N
N7	06/12/2012 22:36	1.7	0.0	47	Y	IA	N
N9	06/12/2012 23:05	2.1	-0.3	NA	N	IA	NA
N12	06/12/2012 22:00	2.2	-0.2	NA	N	27	NA

Notes:

1. *Noise emission limits apply for winds up to 3 metres per second (at a height of 10 metres, or, vertical temperature gradients of up to 3 degrees/100m with wind speed up to 2 m/s;*
2. *These are results for WCP in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;*
7. *NA in criterion column means the criteria are not applicable at this location, NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified;*
8. *Atmospheric data is sourced from the WCP weather station; and*
9. *Criterion may or may not apply due to rounding of meteorological data values.*

Table 4.3 $L_{A1,1 minute}$ dB GENRATED BY WCP AGAINST IMPACT ASSESSMENT CRITERIA – DECEMBER 2012

Location	Date and Time	Wind Speed m/s [8,9]	VTG °C per 100m [6,8,9]	Criterion dB [7]	Criterion Applies?[1,5]	WCP $L_{A1, 1 min}$ dB [2,3]	Exceedance[4,5,7]
	Night						
N4	05/12/2012 22:01	1.7	-0.2	NA	N	41	NA
N6	05/12/2012 22:25	1.2	0.2	45	Y	20	N
N7	05/12/2012 23:20	1.5	0.5	45	Y	40	N
N9	05/12/2012 22:52	1.9	0.0	NA	N	40	NA
N12	05/12/2012 23:56	1.3	2.2	NA	N	26	NA
	Night						
N4	06/12/2012 23:55	2.5	-0.9	NA	N	IA	NA
N6	06/12/2012 23:32	1.9	-0.3	45	Y	IA	N
N7	06/12/2012 22:36	1.7	0.0	45	Y	IA	N
N9	06/12/2012 23:05	2.1	-0.3	NA	N	IA	NA
N12	06/12/2012 22:00	2.2	-0.2	NA	N	32	NA

Notes: 1. *Noise emission limits apply for winds up to 3 metres per second (at a height of 10 metres, and, vertical temperature gradients of up to 3 degrees/100m with wind speed up to 2 m/s;*
2. *These are results for WCP in the absence of all other noise sources;*
3. *NM denotes audible but not measurable, IA denotes inaudible;*
4. *Bolded results in red are those greater than the relevant criterion (if applicable);*
5. *Y denotes Yes, N denotes No;*
6. *Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;*
7. *NA in criterion column means the criteria are not applicable at this location, NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified;*
8. *Atmospheric data is sourced from the WCP weather station; and*
9. *Criterion may or may not apply due to rounding of meteorological data values.*

Where WCP only noise levels are within the impact assessment criteria, it is not necessary to compare these noise levels to acquisition or mitigation criteria, as these levels are higher. Compliance with impact assessment indicates compliance with acquisition or mitigation criteria.

4.2 Low Frequency Assessment

Table 4.4 provides statistics for attended noise monitoring undertaken around WCP during the December 2012 survey.

Table 4.4 ATTENDED MEASUREMENT STATISTICS FOR WCP – DECEMBER 2012

Conditions	Total for December 2012
Number of measurements	20
Number of measurements where met applies	16
Number of measurements where WCP is measurable and criteria and met applies	1

A total of 1 out of 20 measurements occurred during which WCP was directly measurable (not "inaudible", "not measurable" or less than a maximum cut-off value "<30 dB") and where meteorological conditions resulted in criteria applying (in accordance with the consent). This one result was analysed for low frequency content for this report.

Table 4.5 details L_{Ceq} noise levels from WCP. Results have been compared to relevant criteria (as detailed in Section 2 of this report). Only measurements occurring during applicable meteorological conditions and where WCP was audible have been presented.

Table 4.5 MEASURED $L_{Ceq,15 minute}$ NOISE LEVELS AGAINST LOW FREQUENCY NOISE CRITERIA – DECEMBER 2012

Location	Date And Time	WCP only L_{Aeq} dB[1]	L_{Ceq} Criterion[2]	L_{Ceq} (less than 250 Hz) dB[3,6]	INP L_{Ceq} Criterion[4]	Total L_{Ceq} minus L_{Aeq} dB[5,6]	Comments
N7	05/12/12 23:20	35	60	54	15	**19**[7]	Measurement included birds and insects

Notes:

1. *WCP only L_{Aeq} provided as a guide;*
2. *Night L_{Ceq} criterion as detailed in Broner (2010);*
3. *These are measured C-weighted noise levels (at frequencies less than 250 Hz) and are not always the result of activity at WCP. Guidance on this is provided in the Comments column;*
4. *Low frequency criterion as detailed in the INP;*
5. *This is the total measured C-weighted noise level less the total measured A-weighted noise level and are not always the result of activity at WCP. Guidance on this is provided in the Comments column;*
6. *Bolded results in red are those greater than the relevant criterion; and*
7. *Other noise sources occurring during the measurement.*

4.3 Atmospheric Conditions

Atmospheric condition data measured at each location are shown in Table 4.6. Data obtained concurrently by the WCP meteorological station is provided in Table 4.7.

Table 4.6 MEASURED ATMOSPHERIC CONDITIONS – DECEMBER 2012

Location	Date And Time	Temperature (° C)	Wind Speed (m/s)	Wind Direction (° MN)	Cloud Cover (eighths)
	Evening				
N4	5/12/2012 21:44	16	0.0	-	0
N6	5/12/2012 21:08	16	0.9	270	0
N7	5/12/2012 20:12	19	1.4	270	0
N9	5/12/2012 20:41	18	0.0	-	0
N12	5/12/2012 19:35	20	3.1	240	0
	Night				
N4	5/12/2012 22:01	14	0.8	120	0
N6	5/12/2012 22:25	15	0.0	-	0
N7	5/12/2012 23:20	11	0.0	-	0
N9	5/12/2012 22:52	14	0.6	135	0
N12	5/12/2012 23:56	13	0.0	-	0
	Evening				
N4	6/12/2012 19:24	20	1.7	95	0
N6	6/12/2012 19:48	23	0.5	250	0
N7	6/12/2012 20:48	21	2.6	45	0
N9	6/12/2012 20:17	18	0.9	126	0
N12	6/12/2012 21:26	20	1.7	95	0
	Night				
N4	6/12/2012 23:55	17	0.9	130	0
N6	6/12/2012 23:32	17	0.4	10	0
N7	6/12/2012 22:36	18	1.5	60	0
N9	6/12/2012 23:05	18	0.8	80	0
N12	6/12/2012 22:00	19	1.3	95	0

Notes: 1. Wind speed and direction measured at 1.8 metres.

Table 4.7 WCP METEOROLOGICAL STATION DATA

Date and Time	Wind Speed (m/s)	Wind Direction (Degrees)	Lapse Rate (Degrees / 100 metres)
05/12/2012 19:00	5.1	269	-1.4
05/12/2012 19:15	4.5	259	-1.2
05/12/2012 19:30	3.8	261	-0.9
05/12/2012 19:45	5.0	255	-0.9
05/12/2012 20:00	4.5	253	-0.9
05/12/2012 20:15	3.1	255	-0.7
05/12/2012 20:30	3.3	257	-0.7
05/12/2012 20:45	2.2	247	-0.5
05/12/2012 21:00	2.0	255	-0.5
05/12/2012 21:15	3.3	243	-0.7
05/12/2012 21:30	2.7	247	-0.5
05/12/2012 21:45	1.9	269	-0.5
05/12/2012 22:00	1.5	258	-0.3
05/12/2012 22:15	1.7	252	-0.2
05/12/2012 22:30	1.8	232	0.5
05/12/2012 22:45	1.2	244	0.2
05/12/2012 23:00	1.9	255	0.0
05/12/2012 23:15	1.6	233	0.7
05/12/2012 23:30	1.5	252	0.5
05/12/2012 23:45	1.5	306	1.2
06/12/2012 00:00	2.2	293	2.4
06/12/2012 00:15	1.3	254	2.2
06/12/2012 00:30	0.0	NA	3.4
06/12/2012 19:00	1.5	268	-1.4
06/12/2012 19:15	1.9	246	-1.2
06/12/2012 19:30	1.4	266	-0.5
06/12/2012 19:45	1.4	280	-0.2
06/12/2012 20:00	2.1	285	0.0
06/12/2012 20:15	2.2	272	0.0
06/12/2012 20:30	2.5	266	0.0
06/12/2012 20:45	1.0	237	0.0
06/12/2012 21:00	3.7	86	-0.7
06/12/2012 21:15	3.1	85	-0.7
06/12/2012 21:30	2.5	87	-0.5
06/12/2012 21:45	2.7	96	-0.5
06/12/2012 22:00	1.7	77	-0.3

Table 4.7 WCP METEOROLOGICAL STATION DATA

Date and Time	Wind Speed (m/s)	Wind Direction (Degrees)	Lapse Rate (Degrees / 100 metres)
06/12/2012 22:15	2.2	80	-0.2
06/12/2012 22:30	1.7	81	-0.2
06/12/2012 22:45	1.7	77	0.0
06/12/2012 23:00	1.9	83	-0.3
06/12/2012 23:15	2.1	79	-0.3
06/12/2012 23:30	2.1	80	-0.3
06/12/2012 23:45	1.9	87	-0.3
07/12/2012 00:00	1.7	96	-0.5
07/12/2012 00:15	2.5	102	-0.9
07/12/2012 00:30	2.7	107	-1.0

Notes: 1. Data supplied by WCP.

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 and Table 4.2 present data gathered during attended monitoring. These noise levels are the result of many sounds reaching the sound level meter microphone during monitoring. Received levels from various noise sources were noted during attended monitoring and particular attention was paid to the extent of WCP's contribution, if any, to measured levels. At each receptor location, WCP's $L_{Aeq,15\ minute}$ and $L_{A1,1\ minute}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis.

From these observations summaries have been derived for each location. The following chapter sections provide these summaries. Statistical 1/3 octave band analysis of environmental noise was undertaken, and Figures 3 to 22 display the frequency ranges for various noise sources at each location for L_{A1}, L_{A10}, L_{A90}, and L_{Aeq}. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 2 where it can be seen that frogs and insects are generating noise at frequencies above 1000 Hz; mining noise is at frequencies less than 1000 Hz (this is typical). Adding levels at frequencies that relate to mining only allows separate statistical results to be calculated. This analysis cannot always be performed if there are significant levels of other noise at the same frequencies as mining; this can be dogs, cows, or, most commonly, road traffic.

It should be noted that the method of summing statistical values up to a cutoff frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq}.

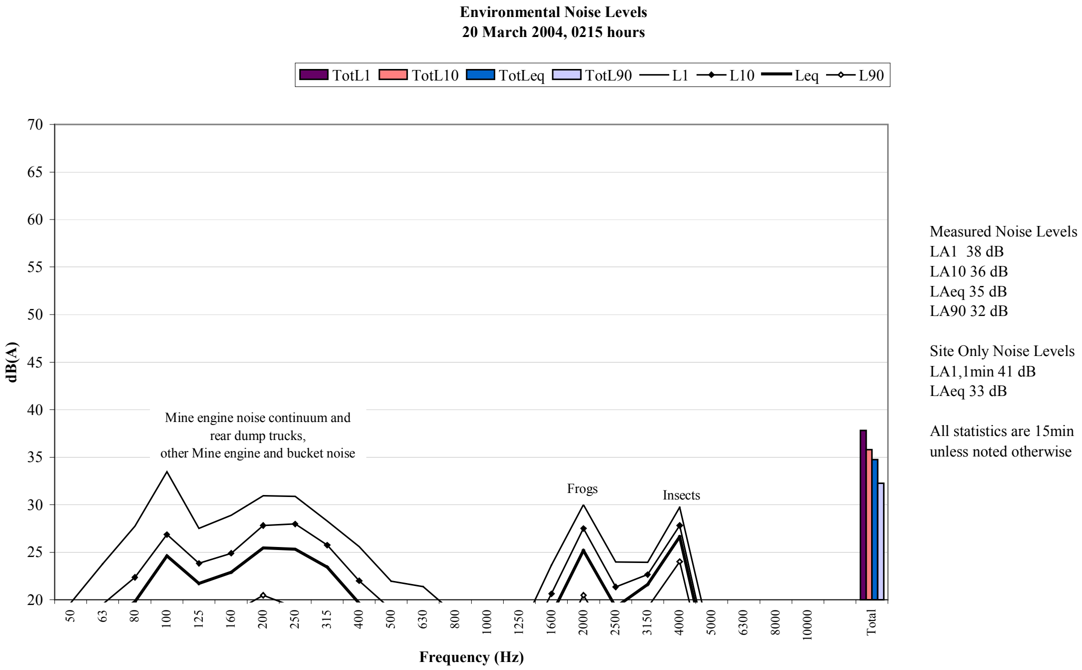


Figure 2 Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N4, 5 December 2012 - Evening

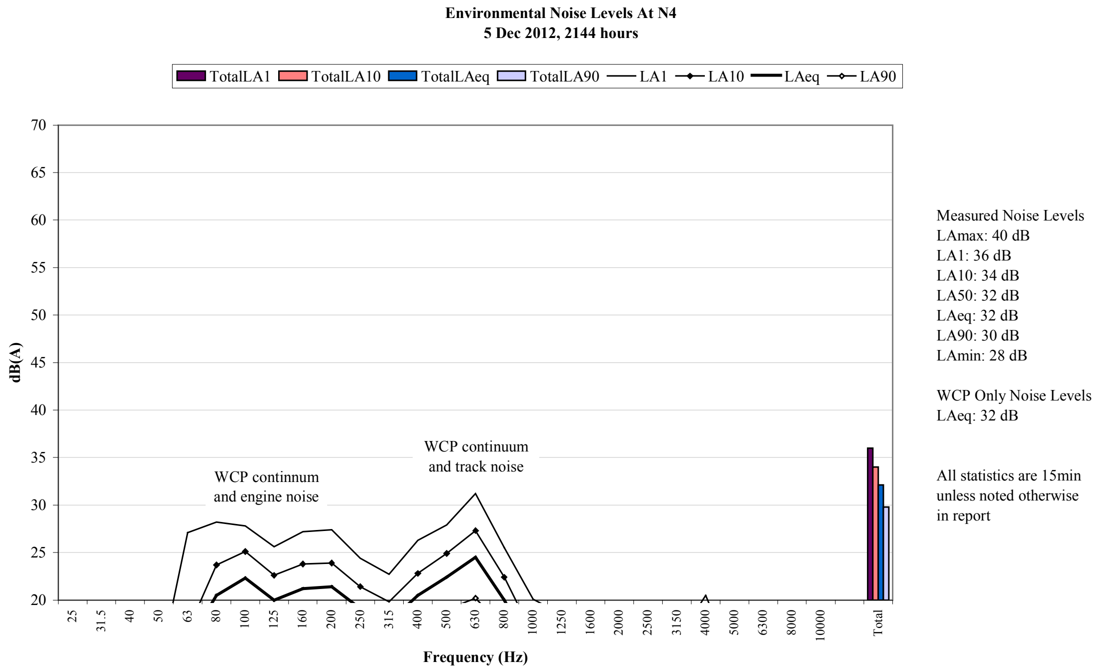


Figure 3 Environmental Noise Levels, N4 – Cumbo Road

A continuum, engine noise and dozer tracks from WCP were audible throughout the measurement and generated the site only L_{Aeq} of 32dB. A horn (twice) was also noted at low levels. WCP was responsible for measured levels.

Insects and an aircraft were also noted at low levels.

5.1.2 N6, 5 December 2012 - Evening

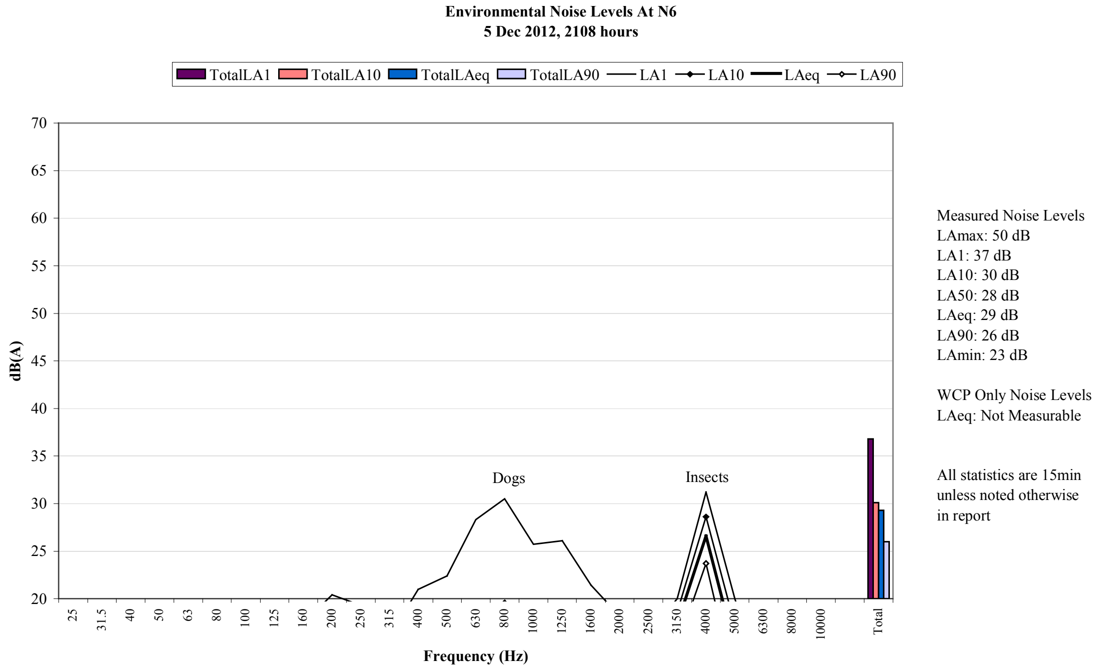


Figure 4 Environmental Noise Levels, N6 – Wollar Church

A low level continuum from WCP was audible at times, but was not measurable.

Dogs and insects generated the measured L_{A1}. Insects generated all other measured levels.

Voices, a residential fan, and an aircraft were also noted.

5.1.3 N7, 5 December 2012 - Evening

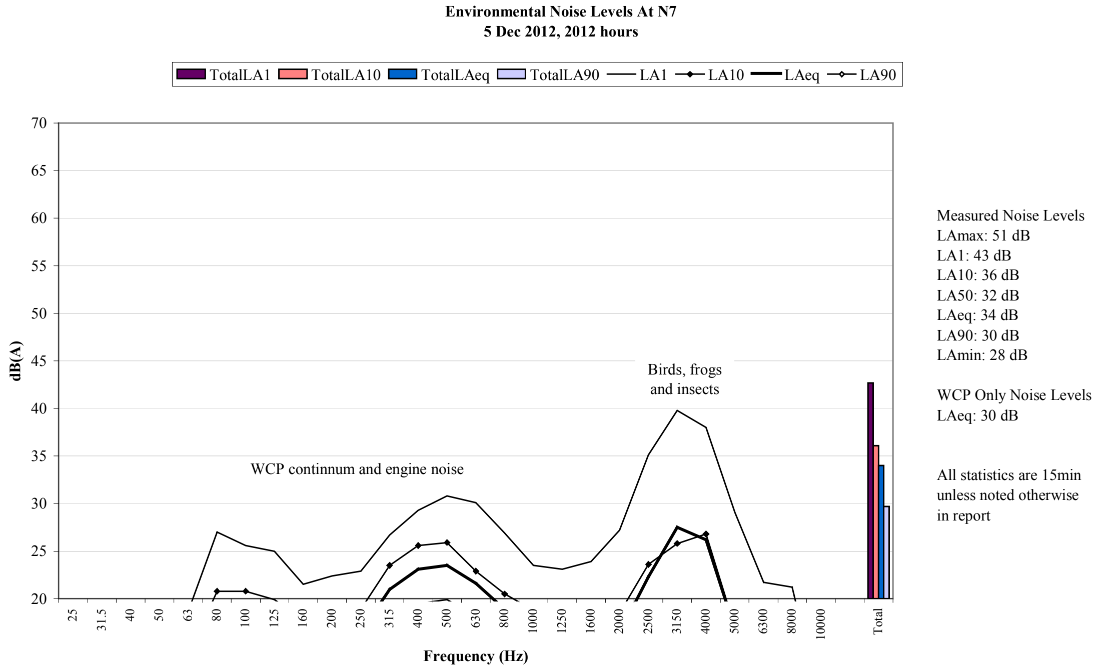


Figure 5 Environmental Noise Levels, N7 – Ulan-Wollar Road (East)

A continuum and engine noise from WCP was audible throughout the measurement and generated the site only L_{Aeq} of 30dB.

Birds generated the measured L_{A1}. A combination of the continuum from WCP, birds, frogs and insects generated all other measured levels.

Breeze in foliage was also noted.