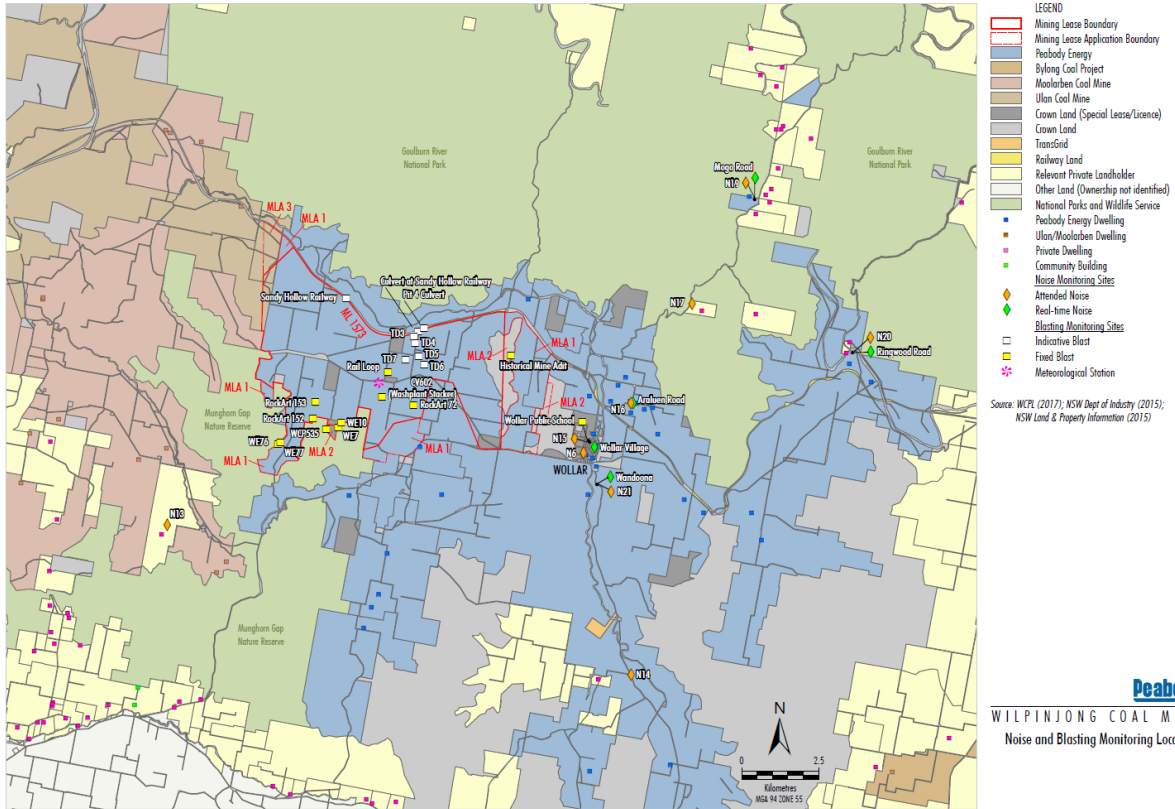


APPENDIX 3F – NOISE MONITORING DATA

Noise Monitoring Locations



Noise Monitoring Locations (Wollar)



LEGEND	
 Peabody Energy	 Crown Land (Special Lease/Licence)
 Crown Land	 Railway Land
 Relevant Private Landholder	 Noise Monitoring Sites
 Landholder Reference Number	 Attended Noise
 Peabody Energy Dwelling	 Real-time Noise
 Community Building	 Blasting Monitoring Sites
 Private Dwelling	 Fixed Blast
 # Special Lease/Licence Holder	 Air Quality Monitoring Sites
	 Static Dust Gauge
	 High Volume Air Sampler
	 Real-time PM _{2.5}
	 Real-time PM ₁₀

Source: WCPL (2017); NSW Dept of Industry (2015); NSW Land & Property Information (2016)

Peabody
 WILPINJONG COAL MINE
 Wollar Environmental Monitoring Sites

Noise Monitoring Reports

Wilpinjong Coal

*Environmental Noise Monitoring
January 2017*

*Prepared for
Wilpinjong Coal Pty Ltd*


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Environmental Noise Monitoring January 2017

Reference: 17010_R01_Draft01

Report date: 9 February 2017

Prepared for

Wilpinjong Coal Pty Ltd

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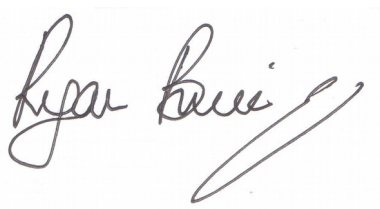
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EXECUTIVE SUMMARY

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

A modification (MOD5) to the WCP consent was approved in November 2014. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

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 night measurement was 15 minutes. Results of monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at seven locations during the night of 22/23 January 2017. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Operational Noise Assessment

WCP complied with relevant noise limits at all monitoring locations during the January 2017 monitoring.

Low Frequency Assessment

During the January 2017 survey WCP complied with the relevant limits using the Broner method of assessing low frequency. However, using the INP method of assessing low frequency, site only noise levels were above the relevant modifying factor trigger during the measurement at location N13. A 5 dB penalty was applied to the relevant site only L_{Aeq} for this measurement.

With the penalty applied, resulting noise levels remained in compliance with relevant noise limits at N13. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at seven locations during the night of 22/23 January 2017. Figure 1 shows the monitoring locations.

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

1.2 Monitoring Locations

There were seven 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: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road
N14	'Tichular', intersection of Tichular and Barigan Roads
N15	Track off Barigan Street near Wollar School, Wollar Village
N16	Araluen Road, off Ulan-Wollar Road
N17	Mogo Road, off Araluen Road
N18	Barigan Road, Barigan Valley

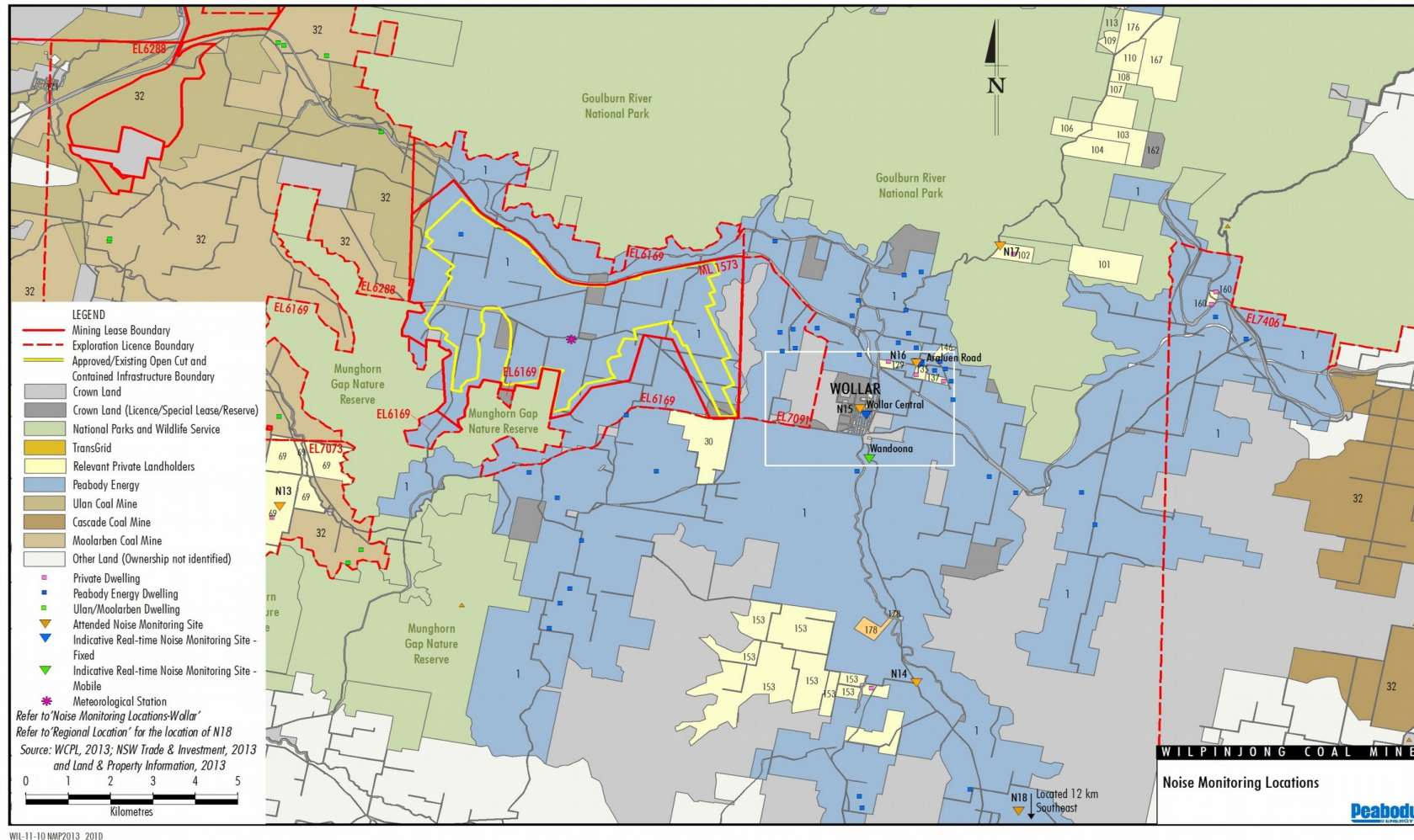


Figure 1: WCP Attended Noise Monitoring Locations

1.3 Terminology & Abbreviations

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

Table 1.2: TERMINOLOGY & ABBREVIATIONS

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
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
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, but could not be quantified
Day	This is the period 7:00am to 6:00pm
Evening	This is the period 6:00pm to 10:00pm
Night	This is the period 10:00pm to 7:00am

2 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in November 2014. The relevant noise conditions from the project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in July 2016. Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in May 2016. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Approval Criteria and Weather Conditions

Criteria detailed in Table 2.1 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with Wilpinjong Coal Project.

Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- a) wind speeds greater than 3 m/s at 10m above ground level;
- b) temperature inversion conditions between 1.5°C and 3°C/100m and wind speeds greater than 2 m/s at 10m above ground level; or
- c) temperature inversion conditions greater than 3°C/100m.

2.5 EPL Criteria and Weather Conditions

Criteria detailed in Table 2.2 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with Wilpinjong Coal Project.

Table 2.2: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

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 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.

2.6 INP Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

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.

2.6.1 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.

2.6.2 Low Frequency Noise

INP Method

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 site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more.*

Broner Method

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 site only C – weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

Low Frequency Assessment Method

Low frequency assessment methods are detailed in Table 2.3.

Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L _{Ceq}	>60	>65
INP	Site only L _{Ceq} minus site only L _{Aeq}	>=15	>=15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a Draft Industrial Noise Guideline (ING) was released in September 2015, low frequency noise results from WCP have been compared to the assessment methods and modifying factor triggers presented above. The applicability of these triggers have been considered when applying low frequency modifying factor corrections.

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. Monitoring is undertaken once per month at each location. The duration of each measurement was 15 minutes.

Attended monitoring during this reporting period was undertaken by Ryan Bruniges.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. NM indicates that some site noise was audible, but indeterminate due to one of the following reasons:

- site noise levels were insignificant and unlikely, in many cases, to be even noticed; or
- site noise levels were masked by another relatively loud noise source, but were estimated to be less than $L_{Aeq} 30$ dB, which is insignificant in terms of any applicable criterion.

If site noise were NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting. All sites noted NM in this report are due to insignificant absolute values.

A measurement of $L_{A1,1\text{minute}}$ 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 a 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 $L_{A1,1\text{minute}}$ 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 noise from WCP was assessed by analysis of the measured L_{Aeq} spectrum.

3.2 Attended Noise 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: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	00701424	22/05/2017
Pulsar 106 acoustic calibrator	74813	25/07/2018

4 RESULTS

4.1 Attended Noise Monitoring

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. 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 2016¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	22/01/2017 23:20	51	39	36	34	35	33	30	43
N13	23/01/2017 01:34	45	39	35	33	33	31	28	53
N14	22/01/2017 22:49	50	44	42	36	38	27	24	41
N15	22/01/2017 23:42	60	53	46	41	43	39	36	55
N16	23/01/2017 00:50	48	30	28	26	26	24	21	47
N17	23/01/2017 00:15	53	52	51	50	50	48	45	49
N18	22/01/2017 22:10	44	36	34	33	33	31	30	37

Note:

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

4.2 Project Approval and Weather Conditions

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines approval. Modifying factors are considered in Section 4.4.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – JANUARY 2016

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	22/01/2017 23:20	2.4	-0.8	35	Yes	IA	Nil
N13	23/01/2017 01:34	1.5	-0.4	36	Yes	30	Nil
N14	22/01/2017 22:49	2.5	-1.0	35	Yes	IA	Nil
N15	22/01/2017 23:42	2.3	-0.6	35	Yes	IA	Nil
N16	23/01/2017 00:50	0.7	-0.4	37	Yes	<20	Nil
N17	23/01/2017 00:15	1.2	-0.6	35	Yes	IA	Nil
N18	22/01/2017 22:10	3.2	-1.0	35	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

Table 4.3: $L_{A1,1minute}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – JANUARY 2016

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{A1,1min}$ dB ^{4,5}	Exceedance ⁶
N6	22/01/2017 23:20	2.4	-0.8	45	Yes	IA	Nil
N13	23/01/2017 01:34	1.5	-0.4	45	Yes	34	Nil
N14	22/01/2017 22:49	2.5	-1.0	45	Yes	IA	Nil
N15	22/01/2017 23:42	2.3	-0.6	45	Yes	IA	Nil
N16	23/01/2017 00:50	0.7	-0.4	45	Yes	<20	Nil
N17	23/01/2017 00:15	1.2	-0.6	45	Yes	IA	Nil
N18	22/01/2017 22:10	3.2	-1.0	45	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

4.3 EPL and Weather Conditions

Table 4.4 and Table 4.5 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines EPL.

Table 4.4: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – JANUARY 2016

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	22/01/2017 23:20	2.4	-0.8	35	Yes	IA	Nil
N13	23/01/2017 01:34	1.5	-0.4	35	Yes	30	Nil
N14	22/01/2017 22:49	2.5	-1.0	35	Yes	IA	Nil
N15	22/01/2017 23:42	2.3	-0.6	36	Yes	IA	Nil
N16	23/01/2017 00:50	0.7	-0.4	35	Yes	<20	Nil
N17	23/01/2017 00:15	1.2	-0.6	35	Yes	IA	Nil
N18	22/01/2017 22:10	3.2	-1.0	35	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

Table 4.5: *L_{A1,1minute}* GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – JANUARY 2016

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP <i>L_{A1,1min}</i> dB ^{4,5}	Exceedance ⁶
N6	22/01/2017 23:20	2.4	-0.8	45	Yes	IA	Nil
N13	23/01/2017 01:34	1.5	-0.4	45	Yes	34	Nil
N14	22/01/2017 22:49	2.5	-1.0	45	Yes	IA	Nil
N15	22/01/2017 23:42	2.3	-0.6	45	Yes	IA	Nil
N16	23/01/2017 00:50	0.7	-0.4	45	Yes	<20	Nil
N17	23/01/2017 00:15	1.2	-0.6	45	Yes	IA	Nil
N18	22/01/2017 22:10	3.2	-1.0	45	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

4.4 Low Frequency Assessment

Low frequency results for each monitoring location are presented in Table 4.6.

Table 4.6: LOW FREQUENCY NOISE MODIFYING FACTOR ASSESSMENT – JANUARY 2017

Location	Start Date and Time	WCP only LAeq dB ⁶	Broner low frequency modifying factor trigger dB ¹	Broner, Site only L _{Ceq} dB ^{2,5}	INP low frequency modifying factor trigger dB ³	INP, WCP only L _{Ceq} minus site only LAeq dB ^{4,5}	Comments
N6	22/01/2017 23:20	IA	>60	IA	≥15	IA	WCP inaudible
N13	23/01/2017 01:34	30	>60	53	≥15	23	WCP continuum
N14	22/01/2017 22:49	IA	>60	IA	≥15	IA	WCP inaudible
N15	22/01/2017 23:42	IA	>60	IA	≥15	IA	WCP inaudible
N16	23/01/2017 00:50	<20	>60	NM	≥15	NM	WCP contribution not measurable
N17	23/01/2017 00:15	IA	>60	IA	≥15	IA	WCP inaudible
N18	22/01/2017 22:10	IA	>60	IA	≥15	IA	WCP inaudible

Notes:

1. Night L_{Ceq} modifying factor trigger as detailed in Broner (2010);
2. These are measured or calculated site only Broner C-weighted noise levels, NM denotes site levels were audible but not measurable, IA denotes site noise was inaudible. Where it is not possible to determine the site only Broner result due to the presence of other low frequency noise sources occurring during the measurement, or where MET excludes the measurement, this is noted as NA (not available) and no further assessment has been undertaken. Guidance is provided in the Comments column;
3. Low frequency modifying factor trigger as detailed in the INP;
4. These are measured or calculated site only INP results (site only L_{Ceq} minus site only LAeq), NM denotes site levels were audible but not measurable, IA denotes site noise was inaudible. Where it is not possible to determine the site only INP result due to the presence of other low frequency noise sources occurring during the measurement, or where MET excludes the measurement, this is noted as NA (not available) and no further assessment has been undertaken. Guidance is provided in the Comments column;
5. Bold results are greater than the relevant modifying factor trigger; and
6. WCP L_{Aeq,15minute} provided as a guide.

Where the results in Table 4.6 are greater than the INP or Broner low frequency modifying factor trigger due to activities at WCP a 5 dB modifying factor correction is applied to the measured noise level. See Table 4.7 for more detail.

Table 4.7: MEASURED NOISE LEVELS FOR WCP AGAINST LOW FREQUENCY NOISE CRITERIA – JANUARY 2016

Location	Start Date and Time	WCP only L _{Aeq,15minute} dB	Modifying factor correction dB	Impact assessment criteria EPL/Project Approval dB	Site only L _{Aeq} with modifying factor correction applied ¹ dB	Exceedance of impact assessment criterion EPL/Project Approval dB ¹
N13	23/01/2017 01:34	30	5 (INP only)	35/36	35	Nil/Nil

Notes:

1. Bolded results in red indicate exceedance of the relevant criterion.

As detailed in Table 4.7, there were no exceedances of relevant criteria. No further analysis of low frequency noise was required.

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator at each location using a Kestrel hand-held weather meter is shown in Table 4.8. Atmospheric condition data is routinely recorded on a site-by-site basis to show conditions during the monitoring period. The wind speed, direction and temperature were measured at 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.8: MEASURED ATMOSPHERIC CONDITIONS – JANUARY 2016

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	22/01/2017 23:20	23	0.0	-	0
N13	23/01/2017 01:34	23	0.0	-	0
N14	22/01/2017 22:49	25	0.0	-	0
N15	22/01/2017 23:42	24	0.0	-	0
N16	23/01/2017 00:50	20	0.4	210	0
N17	23/01/2017 00:15	24	0.0	-	0
N18	22/01/2017 22:10	21	0.0	-	0

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained concurrently by the WCP meteorological station is provided in Table 4.9 and is used to determine compliance with specified noise criteria.

Table 4.9: WCP METEOROLOGICAL STATION DATA¹

End Date	End Time	Wind Speed m/s	Wind Direction Degrees ^{2,4}	Lapse Rate Degrees / 100 metres ³
19/12/2016	22:00	2.6	89	-0.8
19/12/2016	22:15	3.2	87	-1.2
19/12/2016	22:30	3.2	85	-1.0
19/12/2016	22:45	2.3	75	-1.0
19/12/2016	23:00	2.5	76	-1.0
19/12/2016	23:15	2.3	85	-1.0
19/12/2016	23:30	2.4	101	-0.8
19/12/2016	23:45	2.3	107	-0.6
20/12/2016	00:00	2.3	97	-0.6
20/12/2016	00:15	2.0	96	-0.6
20/12/2016	00:30	1.2	102	-0.6
20/12/2016	00:45	0.9	140	-0.2
20/12/2016	01:00	0.7	81	-0.4
20/12/2016	01:15	0.8	53	-0.2
20/12/2016	01:30	1.0	70	-0.4
20/12/2016	01:45	1.5	94	-0.4
20/12/2016	02:00	1.3	105	-0.6

Notes:

1. Data supplied by WCP;
2. "-" in wind direction column indicates that conditions were calm;
3. Lapse rate sourced from the WCP inversion tower; and
4. NA indicates data not available/recorded.

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 to Table 4.5 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. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

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 Figure 3 to Figure 9 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 cut-off frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq} .

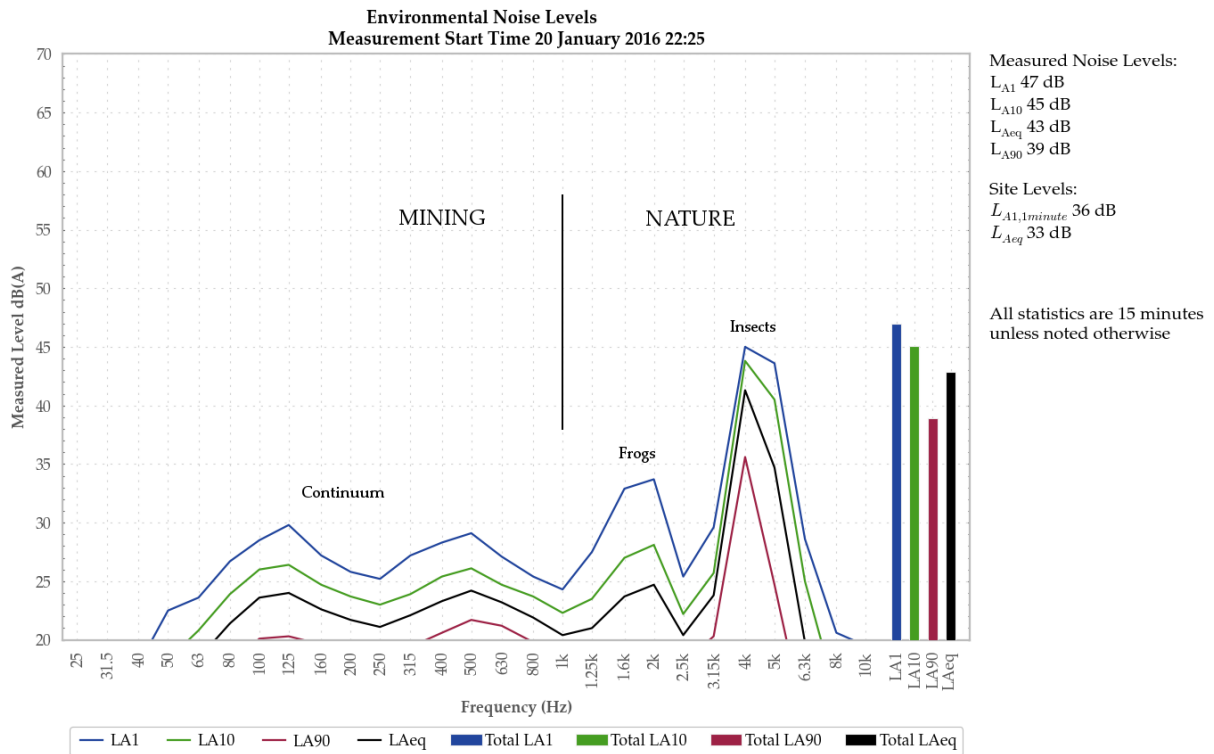


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6, 22 January 2017

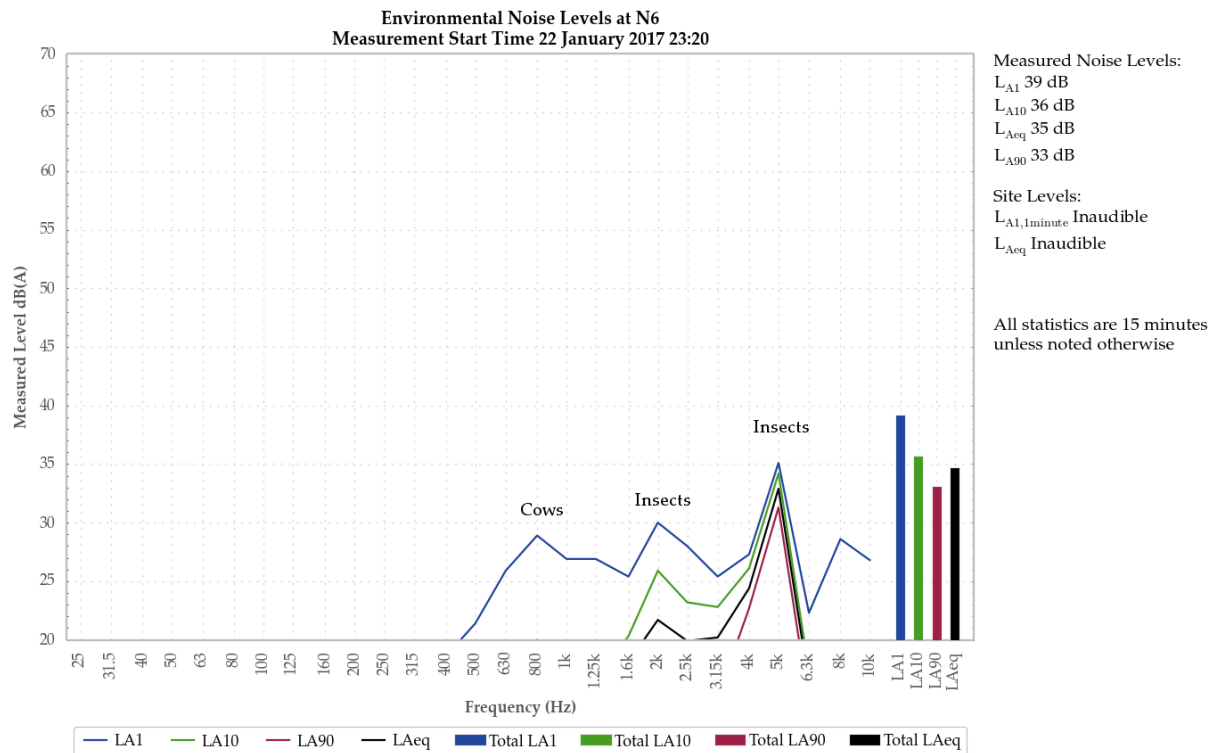


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

WCP was inaudible.

Insects were primarily responsible for measured noise levels. Cows were minor contributors to the measured LA1.

Breeze in foliage, a train and nearby air-conditioner were also noted.

5.1.2 N13, 23 January 2017

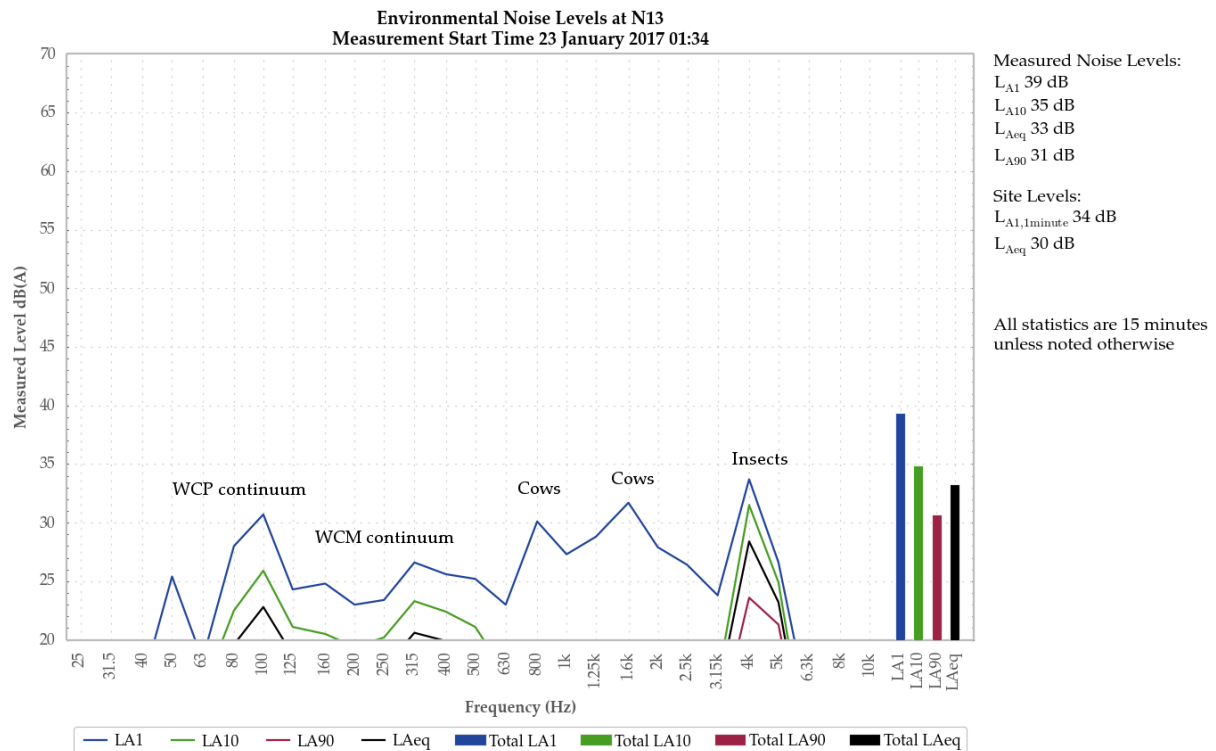


Figure 4: Environmental Noise Levels – N13, 'Coonaroo' off Moolarben Road

An engine and exhaust continuum from WCP was audible during the measurement. Track noise was regularly audible in the continuum. These sources generated the site only LAeq of 30 dB. Engine and exhaust noise surges generated the site only LA1,1minute of 34 dB.

The continuum from WCP and insects were primarily responsible for measured noise levels. Cows contributed to the measured LA1.

Breeze in foliage and sheep were also noted.

5.1.3 N14, 22 January 2017

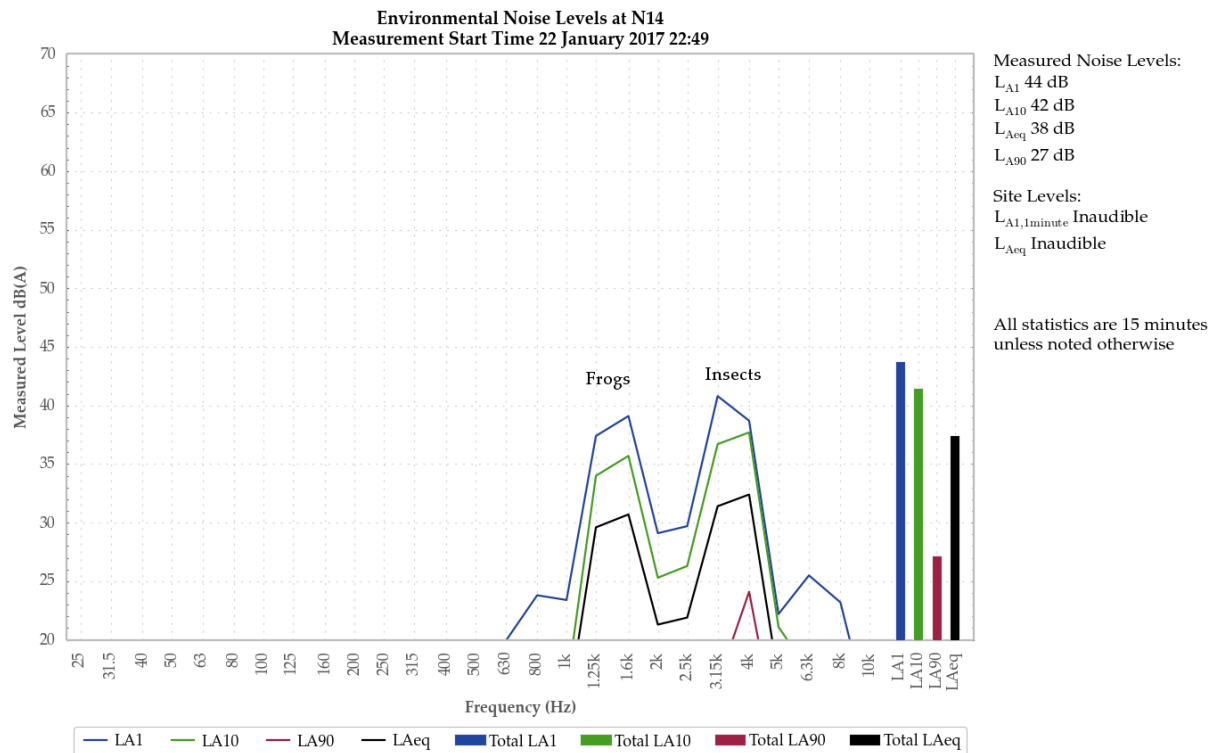


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

WCP was inaudible.

Frogs and insects generated measured levels.

A nearby substation continuum was also noted.

5.1.4 N15, 22 January 2017

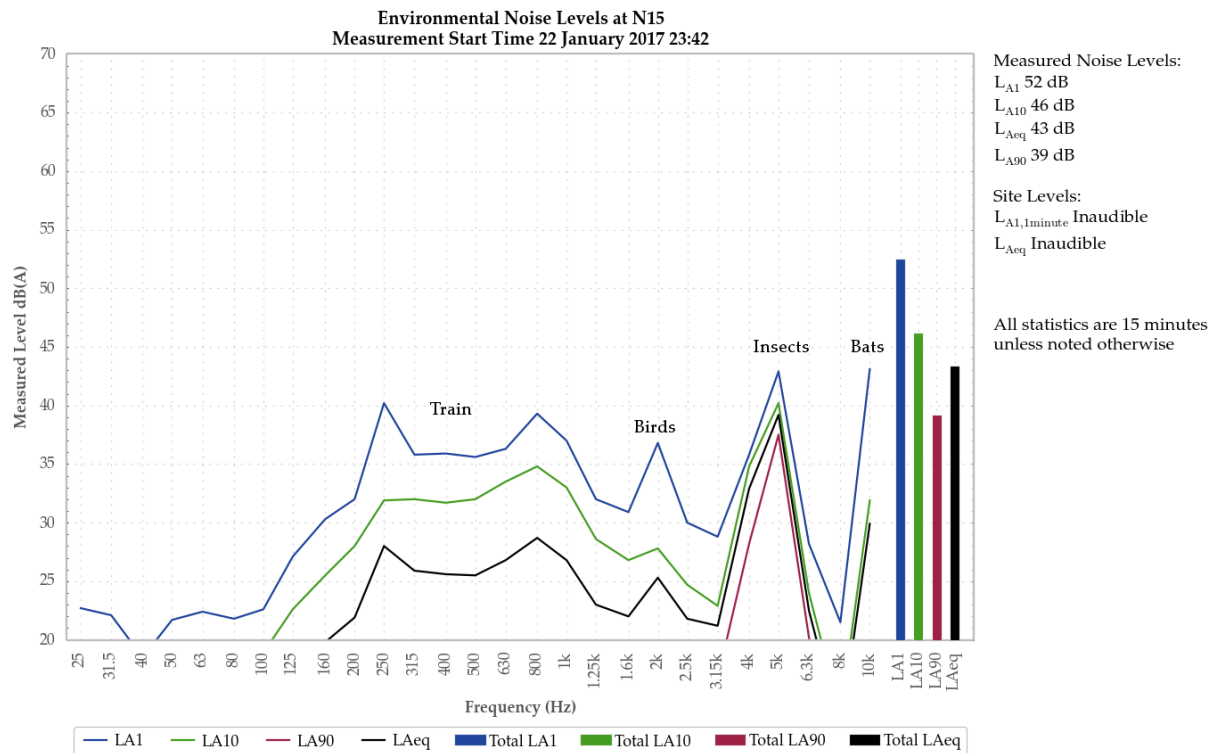


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

WCP was inaudible.

Insects generated the LA90 and combined with a train, birds and bats to generated the measured LA1, LA10 and LAeq.

Breeze in foliage and a residential door slam were also noted.

5.1.5 N16, 23 January 2017

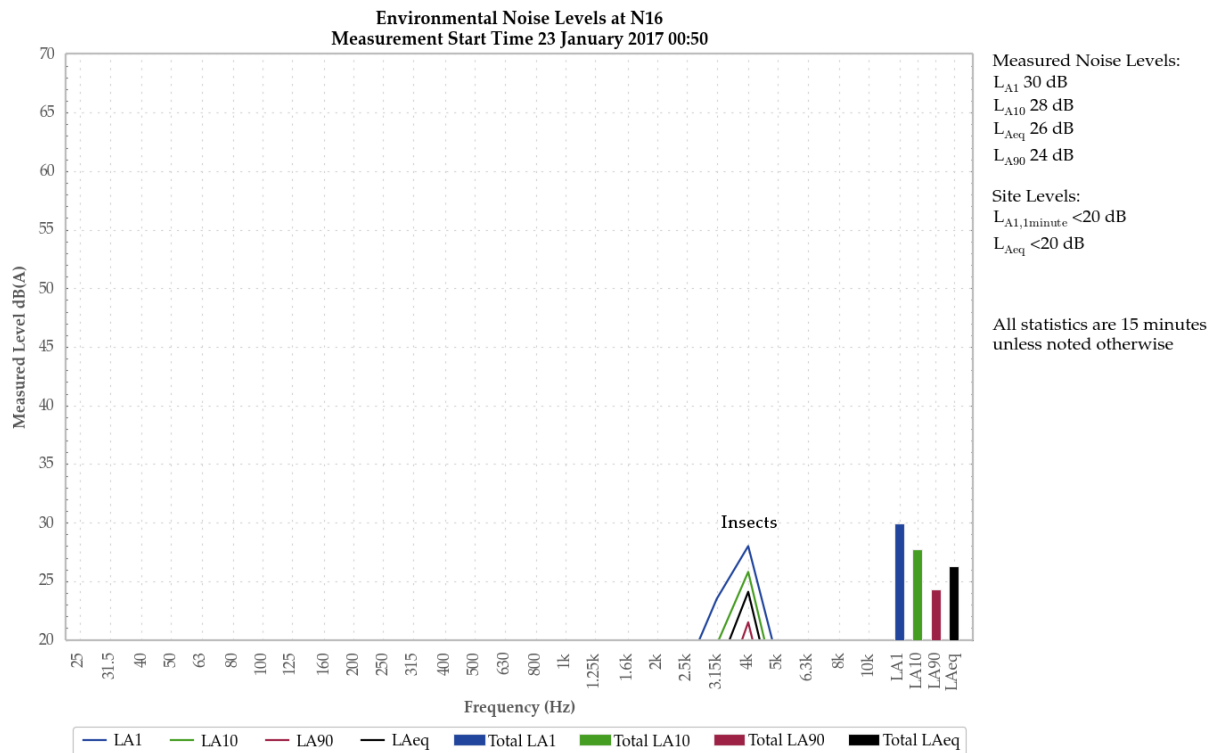


Figure 7: Environmental Noise Levels – N16, Araluen Road, off Ulan-Wollar Road

A low-level continuum from WCP was audible during the measurement and generated the site only LAeq and LA1,1minute of less than 20 dB.

Insects generated measured levels.

A rattling fence was also noted.

5.1.6 N17, 23 January 2017

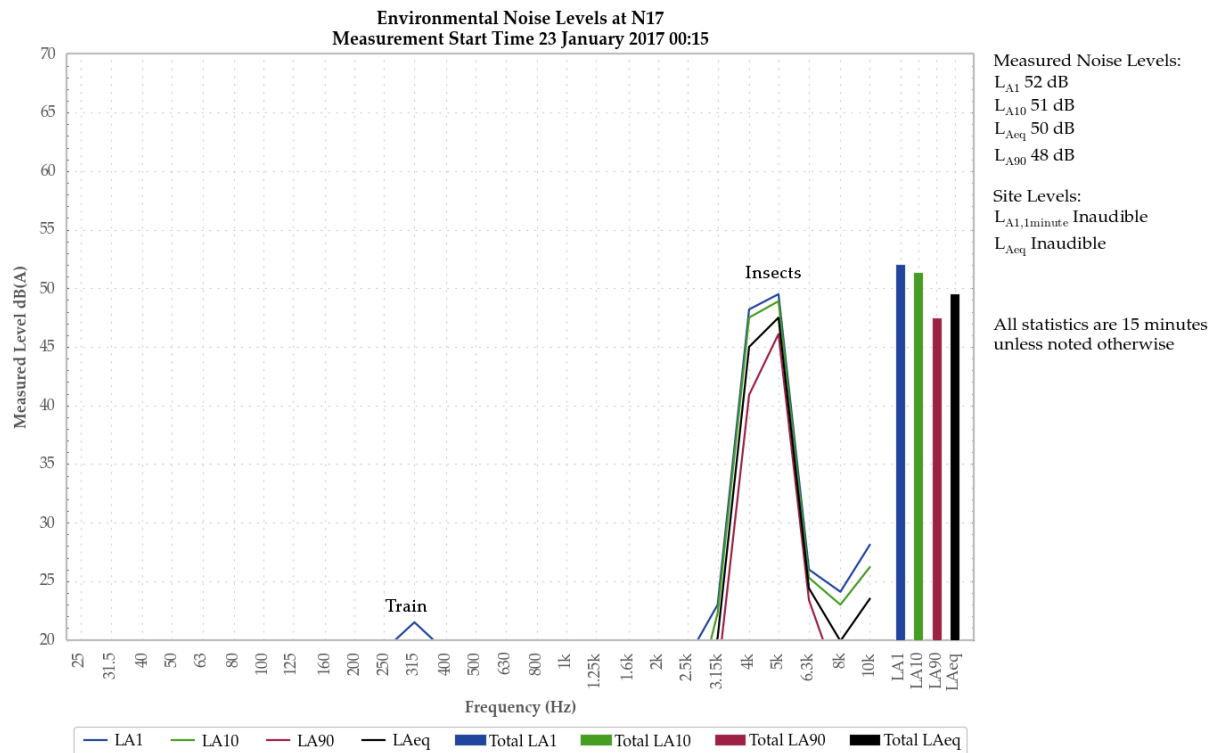


Figure 8: Environmental Noise Levels – N17, Mogo Road, off Araluen Road

WCP was inaudible.

Insects generated measured levels.

A train and nearby animals in foliage were also noted.

5.1.7 N18, 22 January 2017

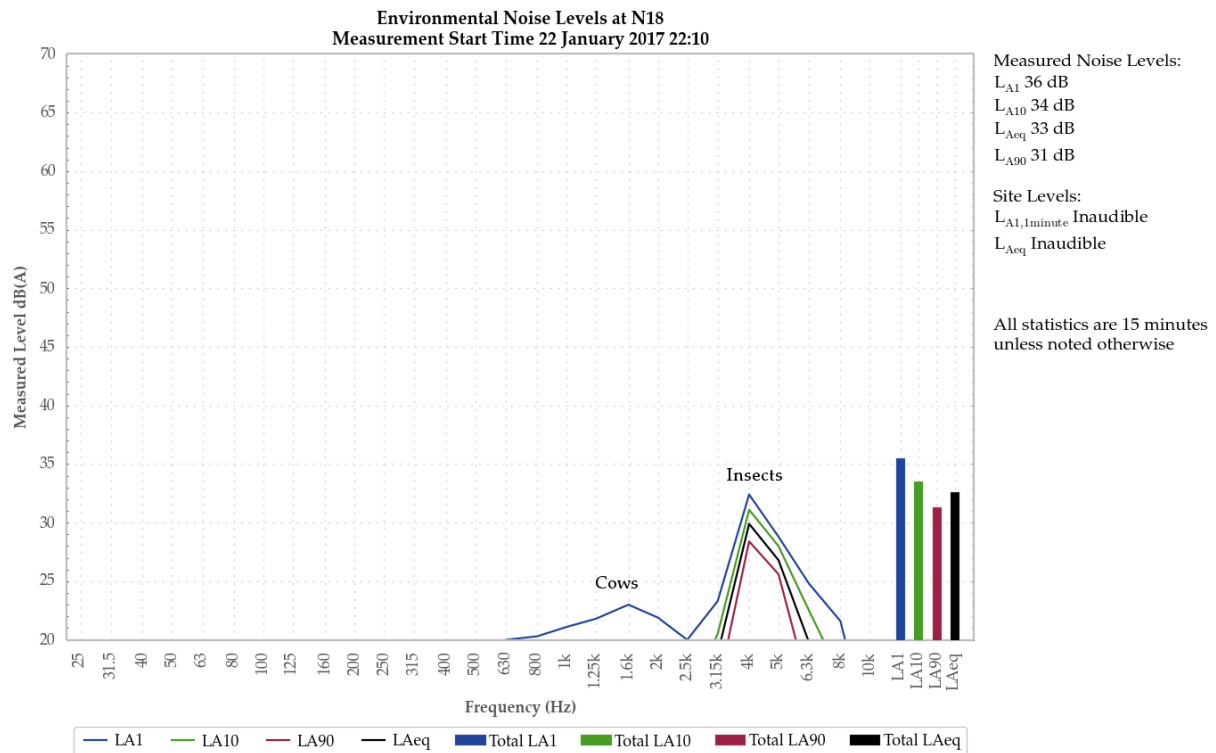


Figure 9: Environmental Noise Levels, N18 - Barigan Road, Barigan Valley

WCP was inaudible.

Insects generated measured levels.

Cows were also noted.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 22/23 January 2017. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the January 2017 monitoring period.

6.2 Low Frequency Assessment

During the January 2017 survey WCP complied with the relevant limits using the Broner method of assessing low frequency. However, using the INP method of assessing low frequency, site only noise levels were above the relevant modifying factor trigger during the measurement at location N13. A 5 dB penalty was applied to the relevant site only L_{Aeq} for this measurement.

With the penalty applied, resulting noise levels remained in compliance with relevant noise limits at N13. No further assessment of low frequency noise was required.

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APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Project Approval

SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

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 5 – 6 of schedule 4.

Table 1: Land subject to acquisition upon request

30 – Gaffney

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

NOISE

Noise 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 at the other specified locations.

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)
135	38	38	38	45
129 and 137	37	37	37	45
69	36	36	36	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		40 (internal) When in use		-
900 – St Laurence O’Toole Catholic Church				-
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 11 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

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; and
- 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.

Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

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

Table 3: Land subject to additional noise mitigation upon request

Receiver ID
69, 129, 135 and 137

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

Operating Conditions

4. The Proponent shall:
 - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
 - (b) operate a comprehensive noise management system that uses a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day to day planning of mining operations, and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this approval;
 - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the project is complying with the relevant conditions of this approval, and publish these monitoring results on its website, to the satisfaction of the Director-General.

Noise Management Plan

5. The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
 - (a) be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this approval; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this approval and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

APPENDIX 8 STATEMENT OF COMMITMENTS

Operational Noise

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) temperature inversion conditions greater than 3°C/100m

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Director-General directs otherwise.
5. Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

A.2 Environmental 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 July 2016.

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)
Wollar village	36	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
All other privately owned land (outside the village of Wollar)	35	35	35	45

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

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:

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

L5.4 For the purpose of condition L5.3:

- 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
- 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.

R4 Other reporting conditions

R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the second round of quarterly monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:

- a) an assessment of compliance with noise limits presented in Condition L5.1; and
- b) an outline of any management actions taken within the monitoring period to address any exceedences of the limits contained in Condition L5.1.

A.3 Noise Monitoring Program

The relevant sections of the noise monitoring program for WCP dated May 2016 are reproduced below.

6 Noise Monitoring Program

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 4**. Unattended or real-time monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake attended monitoring at up to seven locations (**Table 5, Figure 3 and Figure 4**). Real-time units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 5: Noise Related Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Araluen Rd	N16	Attended Noise	778787.4	6417418.7	Location based on the nearest community structure to the East of the Mine
Mogo Rd	N17	Attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Barrigan Valley²	N18	Attended Noise	780033.3	6398618.1	DP&E Recommendation (MOD5) – Location approximately 20 km to the south of the Mine
WCPL Rail Loop		Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions

Wollar Village		Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine
Araluen Rd		Real-Time Noise - Fixed	778856.4	6417401.3	Location based on the nearest non-mine owned residence to the East of the Mine
Wandoona³		Real-Time Noise - Mobile	777684.4	6414786.2	Location based on the nearest non-mine owned residence to the South-East of the Mine

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 5** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&E and the EPA.

6.3 Attended Noise Monitoring

6.3.1 Purpose

Attended noise monitoring will be used to evaluate compliance against the Noise Criteria detailed in **Table 4**.

6.3.2 Summary

Attended noise will be undertaken in accordance with **Table 6**.

Table 6: Attended Noise Monitoring Summary

Element	Description
Locations	As per Table 5 , Figure 3 and Figure 4
Period	Night-time period (10 pm-7 am) being the most sensitive time period for noise.
Frequency	12 times per year and on one night per month

6.3.3 Methodology

Attended noise monitoring will be undertaken as outlined in **Table 6** by an independent acoustic consultant in accordance with the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the noise criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not

exceed the Noise Criteria, as defined in **Table 4**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA₁ measurement will be undertaken at 1 m from the dwelling façade and the LA_{eq} measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

6.3.5 Evaluation of Compliance

Tables 7 and 8 summarises the definition used by WCPL in this NMP for the evaluation of compliance with the Project Approval. The reporting requirements and actions that WCPL will take in the event of an exceedance or non-compliance are detailed in Figure 5 and Section 6.3.7.

Table 7: Definition of an Exceedance

Term	Definition
Exceedance	An exceedance is deemed to have occurred when an attended noise monitoring result, taken in accordance with the INP and Project Approval, exceeds the Noise Criteria in Table 4 . The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6).
Non-compliance	A non-compliance is deemed to have occurred when a second attended noise monitoring result, taken within 75 minutes of an exceedance and in accordance with the INP and Project Approval, exceeds the Noise Criteria in Table 4 for a second time. The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6). Reporting requirements for a non-compliance are detailed in Section 6.3.7 .

6.3.6 Favourable Meteorological Conditions

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 3°C/100m.

Except for wind speed at microphone height, the data used for determining meteorological conditions will be that recorded by the meteorological station located on the Mine site.

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

6.3.7 Response to Non-Compliance or Exceedance

Where any non-compliance of the Noise Criteria has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the non-compliance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (**Section 9.1**);
- Implement remediation measures as directed by the Director-General; and
- Review and, if necessary, revise this Management Plan (**Section 10**), to the satisfaction of the Director-General.

APPENDIX

B CALIBRATION CERTIFICATES



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Octave Band Filter
AS 4476:1997
Calibration Certificate

Calibration Number C15226A

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 00701424
Microphone Serial Number : 01916
Pre-amplifier Serial Number : 01463

Atmospheric Conditions
Ambient Temperature : 22.2°C
Relative Humidity : 52.1%
Barometric Pressure : 99.85kPa

Calibration Technician : Adrian Walker
Calibration Date : 22/05/2015
Secondary Check: Sandra Minto
Report Issue Date : 25/05/2015

Approved Signatory :

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
4.4 & 5.3: 1/1 Octave relative attenuation	Pass	4.6 & 5.5: Linear operating range	Pass
4.4 & 5.3: 1/3 Octave relative attenuation	Pass	4.8 & 5.7: Anti-alias filters	Pass
		4.10 & 5.9: Flat frequency response	Pass

Least Uncertainties of Measurement -			
Electrical Tests		Environmental Conditions	
< 16Hz	±0.182dB	Temperature	±0.3°C
16Hz - 100Hz	±0.105dB	Relative Humidity	±4.1%
100Hz-1000Hz	±0.089dB	Barometric Pressure	±0.1kPa
1000Hz-10kHz	±0.166dB		
> 10kHz	±0.119dB		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.

PAGE 1 OF 1



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**Sound Calibrator
IEC 60942-2004**

Calibration Certificate

Calibration Number C16383

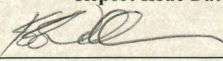
Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
THORNTON NSW 2322

Equipment Tested/ Model Number : Pulsar 106
Instrument Serial Number : 74813

Atmospheric Conditions

Ambient Temperature : 20.9°C
Relative Humidity : 39.8%
Barometric Pressure : 99.08kPa

Calibration Technician : Dennis Kim
Calibration Date : 25/07/2016
Secondary Check: Sandra Minto
Report Issue Date : 25/07/2016

Approved Signatory :  Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
5.2.2: Generated Sound Pressure Level	Pass	5.3.2: Frequency Generated	Pass
5.2.3: Short Term Fluctuation	Pass	5.5: Total Distortion	Pass

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	93.8	1000.34

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2004 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -

Specific Tests	Environmental Conditions
Generated SPL ±0.09dB	Temperature ±0.05°C
Short Term Fluct. ±0.02dB	Relative Humidity ±0.46%
Frequency ±0.01%	Barometric Pressure ±0.017kPa
Distortion ±0.51%	

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

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The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.

PAGE 1 OF 1

Wilpinjong Coal

*Environmental Noise Monitoring
February 2017*

*Prepared for
Wilpinjong Coal Pty Ltd*

Global 
Acoustics

Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring February 2017

Reference: 17050_R01

Report date: 7 March 2017

Prepared for

Wilpinjong Coal Pty Ltd

Locked Bag 2005

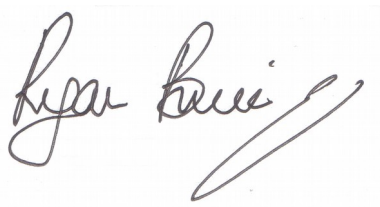
Mudgee NSW 2850

Prepared by

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PO Box 3115

Thornton NSW 2322



Prepared: Ryan Bruniges
Scientist (Acoustics)

QA Review: Katie Weekes
Environmental Scientist (Acoustics)

Global Acoustics Pty Ltd ~ Environmental noise modelling 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

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EXECUTIVE SUMMARY

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

A modification (MOD5) to the WCP consent was approved in November 2014. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

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 night measurement was 15 minutes. Results of monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at seven locations during the night of 22/23 February 2017. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Operational Noise Assessment

WCP complied with relevant noise limits at all monitoring locations during the February 2017 monitoring.

Low Frequency Assessment

During the February 2017 survey WCP complied with the relevant limits using the Broner method of assessing low frequency. However, using the INP method of assessing low frequency, site only noise levels were above the relevant modifying factor trigger during the measurement at location N13. A 5 dB penalty was applied to the relevant site only L_{Aeq} for this measurement.

With the penalty applied, resulting noise levels remained in compliance with relevant noise limits at N13. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at seven locations during the night of 22/23 February 2017. Figure 1 shows the monitoring locations.

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

1.2 Monitoring Locations

There were seven 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: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road
N14	'Tichular', intersection of Tichular and Barigan Roads
N15	Track off Barigan Street near Wollar School, Wollar Village
N16	Araluen Road, off Ulan-Wollar Road
N17	Mogo Road, off Araluen Road
N18	Barigan Road, Barigan Valley

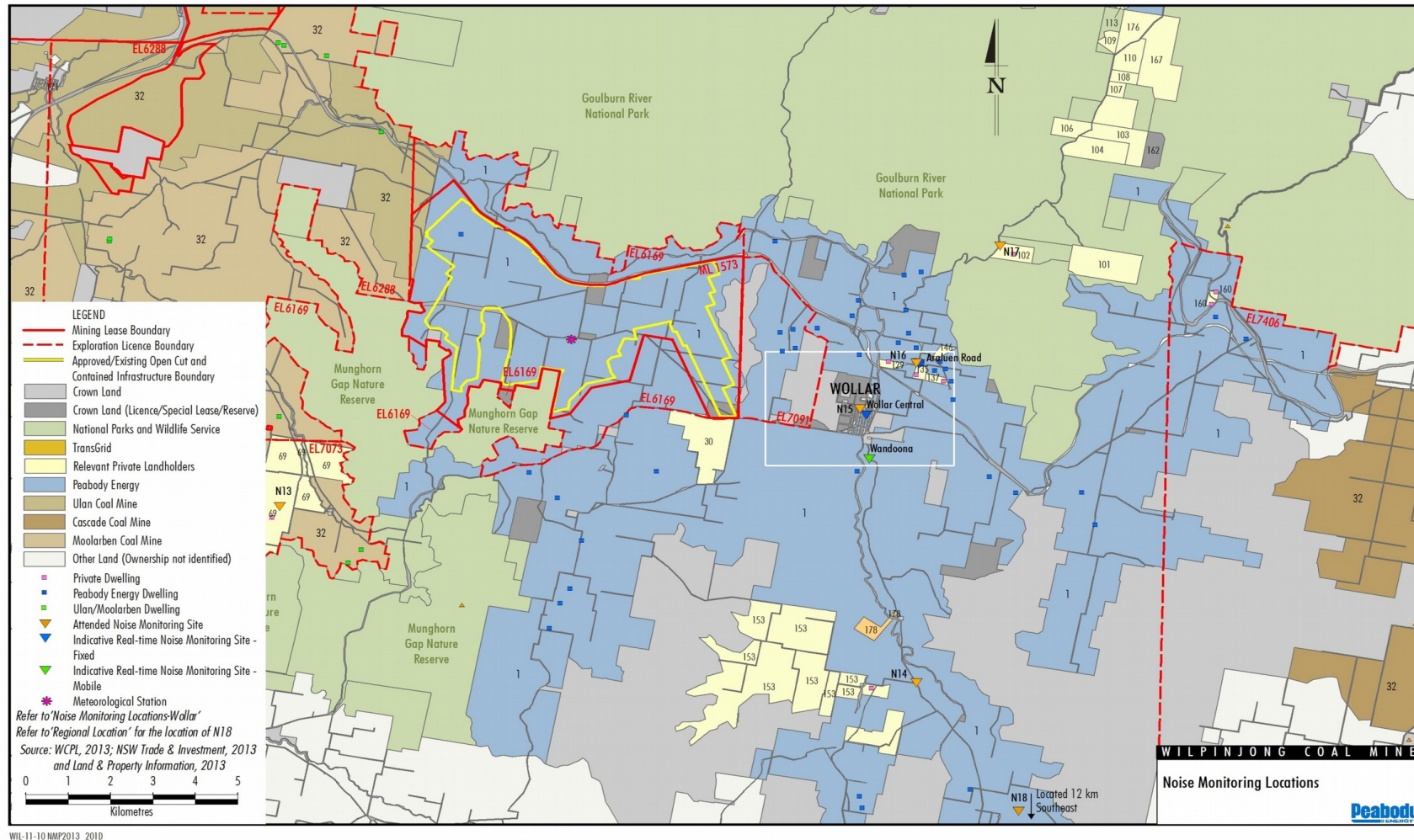


Figure 1: WCP Attended Noise Monitoring Locations

1.3 Terminology & Abbreviations

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

Table 1.2: TERMINOLOGY & ABBREVIATIONS

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
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
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, but could not be quantified
Day	This is the period 7:00am to 6:00pm
Evening	This is the period 6:00pm to 10:00pm
Night	This is the period 10:00pm to 7:00am

2 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in August 2016. The relevant noise conditions from the project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in January 2017. Relevant noise sections of the licence reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in May 2016. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Approval Criteria and Weather Conditions

Criteria detailed in Table 2.1 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with Wilpinjong Coal Project.

Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- a) wind speeds greater than 3 m/s at 10m above ground level;
- b) temperature inversion conditions between 1.5°C and 3°C/100m and wind speeds greater than 2 m/s at 10m above ground level; or
- c) temperature inversion conditions greater than 3°C/100m.

2.5 EPL Criteria and Weather Conditions

Criteria detailed in Table 2.2 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with Wilpinjong Coal Project.

Table 2.2: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

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 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.

2.6 INP Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

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.

2.6.1 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.

2.6.2 Low Frequency Noise

INP Method

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 site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more.*

Broner Method

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 site only C – weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

Low Frequency Assessment Method

Low frequency assessment methods are detailed in Table 2.3.

Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L_{Ceq}	>60	>65
INP	Site only L_{Ceq} minus site only L_{Aeq}	≥ 15	≥ 15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a Draft Industrial Noise Guideline (ING) was released in September 2015, low frequency noise results from WCP have been compared to the assessment methods and modifying factor triggers presented above. The applicability of these triggers have been considered when applying low frequency modifying factor corrections.

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. Monitoring is undertaken once per month at each location. The duration of each measurement was 15 minutes.

Attended monitoring during this reporting period was undertaken by Ryan Bruniges.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. NM indicates that some site noise was audible, but indeterminate due to one of the following reasons:

- site noise levels were insignificant and unlikely, in many cases, to be even noticed; or
- site noise levels were masked by another relatively loud noise source, but were estimated to be less than $L_{Aeq} 30$ dB, which is insignificant in terms of any applicable criterion.

If site noise were NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting. All sites noted NM in this report are due to insignificant 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 a 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 noise from WCP was assessed by analysis of the measured L_{Aeq} spectrum.

3.2 Attended Noise 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: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	00370304	17/11/2018
Larson Davis CAL150 calibrator	3333	30/09/2018

4 RESULTS

4.1 Attended Noise Monitoring

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. 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 – FEBRUARY 2016¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	22/02/2017 23:05	53	47	36	28	34	26	23	39
N13	23/02/2017 01:19	45	39	37	35	35	33	31	47
N14	22/02/2017 22:36	48	36	32	31	31	29	27	54
N15	22/02/2017 23:27	45	37	34	32	32	27	21	35
N16	23/02/2017 00:33	48	32	30	28	29	25	19	39
N17	23/02/2017 00:00	53	39	38	38	37	35	31	38
N18	22/02/2017 22:00	52	40	39	38	38	37	34	39

Note:

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

4.2 Project Approval and Weather Conditions

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines approval. Modifying factors are considered in Section 4.4.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – FEBRUARY 2016

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	22/02/2017 23:05	1.9	-0.6	35	Yes	IA	Nil
N13	23/02/2017 01:19	1.2	1.8	36	Yes	26	Nil
N14	22/02/2017 22:36	1.9	-1.0	35	Yes	IA	Nil
N15	22/02/2017 23:27	1.5	-0.4	35	Yes	IA	Nil
N16	23/02/2017 00:33	1.0	1.8	37	Yes	<20	Nil
N17	23/02/2017 00:00	1.1	1.4	35	Yes	IA	Nil
N18	22/02/2017 22:00	2.5	-1.0	35	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

Table 4.3: $L_{A1,1minute}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – FEBRUARY 2016

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{A1,1min}$ dB ^{4,5}	Exceedance ⁶
N6	22/02/2017 23:05	1.9	-0.6	45	Yes	IA	Nil
N13	23/02/2017 01:19	1.2	1.8	45	Yes	31	Nil
N14	22/02/2017 22:36	1.9	-1.0	45	Yes	IA	Nil
N15	22/02/2017 23:27	1.5	-0.4	45	Yes	IA	Nil
N16	23/02/2017 00:33	1.0	1.8	45	Yes	<20	Nil
N17	23/02/2017 00:00	1.1	1.4	45	Yes	IA	Nil
N18	22/02/2017 22:00	2.5	-1.0	45	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

4.3 EPL and Weather Conditions

Table 4.4 and Table 4.5 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines EPL.

Table 4.4: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – FEBRUARY 2016

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	22/02/2017 23:05	1.9	-0.6	35	Yes	IA	Nil
N13	23/02/2017 01:19	1.2	1.8	35	Yes	26	Nil
N14	22/02/2017 22:36	1.9	-1.0	35	Yes	IA	Nil
N15	22/02/2017 23:27	1.5	-0.4	36	Yes	IA	Nil
N16	23/02/2017 00:33	1.0	1.8	35	Yes	<20	Nil
N17	23/02/2017 00:00	1.1	1.4	35	Yes	IA	Nil
N18	22/02/2017 22:00	2.5	-1.0	35	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

Table 4.5: *L_{A1,1minute}* GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – FEBRUARY 2016

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP <i>L_{A1,1min}</i> dB ^{4,5}	Exceedance ⁶
N6	22/02/2017 23:05	1.9	-0.6	45	Yes	IA	Nil
N13	23/02/2017 01:19	1.2	1.8	45	Yes	31	Nil
N14	22/02/2017 22:36	1.9	-1.0	45	Yes	IA	Nil
N15	22/02/2017 23:27	1.5	-0.4	45	Yes	IA	Nil
N16	23/02/2017 00:33	1.0	1.8	45	Yes	<20	Nil
N17	23/02/2017 00:00	1.1	1.4	45	Yes	IA	Nil
N18	22/02/2017 22:00	2.5	-1.0	45	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

4.4 Low Frequency Assessment

Low frequency results for each monitoring location are presented in Table 4.6.

Table 4.6: LOW FREQUENCY NOISE MODIFYING FACTOR ASSESSMENT – FEBRUARY 2017

Location	Start Date and Time	WCP only LAeq dB ⁶	Broner low frequency modifying factor trigger dB ¹	Broner, Site only L _{Ceq} dB ^{2,5}	INP low frequency modifying factor trigger dB ³	INP, WCP only L _{Ceq} minus site only LAeq dB ^{4,5}	Comments
N6	22/02/2017 23:05	IA	>60	IA	≥15	IA	WCP inaudible
N13	23/02/2017 01:19	26	>60	47	≥15	21	WCP continuum
N14	22/02/2017 22:36	IA	>60	IA	≥15	IA	WCP inaudible
N15	22/02/2017 23:27	IA	>60	IA	≥15	IA	WCP inaudible
N16	23/02/2017 00:33	<20	>60	NM	≥15	NM	WCP contribution not measurable
N17	23/02/2017 00:00	IA	>60	IA	≥15	IA	WCP inaudible
N18	22/02/2017 22:00	IA	>60	IA	≥15	IA	WCP inaudible

Notes:

1. Night L_{Ceq} modifying factor trigger as detailed in Broner (2010);
2. These are measured or calculated site only Broner C-weighted noise levels, NM denotes site levels were audible but not measurable, IA denotes site noise was inaudible. Where it is not possible to determine the site only Broner result due to the presence of other low frequency noise sources occurring during the measurement, or where MET excludes the measurement, this is noted as NA (not available) and no further assessment has been undertaken. Guidance is provided in the Comments column;
3. Low frequency modifying factor trigger as detailed in the INP;
4. These are measured or calculated site only INP results (site only L_{Ceq} minus site only LAeq), NM denotes site levels were audible but not measurable, IA denotes site noise was inaudible. Where it is not possible to determine the site only INP result due to the presence of other low frequency noise sources occurring during the measurement, or where MET excludes the measurement, this is noted as NA (not available) and no further assessment has been undertaken. Guidance is provided in the Comments column;
5. Bold results are greater than the relevant modifying factor trigger; and
6. WCP L_{Aeq,15minute} provided as a guide.

Where the results in Table 4.6 are greater than the INP or Broner low frequency modifying factor trigger due to activities at WCP a 5 dB modifying factor correction is applied to the measured noise level. See Table 4.7 for more detail.

Table 4.7: MEASURED NOISE LEVELS FOR WCP AGAINST LOW FREQUENCY NOISE CRITERIA – FEBRUARY 2016

Location	Start Date and Time	WCP only L _{Aeq,15minute} dB	Modifying factor correction dB	Impact assessment criteria EPL/Project Approval dB	Site only L _{Aeq} with modifying factor correction applied ¹ dB	Exceedance of impact assessment criterion EPL/Project Approval dB ¹
N13	23/02/2017 01:19	26	5 (INP only)	35/36	31	Nil/Nil

Notes:

1. Bolded results in red indicate exceedance of the relevant criterion.

As detailed in Table 4.7, there were no exceedances of relevant criteria. No further analysis of low frequency noise was required.

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator at each location using a Kestrel hand-held weather meter is shown in Table 4.8. Atmospheric condition data is routinely recorded on a site-by-site basis to show conditions during the monitoring period. The wind speed, direction and temperature were measured at 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.8: MEASURED ATMOSPHERIC CONDITIONS – FEBRUARY 2016

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	22/02/2017 23:05	25	0.0	-	0
N13	23/02/2017 01:19	22	0.5	230	0
N14	22/02/2017 22:36	26	1.8	60	0
N15	22/02/2017 23:27	25	1.1	250	0
N16	23/02/2017 00:33	22	0.0	-	0
N17	23/02/2017 00:00	23	0.0	-	0
N18	22/02/2017 22:00	21	0.0	-	0

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained concurrently by the WCP meteorological station is provided in Table 4.9 and is used to determine compliance with specified noise criteria.

Table 4.9: WCP METEOROLOGICAL STATION DATA¹

End Date	End Time	Wind Speed m/s	Wind Direction Degrees ^{2,4}	Lapse Rate Degrees / 100 metres ³
22/02/2017	22:00	3.0	92	-0.8
22/02/2017	22:15	2.5	95	-1.0
22/02/2017	22:30	1.9	95	-0.8
22/02/2017	22:45	1.9	94	-1.0
22/02/2017	23:00	1.5	99	-0.6
22/02/2017	23:15	1.9	95	-0.6
22/02/2017	23:30	1.8	90	-0.6
22/02/2017	23:45	1.5	87	-0.4
23/02/2017	00:00	1.1	124	0.4
23/02/2017	00:15	1.1	153	1.4
23/02/2017	00:30	1.1	142	1.6
23/02/2017	00:45	1.0	136	1.8
23/02/2017	01:00	0.0	-	2.6
23/02/2017	01:15	0.0	-	2.6
23/02/2017	01:30	1.2	134	1.8
23/02/2017	01:45	0.3	44	3.0
23/02/2017	02:00	0.9	353	3.2

Notes:

1. Data supplied by WCP;
2. "-" in wind direction column indicates that conditions were calm;
3. Lapse rate sourced from the WCP inversion tower; and
4. NA indicates data not available/recorded.

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 to Table 4.5 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. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

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 Figure 3 to Figure 9 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 cut-off frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq} .

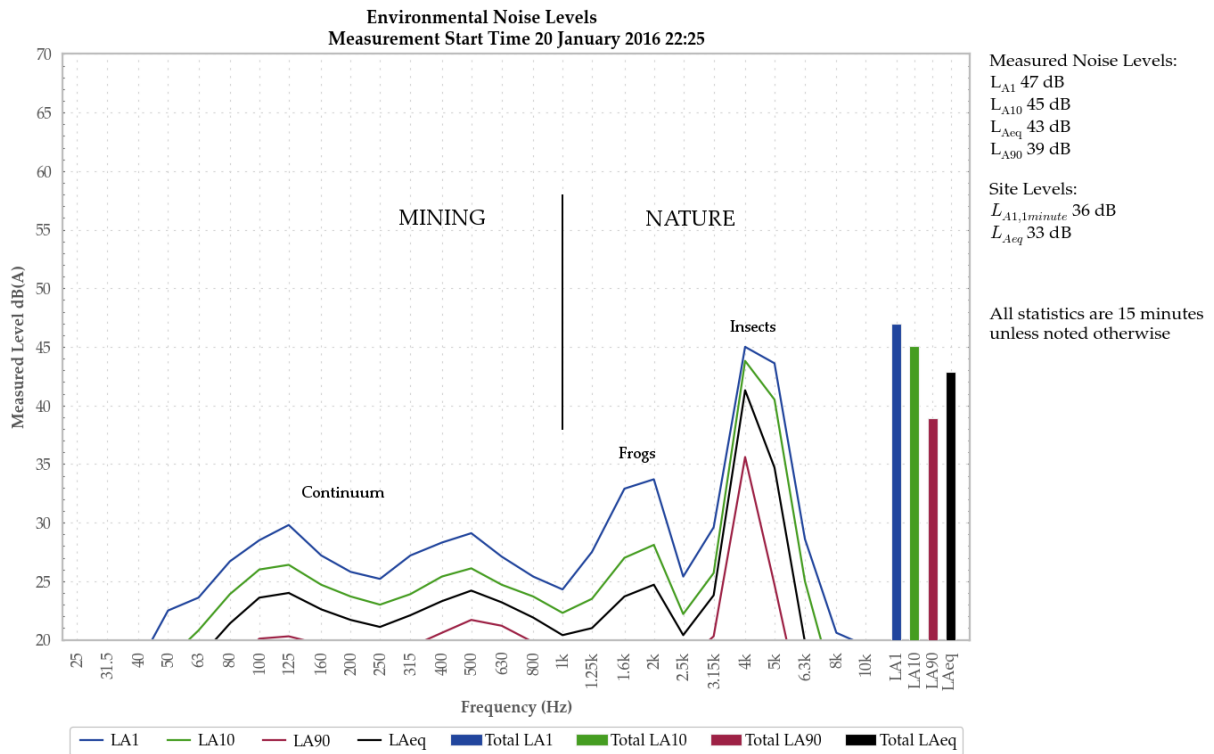


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6, 22 February 2017

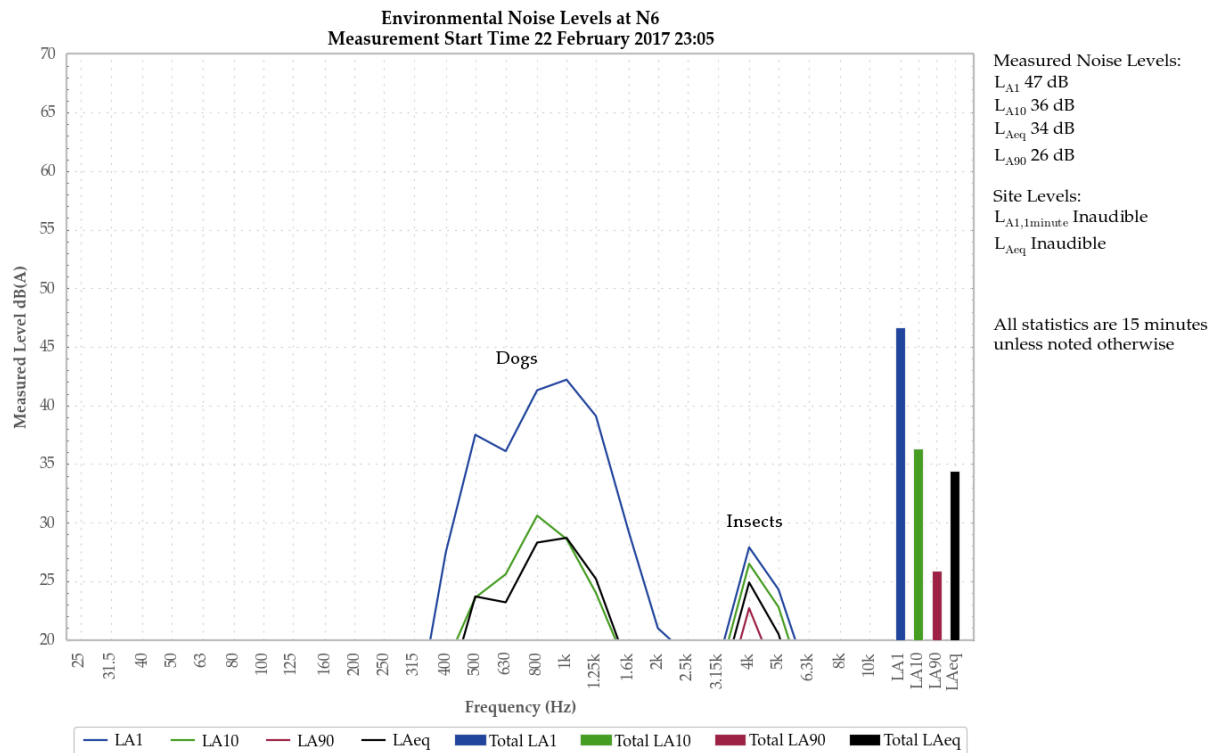


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

WCP was inaudible.

Dogs were responsible for the measured L_{A1} and contributed to the measured L_{A10} and L_{Aeq} . Insects generated the measured L_{A90} and contributed to the measured L_{A10} and L_{Aeq} .

An aircraft and distant road traffic tyre and engine noise were also noted.

5.1.2 N13, 23 February 2017

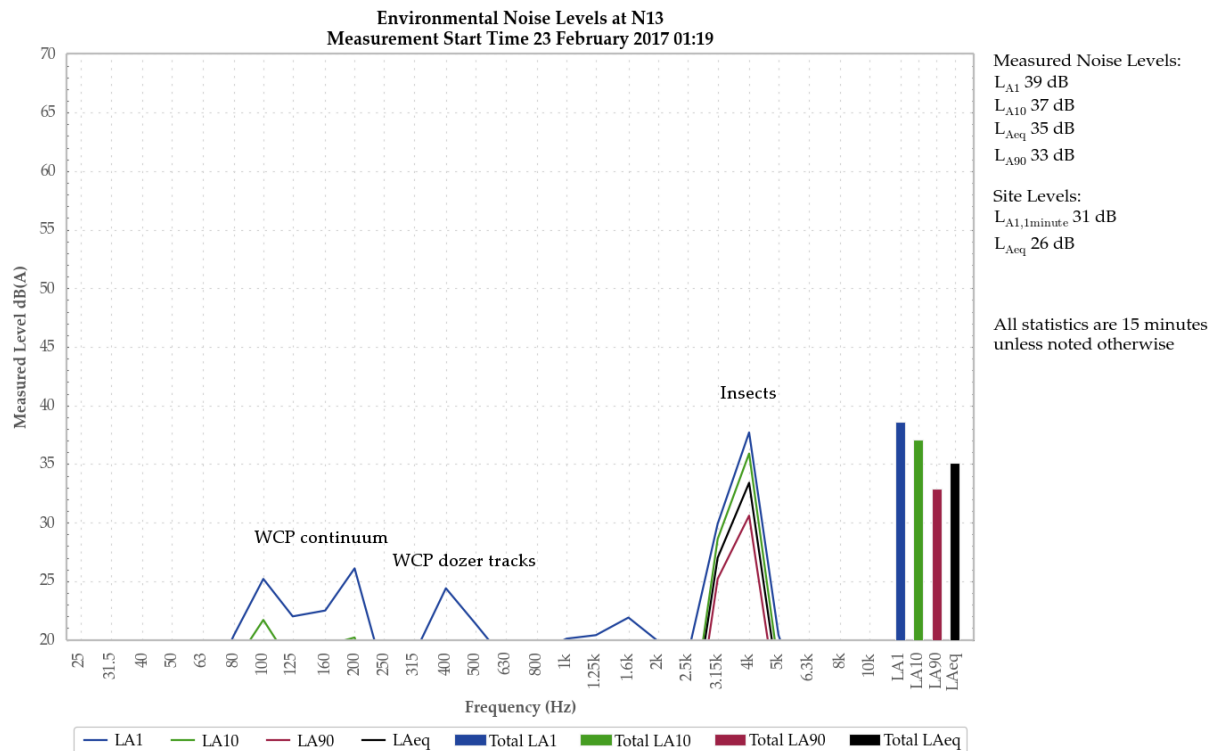


Figure 4: Environmental Noise Levels – N13, 'Coonaroo' off Moolarben Road

An engine and exhaust continuum from WCP was audible during the measurement. Track noise was regularly audible in the continuum. These sources generated the site only L_{Aeq} of 26 dB. Dozer track noise generated the site only L_{A1,1minute} of 31 dB.

Insects were primarily responsible for measured noise levels. Engine, exhaust and track noise from WCP was a minor contributor to measured levels.

5.1.3 N14, 22 February 2017

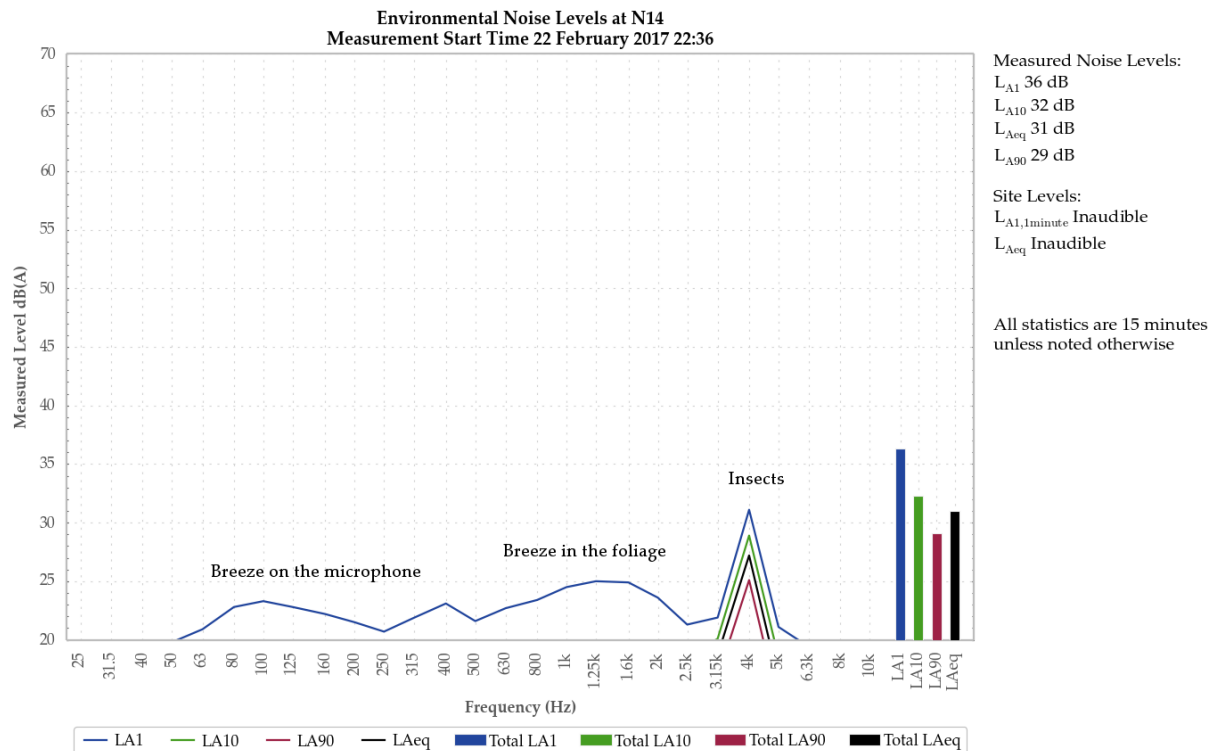


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

WCP was inaudible.

Insects were primarily responsible for all measured levels. Breeze in foliage and breeze on the microphone contributed to the measured L_{A1}, L_{A10} and L_{Aeq}.

A local continuum was also noted.

5.1.4 N15, 22 February 2017

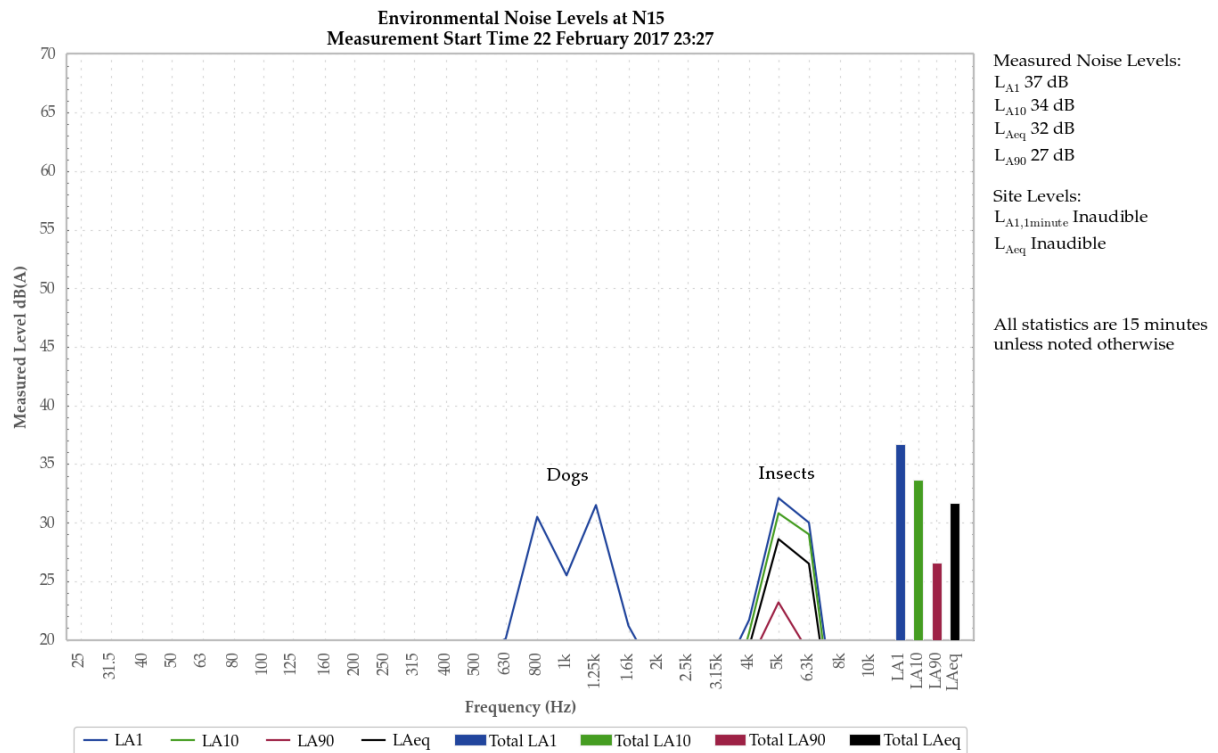


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

WCP was inaudible.

Insects were primarily responsible for measured noise levels. Dogs contributed to the measured LA1.

Breeze in foliage and bats were also noted.

5.1.5 N16, 23 February 2017

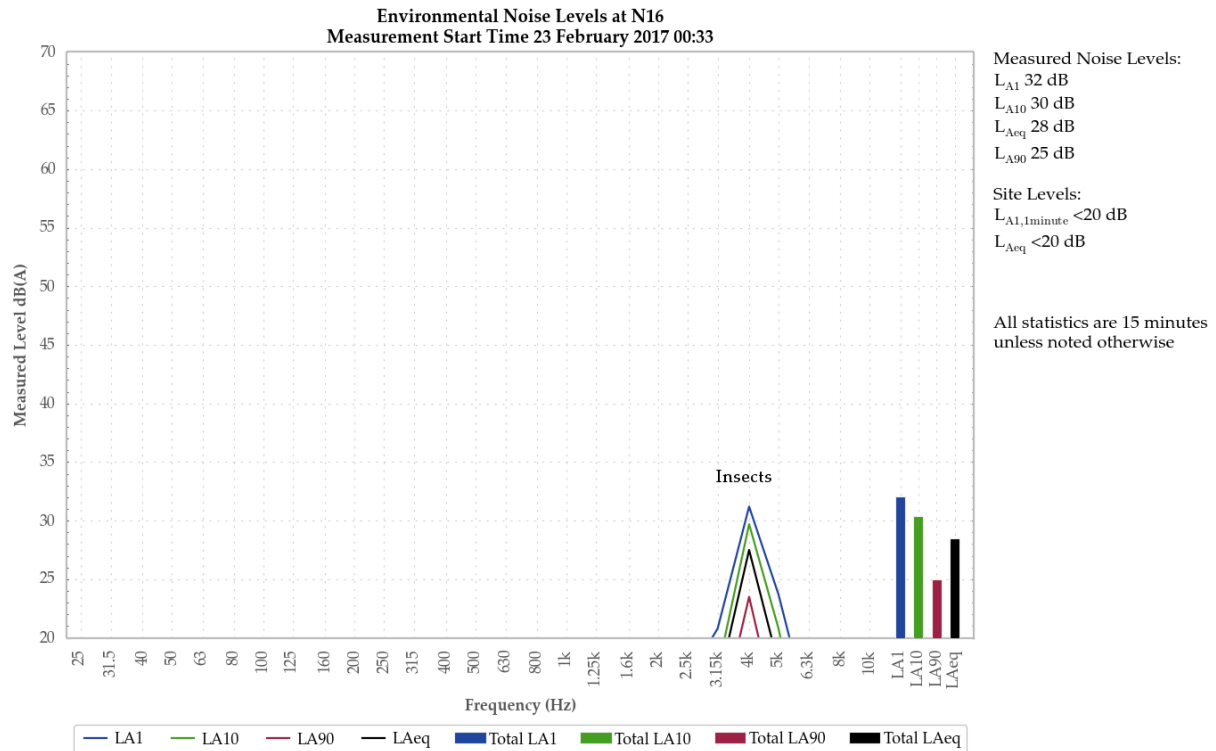


Figure 7: Environmental Noise Levels – N16, Araluen Road, off Ulan-Wollar Road

A low-level continuum from WCP was audible during the measurement and generated the site only LAeq and LA1,1minute of less than 20 dB.

Insects generated measured levels.

Bats and animals in the foliage were also noted.

5.1.6 N17, 23 February 2017

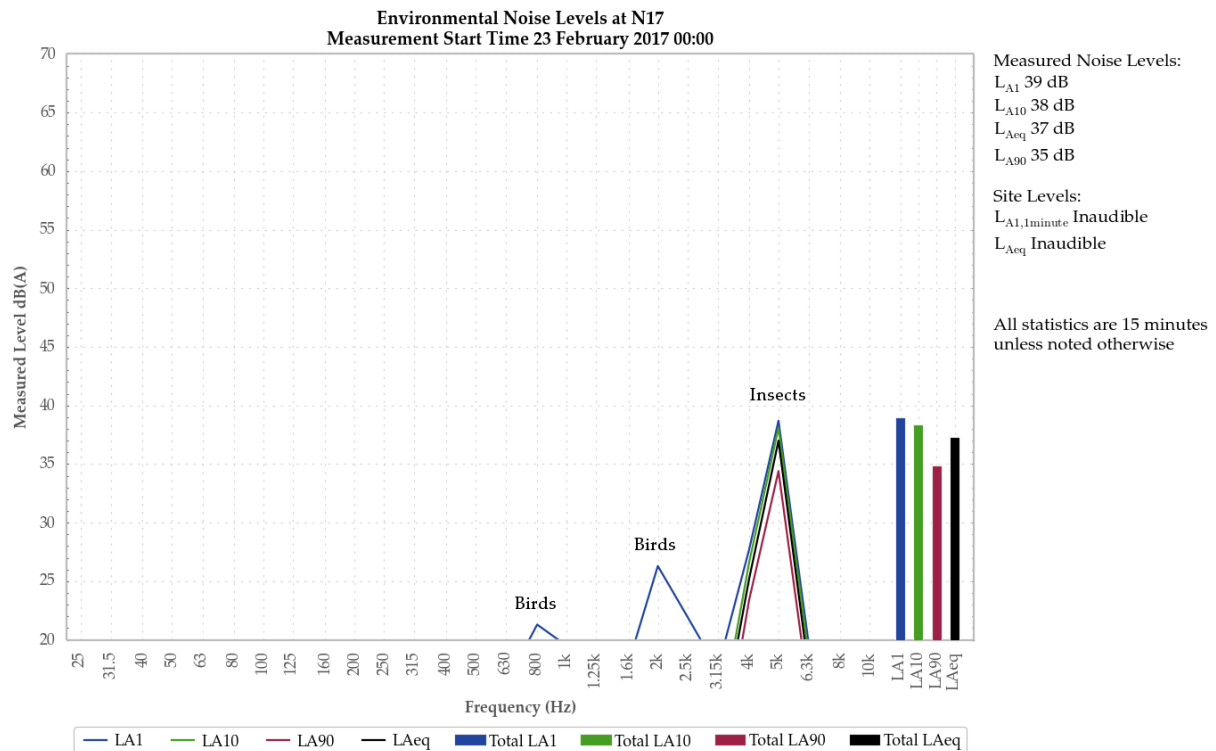


Figure 8: Environmental Noise Levels – N17, Mogo Road, off Araluen Road

WCP was inaudible.

Insects generated measured levels.

Birds and animals in foliage were also noted.

5.1.7 N18, 22 February 2017

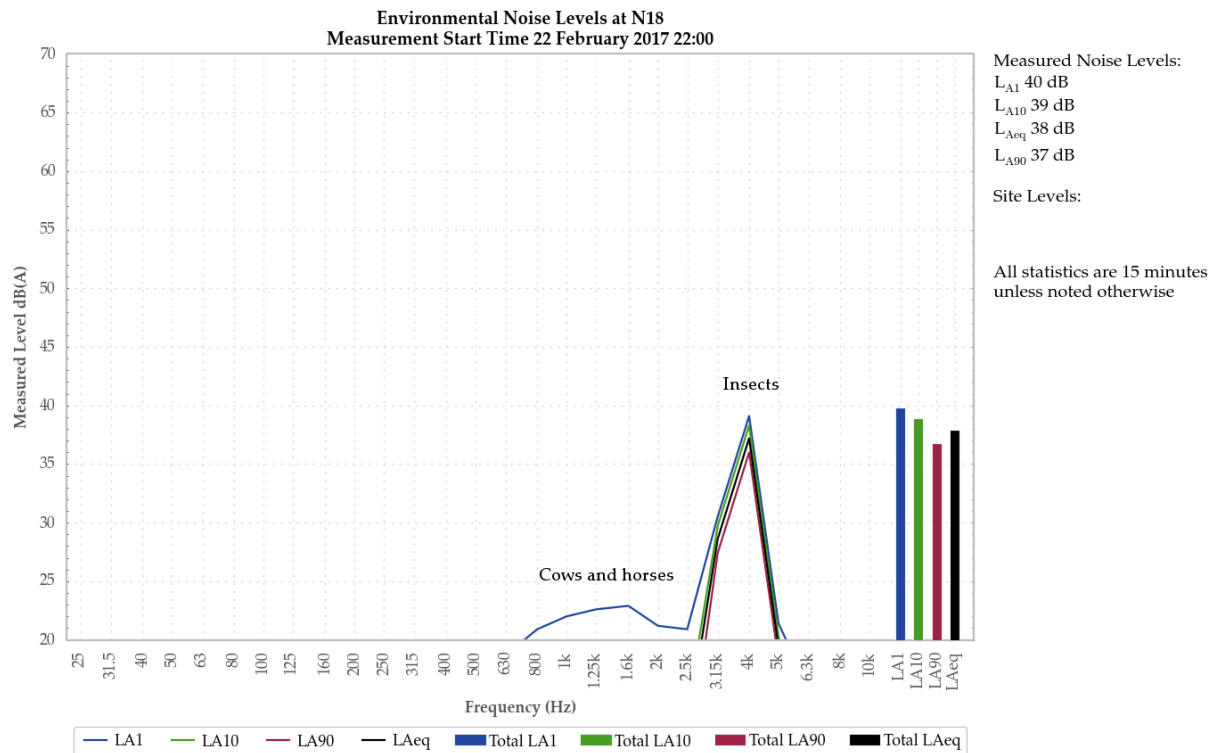


Figure 9: Environmental Noise Levels, N18 - Barigan Road, Barigan Valley

WCP was inaudible.

Insects generated measured levels.

Cows, horses, birds and animals in foliage were also noted.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 22/23 February 2017. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the February 2017 monitoring period.

6.2 Low Frequency Assessment

During the February 2017 survey WCP complied with the relevant limits using the Broner method of assessing low frequency. However, using the INP method of assessing low frequency, site only noise levels were above the relevant modifying factor trigger during the measurement at location N13. A 5 dB penalty was applied to the relevant site only L_{Aeq} for this measurement.

With the penalty applied, resulting noise levels remained in compliance with relevant noise limits at N13. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Project Approval

SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

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 5 – 6 of schedule 4.

Table 1: Land subject to acquisition upon request

30 – Gaffney

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

NOISE

Noise 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 at the other specified locations.

Table 2: Noise Impact assessment criteria dB(A)

Location	Day	Evening	Night	
	<i>L_{Aeq}(15 minute)</i>	<i>L_{Aeq}(15 minute)</i>	<i>L_{Aeq}(15 minute)</i>	<i>L_{A1}(1 minute)</i>
135	38	38	38	45
129 and 137	37	37	37	45
69	36	36	36	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		40 (internal) When in use		-
900 – St Laurence O’Toole Catholic Church				
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 10 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

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; and
- 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.

Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

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

Table 3: Land subject to additional noise mitigation upon request

<i>Receiver ID</i>
<i>69, 129, 135 and 137</i>

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

Operating Conditions

4. The Proponent shall:
 - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
 - (b) operate a comprehensive noise management system that uses a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day to day planning of mining operations, and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this approval;
 - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the project is complying with the relevant conditions of this approval, and publish these monitoring results on its website, to the satisfaction of the Director-General.

Noise Management Plan

5. The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
- (a) be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this approval; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this approval and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

APPENDIX 8 STATEMENT OF COMMITMENTS

Operational Noise

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) temperature inversion conditions greater than 3°C/100m

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Director-General directs otherwise.
5. Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

A.2 Environmental 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 January 2017.

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)
Wollar village	36	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
All other privately owned land (outside the village of Wollar)	35	35	35	45

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

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 3°C/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
- c) Temperature inversion conditions greater than 3°C/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.

R4 Other reporting conditions

R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the second round of quarterly monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:

- a) an assessment of compliance with noise limits presented in Condition L5.1; and
- b) an outline of any management actions taken within the monitoring period to address any exceedences of the limits contained in Condition L5.1.

A.3 Noise Monitoring Program

The relevant sections of the noise monitoring program for WCP dated May 2016 are reproduced below.

6 Noise Monitoring Program

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 4**. Unattended or real-time monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake attended monitoring at up to seven locations (**Table 5, Figure 3 and Figure 4**). Real-time units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 5: Noise Related Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Araluen Rd	N16	Attended Noise	778787.4	6417418.7	Location based on the nearest community structure to the East of the Mine
Mogo Rd	N17	Attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Barrigan Valley²	N18	Attended Noise	780033.3	6398618.1	DP&E Recommendation (MOD5) – Location approximately 20 km to the south of the Mine
WCPL Rail Loop		Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions

Wollar Village		Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine
Araluen Rd		Real-Time Noise - Fixed	778856.4	6417401.3	Location based on the nearest non-mine owned residence to the East of the Mine
Wandoona³		Real-Time Noise - Mobile	777684.4	6414786.2	Location based on the nearest non-mine owned residence to the South-East of the Mine

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 5** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&E and the EPA.

6.3 Attended Noise Monitoring

6.3.1 Purpose

Attended noise monitoring will be used to evaluate compliance against the Noise Criteria detailed in **Table 4**.

6.3.2 Summary

Attended noise will be undertaken in accordance with **Table 6**.

Table 6: Attended Noise Monitoring Summary

Element	Description
Locations	As per Table 5, Figure 3 and Figure 4
Period	Night-time period (10 pm-7 am) being the most sensitive time period for noise.
Frequency	12 times per year and on one night per month

6.3.3 Methodology

Attended noise monitoring will be undertaken as outlined in **Table 6** by an independent acoustic consultant in accordance with the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the noise criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not

exceed the Noise Criteria, as defined in **Table 4**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA₁ measurement will be undertaken at 1 m from the dwelling façade and the LA_{eq} measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

6.3.5 Evaluation of Compliance

Tables 7 and **8** summarises the definition used by WCPL in this NMP for the evaluation of compliance with the Project Approval. The reporting requirements and actions that WCPL will take in the event of an exceedance or non-compliance are detailed in **Figure 5** and **Section 6.3.7**.

Table 7: Definition of an Exceedance

Term	Definition
Exceedance	An exceedance is deemed to have occurred when an attended noise monitoring result, taken in accordance with the INP and Project Approval, exceeds the Noise Criteria in Table 4 . The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6).
Non-compliance	A non-compliance is deemed to have occurred when a second attended noise monitoring result, taken within 75 minutes of an exceedance and in accordance with the INP and Project Approval, exceeds the Noise Criteria in Table 4 for a second time. The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6). Reporting requirements for a non-compliance are detailed in Section 6.3.7 .

6.3.6 Favourable Meteorological Conditions

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 3°C/100m.

Except for wind speed at microphone height, the data used for determining meteorological conditions will be that recorded by the meteorological station located on the Mine site.

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

6.3.7 Response to Non-Compliance or Exceedance

Where any non-compliance of the Noise Criteria has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the non-compliance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (**Section 9.1**);
- Implement remediation measures as directed by the Director-General; and
- Review and, if necessary, revise this Management Plan (**Section 10**), to the satisfaction of the Director-General.

APPENDIX

B CALIBRATION CERTIFICATES



Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
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Octave Band Filter
AS 4476:1997
Calibration Certificate

Calibration Number C16643A

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
THORNTON NSW 2322

Filter Model Number : Rion NA-28
Filter Serial Number : N/A
Instrument Serial Number : 00370304
Microphone Serial Number : 10421
Pre-amplifier Serial Number : 60313

Atmospheric Conditions
Ambient Temperature : 22.3°C
Relative Humidity : 43%
Barometric Pressure : 99.96kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 17/11/2016
Secondary Check: Sandra Minto
Report Issue Date : 17/11/2016

Approved Signatory :  Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
4.4 & 5.3: 1/1 Octave relative attenuation	Pass	4.6 & 5.5: Linear operating range	Pass
4.4 & 5.3: 1/3 Octave relative attenuation	Pass	4.8 & 5.7: Anti-alias filters	Pass
		4.10 & 5.9: Flat frequency response	Pass

The fractional octave band meter under test has been shown to conform to the class 1 requirements for periodic testing as described in AS 4476:1997 for the tests stated above.

Electrical Tests		Least Uncertainties of Measurement - Environmental Conditions	
< 16Hz	±0.19dB	Temperature	±0.05°C
16Hz-100Hz	±0.11dB	Relative Humidity	±0.46%
100Hz-1000Hz	±0.09dB	Barometric Pressure	±0.017kPa
1000Hz-10kHz	±0.09dB		
> 10kHz	±0.16dB		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.



Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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Sound Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C16526

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : LarsonDavis Cal150
Instrument Serial Number : 3333

Atmospheric Conditions

Ambient Temperature : 21.8°C
Relative Humidity : 38.1%
Barometric Pressure : 97.74kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 30/09/2016

Secondary Check: Riley Cooper
Report Issue Date : 04/10/2016

Approved Signatory :

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
5.2.2: Generated Sound Pressure Level	Pass	5.3.2: Frequency Generated	Pass
5.2.3: Short Term Fluctuation	Pass	5.5: Total Distortion	Pass

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	94.1	1000.04
Measured Output	114.0	1000.0	113.9	1000.05

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2004 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	±0.09dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
Distortion	±0.5%		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

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The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.

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Wilpinjong Coal

*Environmental Noise Monitoring
March 2017*

*Prepared for
Wilpinjong Coal Pty Ltd*


Global
Acoustics

Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring March 2017

Reference: 17086_R01

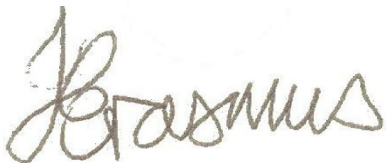
Report date: 24 March 2017

Prepared for

Wilpinjong Coal Pty Ltd
Locked Bag 2005
Mudgee NSW 2850

Prepared by

Global Acoustics Pty Ltd
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Thornton NSW 2322



Prepared: Jonathan Erasmus
Acoustics Technician



QA Review: Katie Weekes
Environmental Scientist (Acoustics)

Global Acoustics Pty Ltd ~ Environmental noise modelling 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 Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

A modification (MOD7) to the WCP consent was approved in August 2016. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

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 night measurement was 15 minutes. Results of monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at seven locations during the night of 9/10 March 2017. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Operational Noise Assessment

WCP complied with relevant noise limits at all monitoring locations during the March 2017 monitoring.

Low Frequency Assessment

During the March 2017 survey WCP complied with the relevant limits using the Broner and INP methods of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at seven locations during the night of 9/10 March 2017. Figure 1 shows the monitoring locations.

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

1.2 Monitoring Locations

There were seven 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: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road
N14	'Tichular', intersection of Tichular and Barigan Roads
N15	Track off Barigan Street near Wollar School, Wollar Village
N16	Araluen Road, off Ulan-Wollar Road
N17	Mogo Road, off Araluen Road
N18	Barigan Road, Barigan Valley

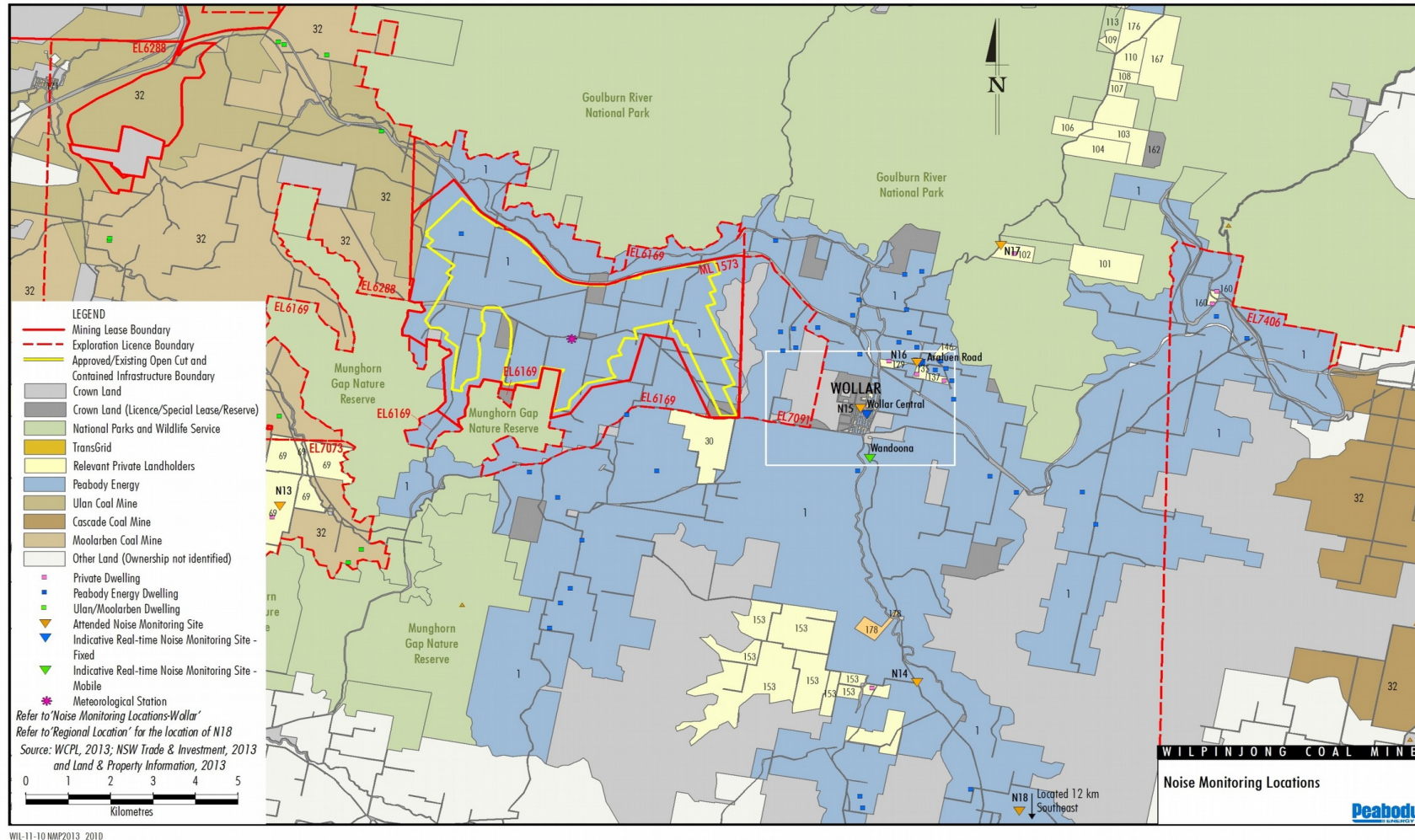


Figure 1: WCP Attended Noise Monitoring Locations

1.3 Terminology & Abbreviations

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

Table 1.2: TERMINOLOGY & ABBREVIATIONS

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
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
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, but could not be quantified
Day	This is the period 7:00am to 6:00pm
Evening	This is the period 6:00pm to 10:00pm
Night	This is the period 10:00pm to 7:00am

2 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in August 2016. The relevant noise conditions from the project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in January 2017. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in May 2016. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Approval Criteria and Weather Conditions

Criteria detailed in Table 2.1 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with Wilpinjong Coal Project.

Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- a) wind speeds greater than 3 m/s at 10m above ground level;
- b) temperature inversion conditions between 1.5°C and 3°C/100m and wind speeds greater than 2 m/s at 10m above ground level; or
- c) temperature inversion conditions greater than 3°C/100m.

2.5 EPL Criteria and Weather Conditions

Criteria detailed in Table 2.2 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with Wilpinjong Coal Project.

Table 2.2: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

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 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.

2.6 INP Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

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.

2.6.1 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.

2.6.2 Low Frequency Noise

INP Method

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 site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more.*

Broner Method

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 site only C – weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

Low Frequency Assessment Method

Low frequency assessment methods are detailed in Table 2.3.

Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L_{Ceq}	>60	>65
INP	Site only L_{Ceq} minus site only L_{Aeq}	≥ 15	≥ 15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a Draft Industrial Noise Guideline (ING) was released in September 2015, low frequency noise results from WCP have been compared to the assessment methods and modifying factor triggers presented above. The applicability of these triggers have been considered when applying low frequency modifying factor corrections.

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. Monitoring is undertaken once per month at each location. The duration of each measurement was 15 minutes.

Attended monitoring during this reporting period was undertaken by Ryan Bruniges.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. NM indicates that some site noise was audible, but indeterminate due to one of the following reasons:

- site noise levels were insignificant and unlikely, in many cases, to be even noticed; or
- site noise levels were masked by another relatively loud noise source, but were estimated to be less than $L_{Aeq} 30$ dB, which is insignificant in terms of any applicable criterion.

If site noise were NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting. All sites noted NM in this report are due to insignificant absolute values.

A measurement of $L_{A1,1\text{minute}}$ 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 a 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 $L_{A1,1\text{minute}}$ 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 noise from WCP was assessed by analysis of the measured L_{Aeq} spectrum.

3.2 Attended Noise 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: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	01070590	06/11/2017
Rion NC-73 acoustic calibrator	11248300	25/07/2018

4 RESULTS

4.1 Attended Noise Monitoring

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. 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 2017¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	09/03/2017 23:16	39	33	28	22	25	19	17	41
N13	10/03/2017 01:16	44	30	23	20	21	18	16	36
N14	09/03/2017 23:43	55	30	25	22	24	20	18	33
N15	09/03/2017 22:57	56	52	42	27	39	21	19	56
N16	09/03/2017 22:31	57	52	43	23	40	19	17	55
N17	09/03/2017 22:00	40	26	21	19	20	18	17	39
N18	10/03/2017 00:17	47	40	31	20	28	17	16	30

Note:

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

4.2 Project Approval and Weather Conditions

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines approval. Modifying factors are considered in Section 4.4.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – MARCH 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	09/03/2017 23:16	1.7	-0.2	35	Yes	IA	Nil
N13	10/03/2017 01:16	1.7	-0.4	36	Yes	IA	Nil
N14	09/03/2017 23:43	2.3	0.0	35	Yes	IA	Nil
N15	09/03/2017 22:57	1.8	-0.2	35	Yes	IA	Nil
N16	09/03/2017 22:31	2.5	-0.4	37	Yes	IA	Nil
N17	09/03/2017 22:00	2.5	-0.2	35	Yes	IA	Nil
N18	10/03/2017 00:17	1.4	0.0	35	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

Table 4.3: $L_{A1,1minute}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – MARCH 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{A1,1min}$ dB ^{4,5}	Exceedance ⁶
N6	09/03/2017 23:16	1.7	-0.2	45	Yes	IA	Nil
N13	10/03/2017 01:16	1.7	-0.4	45	Yes	IA	Nil
N14	09/03/2017 23:43	2.3	0.0	45	Yes	IA	Nil
N15	09/03/2017 22:57	1.8	-0.2	45	Yes	IA	Nil
N16	09/03/2017 22:31	2.5	-0.4	45	Yes	IA	Nil
N17	09/03/2017 22:00	2.5	-0.2	45	Yes	IA	Nil
N18	10/03/2017 00:17	1.4	0.0	45	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

4.3 EPL and Weather Conditions

Table 4.4 and Table 4.5 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines EPL.

Table 4.4: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – MARCH 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	09/03/2017 23:16	1.7	-0.2	35	Yes	IA	Nil
N13	10/03/2017 01:16	1.7	-0.4	35	Yes	IA	Nil
N14	09/03/2017 23:43	2.3	0.0	35	Yes	IA	Nil
N15	09/03/2017 22:57	1.8	-0.2	36	Yes	IA	Nil
N16	09/03/2017 22:31	2.5	-0.4	35	Yes	IA	Nil
N17	09/03/2017 22:00	2.5	-0.2	35	Yes	IA	Nil
N18	10/03/2017 00:17	1.4	0.0	35	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

Table 4.5: *L_{A1,1minute}* GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – MARCH 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP <i>L_{A1,1min}</i> dB ^{4,5}	Exceedance ⁶
N6	09/03/2017 23:16	1.7	-0.2	45	Yes	IA	Nil
N13	10/03/2017 01:16	1.7	-0.4	45	Yes	IA	Nil
N14	09/03/2017 23:43	2.3	0.0	45	Yes	IA	Nil
N15	09/03/2017 22:57	1.8	-0.2	45	Yes	IA	Nil
N16	09/03/2017 22:31	2.5	-0.4	45	Yes	IA	Nil
N17	09/03/2017 22:00	2.5	-0.2	45	Yes	IA	Nil
N18	10/03/2017 00:17	1.4	0.0	45	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

4.4 Low Frequency Assessment

Low frequency results for each monitoring location are presented in Table 4.6.

Table 4.6: LOW FREQUENCY NOISE MODIFYING FACTOR ASSESSMENT – MARCH 2017

Location	Start Date and Time	WCP only LAeq dB ⁶	Broner low frequency modifying factor trigger dB ¹	Broner, Site only L _{Ceq} dB ^{2,5}	INP low frequency modifying factor trigger dB ³	INP, WCP only L _{Ceq} minus site only LAeq dB ^{4,5}	Comments
N6	09/03/2017 23:16	IA	>60	IA	≥15	IA	WCP inaudible
N13	10/03/2017 01:16	IA	>60	IA	≥15	IA	WCP inaudible
N14	09/03/2017 23:43	IA	>60	IA	≥15	IA	WCP inaudible
N15	09/03/2017 22:57	IA	>60	IA	≥15	IA	WCP inaudible
N16	09/03/2017 22:31	IA	>60	IA	≥15	IA	WCP inaudible
N17	09/03/2017 22:00	IA	>60	IA	≥15	IA	WCP inaudible
N18	10/03/2017 00:17	IA	>60	IA	≥15	IA	WCP inaudible

Notes:

1. Night L_{Ceq} modifying factor trigger as detailed in Broner (2010);
2. These are measured or calculated site only Broner C-weighted noise levels, NM denotes site levels were audible but not measurable, IA denotes site noise was inaudible. Where it is not possible to determine the site only Broner result due to the presence of other low frequency noise sources occurring during the measurement, or where MET excludes the measurement, this is noted as NA (not available) and no further assessment has been undertaken. Guidance is provided in the Comments column;
3. Low frequency modifying factor trigger as detailed in the INP;
4. These are measured or calculated site only INP results (site only L_{Ceq} minus site only LAeq), NM denotes site levels were audible but not measurable, IA denotes site noise was inaudible. Where it is not possible to determine the site only INP result due to the presence of other low frequency noise sources occurring during the measurement, or where MET excludes the measurement, this is noted as NA (not available) and no further assessment has been undertaken. Guidance is provided in the Comments column;
5. Bold results are greater than the relevant modifying factor trigger; and
6. WCP L_{Aeq,15minute} provided as a guide.

As detailed in Table 4.6, there were no low frequency correction triggers applied. No further analysis of low frequency noise was required.

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator at each location using a Kestrel hand-held weather meter is shown in Table 4.7. Atmospheric condition data is routinely recorded on a site-by-site basis to show conditions during the monitoring period. The wind speed, direction and temperature were measured at 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – MARCH 2017

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	09/03/2017 23:16	18	0.7	90	0
N13	10/03/2017 01:16	17	0.0	-	0
N14	09/03/2017 23:43	19	1.0	120	0
N15	09/03/2017 22:57	17	0.0	-	0
N16	09/03/2017 22:31	16	0.7	110	0
N17	09/03/2017 22:00	21	0.0	-	0
N18	10/03/2017 00:17	17	0.0	-	0

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained concurrently by the WCP meteorological station is provided in Table 4.8 and is used to determine compliance with specified noise criteria.

Table 4.8: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees^{2,4}	Lapse Rate Degrees / 100 metres³
09/03/2017 22:00	2.6	107	-0.2
09/03/2017 22:15	2.5	104	-0.2
09/03/2017 22:30	2.8	110	-0.2
09/03/2017 22:45	2.5	119	-0.4
09/03/2017 23:00	2.6	120	-0.4
09/03/2017 23:15	1.8	109	-0.2
09/03/2017 23:30	1.7	99	-0.2
09/03/2017 23:45	1.9	89	0.2
10/03/2017 00:00	2.3	85	0.0
10/03/2017 00:15	1.7	89	-0.2
10/03/2017 00:30	1.4	72	0.0
10/03/2017 00:45	1.0	103	0.4
10/03/2017 01:00	1.3	94	0.0
10/03/2017 01:15	1.5	122	0.2
10/03/2017 01:30	1.7	126	-0.4
10/03/2017 01:45	0.4	74	0.6
10/03/2017 02:00	0.5	26	0.6

Notes:

1. Data supplied by WCP;
2. "-" in wind direction column indicates that conditions were calm;
3. Lapse rate sourced from the WCP inversion tower; and
4. NA indicates data not available/recorded.

5 DISCUSSION

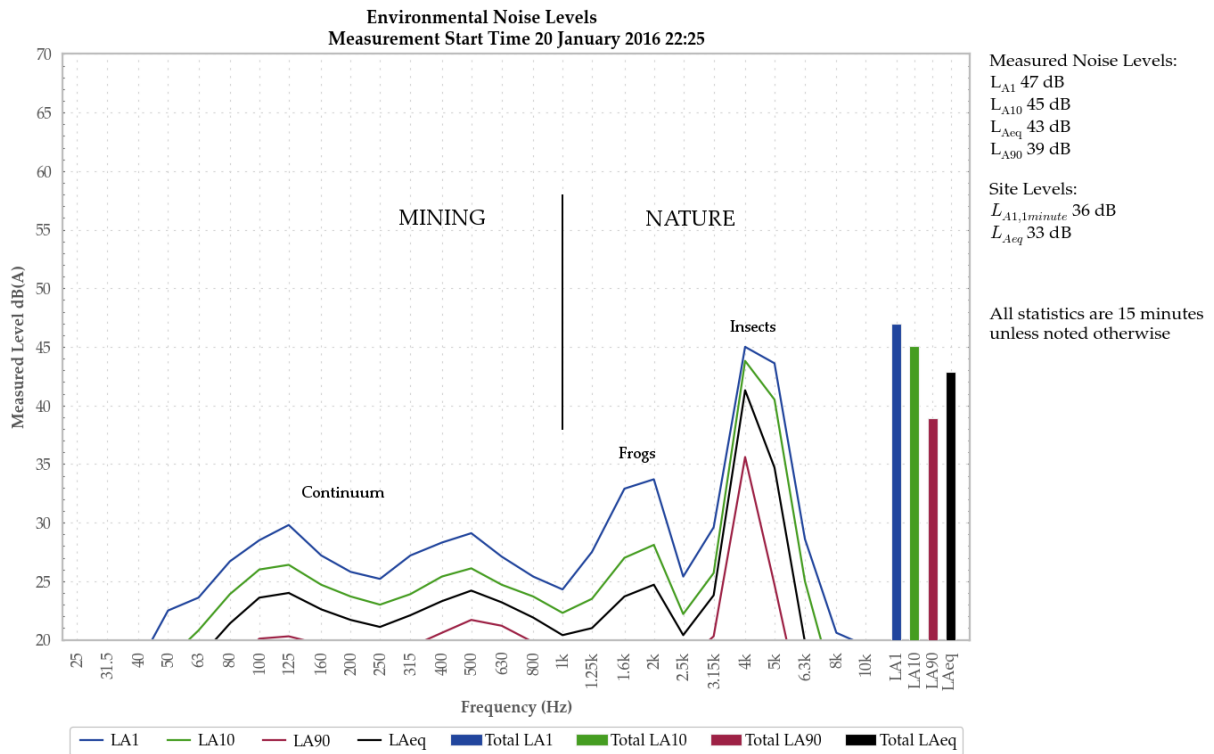
5.1 Noted Noise Sources

Table 4.1 to Table 4.5 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. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

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 Figure 3 to Figure 9 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 cut-off frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq} .



5.1.1 N6, 9 March 2017

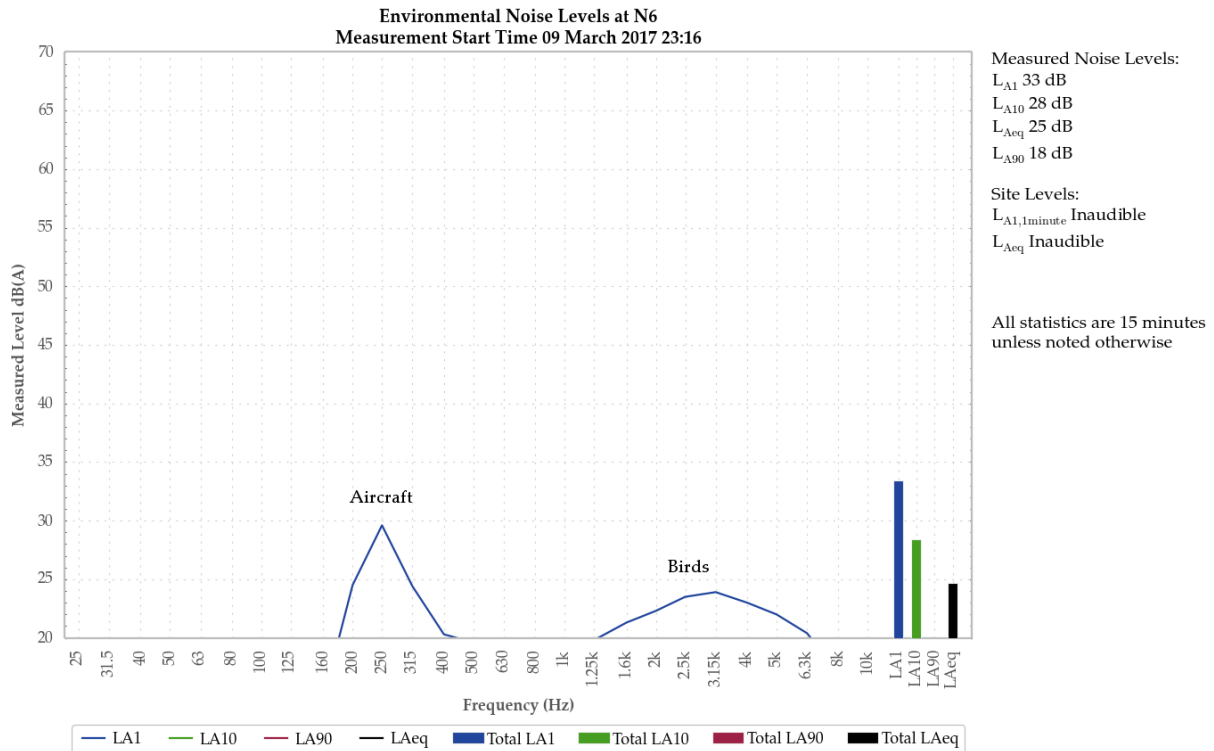


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

WCP was inaudible.

An aircraft and birds generated the measured LA1. Insects primarily generated the measured LA10. Insects, birds and an aircraft generated the measured LAeq. Insects generated the measured LA90.

5.1.2 N13, 10 March 2017

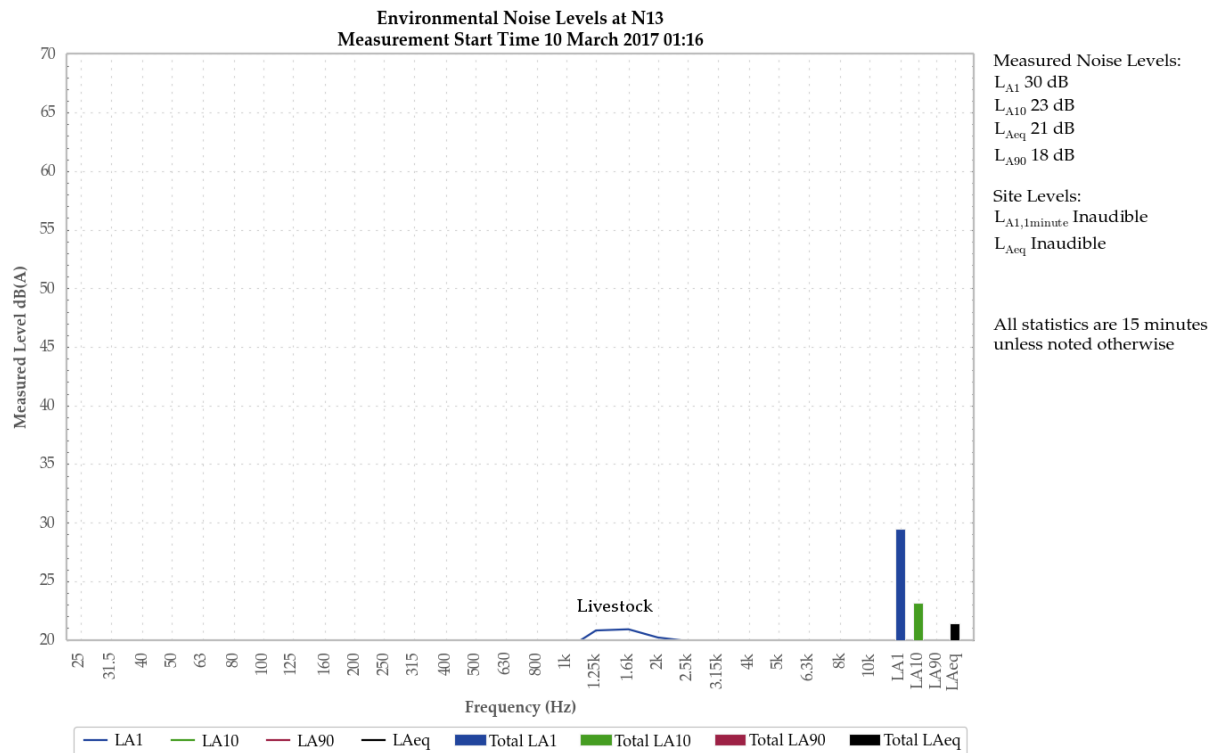


Figure 4: Environmental Noise Levels – N13, 'Coonaroo' off Moolarben Road

WCP was inaudible.

Livestock and insects generated measured levels.

5.1.3 N14, 9 March 2017

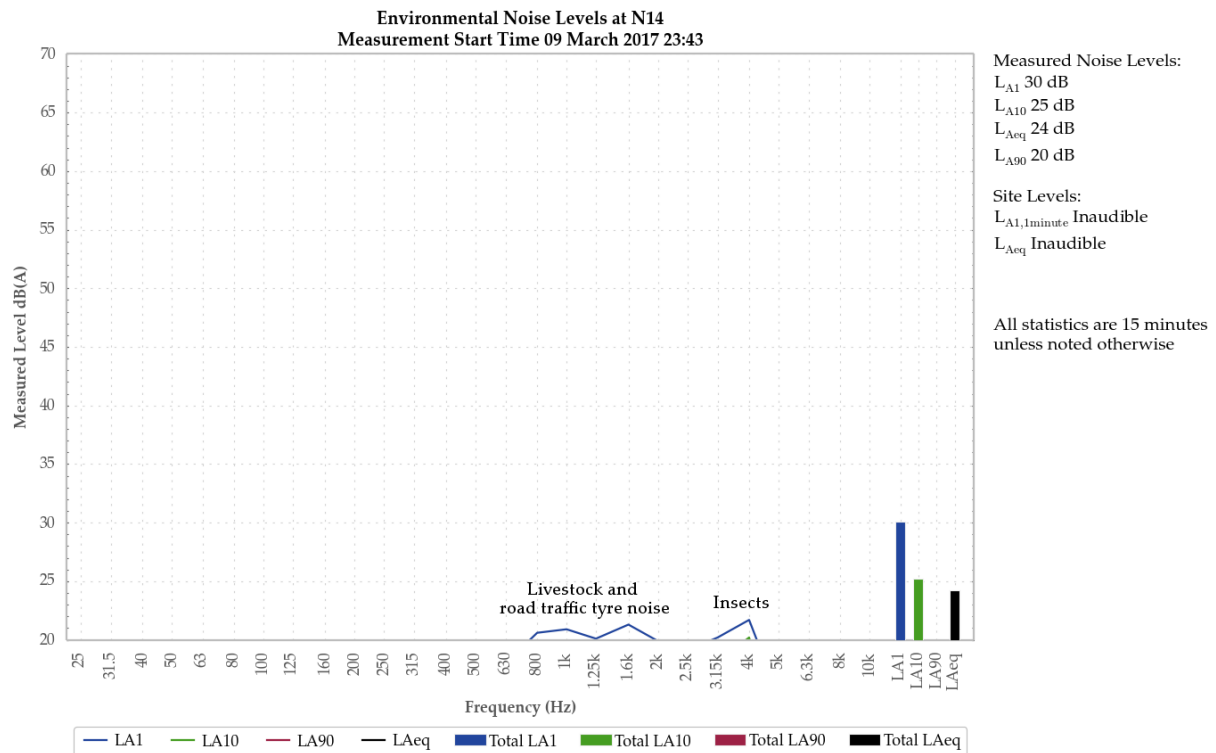


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

WCP was inaudible.

Livestock, road traffic and insects generated the measured LA1 and LAeq. Insects primarily generated the measured LA10 and LA90.

5.1.4 N15, 9 March 2017

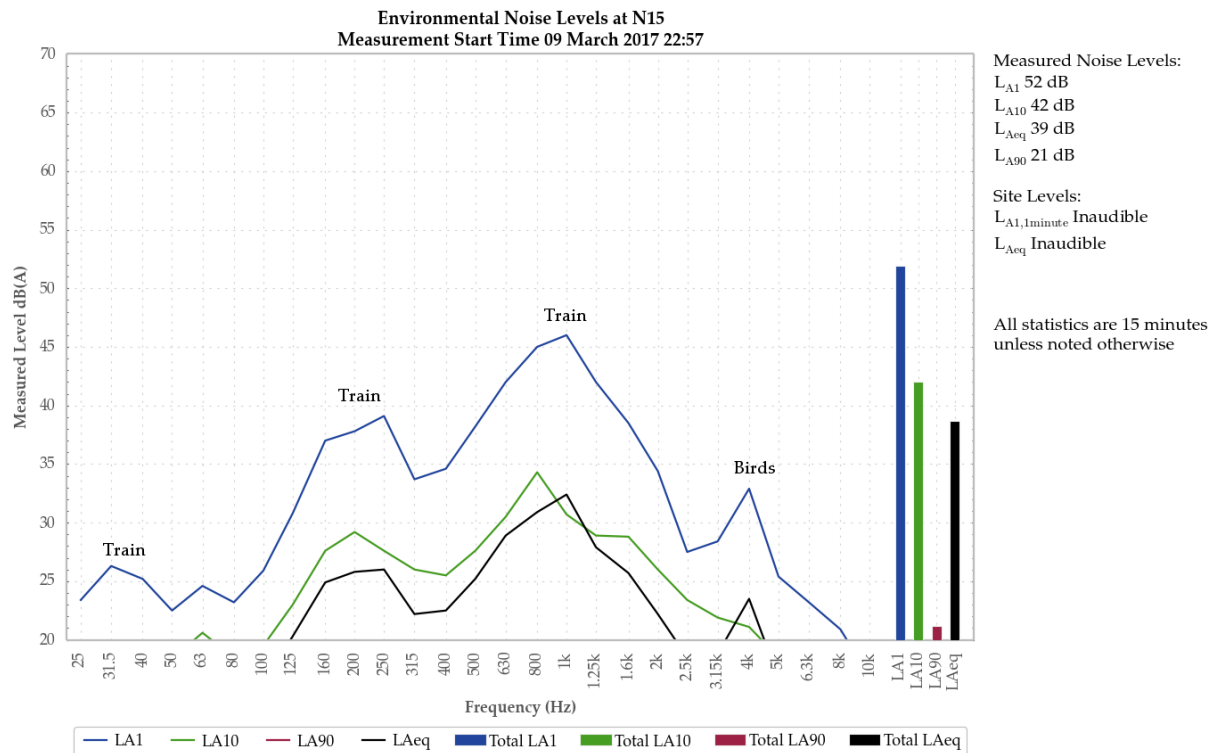


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

WCP was inaudible.

A train generated the measured LA1, LA10 and LAeq. Insects generated the measured LA90.

Road traffic tyre noise, dogs and breeze in foliage were also noted.

5.1.5 N16, 9 March 2017

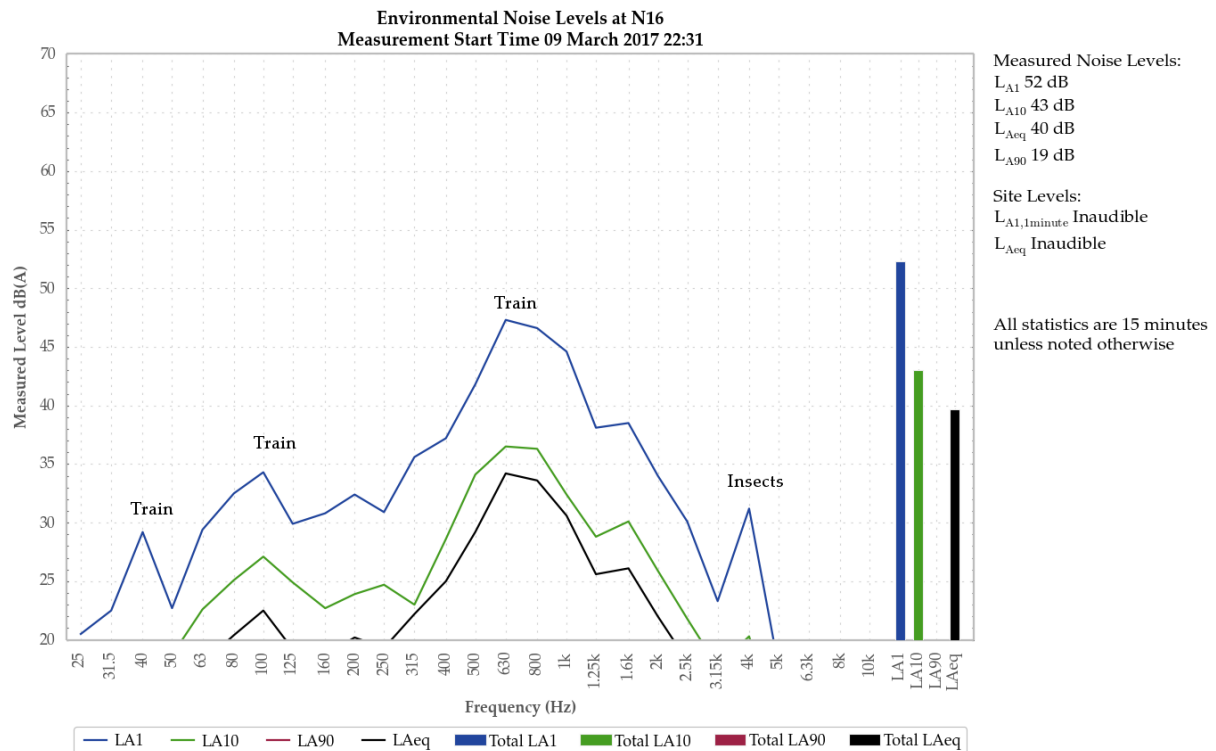


Figure 7: Environmental Noise Levels – N16, Araluen Road, off Ulan-Wollar Road

WCP was inaudible.

A train generated the measured LA1, LA10 and LAeq. Insects generated the measured LA90.

An aircraft was also noted.

5.1.6 N17, 9 March 2017

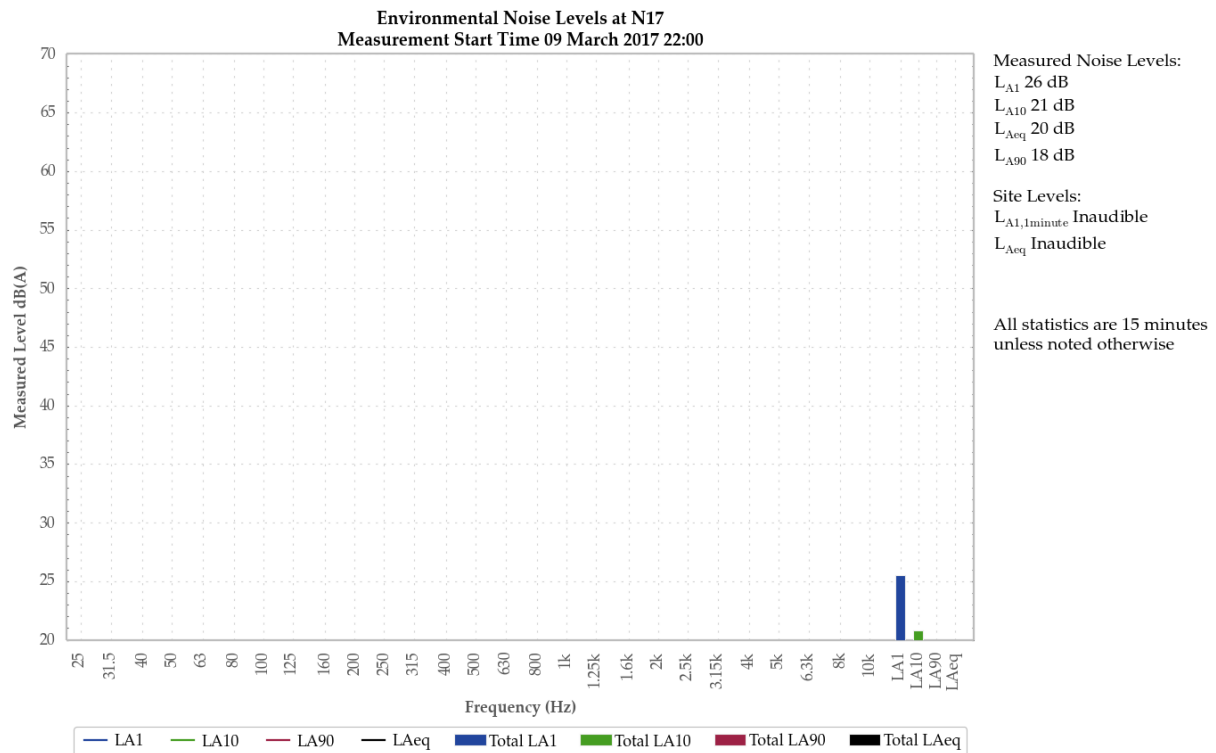


Figure 8: Environmental Noise Levels – N17, Mogo Road, off Araluen Road

WCP was inaudible.

Birds primarily generated the measured LA1. Insects contributed to the measured LA1 and were primarily responsible for the measured LA10, LAeq and LA90. The noise floor of the instrument contributed to measured levels.

5.1.7 N18, 10 March 2017

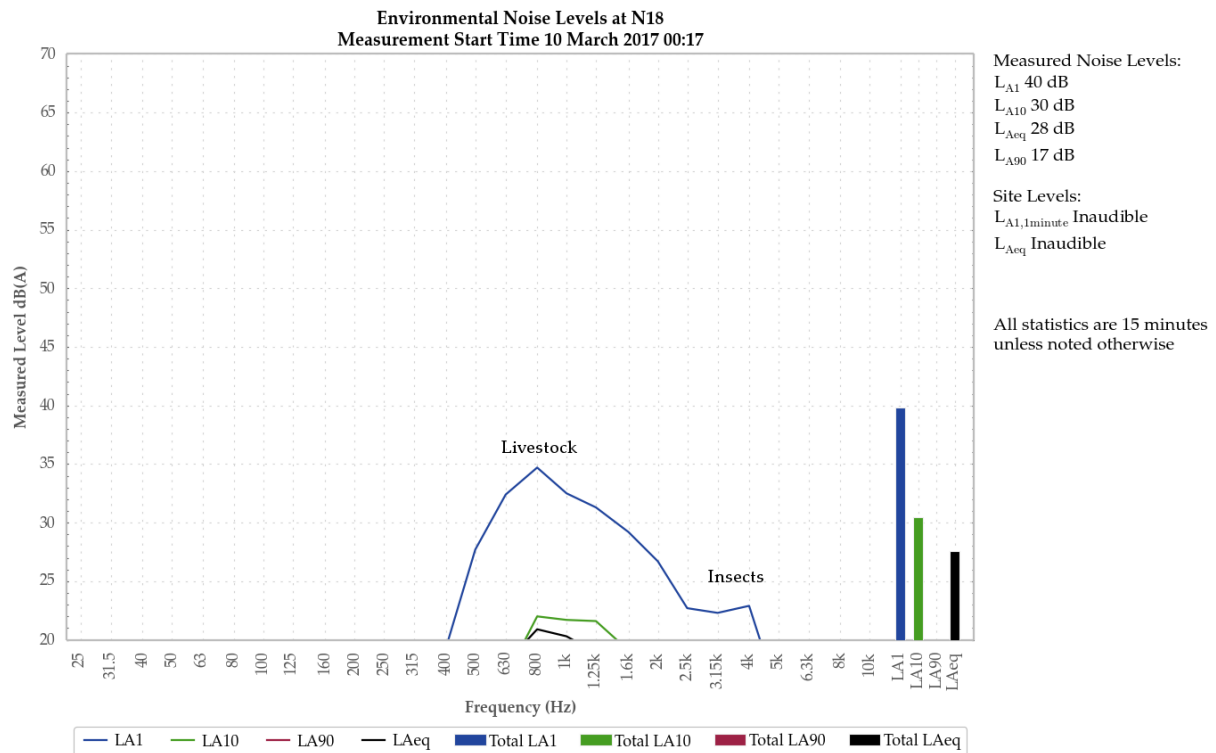


Figure 9: Environmental Noise Levels, N18 - Barigan Road, Barigan Valley

WCP was inaudible.

Livestock generated the measured L_{A1}, L_{A10} and L_{Aeq}. Insects and the noise floor of the instrument generated the measured L_{A90}.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 9/10 March 2017. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the March 2017 monitoring period.

6.2 Low Frequency Assessment

During the March 2017 survey WCP complied with the relevant limits using the Broner and INP methods of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Project Approval

SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

ACQUISITION UPON REQUEST

- 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 5 – 6 of schedule 4.

Table 1: Land subject to acquisition upon request

30 – Gaffney

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

NOISE

Noise Criteria

- 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 at the other specified locations.

Table 2: Noise Impact assessment criteria dB(A)

Location	Day	Evening	Night	
	<i>L_{Aeq}(15 minute)</i>	<i>L_{Aeq}(15 minute)</i>	<i>L_{Aeq}(15 minute)</i>	<i>L_{A1}(1 minute)</i>
135	38	38	38	45
129 and 137	37	37	37	45
69	36	36	36	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		40 (internal) When in use		-
900 – St Laurence O’Toole Catholic Church				
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 10 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

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; and
- 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.

Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

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

Table 3: Land subject to additional noise mitigation upon request

<i>Receiver ID</i>
<i>69, 129, 135 and 137</i>

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

Operating Conditions

4. The Proponent shall:
 - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
 - (b) operate a comprehensive noise management system that uses a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day to day planning of mining operations, and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this approval;
 - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the project is complying with the relevant conditions of this approval, and publish these monitoring results on its website, to the satisfaction of the Director-General.

Noise Management Plan

5. The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
- (a) be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this approval; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this approval and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

APPENDIX 8 STATEMENT OF COMMITMENTS

Operational Noise

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) temperature inversion conditions greater than 3°C/100m

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Director-General directs otherwise.
5. Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

A.2 Environmental 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 January 2017.

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)
Wollar village	36	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
All other privately owned land (outside the village of Wollar)	35	35	35	45

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

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 3°C/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
- c) Temperature inversion conditions greater than 3°C/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.

R4 Other reporting conditions

R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the second round of quarterly monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:

- a) an assessment of compliance with noise limits presented in Condition L5.1; and
- b) an outline of any management actions taken within the monitoring period to address any exceedences of the limits contained in Condition L5.1.

A.3 Noise Monitoring Program

The relevant sections of the noise monitoring program for WCP dated May 2016 are reproduced below.

6 Noise Monitoring Program

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 4**. Unattended or real-time monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake attended monitoring at up to seven locations (**Table 5, Figure 3 and Figure 4**). Real-time units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 5: Noise Related Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Araluen Rd	N16	Attended Noise	778787.4	6417418.7	Location based on the nearest community structure to the East of the Mine
Mogo Rd	N17	Attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Barrigan Valley²	N18	Attended Noise	780033.3	6398618.1	DP&E Recommendation (MOD5) – Location approximately 20 km to the south of the Mine
WCPL Rail Loop		Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions

Wollar Village		Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine
Araluen Rd		Real-Time Noise - Fixed	778856.4	6417401.3	Location based on the nearest non-mine owned residence to the East of the Mine
Wandoona³		Real-Time Noise - Mobile	777684.4	6414786.2	Location based on the nearest non-mine owned residence to the South-East of the Mine

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 5** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&E and the EPA.

6.3 Attended Noise Monitoring

6.3.1 Purpose

Attended noise monitoring will be used to evaluate compliance against the Noise Criteria detailed in **Table 4**.

6.3.2 Summary

Attended noise will be undertaken in accordance with **Table 6**.

Table 6: Attended Noise Monitoring Summary

Element	Description
Locations	As per Table 5, Figure 3 and Figure 4
Period	Night-time period (10 pm-7 am) being the most sensitive time period for noise.
Frequency	12 times per year and on one night per month

6.3.3 Methodology

Attended noise monitoring will be undertaken as outlined in **Table 6** by an independent acoustic consultant in accordance with the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the noise criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not

exceed the Noise Criteria, as defined in **Table 4**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA₁ measurement will be undertaken at 1 m from the dwelling façade and the LA_{eq} measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

6.3.5 Evaluation of Compliance

Tables 7 and **8** summarises the definition used by WCPL in this NMP for the evaluation of compliance with the Project Approval. The reporting requirements and actions that WCPL will take in the event of an exceedance or non-compliance are detailed in **Figure 5** and **Section 6.3.7**.

Table 7: Definition of an Exceedance

Term	Definition
Exceedance	An exceedance is deemed to have occurred when an attended noise monitoring result, taken in accordance with the INP and Project Approval, exceeds the Noise Criteria in Table 4 . The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6).
Non-compliance	A non-compliance is deemed to have occurred when a second attended noise monitoring result, taken within 75 minutes of an exceedance and in accordance with the INP and Project Approval, exceeds the Noise Criteria in Table 4 for a second time. The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6). Reporting requirements for a non-compliance are detailed in Section 6.3.7 .

6.3.6 Favourable Meteorological Conditions

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 3°C/100m.

Except for wind speed at microphone height, the data used for determining meteorological conditions will be that recorded by the meteorological station located on the Mine site.

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

6.3.7 Response to Non-Compliance or Exceedance

Where any non-compliance of the Noise Criteria has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the non-compliance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (**Section 9.1**);
- Implement remediation measures as directed by the Director-General; and
- Review and, if necessary, revise this Management Plan (**Section 10**), to the satisfaction of the Director-General.

APPENDIX

B CALIBRATION CERTIFICATES



**Acoustic
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Sound Level Meter
IEC 61672-3.2006

Calibration Certificate

Calibration Number C15583

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 01070590
Microphone Serial Number : 00533
Pre-amplifier Serial Number : 70607

Pre-Test Atmospheric Conditions
Ambient Temperature : 20.6°C
Relative Humidity : 56.3%
Barometric Pressure : 98.64kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 21.2°C
Relative Humidity : 62.4%
Barometric Pressure : 98.56kPa

Calibration Technician : Corey Stewart
Calibration Date : 06/11/2015

Secondary Check: Kate Alchin
Report Issue Date : 10/11/2015

Approved Signatory :

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10: Self-generated noise	Pass	14: Level linearity on the reference level range	Pass
11: Acoustical tests of a frequency weighting	Pass	15: Level linearity incl. the level range control	Pass
12: Electrical tests of frequency weightings	Pass	16: Toneburst response	Pass
13: Frequency and time weightings at 1 kHz	Pass	17: Peak C sound level	Pass
		18: Overload Indication	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement - Environmental Conditions			
Acoustic Tests		Temperature	±0.3°C
31.5 Hz to 8kHz	±0.120dB	Relative Humidity	±4.1%
12.5kHz	±0.165dB	Barometric Pressure	±0.1kPa
16kHz	±0.245dB		
Electrical Tests			
31.5 Hz to 20 kHz	±0.121dB		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.

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Sound Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C16382

Client Details	Acoustic Research Labs Pty Ltd - Hire Level 7, Building 2, 423 Pennant Hills Road PENNANT HILLS NSW 2120
-----------------------	--

Equipment Tested/ Model Number :	Rion NC-73
Instrument Serial Number :	11248300

Atmospheric Conditions	
Ambient Temperature :	20.9°C
Relative Humidity :	39.6%
Barometric Pressure :	99.15kPa

Calibration Technician :	Dennis Kim	Secondary Check:	Sandra Minto
Calibration Date :	25/07/2016	Report Issue Date :	25/07/2016
Approved Signatory :			Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
5.2.2: Generated Sound Pressure Level	Pass	5.3.2: Frequency Generated	Pass
5.2.3: Short Term Fluctuation	Pass	5.5: Total Distortion	Pass

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	94.1	1002.49

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2004 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -			
Specific Tests		Environmental Conditions	
Generated SPL	±0.09dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
Distortion	±0.51%		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

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Accredited for compliance with ISO/IEC 17025

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.

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Wilpinjong Coal

*Environmental Noise Monitoring
April 2017*

*Prepared for
Wilpinjong Coal Pty Ltd*



Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring April 2017

Reference: 17145_R01

Report date: 10 May 2017

Prepared for

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Prepared: Amanda Borserio
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QA Review: Katie Weekes
Environmental Scientist (Acoustics)

Global Acoustics Pty Ltd ~ Environmental noise modelling 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 Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

A modification (MOD7) to the WCP consent was approved in August 2016. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

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 night measurement was 15 minutes. Results of monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at seven locations during the night of 5/6 April 2017. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Operational Noise Assessment

WCP complied with relevant noise limits at all monitoring locations during the April 2017 monitoring.

Low Frequency Assessment

During the April 2017 survey WCP complied with the relevant limits using the Broner and INP methods of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at seven locations during the night of 5/6 April 2017. Figure 1 shows the monitoring locations.

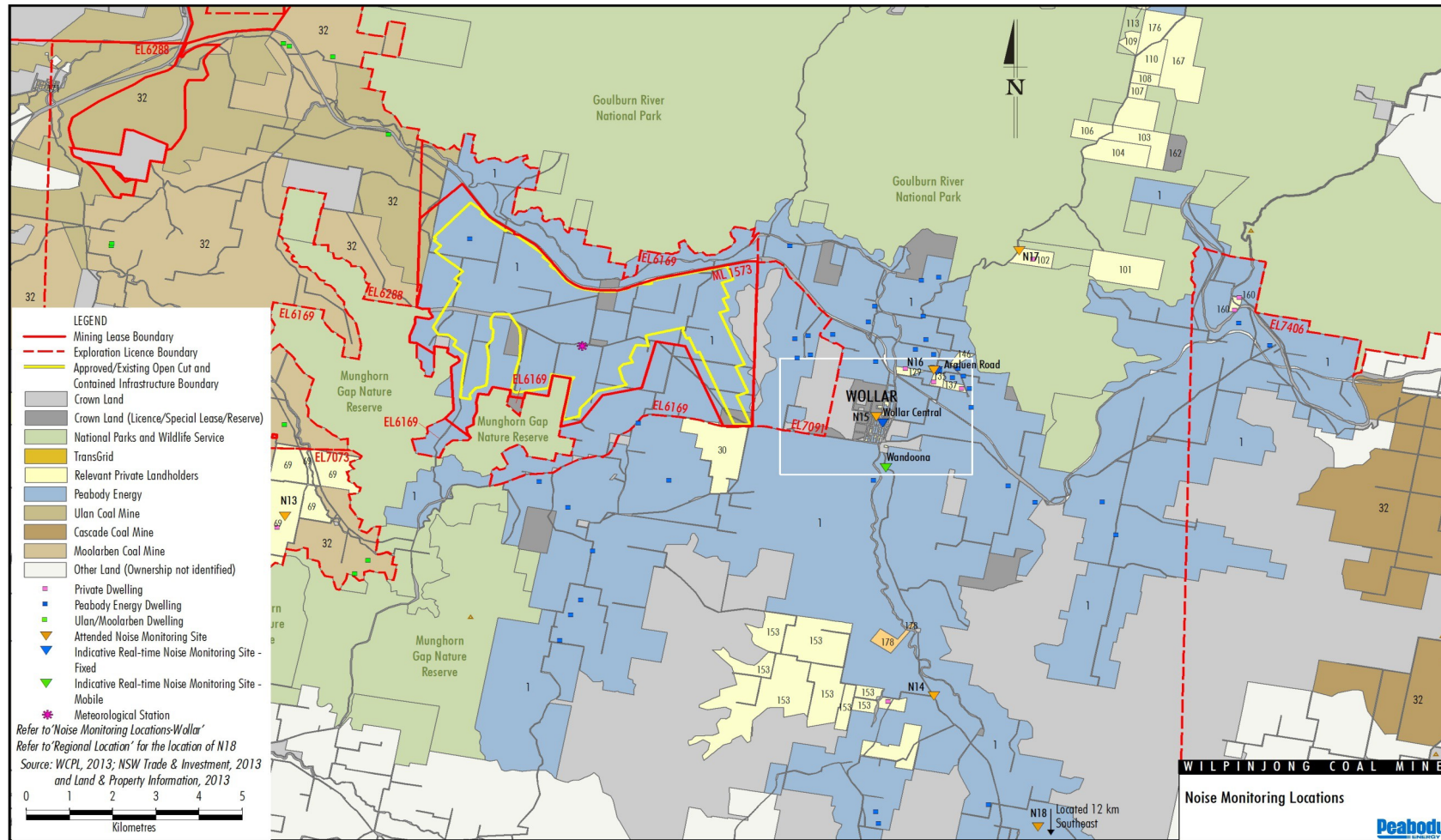
The purpose of the attended noise monitoring survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were seven 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: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road
N14	'Tichular', intersection of Tichular and Barigan Roads
N15	Track off Barigan Street near Wollar School, Wollar Village
N16	Araluen Road, off Ulan-Wollar Road
N17	Mogo Road, off Araluen Road
N18	Barigan Road, Barigan Valley



WIL-11-10 NMP2013_2010

Figure 1: WCP Attended Noise Monitoring Locations

1.3 Terminology & Abbreviations

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

Table 1.2: TERMINOLOGY & ABBREVIATIONS

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
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
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VIG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, but could not be quantified
Day	This is the period 7:00am to 6:00pm
Evening	This is the period 6:00pm to 10:00pm
Night	This is the period 10:00pm to 7:00am

2 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in August 2016. The relevant noise conditions from the project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in January 2017. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in May 2016. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Approval Criteria and Weather Conditions

Criteria detailed in Table 2.1 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with Wilpinjong Coal Project.

Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor/ Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- a) wind speeds greater than 3 m/s at 10m above ground level;
- b) temperature inversion conditions between 1.5°C and 3°C/100m and wind speeds greater than 2 m/s at 10m above ground level; or
- c) temperature inversion conditions greater than 3°C/00m.

2.5 EPL Criteria and Weather Conditions

Criteria detailed in Table 2.2 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with Wilpinjong Coal Project.

Table 2.2: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

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 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.

2.6 Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

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.

2.6.1 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.

2.6.2 Low Frequency Noise

INP Method

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 site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more.*

Broner Method

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 site only C - weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

Low Frequency Assessment Method

Low frequency assessment methods are detailed in Table 2.3.

Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L_{Ceq}	>60	>65
INP	Site only L_{Ceq} minus site only L_{Aeq}	≥ 15	≥ 15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a Draft Industrial Noise Guideline (ING) was released in September 2015, low frequency noise results from WCP have been compared to the assessment methods and modifying factor triggers presented above. The applicability of these triggers have been considered when applying low frequency modifying factor corrections.

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. Monitoring is undertaken once per month at each location. The duration of each measurement was 15 minutes.

Attended monitoring during this reporting period was undertaken by Amanda Borserio.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. NM indicates that some site noise was audible, but indeterminate due to one of the following reasons:

- site noise levels were insignificant and unlikely, in many cases, to be even noticed; or
- site noise levels were masked by another relatively loud noise source, but were estimated to be less than $L_{Aeq} 30$ dB, which is insignificant in terms of any applicable criterion.

If site noise were NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting. All sites noted NM in this report are due to insignificant absolute values.

A measurement of $L_{A1,1\text{minute}}$ 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 a 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 $L_{A1,1\text{minute}}$ 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 noise from WCP was assessed by analysis of the measured L_{Aeq} spectrum.

3.2 Attended Noise 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: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	00701424	22/05/2017
Pulsar 106 acoustic calibrator	74813	25/07/2018

4 RESULTS

4.1 Attended Noise Monitoring

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. 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 – APRIL 2017¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	05/04/2017 23:37	46	38	27	22	26	20	18	41
N13	06/04/2017 01:47	42	36	34	32	32	29	27	45
N14	05/04/2017 23:05	37	26	22	21	21	19	17	40
N15	05/04/2017 23:58	36	26	21	19	20	18	16	35
N16	06/04/2017 01:03	38	25	21	19	20	18	17	29
N17	06/04/2017 00:30	35	23	20	18	18	17	16	20
N18	05/04/2017 22:27	43	34	32	31	31	29	28	46

Note:

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

4.2 Project Approval and Weather Conditions

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines approval. Modifying factors are considered in Section 4.4.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – APRIL 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	05/04/2017 23:37	1.6	-0.2	35	Yes	IA	Nil
N13	06/04/2017 01:47	2.1	0.6	36	Yes	<30	Nil
N14	05/04/2017 23:05	2.3	-0.6	35	Yes	<20	Nil
N15	05/04/2017 23:58	1.2	0.6	35	Yes	IA	Nil
N16	06/04/2017 01:03	1.6	1.0	37	Yes	<20	Nil
N17	06/04/2017 00:30	1.1	1.0	35	Yes	IA	Nil
N18	05/04/2017 22:27	3.2	-0.6	35	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

Table 4.3: *L_{A1,1minute}* GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – APRIL 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP <i>L_{A1,1min}</i> dB ^{4,5}	Exceedance ⁶
N6	05/04/2017 23:37	1.6	-0.2	45	Yes	IA	Nil
N13	06/04/2017 01:47	2.1	0.6	45	Yes	31	Nil
N14	05/04/2017 23:05	2.3	-0.6	45	Yes	<20	Nil
N15	05/04/2017 23:58	1.2	0.6	45	Yes	IA	Nil
N16	06/04/2017 01:03	1.6	1.0	45	Yes	<20	Nil
N17	06/04/2017 00:30	1.1	1.0	45	Yes	IA	Nil
N18	05/04/2017 22:27	3.2	-0.6	45	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

4.3 EPL and Weather Conditions

Table 4.4 and Table 4.5 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines EPL.

Table 4.4: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – APRIL 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	05/04/2017 23:37	1.6	-0.2	35	Yes	IA	Nil
N13	06/04/2017 01:47	2.1	0.6	35	Yes	<30	Nil
N14	05/04/2017 23:05	2.3	-0.6	35	Yes	<20	Nil
N15	05/04/2017 23:58	1.2	0.6	36	Yes	IA	Nil
N16	06/04/2017 01:03	1.6	1.0	35	Yes	<20	Nil
N17	06/04/2017 00:30	1.1	1.0	35	Yes	IA	Nil
N18	05/04/2017 22:27	3.2	-0.6	35	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

Table 4.5: *L_{A1,1minute}* GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – APRIL 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP <i>L_{A1,1min}</i> dB ^{4,5}	Exceedance ⁶
N6	05/04/2017 23:37	1.6	-0.2	45	Yes	IA	Nil
N13	06/04/2017 01:47	2.1	0.6	45	Yes	31	Nil
N14	05/04/2017 23:05	2.3	-0.6	45	Yes	<20	Nil
N15	05/04/2017 23:58	1.2	0.6	45	Yes	IA	Nil
N16	06/04/2017 01:03	1.6	1.0	45	Yes	<20	Nil
N17	06/04/2017 00:30	1.1	1.0	45	Yes	IA	Nil
N18	05/04/2017 22:27	3.2	-0.6	45	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

4.4 Low Frequency Assessment

Low frequency results for each monitoring location are presented in Table 4.6.

Table 4.6: LOW FREQUENCY NOISE MODIFYING FACTOR ASSESSMENT – APRIL 2017

Location	Start Date and Time	WCP only LAeq dB ⁶	Broner low frequency modifying factor trigger dB ¹	Broner, Site only L _{Ceq} dB ^{2,5}	INP low frequency modifying factor trigger dB ³	INP, WCP only L _{Ceq} minus site only LAeq dB ^{4,5}	Comments
N6	05/04/2017 23:37	IA	>60	IA	>=15	IA	WCP inaudible
N13	06/04/2017 01:47	<30	>60	NM	>=15	NM	WCP not measurable
N14	05/04/2017 23:05	<20	>60	NM	>=15	NM	WCP not measurable
N15	05/04/2017 23:58	IA	>60	IA	>=15	IA	WCP inaudible
N16	06/04/2017 01:03	<20	>60	NM	>=15	NM	WCP not measurable
N17	06/04/2017 00:30	IA	>60	IA	>=15	IA	WCP inaudible
N18	05/04/2017 22:27	IA	>60	IA	>=15	IA	WCP inaudible

Notes:

1. Night L_{Ceq} modifying factor trigger as detailed in Broner (2010);
2. These are measured or calculated site only Broner C-weighted noise levels, NM denotes site levels were audible but not measurable, IA denotes site noise was inaudible. Where it is not possible to determine the site only Broner result due to the presence of other low frequency noise sources occurring during the measurement, or where MET excludes the measurement, this is noted as NA (not available) and no further assessment has been undertaken. Guidance is provided in the Comments column;
3. Low frequency modifying factor trigger as detailed in the INP;
4. These are measured or calculated site only INP results (site only L_{Ceq} minus site only LAeq), NM denotes site levels were audible but not measurable, IA denotes site noise was inaudible. Where it is not possible to determine the site only INP result due to the presence of other low frequency noise sources occurring during the measurement, or where MET excludes the measurement, this is noted as NA (not available) and no further assessment has been undertaken. Guidance is provided in the Comments column;
5. Bold results are greater than the relevant modifying factor trigger; and
6. WCP L_{Aeq,15minute} provided as a guide.

As detailed in Table 4.6, there were no low frequency correction triggers applied. No further analysis of low frequency noise was required.

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator at each location using a Kestrel hand-held weather meter is shown in Table 4.7. Atmospheric condition data is routinely recorded on a site-by-site basis to show conditions during the monitoring period. The wind speed, direction and temperature were measured at 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – APRIL 2017

Location	Start Date And Time	Temperature °C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	05/04/2017 23:37	16	0.3	140	0
N13	06/04/2017 01:47	12	0.6	300	1
N14	05/04/2017 23:05	15	0.3	170	1
N15	05/04/2017 23:58	13	0.0	-	0
N16	06/04/2017 01:03	17	0.0	-	0
N17	06/04/2017 00:30	12	0.0	-	0
N18	05/04/2017 22:27	15	0.9	160	1

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained concurrently by the WCP meteorological station is provided in Table 4.8 and is used to determine compliance with specified noise criteria.

Table 4.8: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees ^{2,4}	Lapse Rate Degrees / 100 metres ³
05/04/17 22:00	3.5	103	-0.8
05/04/17 22:15	3.0	116	-0.8
05/04/17 22:30	3.1	126	-0.6
05/04/17 22:45	3.2	115	-0.6
05/04/17 23:00	2.7	104	-0.6
05/04/17 23:15	2.3	96	-0.6
05/04/17 23:30	2.4	98	-0.4
05/04/17 23:45	1.6	87	-0.2
06/04/17 00:00	1.3	100	0.2
06/04/17 00:15	1.2	100	0.6
06/04/17 00:30	1.2	102	0.8
06/04/17 00:45	1.1	96	1.0
06/04/17 01:00	2.2	102	0.8
06/04/17 01:15	1.6	101	1.0
06/04/17 01:30	2.3	119	1.4
06/04/17 01:45	2.5	116	0.8
06/04/17 02:00	2.1	105	0.6

Notes:

1. Data supplied by WCP;
2. "-" in wind direction column indicates that conditions were calm;
3. Lapse rate sourced from the WCP inversion tower; and
4. NA indicates data not available/recorded.

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 to Table 4.5 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. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

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 Figure 3 to Figure 9 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 cut-off frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq} .

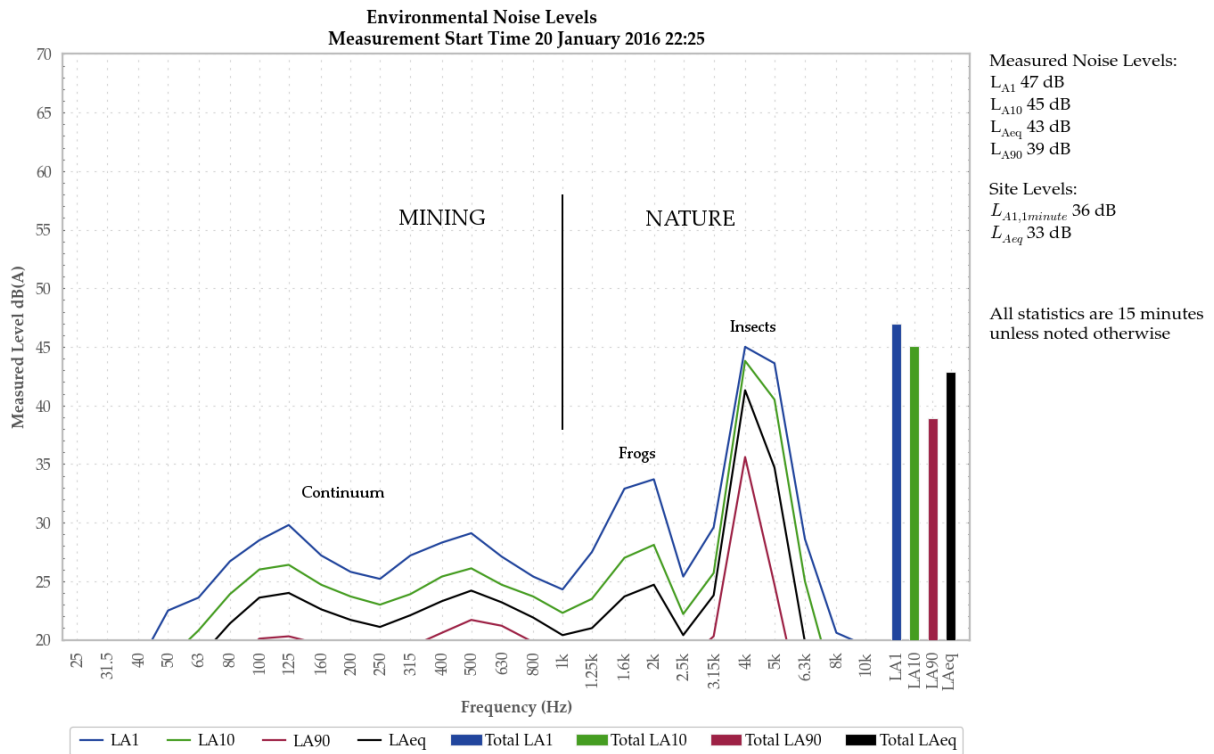


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6, 5 April 2017

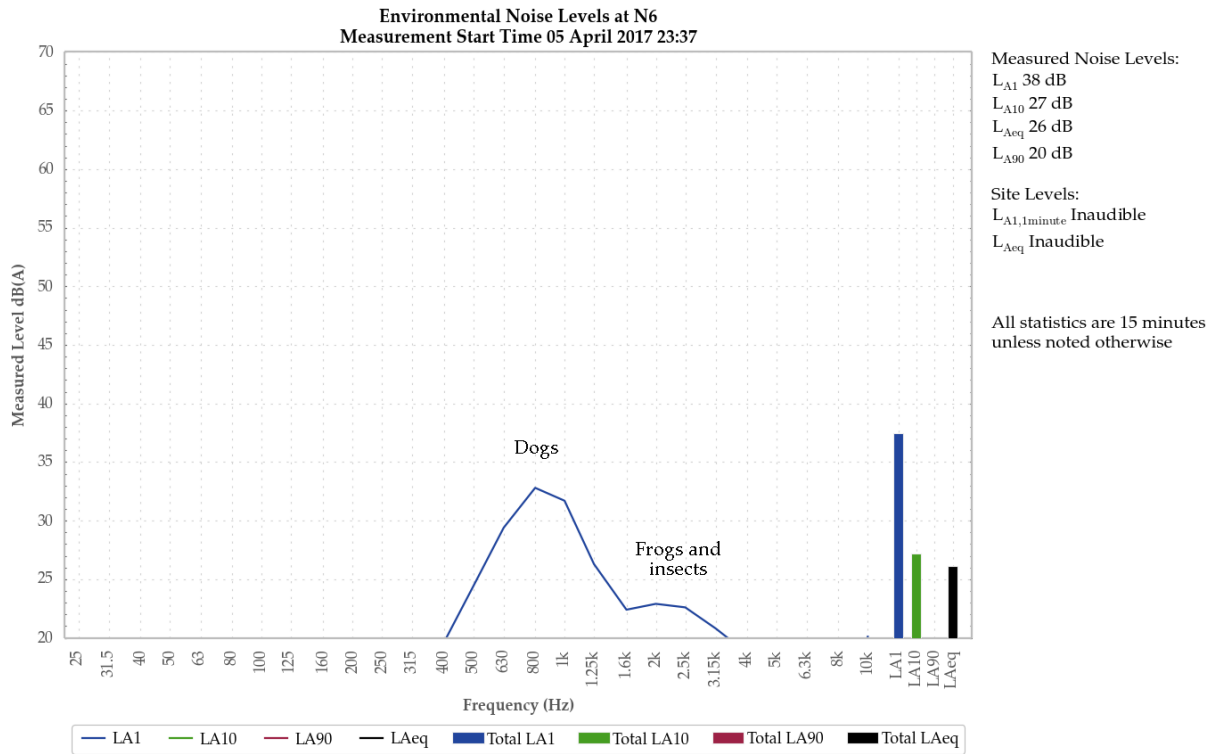


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

WCP was inaudible.

Dogs generated the measured LA1. Frogs and insects primarily generated the measured LA10, LAeq and LA90.

Bats and breeze in foliage were also noted.

5.1.2 N13, 6 April 2017

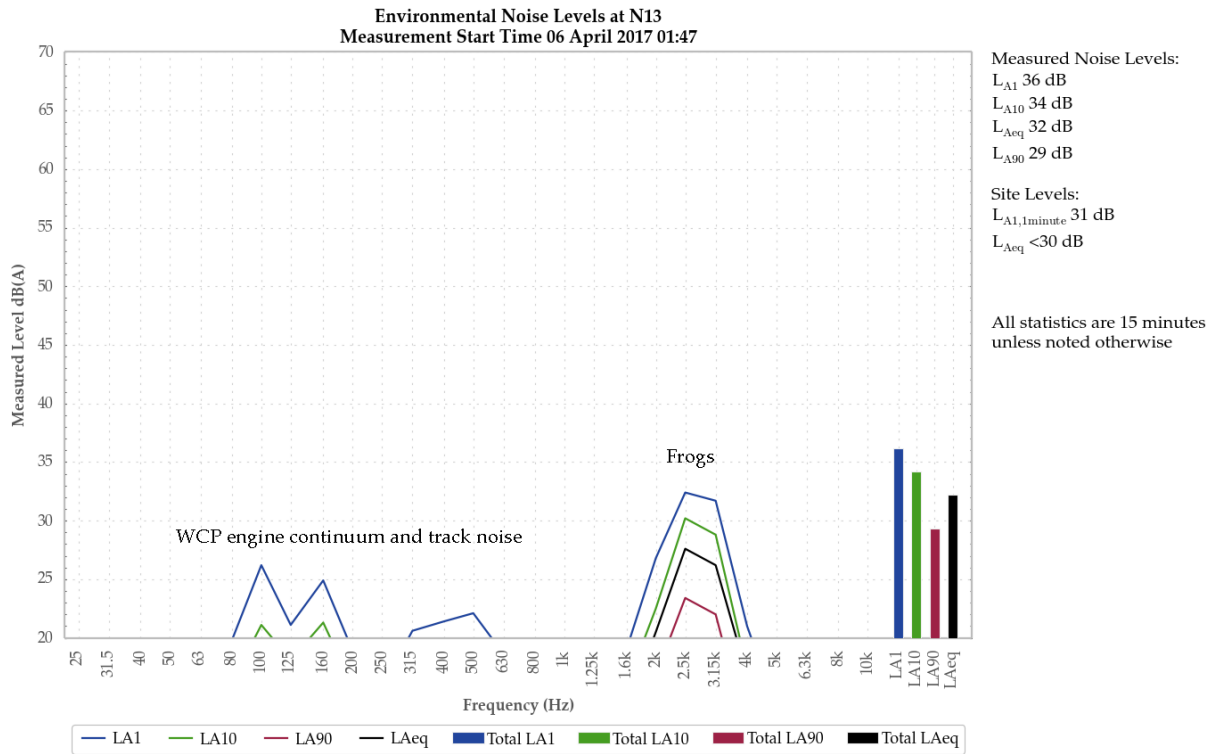


Figure 4: Environmental Noise Levels - N13, 'Coonaroo' off Moolarben Road

WCP was audible as rear dump truck engine continuum and track noise, generating the site only LAeq of less than 30 dB. A surge in the continuum generated the site only LA1,1minute of 31 dB.

Frogs primarily generated measured levels.

Breeze and birds were also noted.

5.1.3 N14, 5 April 2017

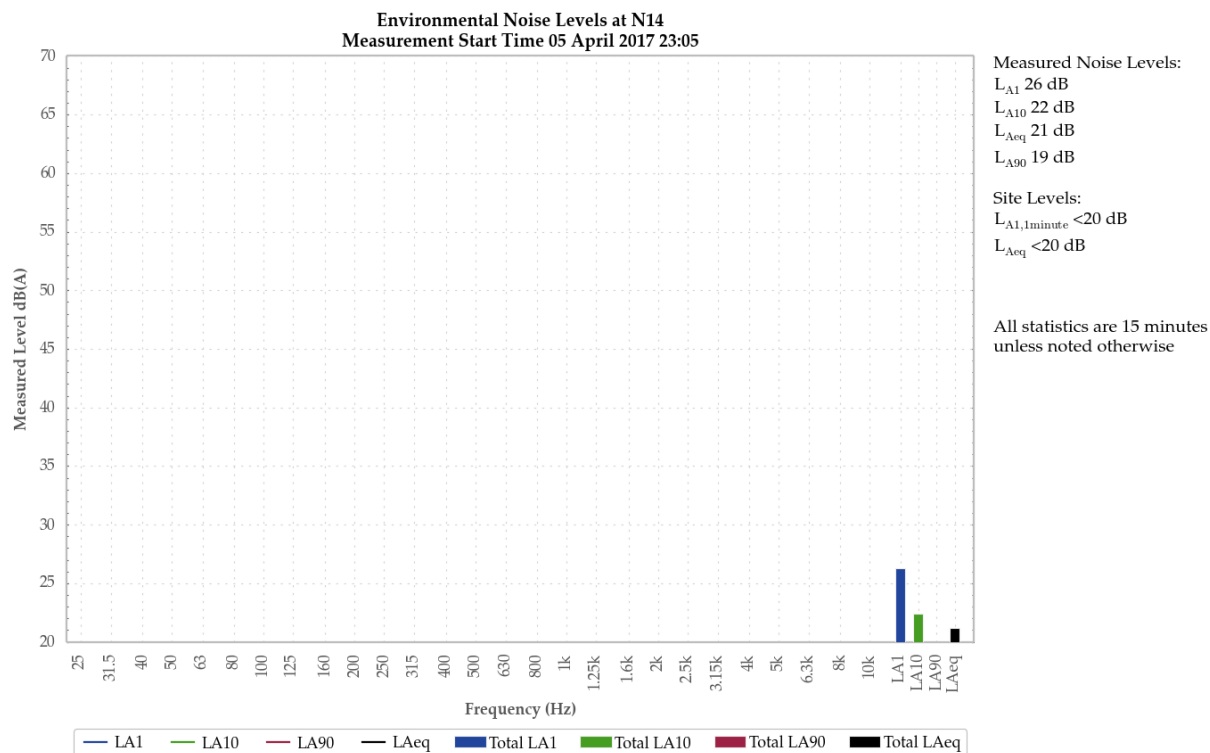


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

WCP was audible as a low-level mining continuum during some of the measurement. This continuum generated the site only LAeq and LA1,1minute of less than 20 dB.

Frogs and breeze primarily generated measured levels.

Birds and ducks were also noted.

5.1.4 N15, 5 April 2017

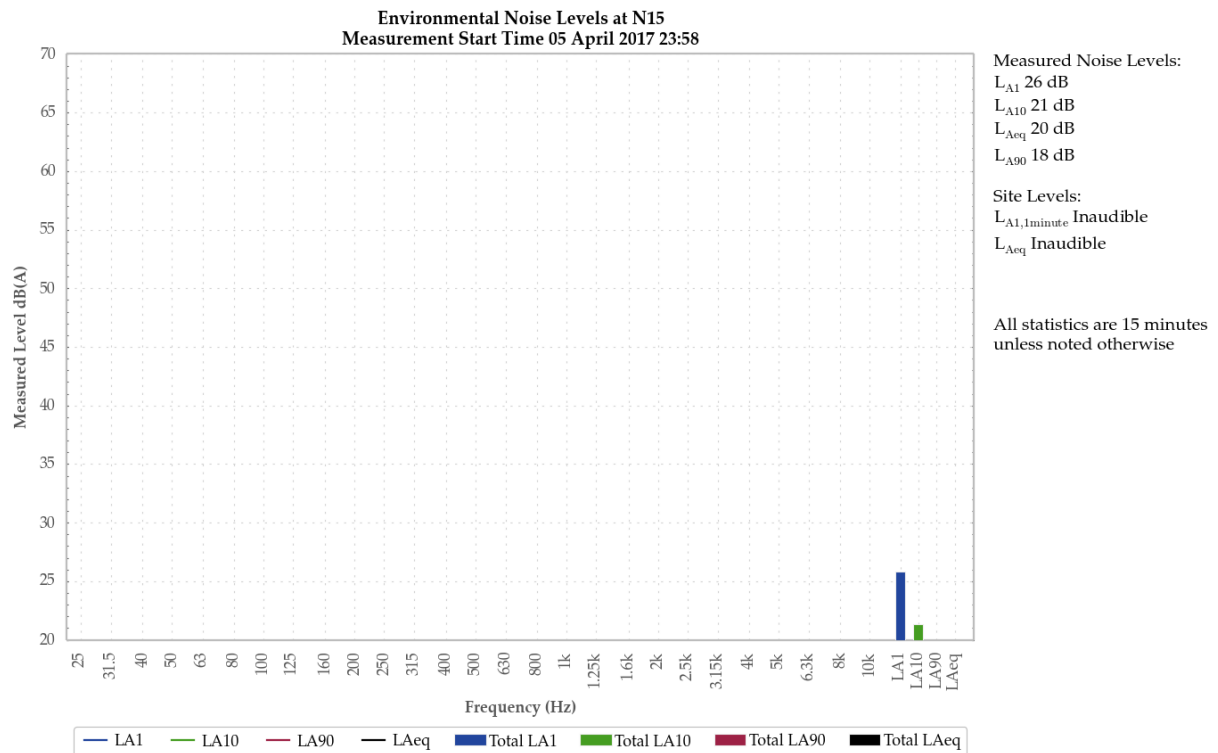


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

WCP was inaudible.

Frogs and insects primarily generated measured levels.

An aircraft, birds, and nearby animals were also noted.

5.1.5 N16, 6 April 2017

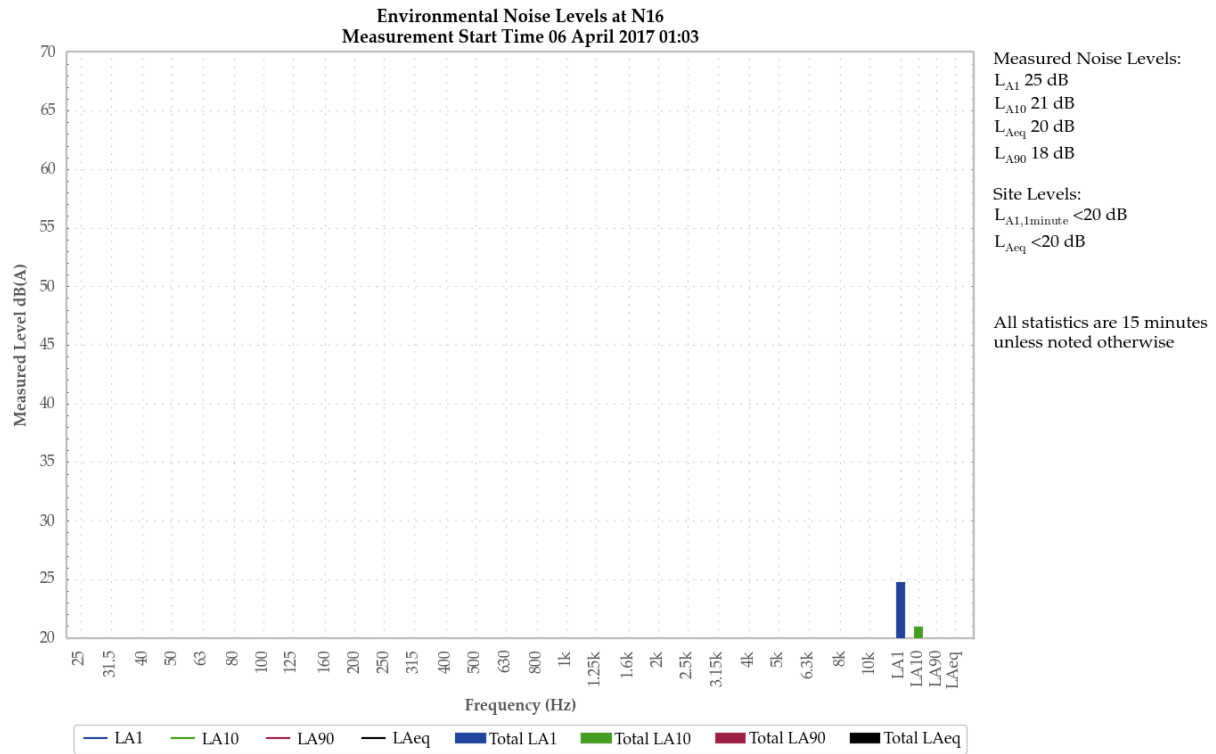


Figure 7: Environmental Noise Levels - N16, Araluen Road, off Ulan-Wollar Road

WCP was audible as a low-level engine continuum during some of the measurement. This continuum generated the site only LAeq and LA1,1minute of less than 20 dB.

Frogs and insects generated measured levels.

Cows, bats, and birds were also noted.

5.1.6 N17, 6 April 2017

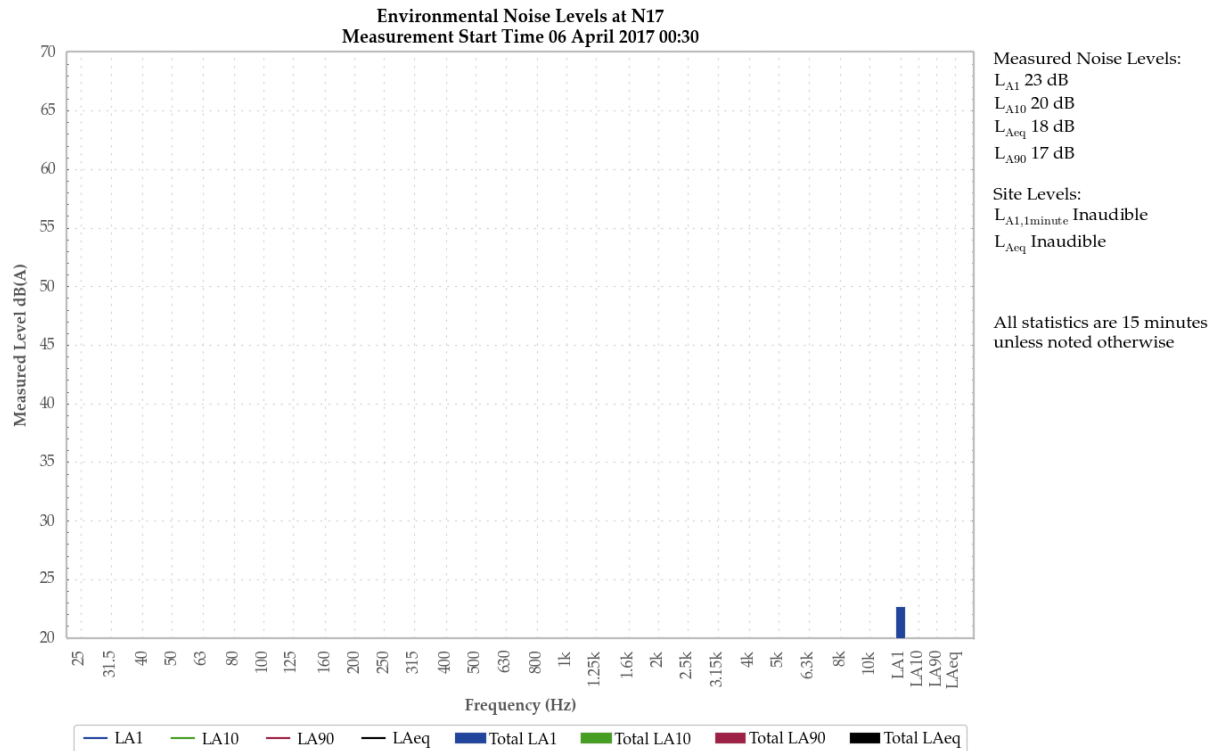


Figure 8: Environmental Noise Levels - N17, Mogo Road, off Araluen Road

WCP was inaudible.

Frogs, insects, and birds were primarily responsible for measured levels.

5.1.7 N18, 5 April 2017

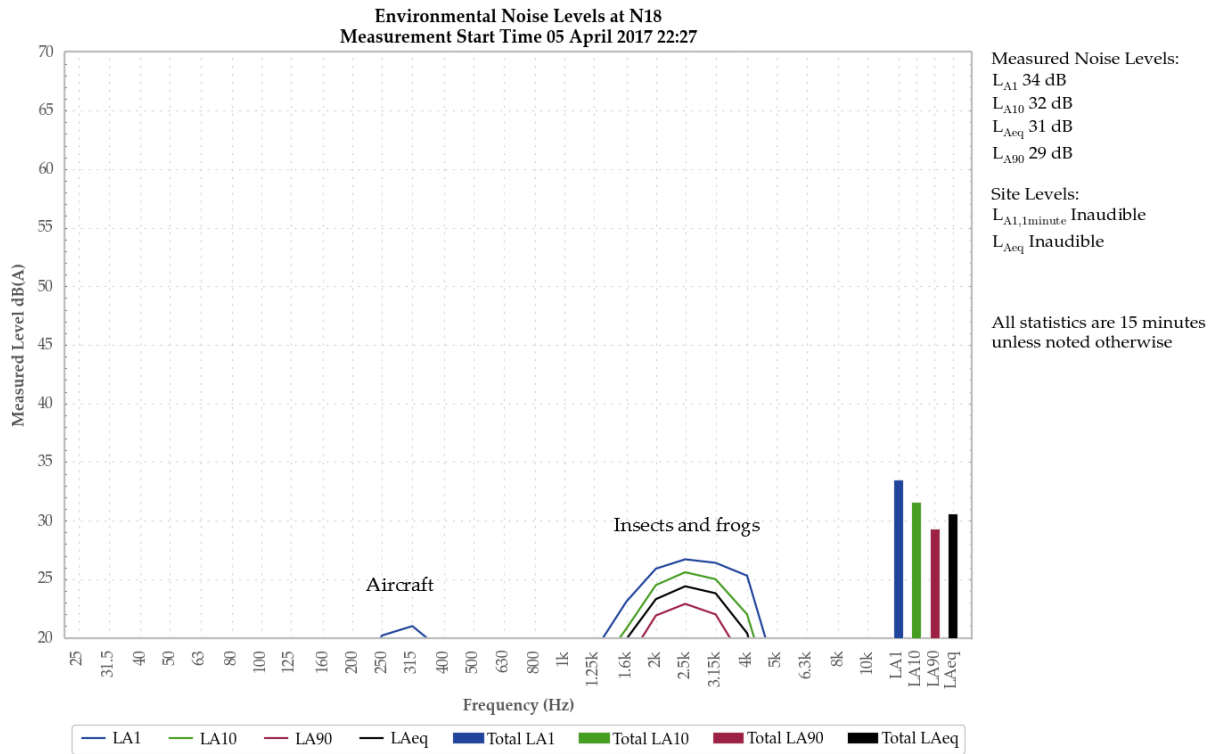


Figure 9: Environmental Noise Levels, N18 - Barigan Road, Barigan Valley

WCP was inaudible.

Insects and frogs generated measured levels.

Cows, an aircraft, bats, and breeze in foliage were also noted.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 5/6 April 2017. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the April 2017 monitoring period.

6.2 Low Frequency Assessment

During the April 2017 survey WCP complied with the relevant limits using the Broner and INP methods of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Project Approval

SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

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 5 – 6 of schedule 4.

Table 1: Land subject to acquisition upon request

30 – Gaffney

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

NOISE

Noise 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 at the other specified locations.

Table 2: Noise Impact assessment criteria dB(A)

Location	Day	Evening	Night	
	<i>L_{Aeq}(15 minute)</i>	<i>L_{Aeq}(15 minute)</i>	<i>L_{Aeq}(15 minute)</i>	<i>LA1(1 minute)</i>
135	38	38	38	45
129 and 137	37	37	37	45
69	36	36	36	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		40 (internal) When in use		-
900 – St Laurence O’Toole Catholic Church				
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 10 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

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; and
- 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.

Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

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

Table 3: Land subject to additional noise mitigation upon request

<i>Receiver ID</i>
<i>69, 129, 135 and 137</i>

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

Operating Conditions

4. The Proponent shall:
 - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
 - (b) operate a comprehensive noise management system that uses a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day to day planning of mining operations, and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this approval;
 - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the project is complying with the relevant conditions of this approval, and publish these monitoring results on its website, to the satisfaction of the Director-General.

Noise Management Plan

5. The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
- (a) be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this approval; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this approval and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

APPENDIX 8 STATEMENT OF COMMITMENTS

Operational Noise

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) temperature inversion conditions greater than 3°C/100m

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Director-General directs otherwise.
5. Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

A.2 Environmental 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 January 2017.

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)
Wollar village	36	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
All other privately owned land (outside the village of Wollar)	35	35	35	45

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

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 3°C/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
- c) Temperature inversion conditions greater than 3°C/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.

R4 Other reporting conditions

R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the second round of quarterly monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:

- a) an assessment of compliance with noise limits presented in Condition L5.1; and
- b) an outline of any management actions taken within the monitoring period to address any exceedences of the limits contained in Condition L5.1.

A.3 Noise Monitoring Program

The relevant sections of the noise monitoring program for WCP dated May 2016 are reproduced below.

6 Noise Monitoring Program

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 4**. Unattended or real-time monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake attended monitoring at up to seven locations (**Table 5, Figure 3 and Figure 4**). Real-time units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 5: Noise Related Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Araluen Rd	N16	Attended Noise	778787.4	6417418.7	Location based on the nearest community structure to the East of the Mine
Mogo Rd	N17	Attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Barrigan Valley²	N18	Attended Noise	780033.3	6398618.1	DP&E Recommendation (MOD5) – Location approximately 20 km to the south of the Mine
WCPL Rail Loop		Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions

Wollar Village		Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine
Araluen Rd		Real-Time Noise - Fixed	778856.4	6417401.3	Location based on the nearest non-mine owned residence to the East of the Mine
Wandoona³		Real-Time Noise - Mobile	777684.4	6414786.2	Location based on the nearest non-mine owned residence to the South-East of the Mine

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 5** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&E and the EPA.

6.3 Attended Noise Monitoring

6.3.1 Purpose

Attended noise monitoring will be used to evaluate compliance against the Noise Criteria detailed in **Table 4**.

6.3.2 Summary

Attended noise will be undertaken in accordance with **Table 6**.

Table 6: Attended Noise Monitoring Summary

Element	Description
Locations	As per Table 5 , Figure 3 and Figure 4
Period	Night-time period (10 pm-7 am) being the most sensitive time period for noise.
Frequency	12 times per year and on one night per month

6.3.3 Methodology

Attended noise monitoring will be undertaken as outlined in **Table 6** by an independent acoustic consultant in accordance with the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the noise criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not

exceed the Noise Criteria, as defined in **Table 4**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA₁ measurement will be undertaken at 1 m from the dwelling façade and the LA_{eq} measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

6.3.5 Evaluation of Compliance

Tables 7 and **8** summarises the definition used by WCPL in this NMP for the evaluation of compliance with the Project Approval. The reporting requirements and actions that WCPL will take in the event of an exceedance or non-compliance are detailed in **Figure 5** and **Section 6.3.7**.

Table 7: Definition of an Exceedance

Term	Definition
Exceedance	An exceedance is deemed to have occurred when an attended noise monitoring result, taken in accordance with the INP and Project Approval, exceeds the Noise Criteria in Table 4 . The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6).
Non-compliance	A non-compliance is deemed to have occurred when a second attended noise monitoring result, taken within 75 minutes of an exceedance and in accordance with the INP and Project Approval, exceeds the Noise Criteria in Table 4 for a second time. The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6). Reporting requirements for a non-compliance are detailed in Section 6.3.7 .

6.3.6 Favourable Meteorological Conditions

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 3°C/100m.

Except for wind speed at microphone height, the data used for determining meteorological conditions will be that recorded by the meteorological station located on the Mine site.

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

6.3.7 Response to Non-Compliance or Exceedance

Where any non-compliance of the Noise Criteria has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the non-compliance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (**Section 9.1**);
- Implement remediation measures as directed by the Director-General; and
- Review and, if necessary, revise this Management Plan (**Section 10**), to the satisfaction of the Director-General.

APPENDIX

B CALIBRATION CERTIFICATES



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Sound Level Meter
IEC 61672-3.2006

Calibration Certificate

Calibration Number C15226

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 00701424
Microphone Serial Number : 01916
Pre-amplifier Serial Number : 01463

Pre-Test Atmospheric Conditions	Post-Test Atmospheric Conditions
Ambient Temperature : 20°C	Ambient Temperature : 21.6°C
Relative Humidity : 55.7%	Relative Humidity : 53%
Barometric Pressure : 99.62kPa	Barometric Pressure : 99.82kPa

Calibration Technician : Dennis Kim **Secondary Check:** Sandra Minto
Calibration Date : 22/05/2015 **Report Issue Date :** 25/05/2015

Approved Signatory :  Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10: Self-generated noise	Pass	14: Level linearity on the reference level range	Pass
11: Acoustical tests of a frequency weighting	Pass	15: Level linearity incl. the level range control	Pass
12: Electrical tests of frequency weightings	Pass	16: Toneburst response	Pass
13: Frequency and time weightings at 1 kHz	Pass	17: Peak C sound level	Pass
		18: Overload Indication	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement -			
Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	±0.120dB	Temperature	±0.3°C
12.5kHz	±0.165dB	Relative Humidity	±4.1%
16kHz	±0.245dB	Barometric Pressure	±0.1kPa
Electrical Tests			
31.5 Hz to 20 kHz	±0.121dB		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.



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Sound Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C16383

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
THORNTON NSW 2322

Equipment Tested/ Model Number : Pulsar 106
Instrument Serial Number : 74813

Atmospheric Conditions

Ambient Temperature : 20.9°C
Relative Humidity : 39.8%
Barometric Pressure : 99.08kPa

Calibration Technician : Dennis Kim
Calibration Date : 25/07/2016
Secondary Check: Sandra Minto
Report Issue Date : 25/07/2016

Approved Signatory :

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
5.2.2: Generated Sound Pressure Level	Pass	5.3.2: Frequency Generated	Pass
5.2.3: Short Term Fluctuation	Pass	5.5: Total Distortion	Pass

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	93.8	1000.34

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2004 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	±0.09dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
Distortion	±0.51%		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.

PAGE 1 OF 1

Wilpinjong Coal

*Environmental Noise Monitoring
May 2017*

*Prepared for
Wilpinjong Coal Pty Ltd*


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Acoustics

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Wilpinjong Coal

Environmental Noise Monitoring May 2017

Reference: 17185_R01

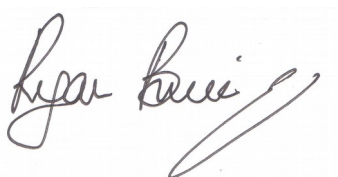
Report date: 30 May 2017

Prepared for

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Prepared: Ryan Bruniges
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QA Review: Katie Weekes
Environmental Scientist (Acoustics)

Global Acoustics Pty Ltd ~ Environmental noise modelling 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 Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

A modification (MOD7) to the WCP consent was approved in August 2016. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

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 night measurement was 15 minutes. Results of monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at seven locations during the night of 16/17 May 2017. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Operational Noise Assessment

WCP complied with relevant noise limits at all monitoring locations during the May 2017 monitoring.

Low Frequency Assessment

During the May 2017 survey WCP complied with the relevant limits using the Broner and INP methods of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at seven locations during the night of 16/17 May 2017. Figure 1 shows the monitoring locations.

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

1.2 Monitoring Locations

There were seven 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: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road
N14	'Tichular', intersection of Tichular and Barigan Roads
N15	Track off Barigan Street near Wollar School, Wollar Village
N16	Araluen Road, off Ulan-Wollar Road
N17	Mogo Road, off Araluen Road
N18	Barigan Road, Barigan Valley

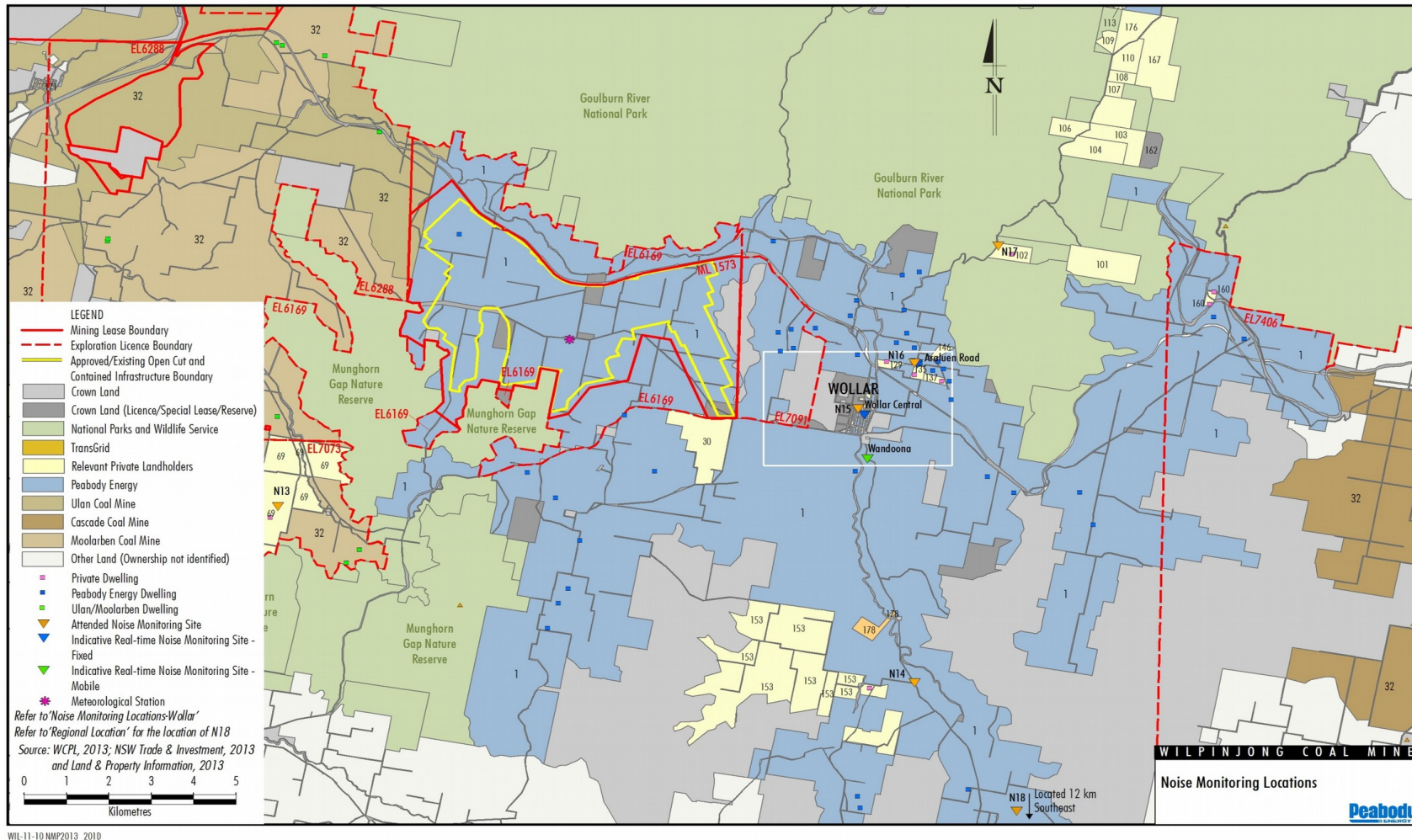


Figure 1: WCP Attended Noise Monitoring Locations

1.3 Terminology & Abbreviations

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

Table 1.2: TERMINOLOGY & ABBREVIATIONS

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
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
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, but could not be quantified
Day	This is the period 7:00am to 6:00pm
Evening	This is the period 6:00pm to 10:00pm
Night	This is the period 10:00pm to 7:00am

2 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in August 2016. The relevant noise conditions from the project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in January 2017. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in May 2016. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Approval Criteria and Weather Conditions

Criteria detailed in Table 2.1 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with Wilpinjong Coal Project.

Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- a) wind speeds greater than 3 m/s at 10m above ground level;
- b) temperature inversion conditions between 1.5°C and 3°C/100m and wind speeds greater than 2 m/s at 10m above ground level; or
- c) temperature inversion conditions greater than 3°C/100m.

2.5 EPL Criteria and Weather Conditions

Criteria detailed in Table 2.2 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with Wilpinjong Coal Project.

Table 2.2: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

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 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.

2.6 Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

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.

2.6.1 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.

2.6.2 Low Frequency Noise

INP Method

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 site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more*.

Broner Method

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 site only C – weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

Low Frequency Assessment Method

Low frequency assessment methods are detailed in Table 2.3.

Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L_{Ceq}	>60	>65
INP	Site only L_{Ceq} minus site only L_{Aeq}	≥ 15	≥ 15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a Draft Industrial Noise Guideline (ING) was released in September 2015, low frequency noise results from WCP have been compared to the assessment methods and modifying factor triggers presented above. The applicability of these triggers have been considered when applying low frequency modifying factor corrections.

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. Monitoring is undertaken once per month at each location. The duration of each measurement was 15 minutes.

Attended monitoring during this reporting period was undertaken by Ryan Bruniges.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. NM indicates that some site noise was audible, but indeterminate due to one of the following reasons:

- site noise levels were insignificant and unlikely, in many cases, to be even noticed; or
- site noise levels were masked by another relatively loud noise source, but were estimated to be less than $L_{Aeq} 30$ dB, which is insignificant in terms of any applicable criterion.

If site noise were NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting. All sites noted NM in this report are due to insignificant absolute values.

A measurement of $L_{A1,1\text{minute}}$ 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 a 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 $L_{A1,1\text{minute}}$ 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 noise from WCP was assessed by analysis of the measured L_{Aeq} spectrum.

3.2 Attended Noise 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: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	3013882	14/03/2019
Pulsar 105 acoustic calibrator	78226	14/03/2019

4 RESULTS

4.1 Attended Noise Monitoring

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. 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 2017¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	16/05/2017 23:14	42	31	22	17	21	16	15	30
N13	17/05/2017 01:27	40	37	35	31	32	28	21	40
N14	16/05/2017 22:43	58	39	26	20	28	17	16	35
N15	16/05/2017 23:36	54	51	48	33	42	19	16	55
N16	17/05/2017 00:44	40	26	20	18	20	17	16	45
N17	17/05/2017 00:11	40	24	17	15	17	15	14	31
N18	16/05/2017 22:05	48	26	23	21	22	19	18	28

Note:

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

4.2 Project Approval and Weather Conditions

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines approval. Modifying factors are considered in Section 4.4.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – MAY 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	16/05/2017 23:14	0.7	4.0	35	No	<20	NA
N13	17/05/2017 01:27	0.0	3.4	36	No	<20	NA
N14	16/05/2017 22:43	0.0	4.6	35	No	IA	NA
N15	16/05/2017 23:36	0.7	3.0	35	Yes	IA	Nil
N16	17/05/2017 00:44	0.6	4.6	37	No	<20	NA
N17	17/05/2017 00:11	0.8	3.6	35	No	IA	NA
N18	16/05/2017 22:05	0.7	3.4	35	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

Table 4.3: $L_{A1,1minute}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – MAY 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{A1,1min}$ dB ^{4,5}	Exceedance ⁶
N6	16/05/2017 23:14	0.7	4.0	45	No	<20	NA
N13	17/05/2017 01:27	0.0	3.4	45	No	<20	NA
N14	16/05/2017 22:43	0.0	4.6	45	No	IA	NA
N15	16/05/2017 23:36	0.7	3.0	45	Yes	IA	Nil
N16	17/05/2017 00:44	0.6	4.6	45	No	24	NA
N17	17/05/2017 00:11	0.8	3.6	45	No	IA	NA
N18	16/05/2017 22:05	0.7	3.4	45	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

4.3 EPL and Weather Conditions

Table 4.4 and Table 4.5 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines EPL.

Table 4.4: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – MAY 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	16/05/2017 23:14	0.7	4	35	No	<20	NA
N13	17/05/2017 01:27	0.0	3.4	35	No	<20	NA
N14	16/05/2017 22:43	0.0	4.6	35	No	IA	NA
N15	16/05/2017 23:36	0.7	3	36	Yes	IA	Nil
N16	17/05/2017 00:44	0.6	4.6	35	No	<20	NA
N17	17/05/2017 00:11	0.8	3.6	35	No	IA	NA
N18	16/05/2017 22:05	0.7	3.4	35	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

Table 4.5: *L_{A1,1minute}* GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – MAY 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP <i>L_{A1,1min}</i> dB ^{4,5}	Exceedance ⁶
N6	16/05/2017 23:14	0.7	4	45	No	<20	NA
N13	17/05/2017 01:27	0.0	3.4	45	No	<20	NA
N14	16/05/2017 22:43	0.0	4.6	45	No	IA	NA
N15	16/05/2017 23:36	0.7	3	45	Yes	IA	Nil
N16	17/05/2017 00:44	0.6	4.6	45	No	24	NA
N17	17/05/2017 00:11	0.8	3.6	45	No	IA	NA
N18	16/05/2017 22:05	0.7	3.4	45	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

4.4 Low Frequency Assessment

Low frequency results for each monitoring location are presented in Table 4.6.

Table 4.6: LOW FREQUENCY NOISE MODIFYING FACTOR ASSESSMENT – MAY 2017

Location	Start Date and Time	WCP only LAeq dB ⁶	Broner low frequency modifying factor trigger dB ¹	Broner, Site only L _{Ceq} dB ^{2,5}	INP low frequency modifying factor trigger dB ³	INP, WCP only L _{Ceq} minus site only LAeq dB ^{4,5}	Comments
N6	16/05/2017 23:14	<20	>60	NM	≥15	NM	WCP not measurable
N13	17/05/2017 01:27	<20	>60	NM	≥15	NM	WCP not measurable
N14	16/05/2017 22:43	IA	>60	IA	≥15	IA	WCP inaudible
N15	16/05/2017 23:36	IA	>60	IA	≥15	IA	WCP inaudible
N16	17/05/2017 00:44	<20	>60	NM	≥15	NM	WCP not measurable
N17	17/05/2017 00:11	IA	>60	IA	≥15	IA	WCP inaudible
N18	16/05/2017 22:05	IA	>60	IA	≥15	IA	WCP inaudible

Notes:

1. Night L_{Ceq} modifying factor trigger as detailed in Broner (2010);
2. These are measured or calculated site only Broner C-weighted noise levels, NM denotes site levels were audible but not measurable, IA denotes site noise was inaudible. Where it is not possible to determine the site only Broner result due to the presence of other low frequency noise sources occurring during the measurement, or where MET excludes the measurement, this is noted as NA (not available) and no further assessment has been undertaken. Guidance is provided in the Comments column;
3. Low frequency modifying factor trigger as detailed in the INP;
4. These are measured or calculated site only INP results (site only L_{Ceq} minus site only LAeq), NM denotes site levels were audible but not measurable, IA denotes site noise was inaudible. Where it is not possible to determine the site only INP result due to the presence of other low frequency noise sources occurring during the measurement, or where MET excludes the measurement, this is noted as NA (not available) and no further assessment has been undertaken. Guidance is provided in the Comments column;
5. Bold results are greater than the relevant modifying factor trigger; and
6. WCP L_{Aeq,15minute} provided as a guide.

As detailed in Table 4.6, there were no low frequency correction triggers applied. No further analysis of low frequency noise was required.

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator at each location using a Kestrel hand-held weather meter is shown in Table 4.7. Atmospheric condition data is routinely recorded on a site-by-site basis to show conditions during the monitoring period. The wind speed, direction and temperature were measured at 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – MAY 2017

Location	Start Date And Time	Temperature °C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	16/05/2017 23:14	4	0.0	-	0
N13	17/05/2017 01:27	6	0.5	200	0
N14	16/05/2017 22:43	7	0.4	170	0
N15	16/05/2017 23:36	3	0.0	-	0
N16	17/05/2017 00:44	3	0.0	-	0
N17	17/05/2017 00:11	6	0.0	-	0
N18	16/05/2017 22:05	7	0.0	-	0

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained concurrently by the WCP meteorological station is provided in Table 4.8 and is used to determine compliance with specified noise criteria.

Table 4.8: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees^{2,4}	Lapse Rate Degrees / 100 metres³
16/05/2017 22:00	0.8	318	5.2
16/05/2017 22:15	NA	NA	NA
16/05/2017 22:30	0.7	278	3.4
16/05/2017 22:45	0.0	-	3.6
16/05/2017 23:00	0.0	-	4.6
16/05/2017 23:15	0.0	-	4.2
16/05/2017 23:30	0.7	356	4.0
16/05/2017 23:45	0.7	313	3.0
17/05/2017 00:00	0.7	317	3.4
17/05/2017 00:15	0.8	310	3.6
17/05/2017 01:00	0.6	346	4.6
17/05/2017 01:15	0.7	322	4.2
17/05/2017 01:30	0.0	-	4.2
17/05/2017 01:45	0.0	-	3.4
17/05/2017 02:00	0.0	-	3.4
17/05/2017 02:15	0.7	14	4.6
17/05/2017 02:30	0.9	328	4.0

Notes:

1. Data supplied by WCP;
2. "-" in wind direction column indicates that conditions were calm;
3. Lapse rate sourced from the WCP inversion tower; and
4. NA indicates data not available/recorded.

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 to Table 4.5 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. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

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 Figure 3 to Figure 9 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 cut-off frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq} .

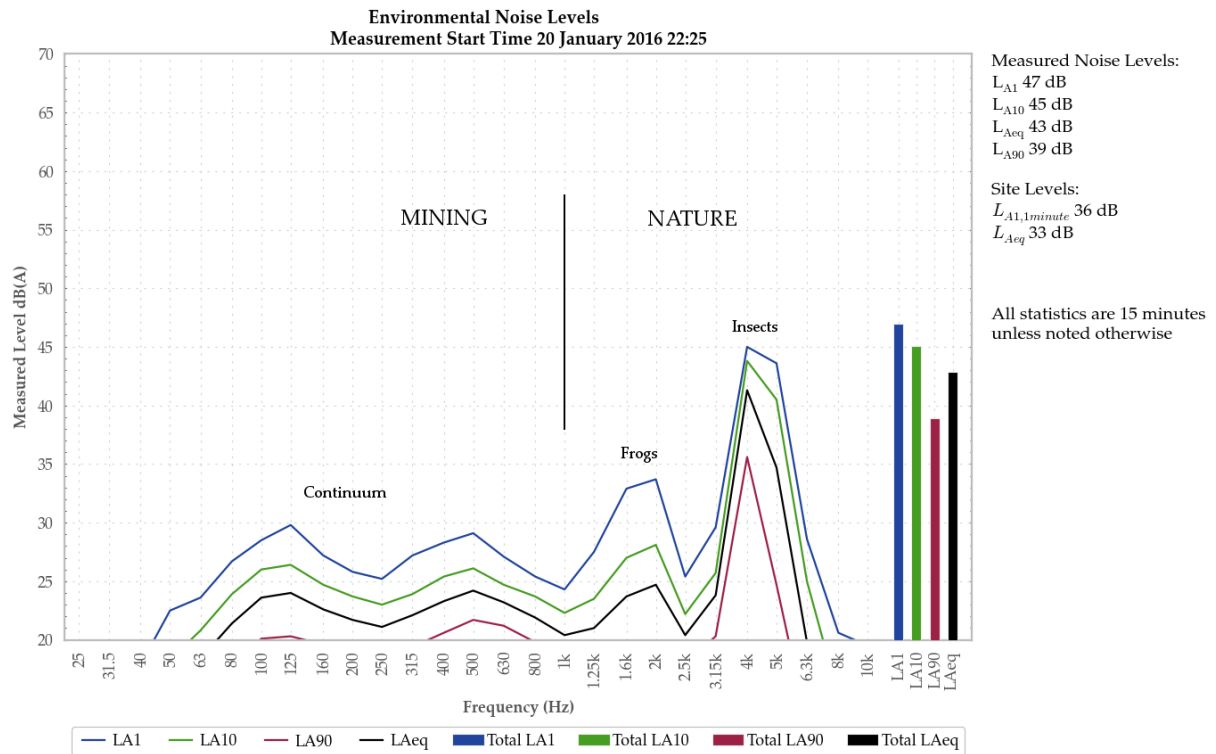


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6, 16 May 2017

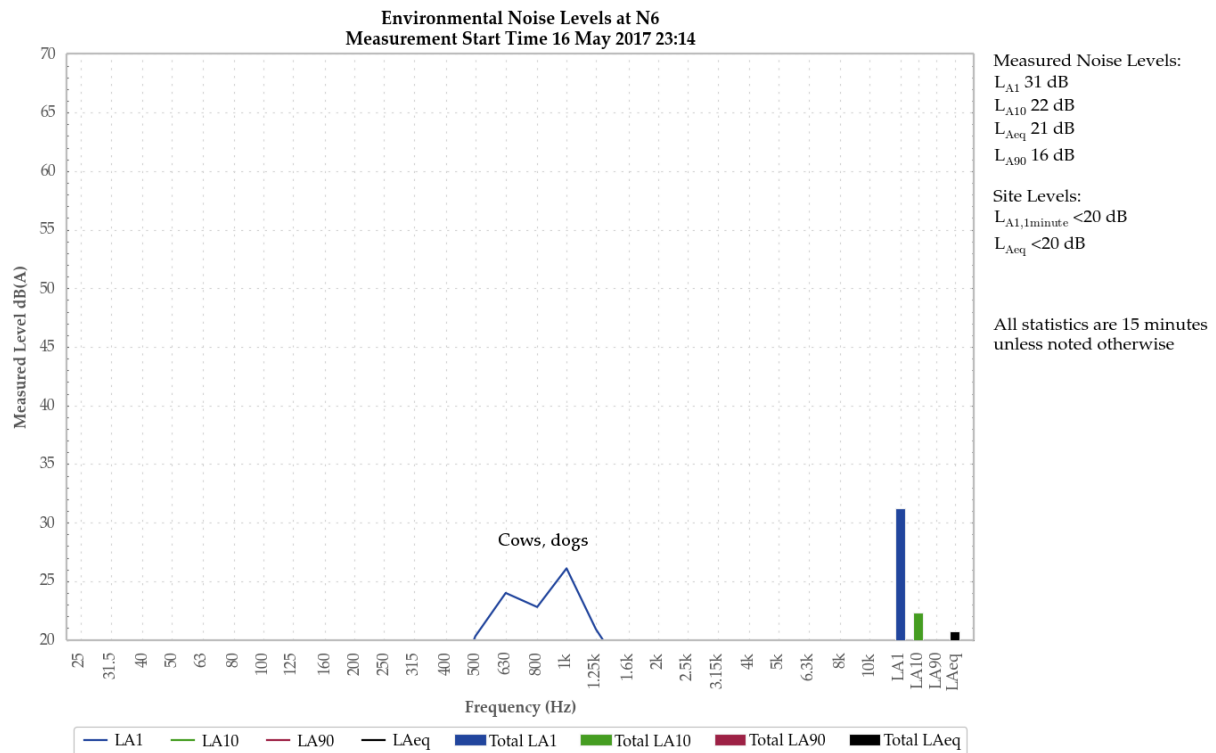


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

A low-level continuum from WCP was audible at times during the measurement and dozer track noise was audible once. These sources were responsible for the site only L_{Aeq} and $L_{A1,1minute}$ of less than 20 dB.

Dogs and cows generated the measured L_{A1} . Insects generated the measured L_{A10} , L_{Aeq} . The noise floor of the sound level meter contributed to the measured L_{A90} .

5.1.2 N13, 17 May 2017

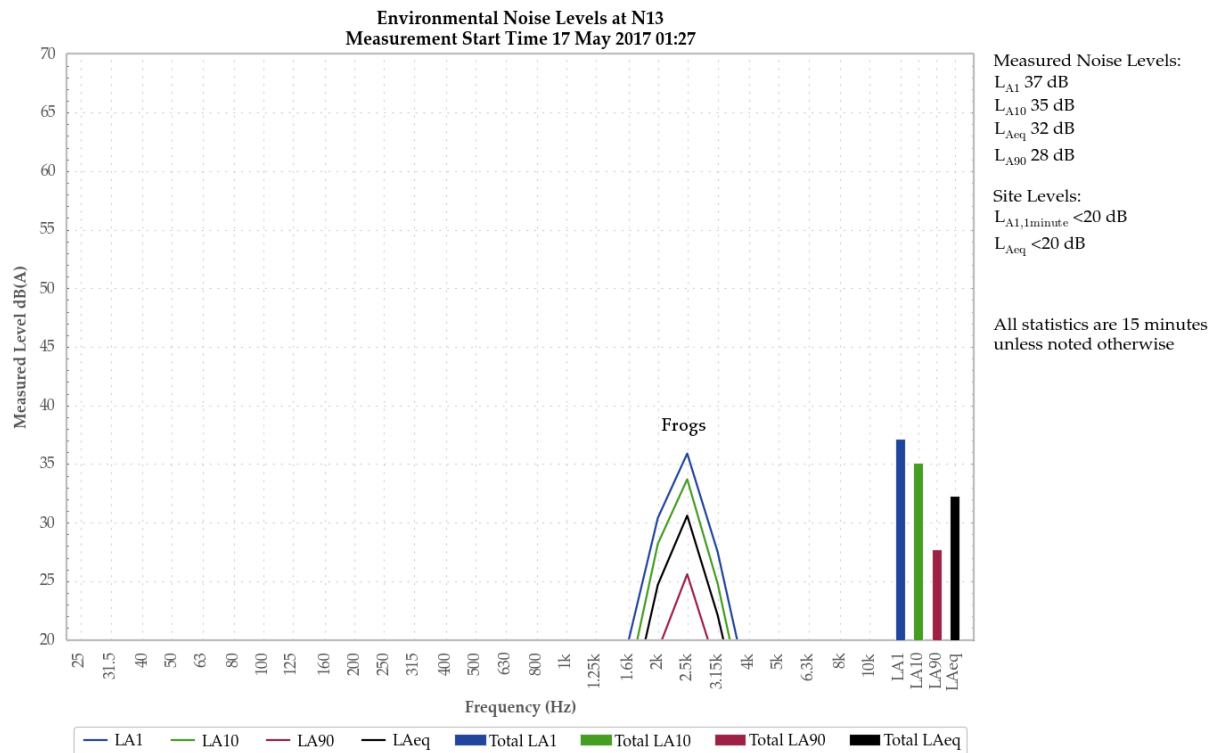


Figure 4: Environmental Noise Levels – N13, 'Coonaroo' off Moolarben Road

A low-level continuum from WCP was audible throughout the measurement and dozer track noise was audible twice. These sources were responsible for the site only LAeq and LA1,1minute of less than 20 dB.

Frogs generated all measured noise levels.

Cows were also noted.

5.1.3 N14, 16 May 2017

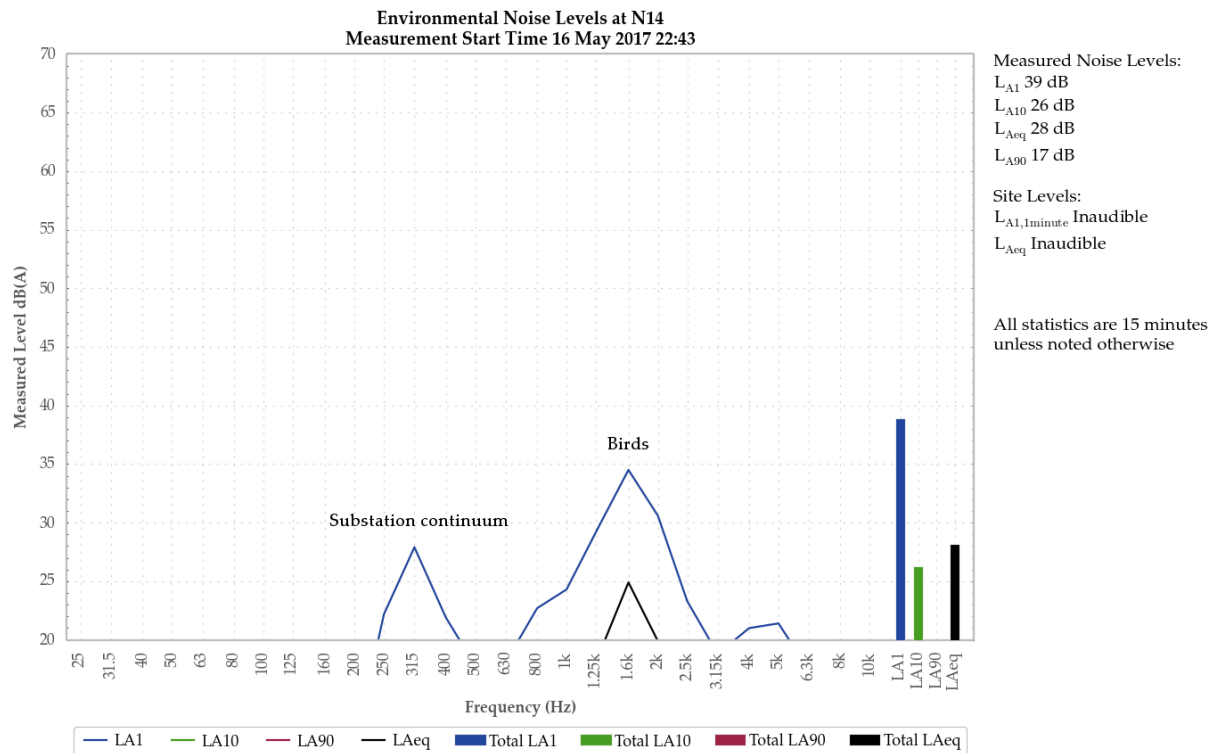


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

WCP was inaudible.

Birds generated the measured L_{A1} , L_{A10} and L_{Aeq} . Frogs, insects and a nearby substation continuum combined to generate the measured L_{A90} .

5.1.4 N15, 16 May 2017

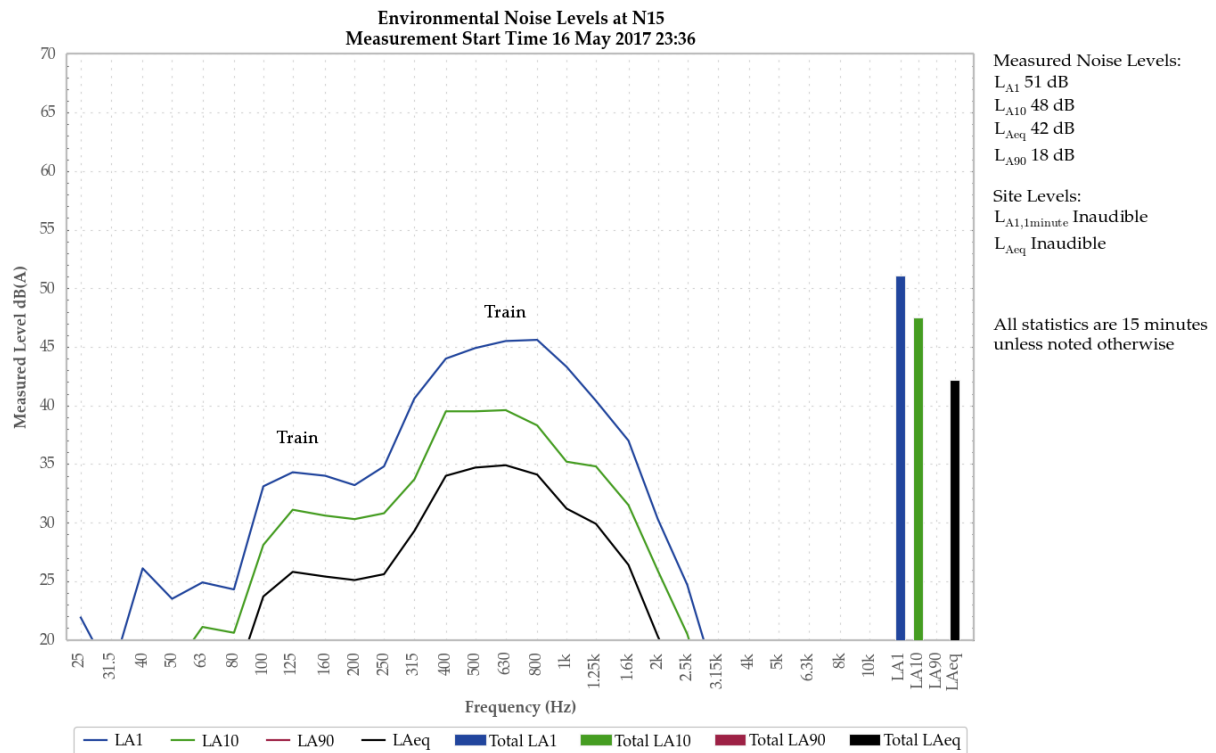


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

WCP was inaudible.

A train was primarily responsible for measured noise levels. The noise floor of the sound level meter was responsible for the measured LA90.

Cows, dogs and birds were also noted.

5.1.5 N16, 17 May 2017

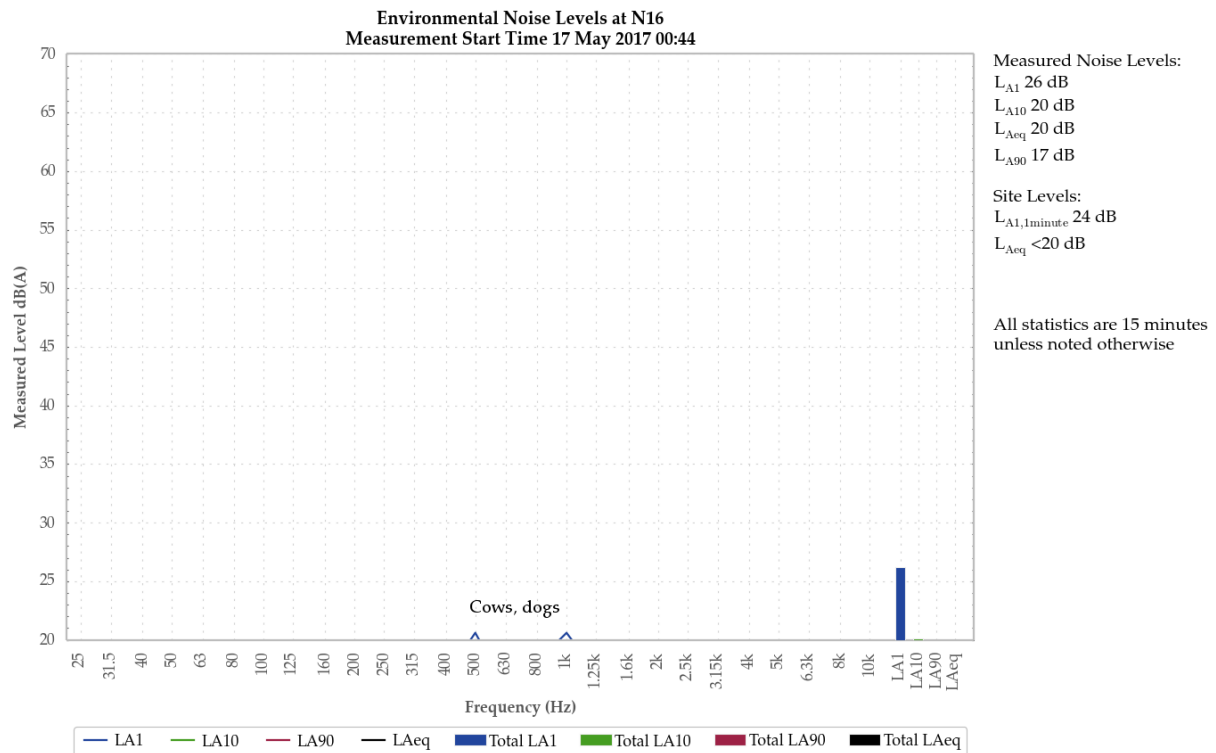


Figure 7: Environmental Noise Levels – N16, Araluen Road, off Ulan-Wollar Road

A low-level engine continuum was audible for WCP throughout the measurement and generated the site only L_{Aeq} of less than 20 dB and $L_{A1,1minute}$ of 24 dB.

Cows and dogs generated the measured L_{A1} and contributed to the measured L_{A10} and L_{Aeq} . The continuum from WCM and the noise floor of the sound level meter contributed to the measured L_{A90} and L_{Aeq} .

Bats were also noted.

5.1.6 N17, 17 May 2017

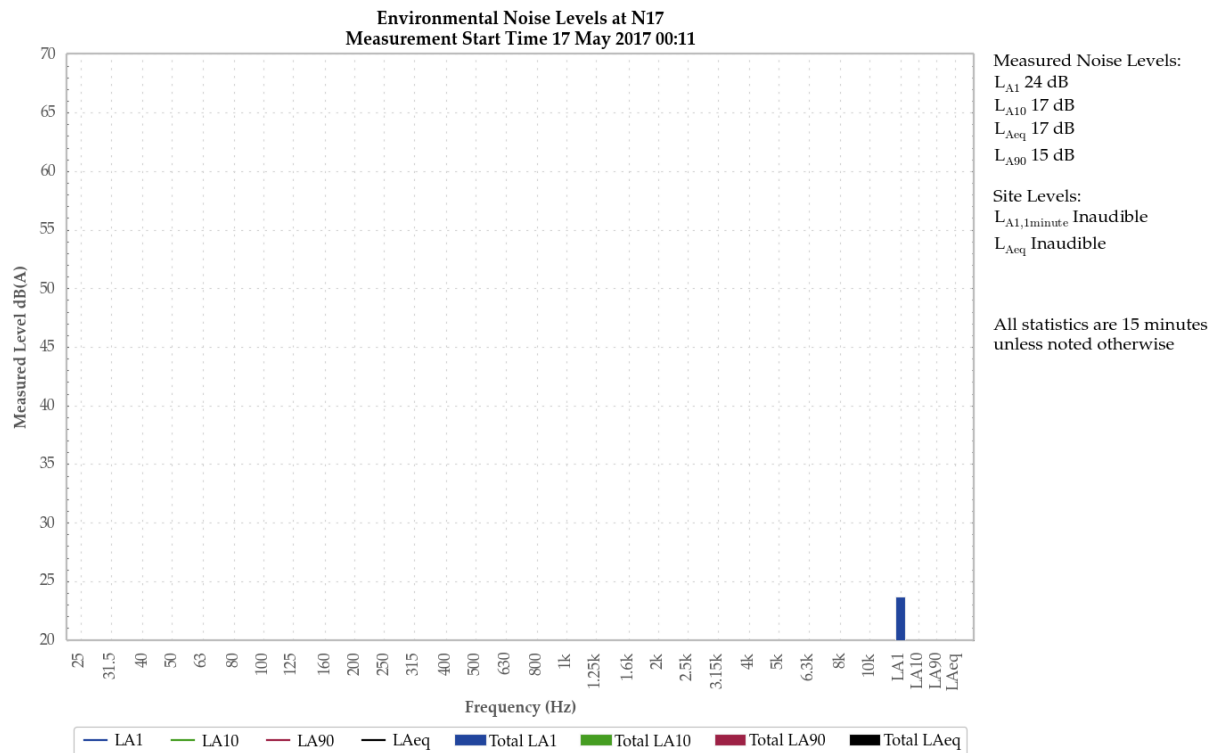


Figure 8: Environmental Noise Levels – N17, Mogo Road, off Araluen Road

WCP was inaudible.

Animals in foliage were responsible for the measured L_{A1}. The noise floor of the sound level meter was primarily responsible for the measured L_{A10}, L_{Aeq} and L_{A90}.

Birds and bats were also noted.

5.1.7 N18, 16 May 2017

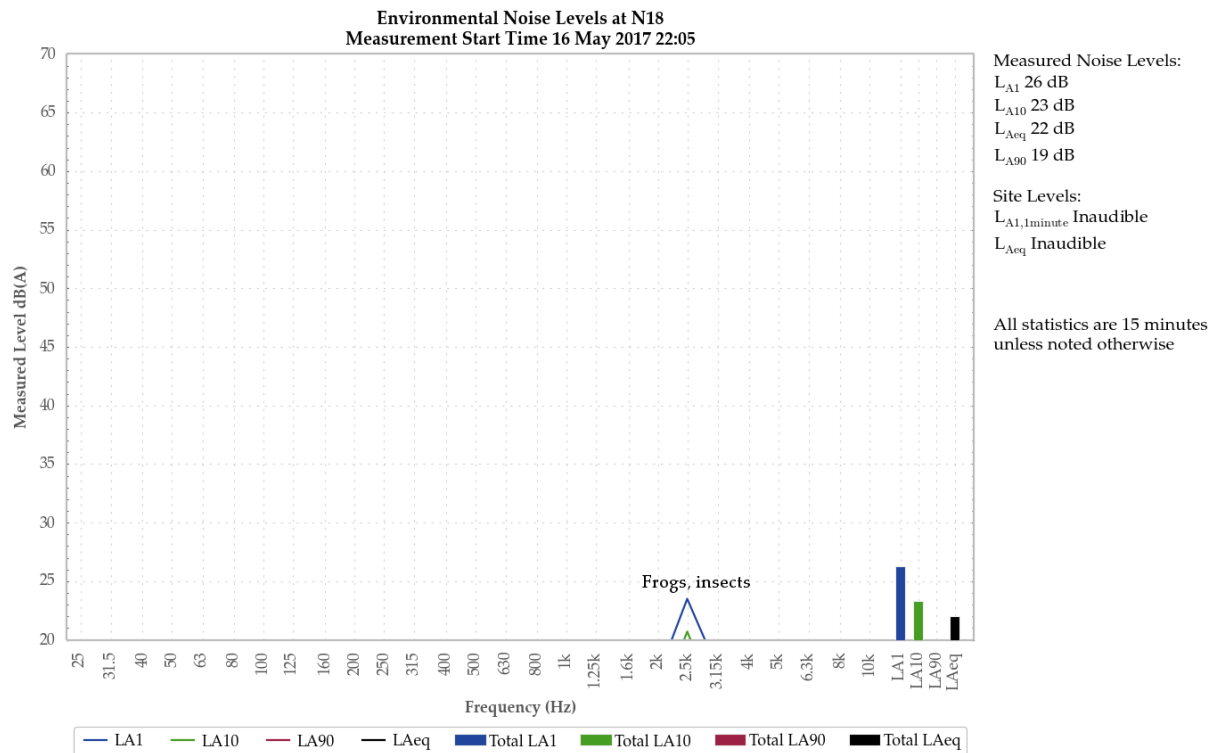


Figure 9: Environmental Noise Levels, N18 - Barigan Road, Barigan Valley

WCP was inaudible.

Insects and frogs primarily generated measured levels.

Cows were also noted.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 16/17 May 2017. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the May 2017 monitoring period.

6.2 Low Frequency Assessment

During the May 2017 survey WCP complied with the relevant limits using the Broner and INP methods of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Project Approval

SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

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 5 – 6 of schedule 4.

Table 1: Land subject to acquisition upon request

30 – Gaffney

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

NOISE

Noise 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 at the other specified locations.

Table 2: Noise Impact assessment criteria dB(A)

Location	Day	Evening	Night	
	<i>L_{Aeq}(15 minute)</i>	<i>L_{Aeq}(15 minute)</i>	<i>L_{Aeq}(15 minute)</i>	<i>LA1(1 minute)</i>
135	38	38	38	45
129 and 137	37	37	37	45
69	36	36	36	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		40 (internal) When in use		-
900 – St Laurence O’Toole Catholic Church				
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 10 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

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; and
- 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.

Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

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

Table 3: Land subject to additional noise mitigation upon request

<i>Receiver ID</i>
<i>69, 129, 135 and 137</i>

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

Operating Conditions

4. The Proponent shall:
 - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
 - (b) operate a comprehensive noise management system that uses a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day to day planning of mining operations, and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this approval;
 - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the project is complying with the relevant conditions of this approval, and publish these monitoring results on its website, to the satisfaction of the Director-General.

Noise Management Plan

5. The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
- (a) be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this approval; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this approval and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

APPENDIX 8 STATEMENT OF COMMITMENTS

Operational Noise

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) temperature inversion conditions greater than 3°C/100m

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Director-General directs otherwise.
5. Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

A.2 Environmental 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 January 2017.

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)
Wollar village	36	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
All other privately owned land (outside the village of Wollar)	35	35	35	45

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

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 3°C/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
- c) Temperature inversion conditions greater than 3°C/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.

R4 Other reporting conditions

R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the second round of quarterly monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:

- a) an assessment of compliance with noise limits presented in Condition L5.1; and
- b) an outline of any management actions taken within the monitoring period to address any exceedences of the limits contained in Condition L5.1.

A.3 Noise Monitoring Program

The relevant sections of the noise monitoring program for WCP dated May 2016 are reproduced below.

6 Noise Monitoring Program

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 4**. Unattended or real-time monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake attended monitoring at up to seven locations (**Table 5, Figure 3 and Figure 4**). Real-time units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 5: Noise Related Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Araluen Rd	N16	Attended Noise	778787.4	6417418.7	Location based on the nearest community structure to the East of the Mine
Mogo Rd	N17	Attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Barrigan Valley²	N18	Attended Noise	780033.3	6398618.1	DP&E Recommendation (MOD5) – Location approximately 20 km to the south of the Mine
WCPL Rail Loop		Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions

Wollar Village		Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine
Araluen Rd		Real-Time Noise - Fixed	778856.4	6417401.3	Location based on the nearest non-mine owned residence to the East of the Mine
Wandoona³		Real-Time Noise - Mobile	777684.4	6414786.2	Location based on the nearest non-mine owned residence to the South-East of the Mine

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 5** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&E and the EPA.

6.3 Attended Noise Monitoring

6.3.1 Purpose

Attended noise monitoring will be used to evaluate compliance against the Noise Criteria detailed in **Table 4**.

6.3.2 Summary

Attended noise will be undertaken in accordance with **Table 6**.

Table 6: Attended Noise Monitoring Summary

Element	Description
Locations	As per Table 5, Figure 3 and Figure 4
Period	Night-time period (10 pm-7 am) being the most sensitive time period for noise.
Frequency	12 times per year and on one night per month

6.3.3 Methodology

Attended noise monitoring will be undertaken as outlined in **Table 6** by an independent acoustic consultant in accordance with the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the noise criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not

exceed the Noise Criteria, as defined in **Table 4**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA₁ measurement will be undertaken at 1 m from the dwelling façade and the LA_{eq} measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

6.3.5 Evaluation of Compliance

Tables 7 and 8 summarises the definition used by WCPL in this NMP for the evaluation of compliance with the Project Approval. The reporting requirements and actions that WCPL will take in the event of an exceedance or non-compliance are detailed in **Figure 5** and **Section 6.3.7**.

Table 7: Definition of an Exceedance

Term	Definition
Exceedance	An exceedance is deemed to have occurred when an attended noise monitoring result, taken in accordance with the INP and Project Approval, exceeds the Noise Criteria in Table 4 . The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6).
Non-compliance	A non-compliance is deemed to have occurred when a second attended noise monitoring result, taken within 75 minutes of an exceedance and in accordance with the INP and Project Approval, exceeds the Noise Criteria in Table 4 for a second time. The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6). Reporting requirements for a non-compliance are detailed in Section 6.3.7 .

6.3.6 Favourable Meteorological Conditions

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 3°C/100m.

Except for wind speed at microphone height, the data used for determining meteorological conditions will be that recorded by the meteorological station located on the Mine site.

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

6.3.7 Response to Non-Compliance or Exceedance

Where any non-compliance of the Noise Criteria has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the non-compliance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (**Section 9.1**);
- Implement remediation measures as directed by the Director-General; and
- Review and, if necessary, revise this Management Plan (**Section 10**), to the satisfaction of the Director-General.

APPENDIX

B CALIBRATION CERTIFICATES



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**Sound Level Meter
IEC 61672-3.2013**

Calibration Certificate

Calibration Number C17126

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 30131882
Microphone Serial Number : 04739
Pre-amplifier Serial Number : 11942

Pre-Test Atmospheric Conditions
Ambient Temperature : 22.4°C
Relative Humidity : 55.6%
Barometric Pressure : 99.91kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 22.6°C
Relative Humidity : 58.1%
Barometric Pressure : 99.85kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 14/03/2017

Secondary Check: Riley Cooper
Report Issue Date : 15/03/2017

Approved Signatory :

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	Pass	17: Level linearity incl. the level range control	Pass
13: Electrical Sig. tests of frequency weightings	Pass	18: Toneburst response	Pass
14: Frequency and time weightings at 1 kHz	Pass	19: C Weighted Peak Sound Level	Pass
15: Long Term Stability	Pass	20: Overload Indication	Pass
16: Level linearity on the reference level range	Pass	21: High Level Stability	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement -			
Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	±0.16dB	Temperature	±0.05°C
12.5kHz	±0.2dB	Relative Humidity	±0.46%
16kHz	±0.29dB	Barometric Pressure	±0.017kPa
Electrical Tests			
31.5 Hz to 20 kHz	±0.12dB		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.



Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

PAGE 1 OF 1



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**Sound Calibrator
IEC 60942-2004**

Calibration Certificate

Calibration Number C17127

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Pulsar 105
Instrument Serial Number : 78226

Atmospheric Conditions

Ambient Temperature : 22.3°C
Relative Humidity : 55.6%
Barometric Pressure : 99.9kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 14/03/2017
Secondary Check: Riley Cooper
Report Issue Date : 15/03/2017

Approved Signatory :  Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
5.2.2: Generated Sound Pressure Level	Pass	5.3.2: Frequency Generated	Pass
5.2.3: Short Term Fluctuation	Pass	5.5: Total Distortion	Pass

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	94.1	1000.32

The sound calibrator has been shown to conform to the class 1 requirements for periodic testing, described in Annex B of IEC 60942:2004 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed..

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
Distortion	±0.5%		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

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The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

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Wilpinjong Coal

*Environmental Noise Monitoring
June 2017*

*Prepared for
Wilpinjong Coal Pty Ltd*


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Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring June 2017

Reference: 17229_R01

Report date: 5 July 2017

Prepared for

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Prepared: Amanda Borserio
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Environmental Scientist (Acoustics)

Global Acoustics Pty Ltd ~ Environmental noise modelling 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 Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

A modification (MOD7) to the WCP consent was approved in August 2016. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

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 night measurement was 15 minutes. Results of monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at seven locations during the night of 20/21 June 2017. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Operational Noise Assessment

WCP complied with relevant noise limits at all monitoring locations during the June 2017 monitoring.

Low Frequency Assessment

During the June 2017 survey WCP complied with the relevant limits using the Broner and INP methods of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at seven locations during the night of 20/21 June 2017. Figure 1 shows the monitoring locations.

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

1.2 Monitoring Locations

There were seven 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: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road
N14	'Tichular', intersection of Tichular and Barigan Roads
N15	Track off Barigan Street near Wollar School, Wollar Village
N16	Araluen Road, off Ulan-Wollar Road
N17	Mogo Road, off Araluen Road
N18	Barigan Road, Barigan Valley

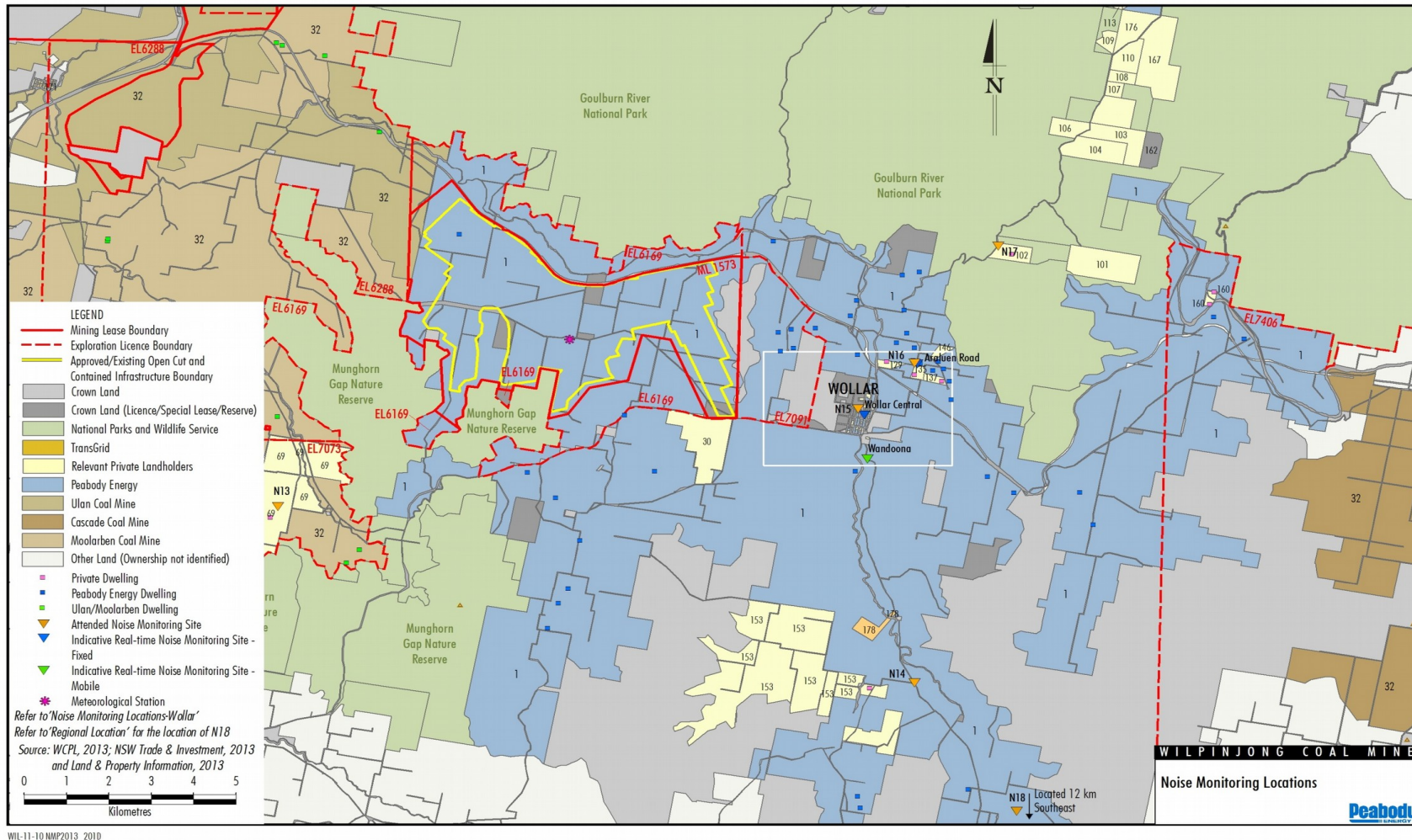


Figure 1: WCP Attended Noise Monitoring Locations

1.3 Terminology & Abbreviations

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

Table 1.2: TERMINOLOGY & ABBREVIATIONS

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
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
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, but could not be quantified
Day	This is the period 7:00am to 6:00pm
Evening	This is the period 6:00pm to 10:00pm
Night	This is the period 10:00pm to 7:00am

2 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in August 2016. The relevant noise conditions from the project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in January 2017. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in May 2016. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Approval Criteria and Weather Conditions

Criteria detailed in Table 2.1 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with Wilpinjong Coal Project.

Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- a) wind speeds greater than 3 m/s at 10m above ground level;
- b) temperature inversion conditions between 1.5°C and 3°C/100m and wind speeds greater than 2 m/s at 10m above ground level; or
- c) temperature inversion conditions greater than 3°C/100m.

2.5 EPL Criteria and Weather Conditions

Criteria detailed in Table 2.2 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with Wilpinjong Coal Project.

Table 2.2: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

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 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.

2.6 Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

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.

2.6.1 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.

2.6.2 Low Frequency Noise

INP Method

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 site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more.*

Broner Method

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 site only C – weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

Low Frequency Assessment Method

Low frequency assessment methods are detailed in Table 2.3.

Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L_{Ceq}	>60	>65
INP	Site only L_{Ceq} minus site only L_{Aeq}	≥ 15	≥ 15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a Draft Industrial Noise Guideline (ING) was released in September 2015, low frequency noise results from WCP have been compared to the assessment methods and modifying factor triggers presented above. The applicability of these triggers have been considered when applying low frequency modifying factor corrections.

3 METHODOLOGY

3.1 Assessment Method

Attended monitoring was conducted in accordance with the EPA INP guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken. Monitoring is undertaken once per month at each location. The duration of each measurement was 15 minutes.

Attended monitoring during this reporting period was undertaken by Amanda Borserio.

If the exact contribution from WCP cannot be established, due to masking by other noise sources in a similar frequency range, but site noise levels are observed to be well below (more than 5 dB lower than) any relevant criterion, a maximum estimate of the potential contribution of the site might be made based on other measured site-only noise levels, for example, L_{A10} , L_{A50} or L_{A90} . This is generally expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may also be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means some noise was audible but could not be quantified. If site noise was NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the INP (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted as NM in this report are due to one or more of the following reasons:

- site noise levels were extremely low and unlikely, in many cases, to be even noticed;
- site noise levels were masked by another relatively loud noise source that is characteristic of the environment (e.g. breeze in foliage or continuous road traffic noise) that cannot be eliminated by moving closer; and/or
- it was not feasible or reasonable to employ INP methods such as move closer and back calculate. Cases may include, but are not limited to, rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

A measurement of $L_{A1,1\text{minute}}$ 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 a 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 $L_{A1,1\text{minute}}$ 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 noise from WCP was assessed by analysis of the measured L_{Aeq} spectrum.

3.2 Attended Noise 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: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	701424	05/06/2019
Pulsar 106 acoustic calibrator	74813	05/06/2019

4 RESULTS

4.1 Attended Noise Monitoring

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. 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 – JUNE 2017¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	20/06/2017 23:29	49	42	31	25	30	23	21	39
N13	21/06/2017 1:55	42	41	39	37	37	35	32	39
N14	20/06/2017 22:54	45	28	25	24	25	23	21	46
N15	20/06/2017 23:52	48	46	39	28	35	23	20	47
N16	21/06/2017 1:03	55	50	46	26	40	20	18	59
N17	21/06/2017 0:28	28	18	16	15	15	15	14	33
N18	20/06/2017 22:18	47	42	32	29	31	27	26	41

Note:

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

4.2 Project Approval and Weather Conditions

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines approval. Modifying factors are considered in Section 4.4.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – JUNE 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	20/06/2017 23:29	0.5	2.6	35	Yes	<30	Nil
N13	21/06/2017 01:55	0.0	4.0	36	No	IA	NA
N14	20/06/2017 22:54	0.0	3.0	35	Yes	<25	Nil
N15	20/06/2017 23:52	0.6	3.0	35	Yes	<30	Nil
N16	21/06/2017 01:03	0.0	3.2	37	No	<25	NA
N17	21/06/2017 00:28	0.0	3.2	35	No	IA	NA
N18	20/06/2017 22:18	0.0	3.6	35	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

Table 4.3: $L_{A1,1minute}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – JUNE 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{A1,1min}$ dB ^{4,5}	Exceedance ⁶
N6	20/06/2017 23:29	0.5	2.6	45	Yes	32	Nil
N13	21/06/2017 01:55	0.0	4.0	45	No	IA	NA
N14	20/06/2017 22:54	0.0	3.0	45	Yes	<25	Nil
N15	20/06/2017 23:52	0.6	3.0	45	Yes	37	Nil
N16	21/06/2017 01:03	0.0	3.2	45	No	<25	NA
N17	21/06/2017 00:28	0.0	3.2	45	No	IA	NA
N18	20/06/2017 22:18	0.0	3.6	45	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

4.3 EPL and Weather Conditions

Table 4.4 and Table 4.5 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines EPL.

Table 4.4: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – JUNE 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	20/06/2017 23:29	0.5	2.6	35	Yes	<30	Nil
N13	21/06/2017 01:55	0.0	4.0	35	No	IA	NA
N14	20/06/2017 22:54	0.0	3.0	35	Yes	<25	Nil
N15	20/06/2017 23:52	0.6	3.0	36	Yes	<30	Nil
N16	21/06/2017 01:03	0.0	3.2	35	No	<25	NA
N17	21/06/2017 00:28	0.0	3.2	35	No	IA	NA
N18	20/06/2017 22:18	0.0	3.6	35	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

Table 4.5: *L_{A1,1minute}* GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – JUNE 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP <i>L_{A1,1min}</i> dB ^{4,5}	Exceedance ⁶
N6	20/06/2017 23:29	0.5	2.6	45	Yes	32	Nil
N13	21/06/2017 01:55	0.0	4.0	45	No	IA	NA
N14	20/06/2017 22:54	0.0	3.0	45	Yes	<25	Nil
N15	20/06/2017 23:52	0.6	3.0	45	Yes	37	Nil
N16	21/06/2017 01:03	0.0	3.2	45	No	<25	NA
N17	21/06/2017 00:28	0.0	3.2	45	No	IA	NA
N18	20/06/2017 22:18	0.0	3.6	45	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bolded results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

4.4 Low Frequency Assessment

Low frequency results for each monitoring location are presented in Table 4.6.

Table 4.6: LOW FREQUENCY NOISE MODIFYING FACTOR ASSESSMENT – JUNE 2017

Location	Start Date and Time	WCP only LAeq dB ⁶	Broner low frequency modifying factor trigger dB ¹	Broner, Site only L _{Ceq} dB ^{2,5}	INP low frequency modifying factor trigger dB ³	INP, WCP only L _{Ceq} minus site only LAeq dB ^{4,5}	Comments
N6	20/06/2017 23:29	<30	>60	NM	≥15	NM	WCP not directly measurable
N13	21/06/2017 01:55	IA	>60	IA	≥15	IA	WCP inaudible
N14	20/06/2017 22:54	<25	>60	NM	≥15	NM	WCP not directly measurable
N15	20/06/2017 23:52	<30	>60	NM	≥15	NM	WCP not directly measurable
N16	21/06/2017 01:03	<25	>60	NM	≥15	NM	WCP not directly measurable
N17	21/06/2017 00:28	IA	>60	IA	≥15	IA	WCP inaudible
N18	20/06/2017 22:18	IA	>60	IA	≥15	IA	WCP inaudible

Notes:

1. Night L_{Ceq} modifying factor trigger as detailed in Broner (2010);
2. These are measured or calculated site only Broner C-weighted noise levels, NM denotes site levels were audible but not measurable, IA denotes site noise was inaudible. Where it is not possible to determine the site only Broner result due to the presence of other low frequency noise sources occurring during the measurement, or where MET excludes the measurement, this is noted as NA (not available) and no further assessment has been undertaken. Guidance is provided in the Comments column;
3. Low frequency modifying factor trigger as detailed in the INP;
4. These are measured or calculated site only INP results (site only L_{Ceq} minus site only LAeq), NM denotes site levels were audible but not measurable, IA denotes site noise was inaudible. Where it is not possible to determine the site only INP result due to the presence of other low frequency noise sources occurring during the measurement, or where MET excludes the measurement, this is noted as NA (not available) and no further assessment has been undertaken. Guidance is provided in the Comments column;
5. Bold results are greater than the relevant modifying factor trigger; and
6. WCP L_{Aeq,15minute} provided as a guide.

As detailed in Table 4.6, there were no low frequency correction triggers applied. No further analysis of low frequency noise was required.

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator at each location using a Kestrel hand-held weather meter is shown in Table 4.7. Atmospheric condition data is routinely recorded on a site-by-site basis to show conditions during the monitoring period. The wind speed, direction and temperature were measured at 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – JUNE 2017

Location	Start Date And Time	Temperature °C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	20/06/2017 23:29	4	0.0	-	0
N13	21/06/2017 1:55	8	0.7	220	0
N14	20/06/2017 22:54	6	0.7	140	0
N15	20/06/2017 23:52	7	0.0	-	0
N16	21/06/2017 1:03	5	0.0	-	0
N17	21/06/2017 0:28	5	0.0	-	0
N18	20/06/2017 22:18	3	0.0	-	0

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained concurrently by the WCP meteorological station is provided in Table 4.8 and is used to determine compliance with specified noise criteria.

Table 4.8: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees^{2,4}	Lapse Rate Degrees / 100 metres³
20/06/2017 22:00	0.0	336	3.6
20/06/2017 22:15	0.0	336	4.6
20/06/2017 22:30	0.0	336	3.6
20/06/2017 22:45	0.0	336	3.2
20/06/2017 23:00	0.0	336	3.4
20/06/2017 23:15	0.0	336	3.0
20/06/2017 23:30	0.7	354	2.8
20/06/2017 23:45	0.5	302	2.6
21/06/2017 00:00	0.6	346	3.0
21/06/2017 00:15	0.7	314	3.8
21/06/2017 00:30	0.0	314	3.6
21/06/2017 00:45	0.0	314	3.2
21/06/2017 01:00	0.0	314	3.6
21/06/2017 01:15	0.0	314	3.2
21/06/2017 01:30	0.6	342	3.0
21/06/2017 01:45	0.5	327	3.6
21/06/2017 02:00	0.6	318	4.4
21/06/2017 02:15	0.0	318	4.0
21/06/2017 02:30	0.7	318	3.0

Notes:

1. Data supplied by WCP; and
2. Lapse rate sourced from the WCP inversion tower.

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 to Table 4.5 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. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

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 Figure 3 to Figure 9 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 cut-off frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq} .

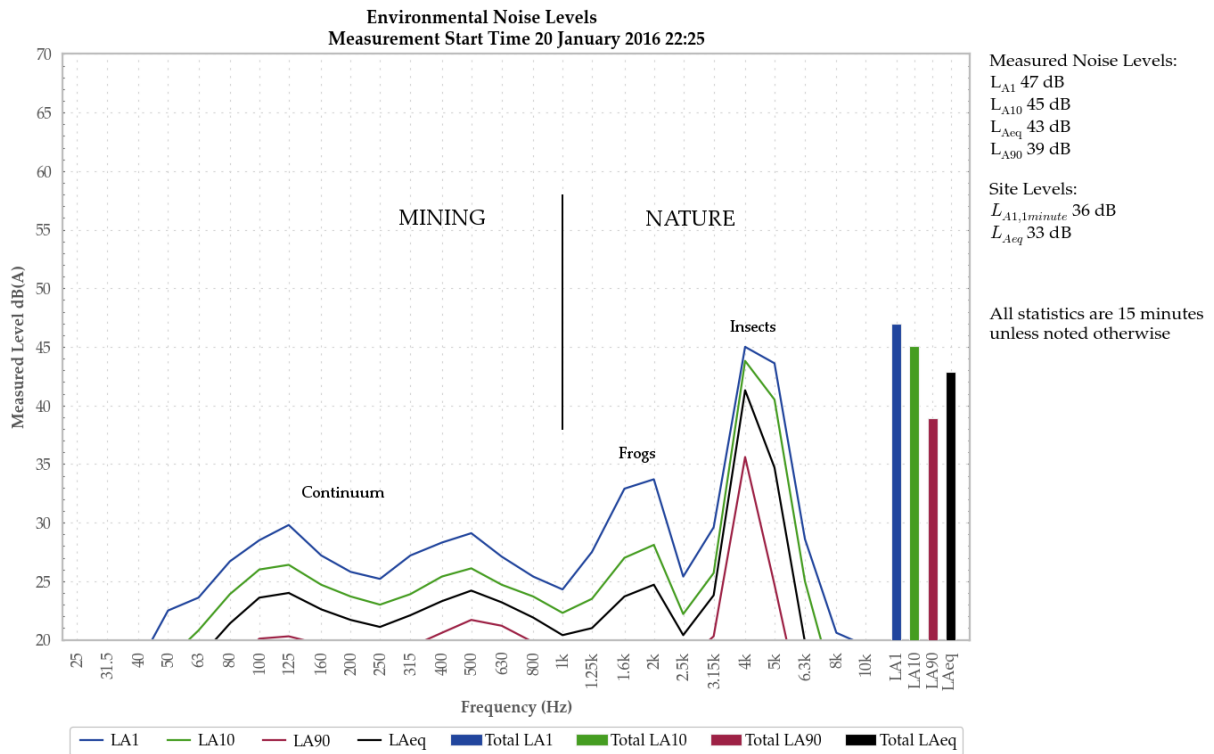


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6, 20 June 2017

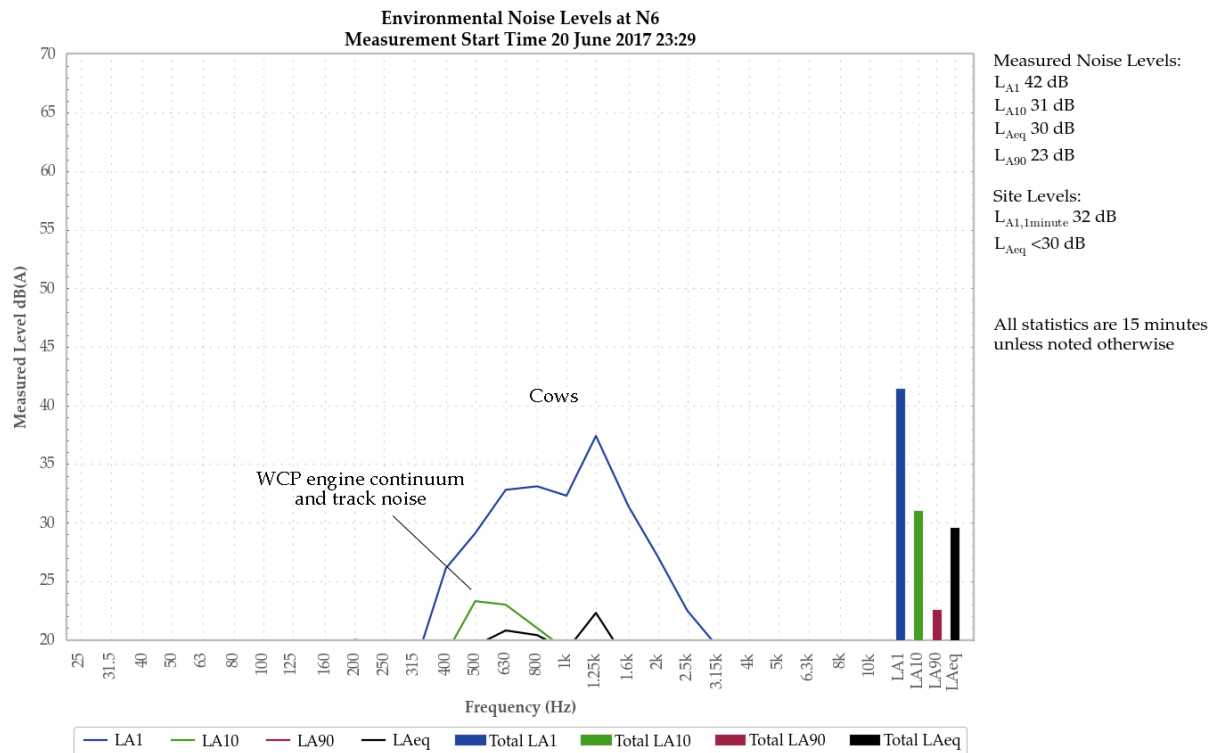


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

An engine continuum and track noise were audible from WCP during the measurement. These sources were responsible for the site only LAeq of less than 30 dB. Track noise generated the site only LA1,1minute of 32 dB.

Cows generated the measured LA1 and contributed to the measured LAeq. WCP track noise generated the measured LA10 and contributed to the measured LAeq. Insects, frogs, and WCP generated the measured LA90.

5.1.2 N13, 21 June 2017

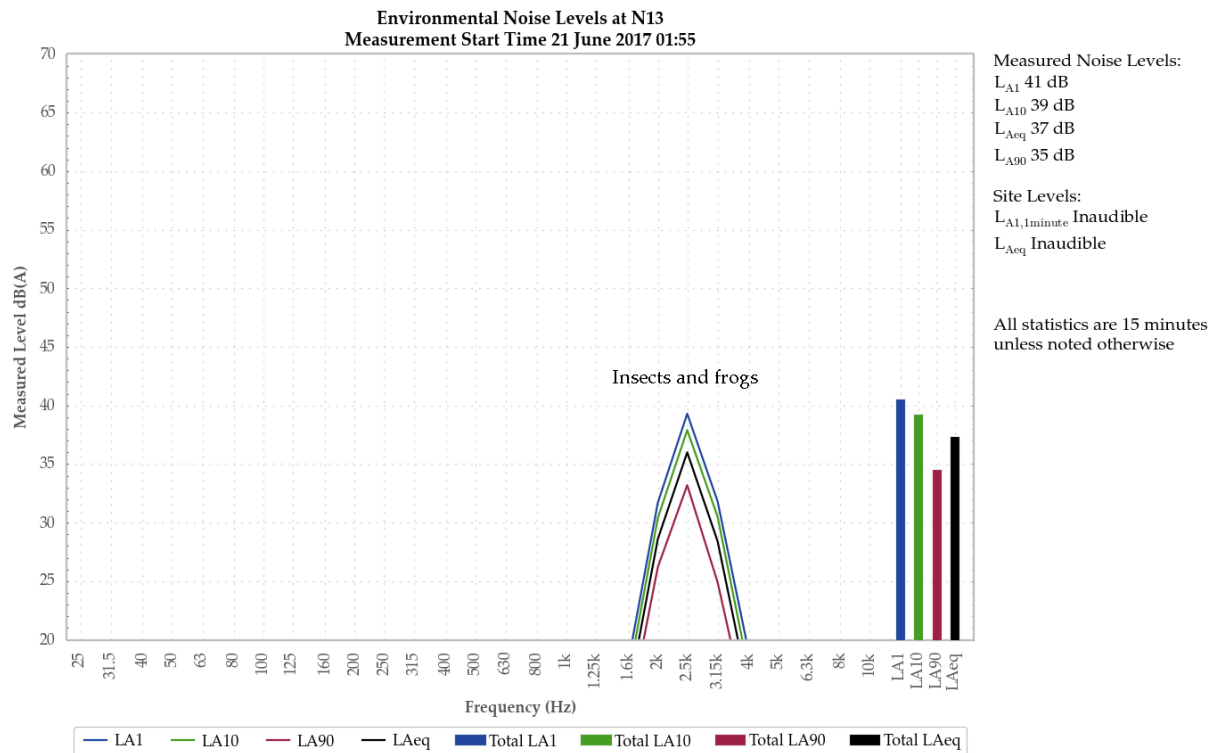


Figure 4: Environmental Noise Levels – N13, 'Coonaroo' off Moolarben Road

WCP was inaudible.

Insects and frogs generated all measured noise levels.

Cows were also noted.

5.1.3 N14, 20 June 2017

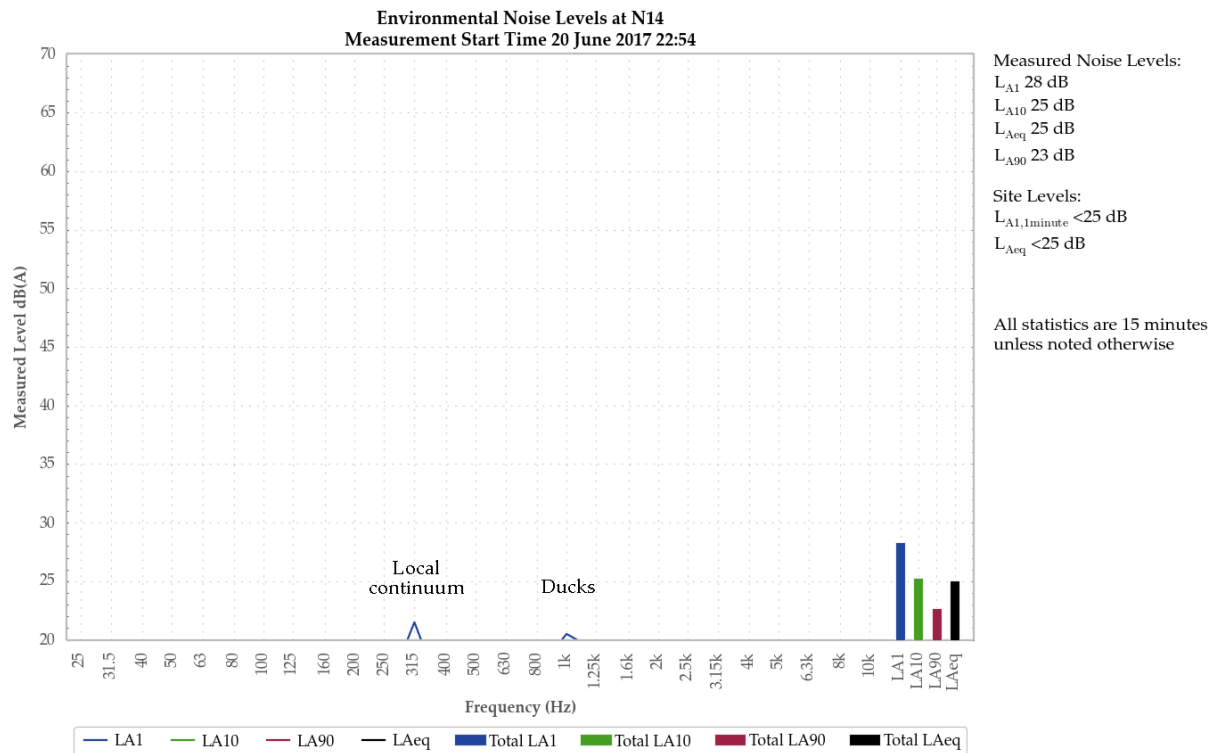


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

A low-level continuum was audible from WCP throughout the measurement. Track noise was also noted at times. These sources generated the site only LAeq and LA1,1minute of less than 25 dB.

A local electrical continuum and ducks primarily generated the measured LA1. Insects and frogs primarily generated the measured LA10, LAeq and LA90.

Cows were also noted.

5.1.4 N15, 20 June 2017

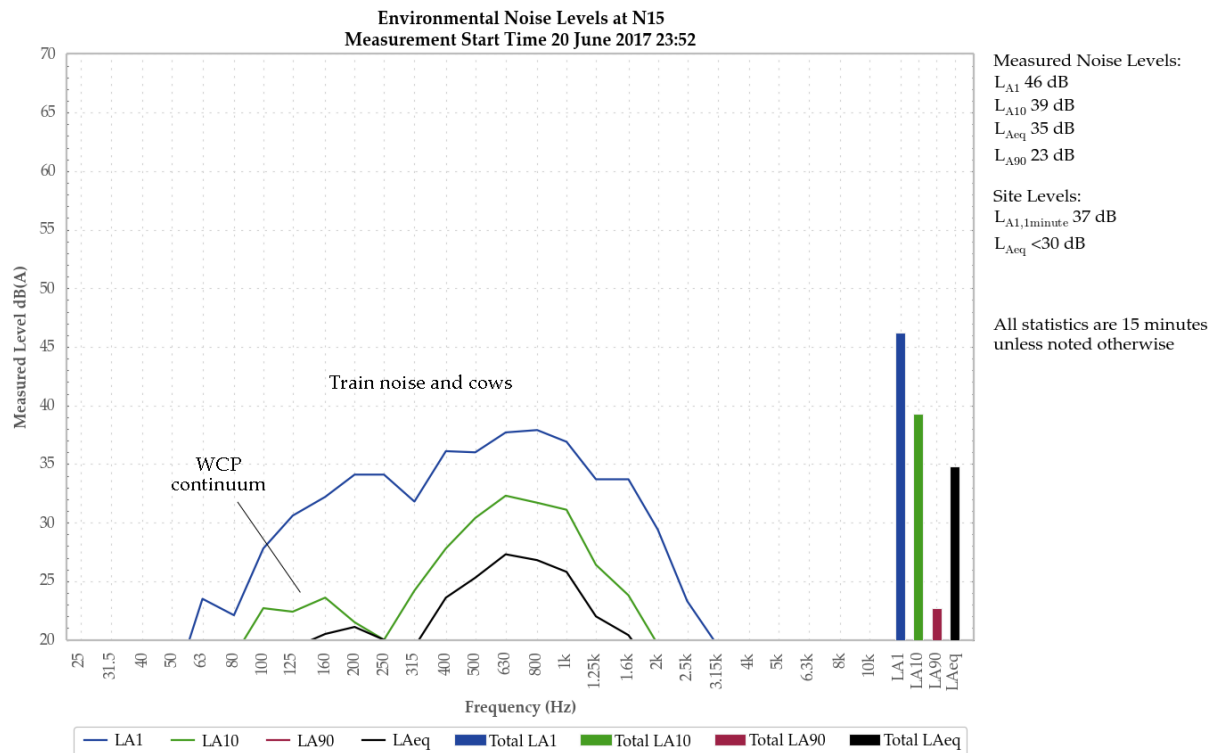


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

A continuum was audible from WCP throughout the measurement. Track noise was also noted at times. These sources generated the site only L_{Aeq} of less than 30 dB. A surge in the continuum generated the site only L_{A1,1minute} of 37 dB.

A train was primarily responsible for the measured L_{A1}, L_{A10} and L_{Aeq}. The WCP continuum, insects, and frogs generated the measured L_{A90}.

Cows were also noted.

5.1.5 N16, 21 June 2017

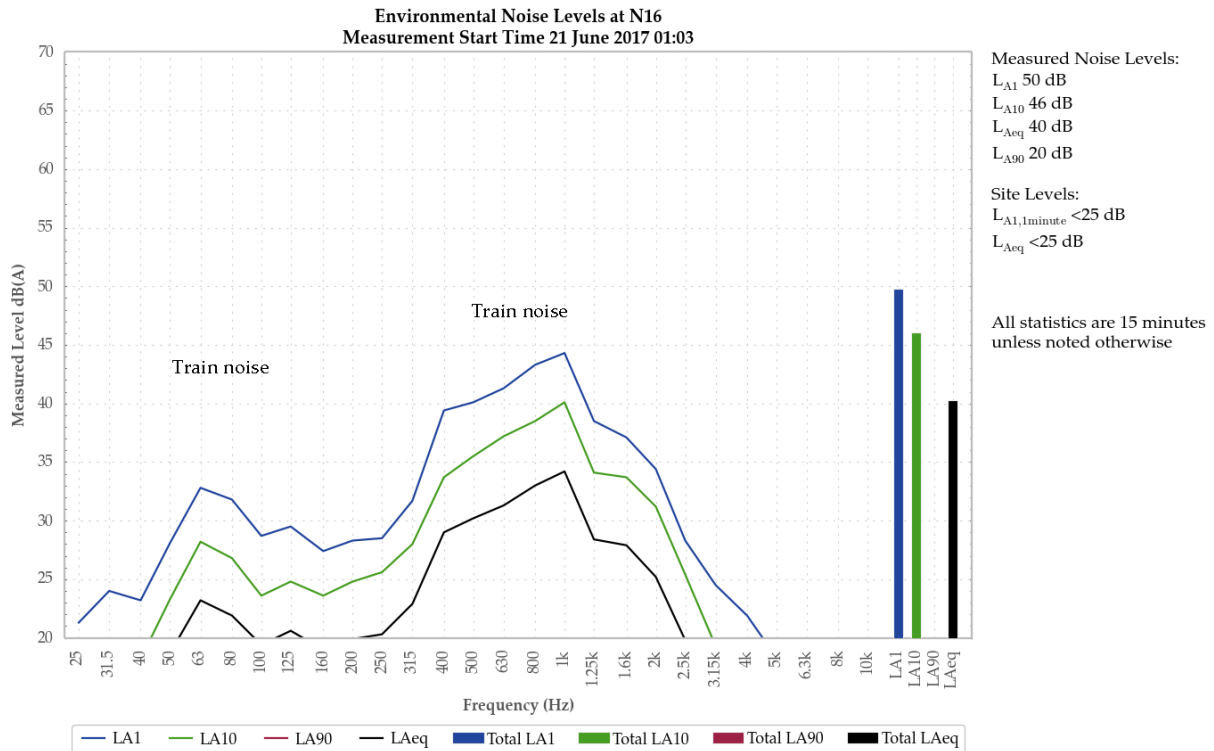


Figure 7: Environmental Noise Levels – N16, Araluen Road, off Ulan-Wollar Road

A low-level continuum was audible from WCP at times during the measurement, generating the site only LAeq and LA1,1minute of less than 25 dB.

Train noise generated the measured LA1, LA10 and LAeq. The continuum from WCP and the noise floor of the sound level meter contributed to the measured LA90.

Kangaroos, insects, and frogs were also noted.

5.1.6 N17, 21 June 2017

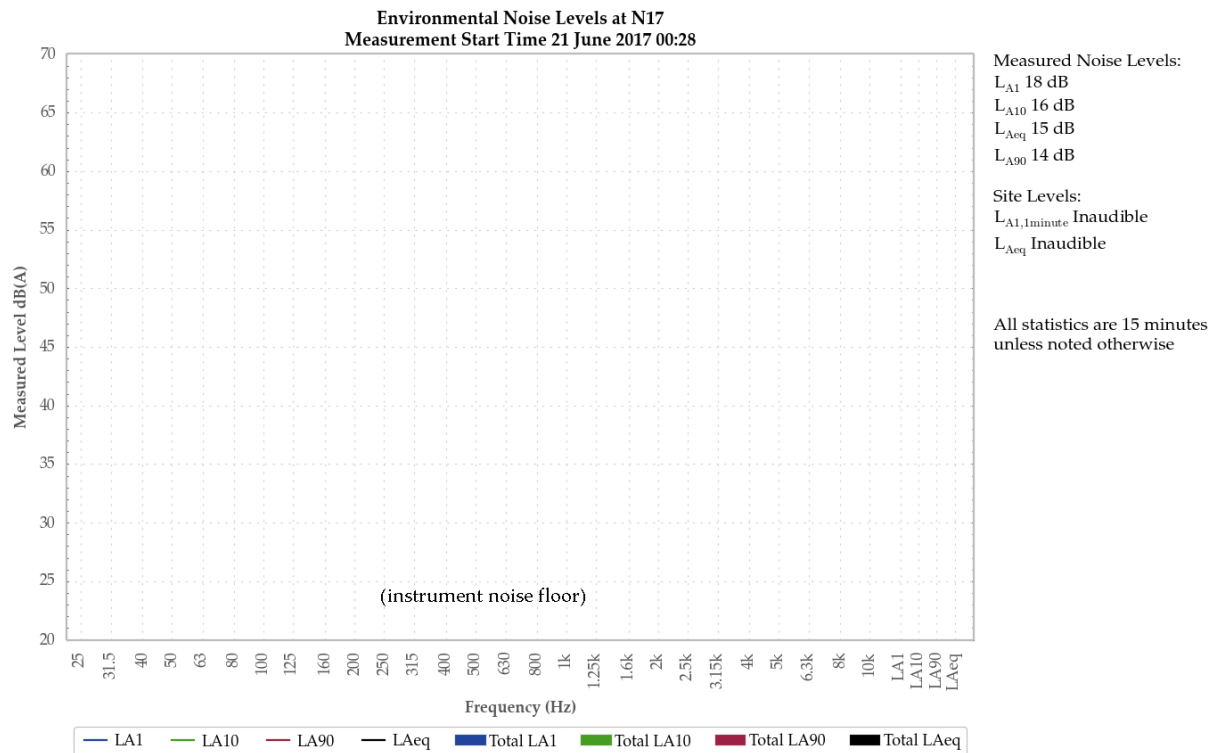


Figure 8: Environmental Noise Levels – N17, Mogo Road, off Araluen Road

WCP was inaudible.

Animals in foliage contributed to the measured LA1. The noise floor of the sound level meter was primarily responsible for all measured levels.

Birds were also noted.

5.1.7 N18, 20 June 2017

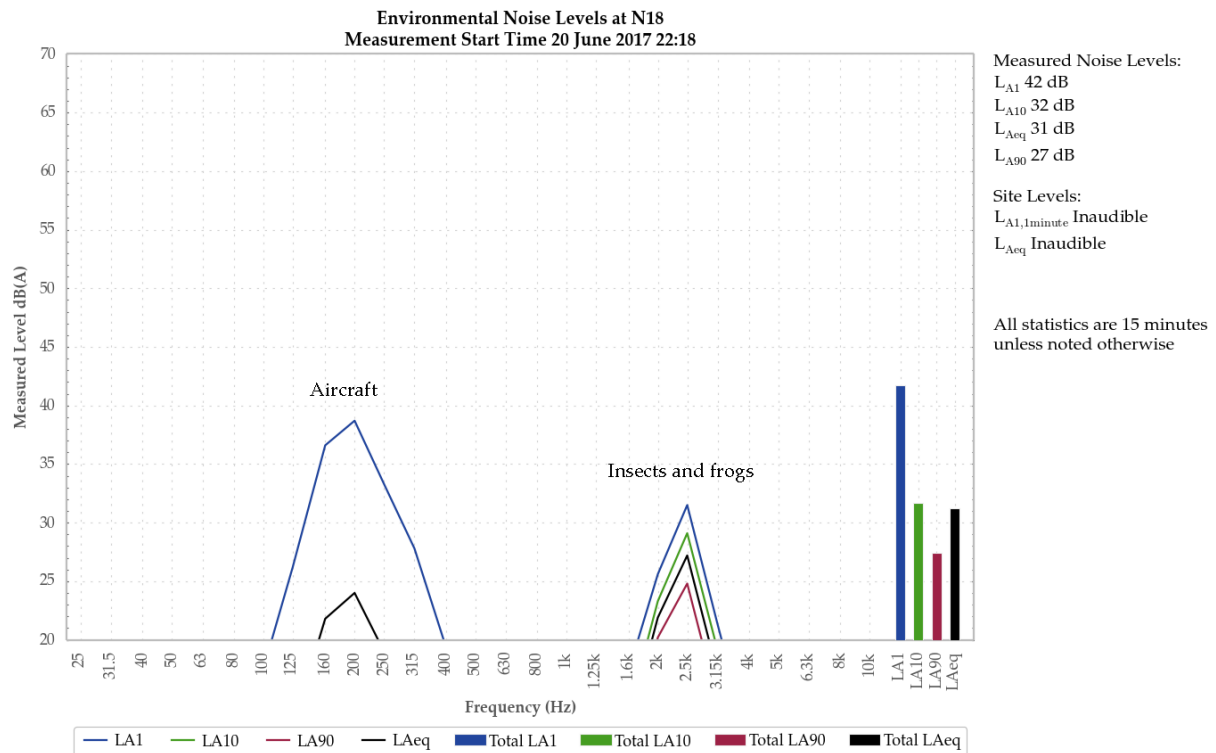


Figure 9: Environmental Noise Levels, N18 - Barigan Road, Barigan Valley

WCP was inaudible.

An aircraft generated the L_{A1} and contributed to the measured L_{A10}. Insects and frogs primarily generated the L_{A10} and were responsible for the L_{Aeq} and L_{A90}.

Dogs and nearby animals were also noted.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 20/21 June 2017. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the June 2017 monitoring period.

6.2 Low Frequency Assessment

During the June 2017 survey WCP complied with the relevant limits using the Broner and INP methods of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Project Approval

SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

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 5 – 6 of schedule 4.

Table 1: Land subject to acquisition upon request

30 – Gaffney

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

NOISE

Noise 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 at the other specified locations.

Table 2: Noise Impact assessment criteria dB(A)

Location	Day	Evening	Night	
	<i>L_{Aeq}(15 minute)</i>	<i>L_{Aeq}(15 minute)</i>	<i>L_{Aeq}(15 minute)</i>	<i>L_{A1}(1 minute)</i>
135	38	38	38	45
129 and 137	37	37	37	45
69	36	36	36	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		40 (internal) When in use		-
900 – St Laurence O’Toole Catholic Church				
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 10 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

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; and
- 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.

Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

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

Table 3: Land subject to additional noise mitigation upon request

Receiver ID
69, 129, 135 and 137

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

Operating Conditions

4. The Proponent shall:
 - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
 - (b) operate a comprehensive noise management system that uses a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day to day planning of mining operations, and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this approval;
 - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the project is complying with the relevant conditions of this approval, and publish these monitoring results on its website, to the satisfaction of the Director-General.

Noise Management Plan

5. The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
- (a) be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this approval; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this approval and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

APPENDIX 8 STATEMENT OF COMMITMENTS

Operational Noise

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) temperature inversion conditions greater than 3°C/100m

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Director-General directs otherwise.
5. Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

A.2 Environmental 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 January 2017.

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)
Wollar village	36	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
All other privately owned land (outside the village of Wollar)	35	35	35	45

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

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 3°C/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
- c) Temperature inversion conditions greater than 3°C/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.

R4 Other reporting conditions

R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the second round of quarterly monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:

- a) an assessment of compliance with noise limits presented in Condition L5.1; and
- b) an outline of any management actions taken within the monitoring period to address any exceedences of the limits contained in Condition L5.1.

A.3 Noise Monitoring Program

The relevant sections of the noise monitoring program for WCP dated May 2016 are reproduced below.

6 Noise Monitoring Program

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 4**. Unattended or real-time monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake attended monitoring at up to seven locations (**Table 5, Figure 3 and Figure 4**). Real-time units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 5: Noise Related Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Araluen Rd	N16	Attended Noise	778787.4	6417418.7	Location based on the nearest community structure to the East of the Mine
Mogo Rd	N17	Attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Barrigan Valley²	N18	Attended Noise	780033.3	6398618.1	DP&E Recommendation (MOD5) – Location approximately 20 km to the south of the Mine
WCPL Rail Loop		Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions

Wollar Village		Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine
Araluen Rd		Real-Time Noise - Fixed	778856.4	6417401.3	Location based on the nearest non-mine owned residence to the East of the Mine
Wandoona³		Real-Time Noise - Mobile	777684.4	6414786.2	Location based on the nearest non-mine owned residence to the South-East of the Mine

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 5** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&E and the EPA.

6.3 Attended Noise Monitoring

6.3.1 Purpose

Attended noise monitoring will be used to evaluate compliance against the Noise Criteria detailed in **Table 4**.

6.3.2 Summary

Attended noise will be undertaken in accordance with **Table 6**.

Table 6: Attended Noise Monitoring Summary

Element	Description
Locations	As per Table 5 , Figure 3 and Figure 4
Period	Night-time period (10 pm-7 am) being the most sensitive time period for noise.
Frequency	12 times per year and on one night per month

6.3.3 Methodology

Attended noise monitoring will be undertaken as outlined in **Table 6** by an independent acoustic consultant in accordance with the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the noise criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not

exceed the Noise Criteria, as defined in **Table 4**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA₁ measurement will be undertaken at 1 m from the dwelling façade and the LA_{eq} measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

6.3.5 Evaluation of Compliance

Tables 7 and **8** summarises the definition used by WCPL in this NMP for the evaluation of compliance with the Project Approval. The reporting requirements and actions that WCPL will take in the event of an exceedance or non-compliance are detailed in **Figure 5** and **Section 6.3.7**.

Table 7: Definition of an Exceedance

Term	Definition
Exceedance	An exceedance is deemed to have occurred when an attended noise monitoring result, taken in accordance with the INP and Project Approval, exceeds the Noise Criteria in Table 4 . The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6).
Non-compliance	A non-compliance is deemed to have occurred when a second attended noise monitoring result, taken within 75 minutes of an exceedance and in accordance with the INP and Project Approval, exceeds the Noise Criteria in Table 4 for a second time. The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6). Reporting requirements for a non-compliance are detailed in Section 6.3.7 .

6.3.6 Favourable Meteorological Conditions

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 3°C/100m.

Except for wind speed at microphone height, the data used for determining meteorological conditions will be that recorded by the meteorological station located on the Mine site.

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

6.3.7 Response to Non-Compliance or Exceedance

Where any non-compliance of the Noise Criteria has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the non-compliance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (**Section 9.1**);
- Implement remediation measures as directed by the Director-General; and
- Review and, if necessary, revise this Management Plan (**Section 10**), to the satisfaction of the Director-General.

APPENDIX

B CALIBRATION CERTIFICATES



**Acoustic
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Level 7 Building 2 423 Pennant Hills Rd
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Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
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Sound Level Meter
IEC 61672-3:2013

Calibration Certificate

Calibration Number C17248

Client Details	Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thornton NSW 2322
Equipment Tested/ Model Number :	Rion NA-28
Instrument Serial Number :	00701424
Microphone Serial Number :	01916
Pre-amplifier Serial Number :	01463
Pre-Test Atmospheric Conditions	Post-Test Atmospheric Conditions
Ambient Temperature : 24.3°C	Ambient Temperature : 24.4°C
Relative Humidity : 40%	Relative Humidity : 39.5%
Barometric Pressure : 100.05kPa	Barometric Pressure : 100kPa
Calibration Technician : Vicky Jaiswal	Secondary Check: Nick Williams
Calibration Date : 05/06/2017	Report Issue Date : 06/06/2017
Approved Signatory :	Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	Pass	17: Level linearity incl. the level range control	Pass
13: Electrical Sig. tests of frequency weightings	Pass	18: Toneburst response	Pass
14: Frequency and time weightings at 1 kHz	Pass	19: C Weighted Peak Sound Level	Pass
15: Long Term Stability	Pass	20: Overload Indication	Pass
16: Level linearity on the reference level range	Pass	21: High Level Stability	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement - Environmental Conditions			
Acoustic Tests		Temperature	±0.05°C
31.5 Hz to 8kHz	±0.16dB	Relative Humidity	±0.46%
12.5kHz	±0.2dB	Barometric Pressure	±0.017kPa
16kHz	±0.29dB		
Electrical Tests			
31.5 Hz to 20 kHz	±0.12dB		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172. Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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**Sound Calibrator
IEC 60942-2004**

Calibration Certificate

Calibration Number C17249

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322


Equipment Tested/ Model Number : Pulsar 106
Instrument Serial Number : 74813

Atmospheric Conditions

Ambient Temperature : 24.3°C
Relative Humidity : 38.9%
Barometric Pressure : 99.96kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017

Secondary Check: Nick Williams
Report Issue Date : 06/06/2017

Approved Signatory : 

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
5.2.2: Generated Sound Pressure Level	Pass	5.3.2: Frequency Generated	Pass
5.2.3: Short Term Fluctuation	Pass	5.5: Total Distortion	Pass

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	93.8	1000.33

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2004 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -			
Specific Tests		Environmental Conditions	
Generated SPL	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
Distortion	±0.5%		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025.

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Wilpinjong Coal

*Environmental Noise Monitoring
July 2017*

*Prepared for
Wilpinjong Coal Pty Ltd*

Global 
Acoustics

Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring July 2017

Reference: 17271_R01

Report date: 17 July 2017

Prepared for

Wilpinjong Coal Pty Ltd
Locked Bag 2005
Mudgee NSW 2850

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322



Prepared: Joel Curran
Acoustic Consultant

QA Review: Jesse Tribby
Scientist (Acoustics)

Global Acoustics Pty Ltd ~ Environmental noise modelling 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 Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

A modification (MOD7) to the WCP consent was approved in August 2016. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

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 night measurement was 15 minutes. Results of monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at seven locations during the night of 12/13 July 2017. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Operational Noise Assessment

WCP complied with relevant noise limits at all monitoring locations during the July 2017 monitoring.

Low Frequency Assessment

During the July 2017 survey, WCP complied with the relevant limits using the Broner and INP methods of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at seven locations during the night of 12/13 July 2017. Figure 1 shows the monitoring locations.

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

1.2 Monitoring Locations

There were seven 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: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road
N14	'Tichular', intersection of Tichular and Barigan Roads
N15	Track off Barigan Street near Wollar School, Wollar Village
N16	Araluen Road, off Ulan-Wollar Road
N17	Mogo Road, off Araluen Road
N18	Barigan Road, Barigan Valley

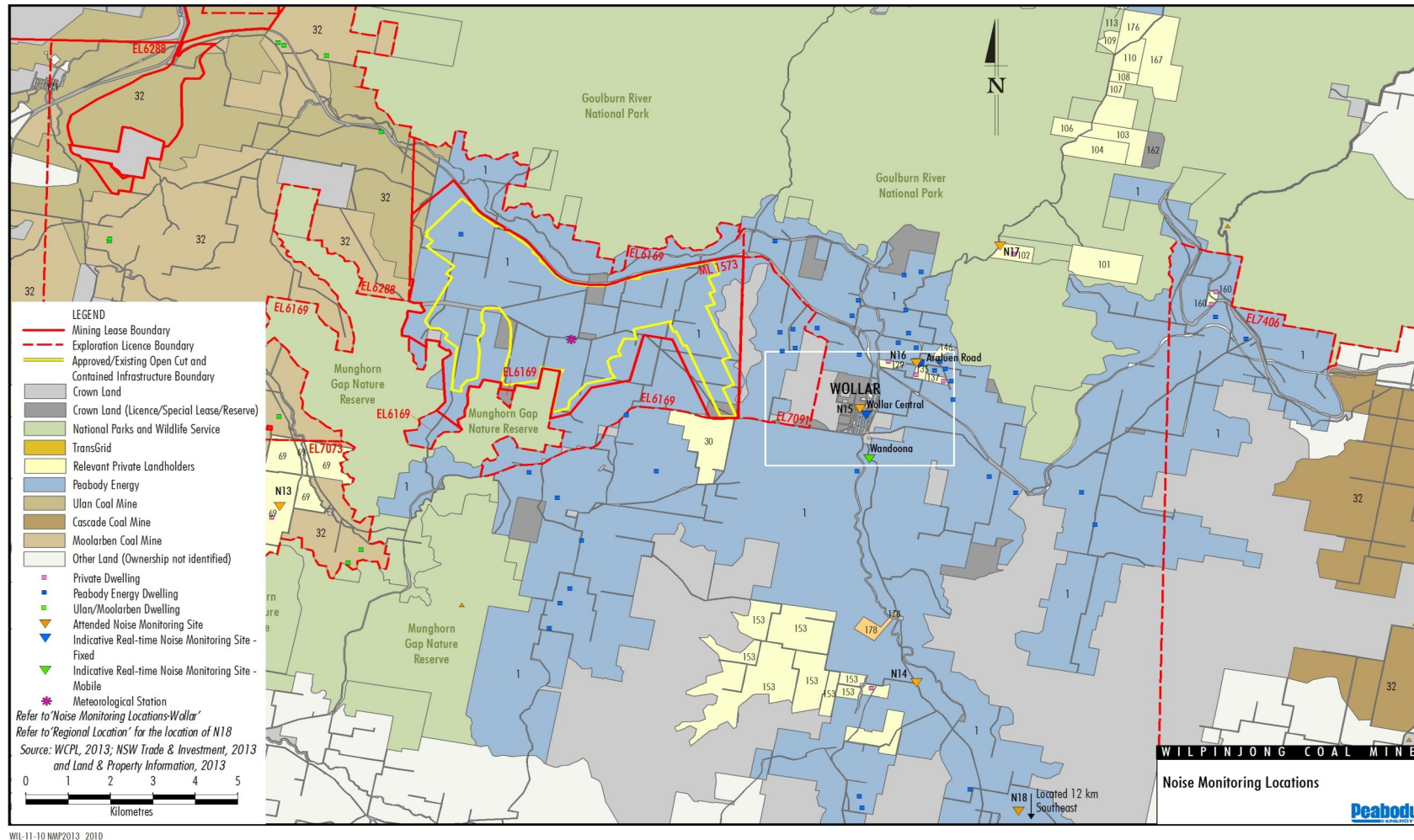


Figure 1: WCP Attended Noise Monitoring Locations

1.3 Terminology & Abbreviations

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

Table 1.2: TERMINOLOGY & ABBREVIATIONS

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
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
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, but could not be quantified
Day	This is the period 7:00am to 6:00pm
Evening	This is the period 6:00pm to 10:00pm
Night	This is the period 10:00pm to 7:00am

2 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in August 2016. The relevant noise conditions from the project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in January 2017. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in May 2016. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Approval Criteria and Weather Conditions

Criteria detailed in Table 2.1 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with Wilpinjong Coal Project.

Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- a) wind speeds greater than 3 m/s at 10m above ground level;
- b) temperature inversion conditions between 1.5°C and 3°C/100m and wind speeds greater than 2 m/s at 10m Barrigan above ground level; or
- c) temperature inversion conditions greater than 3°C/100m.

2.5 EPL Criteria and Weather Conditions

Criteria detailed in Table 2.2 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with Wilpinjong Coal Project.

Table 2.2: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

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 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.

2.6 Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

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.

2.6.1 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.

2.6.2 Low Frequency Noise

INP Method

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 site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more.*

Broner Method

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 site only C – weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

Low Frequency Assessment Method

Low frequency assessment methods are detailed in Table 2.3.

Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L_{Ceq}	>60	>65
INP	Site only L_{Ceq} minus site only L_{Aeq}	≥ 15	≥ 15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a Draft Industrial Noise Guideline (ING) was released in September 2015, low frequency noise results from WCP have been compared to the assessment methods and modifying factor triggers presented above. The applicability of these triggers have been considered when applying low frequency modifying factor corrections.

3 METHODOLOGY

3.1 Assessment Method

Attended monitoring was conducted in accordance with the EPA INP guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken. Monitoring is undertaken once per month at each location. The duration of each measurement was 15 minutes.

Attended monitoring during this reporting period was undertaken by Jesse Tribby.

If the exact contribution from WCP cannot be established, due to masking by other noise sources in a similar frequency range, but site noise levels are observed to be well below (more than 5 dB lower than) any relevant criterion, a maximum estimate of the potential contribution of the site might be made based on other measured site-only noise levels, for example, L_{A10} , L_{A50} or L_{A90} . This is generally expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may also be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means some noise was audible but could not be quantified. If site noise was NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the INP (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted as NM in this report are due to one or more of the following reasons:

- site noise levels were extremely low and unlikely, in many cases, to be even noticed;
- site noise levels were masked by another relatively loud noise source that is characteristic of the environment (e.g. breeze in foliage or continuous road traffic noise) that cannot be eliminated by moving closer; and/or
- it was not feasible or reasonable to employ INP methods such as move closer and back calculate. Cases may include, but are not limited to, rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

A measurement of $L_{A1,1\text{minute}}$ 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 a 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 $L_{A1,1\text{minute}}$ 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 noise from WCP was assessed by analysis of the measured L_{Aeq} spectrum.

3.2 Attended Noise 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: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	701424	05/06/2019
Pulsar 106 acoustic calibrator	74813	05/06/2019

4 RESULTS

4.1 Attended Noise Monitoring

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. 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 2017¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	12/07/2017 22:56	54	45	31	19	32	17	15	35
N13	13/07/2017 00:54	52	36	33	30	31	27	23	46
N14	12/07/2017 22:31	41	28	23	19	21	18	16	36
N15	12/07/2017 23:16	46	41	32	23	29	19	16	39
N16	13/07/2017 00:14	54	52	42	36	41	23	17	53
N17	12/07/2017 23:45	33	25	19	15	17	14	13	32
N18	12/07/2017 22:00	40	28	19	17	19	16	14	30

Note:

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

4.2 Project Approval and Weather Conditions

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines approval. Modifying factors are considered in Section 4.4.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – JULY 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	12/07/2017 22:56	0.0	6.8	35	No	IA	NA
N13	13/07/2017 00:54	0.6	3.6	36	No	29	NA
N14	12/07/2017 22:31	0.7	7.0	35	No	IA	NA
N15	12/07/2017 23:16	0.0	6.0	35	No	IA	NA
N16	13/07/2017 00:14	0.9	5.4	37	No	IA	NA
N17	12/07/2017 23:45	0.8	5.6	35	No	IA	NA
N18	12/07/2017 22:00	1.1	7.4	35	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

Table 4.3: $L_{A1,1minute}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – JULY 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{A1,1min}$ dB ^{4,5}	Exceedance ⁶
N6	12/07/2017 22:56	0.0	6.8	45	No	IA	NA
N13	13/07/2017 00:54	0.6	3.6	45	No	34	NA
N14	12/07/2017 22:31	0.7	7.0	45	No	IA	NA
N15	12/07/2017 23:16	0.0	6.0	45	No	IA	NA
N16	13/07/2017 00:14	0.9	5.4	45	No	IA	NA
N17	12/07/2017 23:45	0.8	5.6	45	No	IA	NA
N18	12/07/2017 22:00	1.1	7.4	45	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

4.3 EPL and Weather Conditions

Table 4.4 and Table 4.5 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines EPL.

Table 4.4: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – JULY 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	12/07/2017 22:56	0.0	6.8	35	No	IA	NA
N13	13/07/2017 00:54	0.6	3.6	35	No	29	NA
N14	12/07/2017 22:31	0.7	7.0	35	No	IA	NA
N15	12/07/2017 23:16	0.0	6.0	36	No	IA	NA
N16	13/07/2017 00:14	0.9	5.4	35	No	IA	NA
N17	12/07/2017 23:45	0.8	5.6	35	No	IA	NA
N18	12/07/2017 22:00	1.1	7.4	35	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

Table 4.5: *L_{A1,1minute}* GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – JULY 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP <i>L_{A1,1min}</i> dB ^{4,5}	Exceedance ⁶
N6	12/07/2017 22:56	0.0	6.8	45	No	IA	NA
N13	13/07/2017 00:54	0.6	3.6	45	No	34	NA
N14	12/07/2017 22:31	0.7	7.0	45	No	IA	NA
N15	12/07/2017 23:16	0.0	6.0	45	No	IA	NA
N16	13/07/2017 00:14	0.9	5.4	45	No	IA	NA
N17	12/07/2017 23:45	0.8	5.6	45	No	IA	NA
N18	12/07/2017 22:00	1.1	7.4	45	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

4.4 Low Frequency Assessment

Low frequency results for each monitoring location are presented in Table 4.6.

Table 4.6: LOW FREQUENCY NOISE MODIFYING FACTOR ASSESSMENT – JULY 2017

Location	Start Date and Time	WCP only LAeq dB ⁶	Broner low frequency modifying factor trigger dB ¹	Broner, Site only L _{Ceq} dB ^{2,5}	INP low frequency modifying factor trigger dB ³	INP, WCP only L _{Ceq} minus site only LAeq dB ^{4,5}	Comments
N6	12/07/2017 22:56	IA	>60	IA	≥15	IA	WCP inaudible
N13	13/07/2017 00:54	29	>60	NA	≥15	NA	WCP exhaust and engine/fan continuum
N14	12/07/2017 22:31	IA	>60	IA	≥15	IA	WCP inaudible
N15	12/07/2017 23:16	IA	>60	IA	≥15	IA	WCP inaudible
N16	13/07/2017 00:14	IA	>60	IA	≥15	IA	WCP inaudible
N17	12/07/2017 23:45	IA	>60	IA	≥15	IA	WCP inaudible
N18	12/07/2017 22:00	IA	>60	IA	≥15	IA	WCP inaudible

Notes:

1. Night L_{Ceq} modifying factor trigger as detailed in Broner (2010);
2. These are measured or calculated site only Broner C-weighted noise levels, NM denotes site levels were audible but not measurable, IA denotes site noise was inaudible. Where it is not possible to determine the site only Broner result due to the presence of other low frequency noise sources occurring during the measurement, or where MET excludes the measurement, this is noted as NA (not available) and no further assessment has been undertaken. Guidance is provided in the Comments column;
3. Low frequency modifying factor trigger as detailed in the INP;
4. These are measured or calculated site only INP results (site only L_{Ceq} minus site only LAeq), NM denotes site levels were audible but not measurable, IA denotes site noise was inaudible. Where it is not possible to determine the site only INP result due to the presence of other low frequency noise sources occurring during the measurement, or where MET excludes the measurement, this is noted as NA (not available) and no further assessment has been undertaken. Guidance is provided in the Comments column;
5. Bold results are greater than the relevant modifying factor trigger; and
6. WCP L_{Aeq,15minute} provided as a guide.

As detailed in Table 4.6, there were no low frequency correction triggers applied. No further analysis of low frequency noise was required.

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator at each location using a Kestrel hand-held weather meter is shown in Table 4.7. Atmospheric condition data is routinely recorded on a site-by-site basis to show conditions during the monitoring period. The wind speed, direction and temperature were measured at 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – JULY 2017

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	12/07/2017 22:56	2	0.3	120	0
N13	13/07/2017 00:54	4	1.2	180	0
N14	12/07/2017 22:31	4	-	-	0
N15	12/07/2017 23:16	3	0.3	330	0
N16	13/07/2017 00:14	3	0.3	130	0
N17	12/07/2017 23:45	7	-	-	0
N18	12/07/2017 22:00	3	0.5	130	0

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained concurrently by the WCP meteorological station is provided in Table 4.8 and is used to determine compliance with specified noise criteria.

Table 4.8: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees^{2,4}	Lapse Rate Degrees / 100 metres³
12/07/2017 22:00	0.4	255	7.2
12/07/2017 22:15	1.1	344	7.4
12/07/2017 22:30	0.7	343	7.0
12/07/2017 22:45	0.0	343	7.0
12/07/2017 23:00	0.0	343	6.8
12/07/2017 23:15	0.0	343	6.0
12/07/2017 23:30	0.0	343	6.0
12/07/2017 23:45	0.0	343	6.2
13/07/2017 00:00	0.8	334	5.6
13/07/2017 00:15	0.9	308	5.4
13/07/2017 00:30	0.0	308	4.2
13/07/2017 00:45	0.0	308	4.4
13/07/2017 01:00	0.6	100	3.6
13/07/2017 01:15	0.0	100	2.4
13/07/2017 01:30	0.0	100	3.2
13/07/2017 01:45	0.8	78	3.4
13/07/2017 02:00	0.6	341	4.4
13/07/2017 02:15	0.7	308	5.4
13/07/2017 02:30	0.6	328	4.8

Notes:

1. Data supplied by WCP; and
2. Lapse rate sourced from the WCP inversion tower.

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 to Table 4.5 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. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

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 Figure 3 to Figure 9 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 cut-off frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq} .

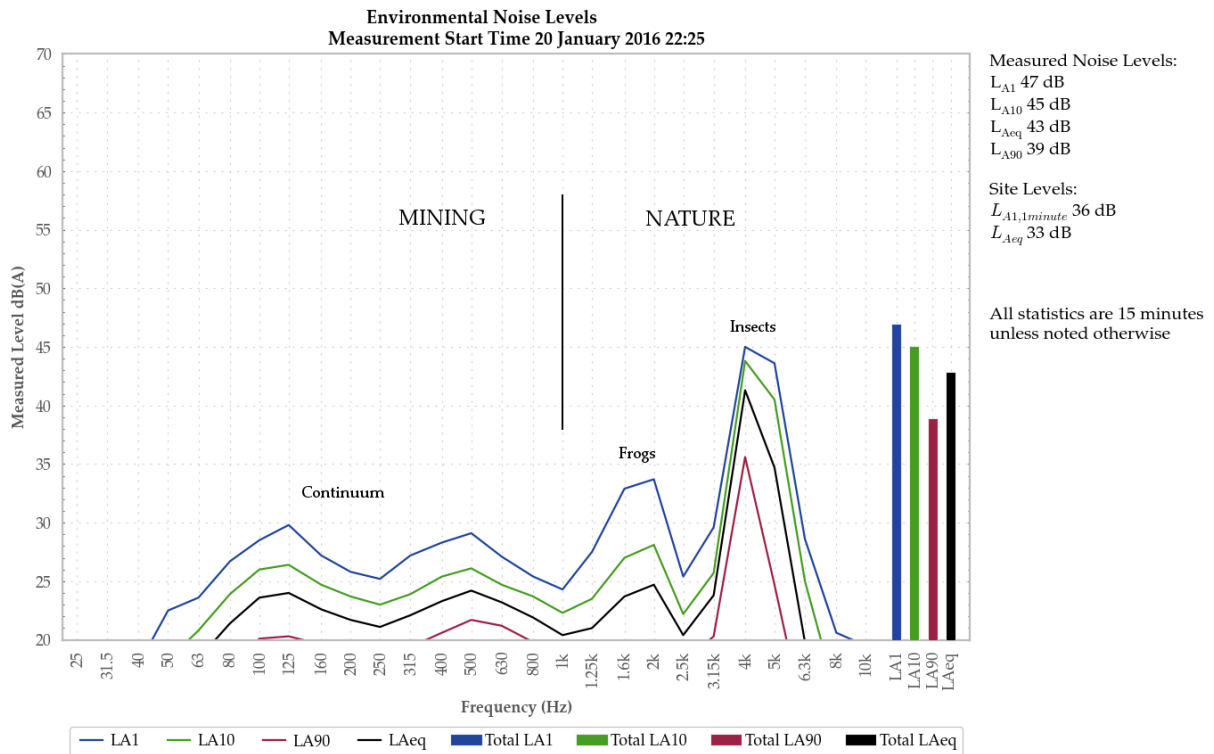


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6, 12 July 2017

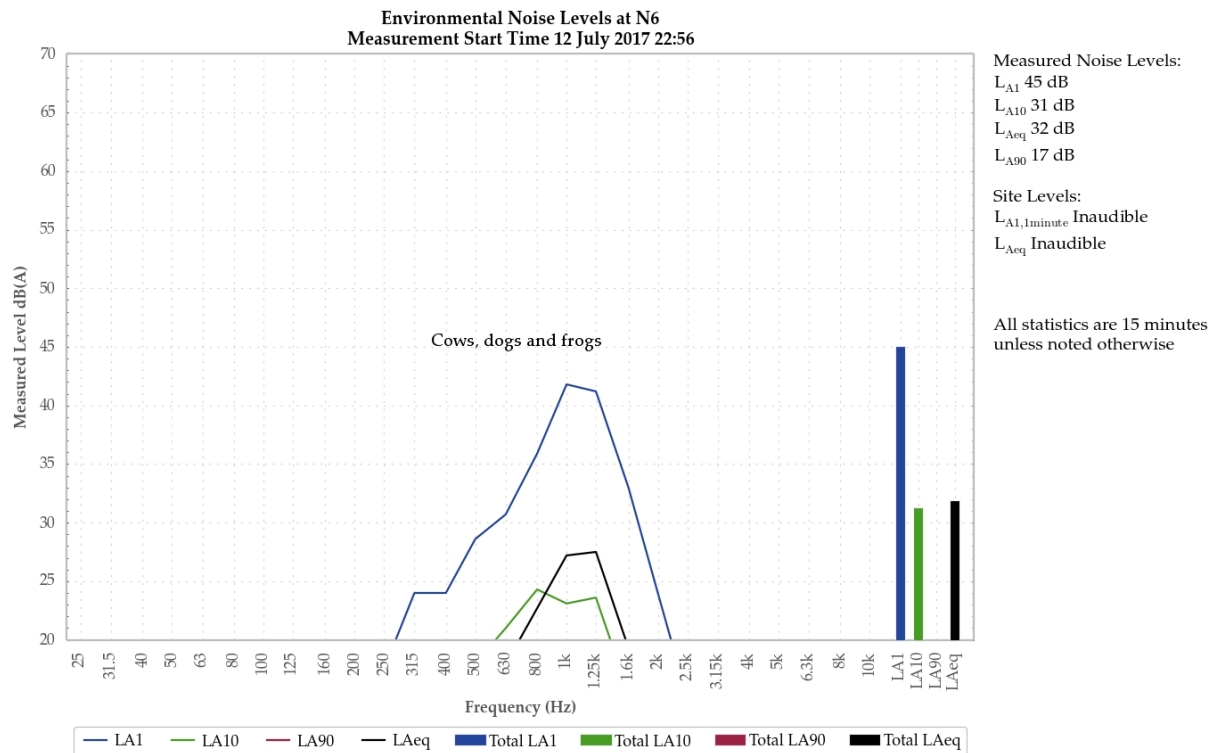


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

WCP was inaudible.

Cows and dogs generated the L_{Amax} , L_{A1} , L_{A10} and L_{Aeq} . Frogs and the noise floor of the measurement instrument contributed to the L_{A90} .

5.1.2 N13, 13 July 2017

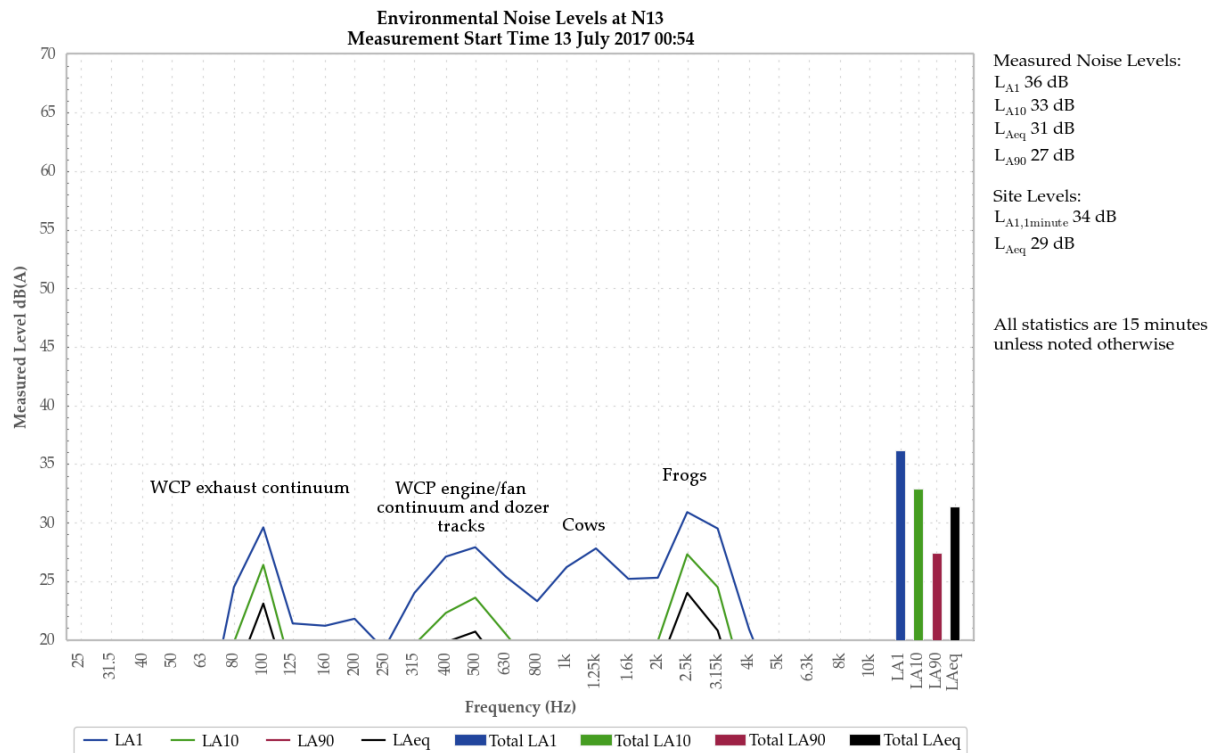


Figure 4: Environmental Noise Levels – N13, 'Coonaroo' off Moolarben Road

An exhaust and engine/fan continuum from WCP was audible throughout the measurement, generating the site only LAeq of 29 dB. Impact noise generated the site only LA1,1minute of 34 dB. Track noise was also noted.

Cows generated the LAmax and contributed to the LA1 and LAeq. WCP and frogs contributed to the LA1, LA10, LAeq and LA90.

Bats were also noted.

5.1.3 N14, 12 July 2017

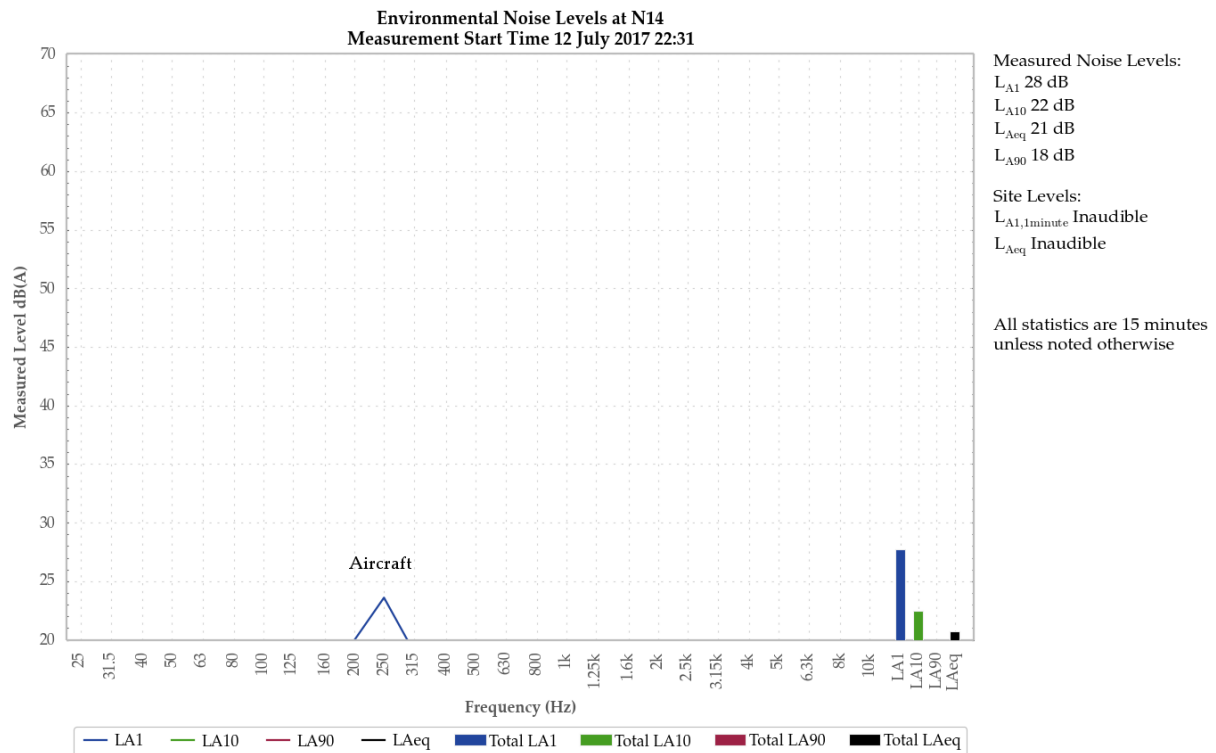


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

WCP was inaudible.

Aircraft generated the LAmax, LA1 and LA10 and contributed to the LAeq. Frogs and a local power substation contributed to the LAeq and LA90. The noise floor of the measurement instrument contributed to the LAeq and LA90.

5.1.4 N15, 12 July 2017

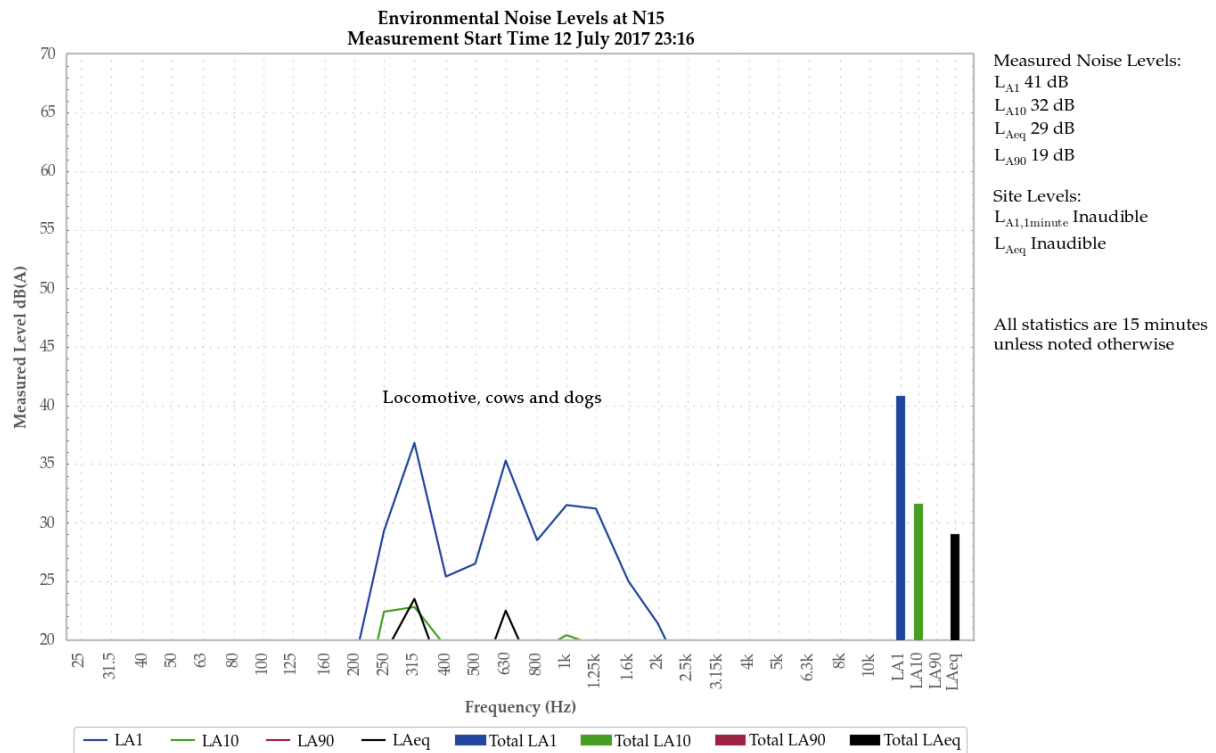


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

WCP was inaudible.

A train was primarily responsible for the measured LA1, LA10 and LAeq. Cows and dogs contributed to the LA1, LA10 and LAeq. A local town continuum combined with the noise floor of the measurement instrument to generate the LA90.

5.1.5 N16, 13 July 2017

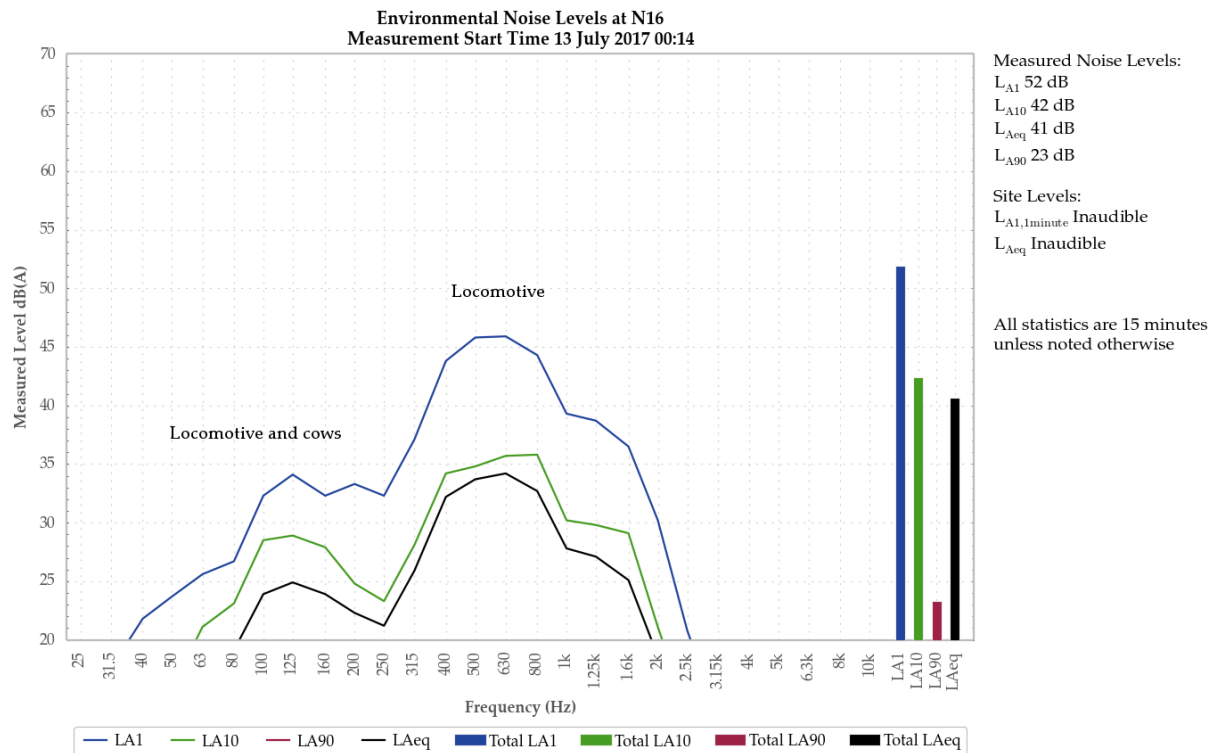


Figure 7: Environmental Noise Levels – N16, Araluen Road, off Ulan-Wollar Road

WCP was inaudible.

A locomotive was responsible for all measured noise levels.

Cows were also noted.

5.1.6 N17, 12 July 2017

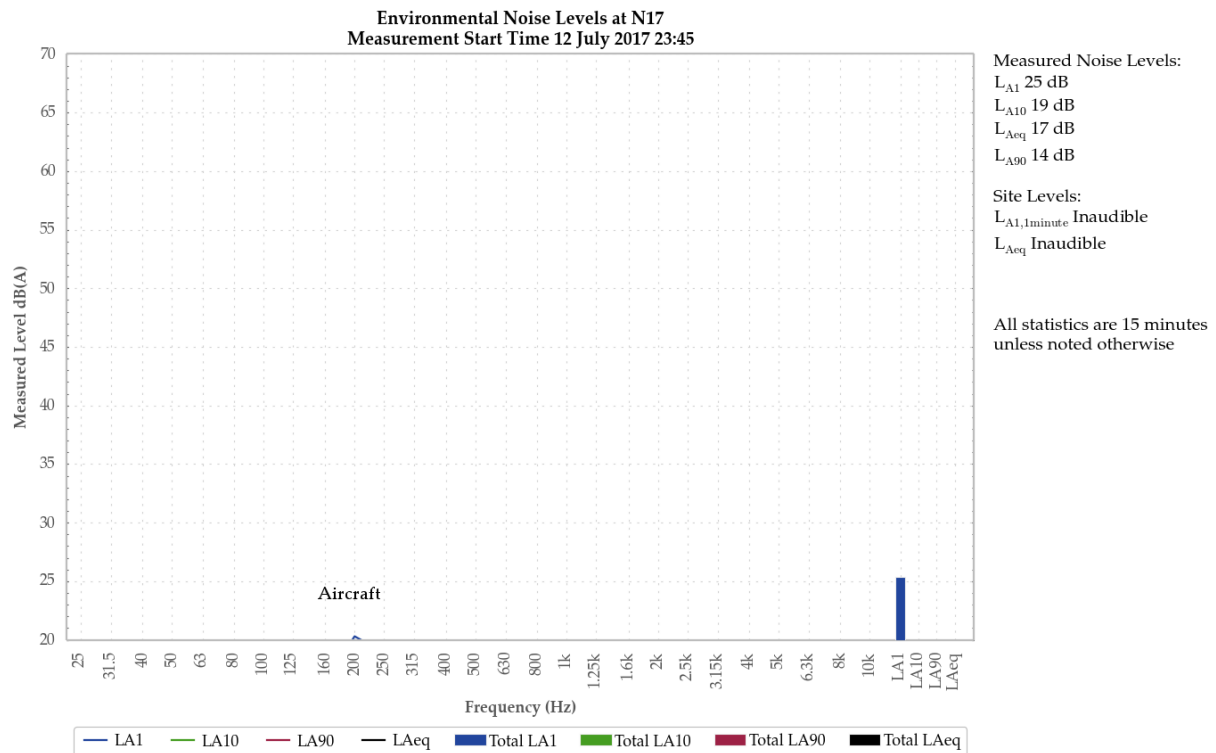


Figure 8: Environmental Noise Levels – N17, Mogo Road, off Araluen Road

WCP was inaudible.

Aircraft generated the LAmax, LA1, LA10 and contributed to the LAeq. The noise floor of the measurement instrument contributed to the measured LA10 and LAeq, and generated the LA90.

5.1.7 N18, 12 July 2017

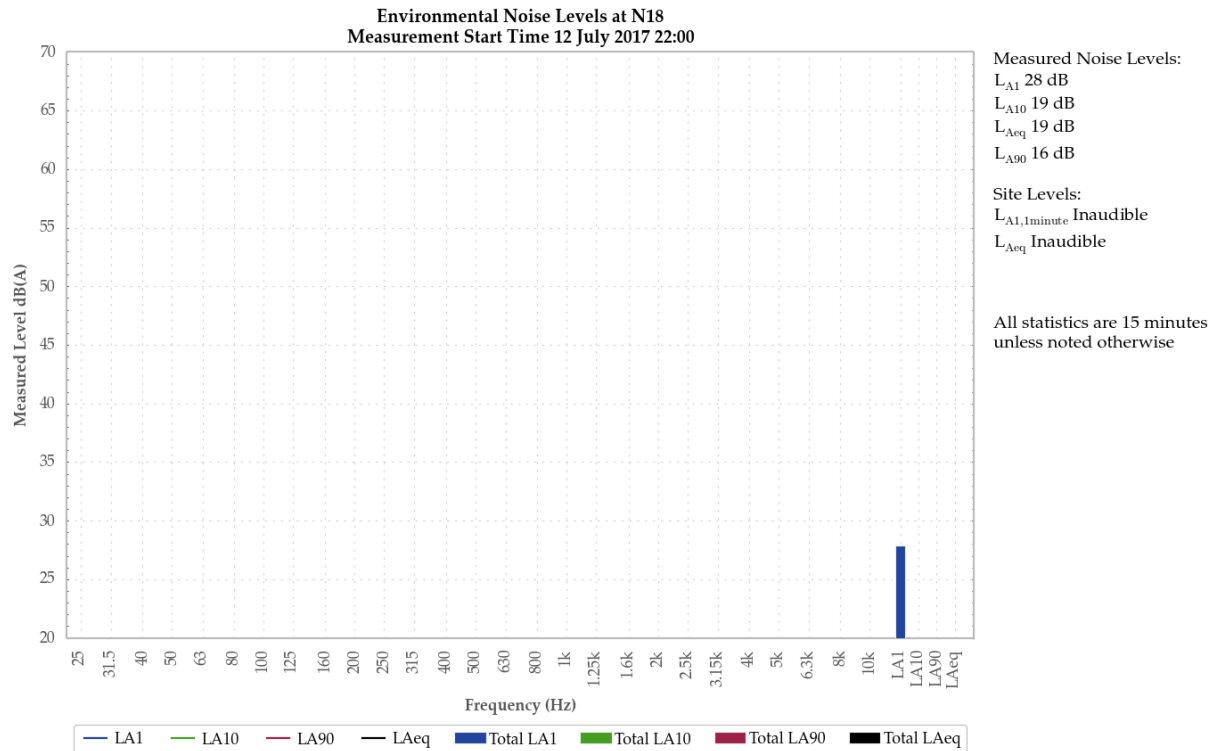


Figure 9: Environmental Noise Levels, N18 - Barigan Road, Barigan Valley

WCP was inaudible.

A bull generated the LAmax. Frogs generated the LA1 and contributed to the LA10, LAeq and LA90. The noise floor of the measurement instrument contributed to the measured LA10, LAeq and LA90.

Birds and a bull were also noted.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 12/13 July 2017. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the July 2017 monitoring period.

6.2 Low Frequency Assessment

During the July 2017 survey WCP complied with the relevant limits using the Broner and INP methods of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

APPENDIX

A *STATUTORY REQUIREMENTS*

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Project Approval

SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

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 5 – 6 of schedule 4.

Table 1: Land subject to acquisition upon request

30 – Gaffney

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

NOISE

Noise 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 at the other specified locations.

Table 2: Noise Impact assessment criteria dB(A)

Location	Day	Evening	Night	
	<i>L_{Aeq}(15 minute)</i>	<i>L_{Aeq}(15 minute)</i>	<i>L_{Aeq}(15 minute)</i>	<i>L_{A1}(1 minute)</i>
135	38	38	38	45
129 and 137	37	37	37	45
69	36	36	36	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		40 (internal) When in use		-
900 – St Laurence O’Toole Catholic Church				
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 10 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

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; and
- 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.

Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

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

Table 3: Land subject to additional noise mitigation upon request

<i>Receiver ID</i>
<i>69, 129, 135 and 137</i>

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

Operating Conditions

4. The Proponent shall:
 - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
 - (b) operate a comprehensive noise management system that uses a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day to day planning of mining operations, and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this approval;
 - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the project is complying with the relevant conditions of this approval, and publish these monitoring results on its website, to the satisfaction of the Director-General.

Noise Management Plan

5. The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
- (a) be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this approval; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this approval and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

APPENDIX 8 STATEMENT OF COMMITMENTS

Operational Noise

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) temperature inversion conditions greater than 3°C/100m

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Director-General directs otherwise.
5. Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

A.2 Environmental 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 January 2017.

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)
Wollar village	36	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
All other privately owned land (outside the village of Wollar)	35	35	35	45

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

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 3°C/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
- c) Temperature inversion conditions greater than 3°C/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.

R4 Other reporting conditions

R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the second round of quarterly monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:

- a) an assessment of compliance with noise limits presented in Condition L5.1; and
- b) an outline of any management actions taken within the monitoring period to address any exceedences of the limits contained in Condition L5.1.

A.3 Noise Monitoring Program

The relevant sections of the noise monitoring program for WCP dated May 2016 are reproduced below.

6 Noise Monitoring Program

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 4**. Unattended or real-time monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake attended monitoring at up to seven locations (**Table 5, Figure 3 and Figure 4**). Real-time units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 5: Noise Related Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Araluen Rd	N16	Attended Noise	778787.4	6417418.7	Location based on the nearest community structure to the East of the Mine
Mogo Rd	N17	Attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Barrigan Valley²	N18	Attended Noise	780033.3	6398618.1	DP&E Recommendation (MOD5) – Location approximately 20 km to the south of the Mine
WCPL Rail Loop		Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions

Wollar Village		Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine
Araluen Rd		Real-Time Noise - Fixed	778856.4	6417401.3	Location based on the nearest non-mine owned residence to the East of the Mine
Wandoona³		Real-Time Noise - Mobile	777684.4	6414786.2	Location based on the nearest non-mine owned residence to the South-East of the Mine

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 5** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&E and the EPA.

6.3 Attended Noise Monitoring

6.3.1 Purpose

Attended noise monitoring will be used to evaluate compliance against the Noise Criteria detailed in **Table 4**.

6.3.2 Summary

Attended noise will be undertaken in accordance with **Table 6**.

Table 6: Attended Noise Monitoring Summary

Element	Description
Locations	As per Table 5 , Figure 3 and Figure 4
Period	Night-time period (10 pm-7 am) being the most sensitive time period for noise.
Frequency	12 times per year and on one night per month

6.3.3 Methodology

Attended noise monitoring will be undertaken as outlined in **Table 6** by an independent acoustic consultant in accordance with the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the noise criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not

exceed the Noise Criteria, as defined in **Table 4**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA₁ measurement will be undertaken at 1 m from the dwelling façade and the LA_{eq} measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

6.3.5 Evaluation of Compliance

Tables 7 and 8 summarises the definition used by WCPL in this NMP for the evaluation of compliance with the Project Approval. The reporting requirements and actions that WCPL will take in the event of an exceedance or non-compliance are detailed in Figure 5 and Section 6.3.7.

Table 7: Definition of an Exceedance

Term	Definition
Exceedance	An exceedance is deemed to have occurred when an attended noise monitoring result, taken in accordance with the INP and Project Approval, exceeds the Noise Criteria in Table 4 . The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6).
Non-compliance	A non-compliance is deemed to have occurred when a second attended noise monitoring result, taken within 75 minutes of an exceedance and in accordance with the INP and Project Approval, exceeds the Noise Criteria in Table 4 for a second time. The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6). Reporting requirements for a non-compliance are detailed in Section 6.3.7 .

6.3.6 Favourable Meteorological Conditions

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 3°C/100m.

Except for wind speed at microphone height, the data used for determining meteorological conditions will be that recorded by the meteorological station located on the Mine site.

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

6.3.7 Response to Non-Compliance or Exceedance

Where any non-compliance of the Noise Criteria has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the non-compliance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (**Section 9.1**);
- Implement remediation measures as directed by the Director-General; and
- Review and, if necessary, revise this Management Plan (**Section 10**), to the satisfaction of the Director-General.

APPENDIX

B CALIBRATION CERTIFICATES



**Acoustic
Research
Labs Pty Ltd**

Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3:2013

Calibration Certificate

Calibration Number C17248

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 00701424
Microphone Serial Number : 01916
Pre-amplifier Serial Number : 01463

Pre-Test Atmospheric Conditions
Ambient Temperature : 24.3°C
Relative Humidity : 40%
Barometric Pressure : 100.05kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 24.4°C
Relative Humidity : 39.5%
Barometric Pressure : 100kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017

Secondary Check: Nick Williams
Report Issue Date : 06/06/2017

Approved Signatory :

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	Pass	17: Level linearity incl. the level range control	Pass
13: Electrical Sig. tests of frequency weightings	Pass	18: Toneburst response	Pass
14: Frequency and time weightings at 1 kHz	Pass	19: C Weighted Peak Sound Level	Pass
15: Long Term Stability	Pass	20: Overload Indication	Pass
16: Level linearity on the reference level range	Pass	21: High Level Stability	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement - Environmental Conditions			
Acoustic Tests		Temperature	±0.05°C
31.5 Hz to 8kHz	±0.16dB	Relative Humidity	±0.46%
12.5kHz	±0.2dB	Barometric Pressure	±0.017kPa
16kHz	±0.29dB		
Electrical Tests			
31.5 Hz to 20 kHz	±0.12dB		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172. Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

PAGE 1 OF 1



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**Sound Calibrator
IEC 60942-2004**

Calibration Certificate

Calibration Number C17249

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Pulsar 106
Instrument Serial Number : 74813

Atmospheric Conditions

Ambient Temperature : 24.3°C
Relative Humidity : 38.9%
Barometric Pressure : 99.96kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017

Secondary Check: Nick Williams
Report Issue Date : 06/06/2017

Approved Signatory : 

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
5.2.2: Generated Sound Pressure Level	Pass	5.3.2: Frequency Generated	Pass
5.2.3: Short Term Fluctuation	Pass	5.5: Total Distortion	Pass

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	93.8	1000.33

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2004 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed..

Specific Tests

Generated SPL ±0.11dB
Short Term Fluct. ±0.02dB
Frequency ±0.01%
Distortion ±0.5%

Least Uncertainties of Measurement -

Environmental Conditions

Temperature ±0.05°C
Relative Humidity ±0.46%
Barometric Pressure ±0.017kPa

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025.

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PAGE 1 OF 1

Wilpinjong Coal

*Environmental Noise Monitoring
August 2017*

*Prepared for
Wilpinjong Coal Pty Ltd*



Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring August 2017

Reference: 17311_R01

Report date: 31 August 2017

Prepared for

Wilpinjong Coal Pty Ltd

Locked Bag 2005

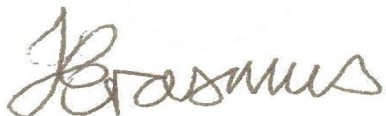
Mudgee NSW 2850

Prepared by

Global Acoustics Pty Ltd

PO Box 3115

Thornton NSW 2322



Prepared: Jonathan Erasmus
Acoustics Technician

QA Review: Amanda Borserio
Environmental Scientist (Acoustics)

Global Acoustics Pty Ltd ~ Environmental noise modelling 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

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ABN 94 094 985 734

EXECUTIVE SUMMARY

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

A modification (MOD7) to the WCP consent was approved in August 2016. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

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 night measurement was 15 minutes. Results of monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at seven locations during the night period of 9/10 August 2017. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Operational Noise Assessment

WCP complied with relevant noise limits at all monitoring locations during the August 2017 monitoring.

Low Frequency Assessment

During the August 2017 survey, WCP complied with the relevant limits using the Broner, INP and ING methods of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at seven locations during the night period of 9/10 August 2017. Figure 1 shows the monitoring locations.

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

1.2 Monitoring Locations

There were seven 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: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road
N14	'Tichular', intersection of Tichular and Barigan Roads
N15	Track off Barigan Street near Wollar School, Wollar Village
N16	Araluen Road, off Ulan-Wollar Road
N17	Mogo Road, off Araluen Road
N18	Barigan Road, Barigan Valley

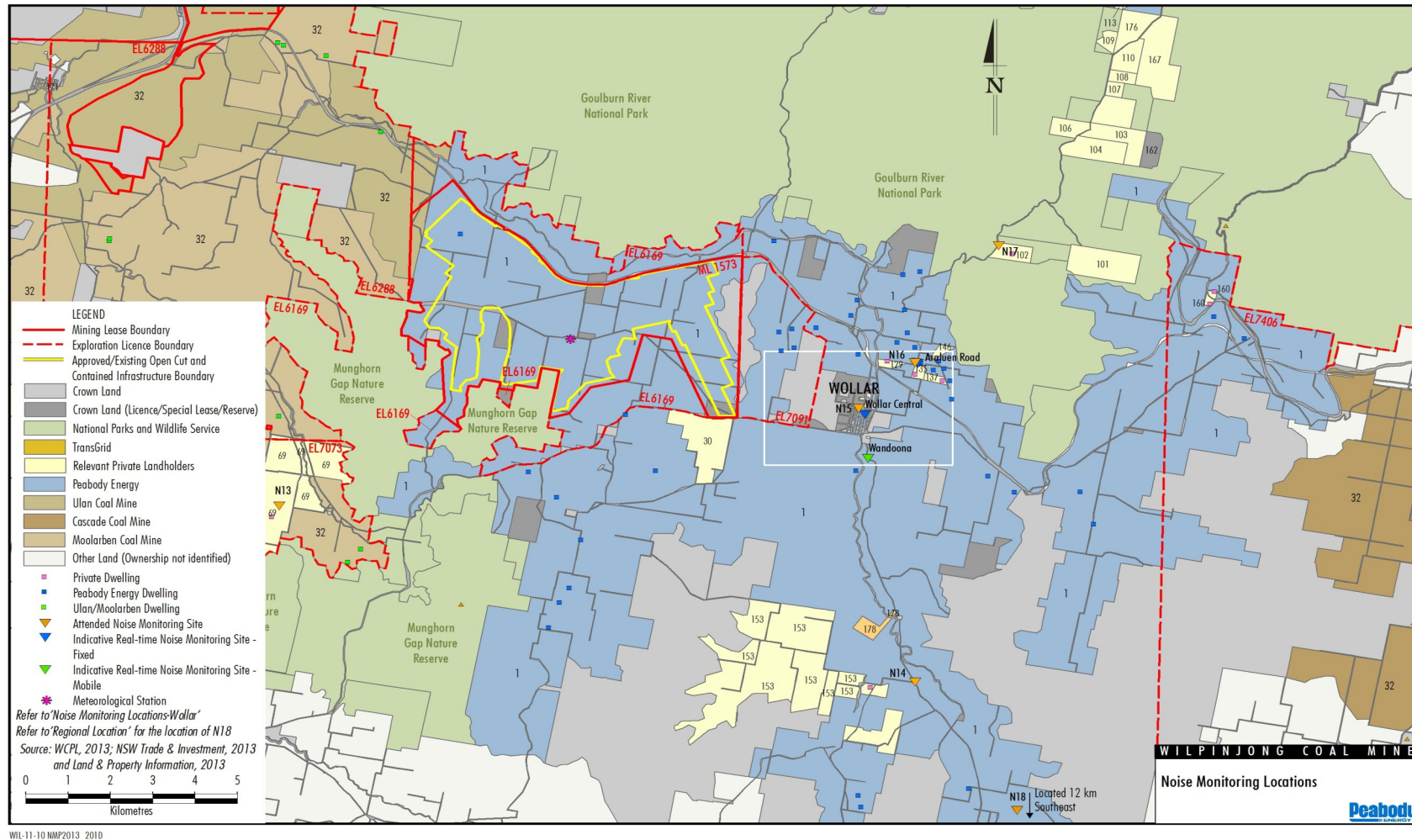


Figure 1: WCP Attended Noise Monitoring Locations

1.3 Terminology & Abbreviations

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

Table 1.2: TERMINOLOGY & ABBREVIATIONS

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
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
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, but could not be quantified
Day	This is the period 7:00am to 6:00pm
Evening	This is the period 6:00pm to 10:00pm
Night	This is the period 10:00pm to 7:00am

2 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in August 2016. The relevant noise conditions from the project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in January 2017. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in May 2016. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Approval Criteria and Weather Conditions

Criteria detailed in Table 2.1 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with Wilpinjong Coal Project.

Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- a) wind speeds greater than 3 m/s at 10m above ground level;
- b) temperature inversion conditions between 1.5°C and 3°C/100m and wind speeds greater than 2 m/s at 10m Barrigan above ground level; or
- c) temperature inversion conditions greater than 3°C/100m.

2.5 EPL Criteria and Weather Conditions

Criteria detailed in Table 2.2 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with Wilpinjong Coal Project.

Table 2.2: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

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 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.

2.6 Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

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.

2.6.1 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.

2.6.2 Low Frequency Noise

INP Method

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 site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more.*

Broner Method

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 site only C - weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

dING Method

Whilst the INP is the current document for assessment of industrial noise impact in NSW, the EPA has recently published the Draft Industrial Noise Guideline (dING), which is currently under review after a period of public consultation. The dING contains an alternate method of assessing low frequency noise to the INP, which is:

Measure/assess C-weighted and A-weighted $L_{eq,T}$ levels over the same time period. The low frequency noise modifying factor correction is to be applied where the C-A level exceeds 15 dB and:

- *where any of the 1/3 octave noise levels in Table C2 are exceeded by **up to 5 dB** and cannot be mitigated, a 2 dBA positive adjustment to measured A weighted levels applies for the evening/night period; and*
- *where any of the 1/3 octave noise levels in Table C2 are exceeded by **more than 5 dB** and cannot be mitigated, a 5 dBA positive adjustment to measured A weighted levels applies for the evening/night period and a 2 dBA positive adjustment applies for the daytime period.*

Table C2 of the dING is reproduced below:

Table C2: One-third octave low frequency noise thresholds

Hz/dB(Z)	One-third octave $L_{Zeq,15minute}$ threshold level												
f,Hz	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

Note: dB(z) = decibel (Z-weighted); f,Hz = frequency in Hertz; Hz/dB(Z) = hertz per decibel (Z-weighted). For the assessment of low frequency noise, care should be taken to select a wind screen that has wind-induced noise characteristics at least 10 dB below the threshold values in Table C2 for wind speeds up to 5 metres per second. It is likely that high performance larger diameter wind screens (nominally 175 mm) will be required to achieve this performance (Hessler et.al. 2008). In any case, the performance of the wind screen and wind speeds at which data will be excluded needs to be stated.

Low frequency noise shall be assessed under the meteorological conditions under which noise limits would apply.

Measurements should be made between 1.2 and 1.5 metres above ground level unless otherwise approved through a planning instrument (consent/approval) or Environment Protection Licence and at locations nominated in the development consent or license.

2.6.3 Low Frequency Assessment Methods

Low frequency assessment methods are detailed in Table 2.3.

Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFYING FACTOR TRIGGERS

Assessment Method	Calculation Method
Broner, 2010	Site only L_{Ceq}
INP	Site only L_{Ceq} minus site only L_{Aeq}
dING	1. Site only L_{Ceq} minus site only L_{Aeq} 2. One third octave low frequency noise threshold

Triggers and penalties associated with each method are outlined in Section 2.6.2.

3 METHODOLOGY

3.1 Assessment Method

Attended monitoring was conducted in accordance with the EPA INP guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken. Monitoring is undertaken once per month at each location. The duration of each measurement was 15 minutes.

Attended monitoring during this reporting period was undertaken by Jonathan Erasmus.

If the exact contribution from WCP cannot be established, due to masking by other noise sources in a similar frequency range, but site noise levels are observed to be well below (more than 5 dB lower than) any relevant criterion, a maximum estimate of the potential contribution of the site might be made based on other measured site-only noise levels, for example, L_{A10} , L_{A50} or L_{A90} . This is generally expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may also be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means some noise was audible but could not be quantified. If site noise was NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the INP (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted as NM in this report are due to one or more of the following reasons:

- site noise levels were extremely low and unlikely, in many cases, to be even noticed;
- site noise levels were masked by another relatively loud noise source that is characteristic of the environment (e.g. breeze in foliage or continuous road traffic noise) that cannot be eliminated by moving closer; and/or
- it was not feasible or reasonable to employ INP methods such as move closer and back calculate. Cases may include, but are not limited to, rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

A measurement of $L_{A1,1\text{minute}}$ 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 a 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 $L_{A1,1\text{minute}}$ 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 noise from WCP was assessed by analysis of the measured L_{Aeq} spectrum.

3.2 Attended Noise 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: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	30131882	14/03/2019
Pulsar 105 acoustic calibrator	78226	14/03/2019

4 RESULTS

4.1 Attended Noise Monitoring

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. 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 – AUGUST 2017¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	09/08/2017 23:18	50	36	31	26	28	25	23	43
N13	10/08/2017 01:15	51	37	31	27	29	24	21	47
N14	09/08/2017 23:45	42	32	25	22	24	21	20	42
N15	09/08/2017 22:59	45	35	31	29	30	27	25	46
N16	09/08/2017 22:33	42	34	31	28	29	26	24	49
N17	09/08/2017 22:04	46	33	25	19	23	18	17	40
N18	10/08/2017 00:18	44	36	27	20	25	18	16	41

Note:

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

4.2 Project Approval and Weather Conditions

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines approval. Modifying factors are considered in Section 4.4.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – AUGUST 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	09/08/2017 23:18	0.0	4.4	35	No	<20	NA
N13	10/08/2017 01:15	0.0	4.2	36	No	IA	NA
N14	09/08/2017 23:45	0.0	4.2	35	No	IA	NA
N15	09/08/2017 22:59	0.0	3.4	35	No	27	NA
N16	09/08/2017 22:33	0.0	4.4	37	No	28	NA
N17	09/08/2017 22:04	0.0	4.6	35	No	<20	NA
N18	10/08/2017 00:18	0.0	5.4	35	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

Table 4.3: LA1,1minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – AUGUST 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP LA1,1min dB ^{4,5}	Exceedance ⁶
N6	09/08/2017 23:18	0.0	4.4	45	No	<20	NA
N13	10/08/2017 01:15	0.0	4.2	45	No	IA	NA
N14	09/08/2017 23:45	0.0	4.2	45	No	IA	NA
N15	09/08/2017 22:59	0.0	3.4	45	No	30	NA
N16	09/08/2017 22:33	0.0	4.4	45	No	32	NA
N17	09/08/2017 22:04	0.0	4.6	45	No	<20	NA
N18	10/08/2017 00:18	0.0	5.4	45	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

4.3 EPL and Weather Conditions

Table 4.4 and Table 4.5 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines EPL.

Table 4.4: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – AUGUST 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	09/08/2017 23:18	0.0	4.4	35	No	<20	NA
N13	10/08/2017 01:15	0.0	4.2	36	No	IA	NA
N14	09/08/2017 23:45	0.0	4.2	35	No	IA	NA
N15	09/08/2017 22:59	0.0	3.4	35	No	27	NA
N16	09/08/2017 22:33	0.0	4.4	37	No	28	NA
N17	09/08/2017 22:04	0.0	4.6	35	No	<20	NA
N18	10/08/2017 00:18	0.0	5.4	35	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

Table 4.5: *LA1,1minute* GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – AUGUST 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP <i>LA1,1min</i> dB ^{4,5}	Exceedance ⁶
N6	09/08/2017 23:18	0.0	4.4	45	No	<20	NA
N13	10/08/2017 01:15	0.0	4.2	45	No	IA	NA
N14	09/08/2017 23:45	0.0	4.2	45	No	IA	NA
N15	09/08/2017 22:59	0.0	3.4	45	No	30	NA
N16	09/08/2017 22:33	0.0	4.4	45	No	32	NA
N17	09/08/2017 22:04	0.0	4.6	45	No	<20	NA
N18	10/08/2017 00:18	0.0	5.4	45	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

4.4 Low Frequency Assessment

Low frequency results for each monitoring location are presented in Table 4.6.

Table 4.6: LOW FREQUENCY NOISE MODIFYING FACTOR ASSESSMENT – AUGUST 2017

Location	Start Date and Time	INP		Broner		dING	
		Result ^{1,5} L _{Ceq} - L _{Aeq} dB	Penalty dB	Result ^{2,5} L _{Ceq} dB	Penalty dB	Result ^{3,5} Max exceedance of ref spectrum dB	Penalty dB
N6	09/08/2017 23:18	NA	0	NA	0	NA	0
N13	10/08/2017 01:15	NA	0	NA	0	NA	0
N14	09/08/2017 23:45	NA	0	NA	0	NA	0
N15	09/08/2017 22:59	NA	0	NA	0	NA	0
N16	09/08/2017 22:33	NA	0	NA	0	NA	0
N17	09/08/2017 22:04	NA	0	NA	0	NA	0
N18	10/08/2017 00:18	NA	0	NA	0	NA	0

Notes:

1. Low frequency modifying factor trigger is $L_{Ceq} - L_{Aeq} \geq 15$ dB as per the INP;
2. Night L_{Ceq} modifying factor trigger is L_{Ceq} 60 dB as per Broner (2010);
3. Low frequency modifying factor trigger is comparison of measured spectrum against a reference spectrum as per the dING;
4. Bold results and penalties in red are where the relevant modifying factor trigger was exceeded;
5. Where it is not possible to determine the site only result due to the presence of other low frequency noise sources occurring during the measurement, or where site only level is 5 dB or more less than criterion, this is noted as NA (not available) and no further assessment has been undertaken; and
6. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m. No further low frequency assessment undertaken where criterion do not apply due to meteorological conditions.

As detailed in Table 4.6, there were no low frequency correction triggers applied. No further analysis of low frequency noise was required.

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator at each location using a Kestrel hand-held weather meter is shown in Table 4.7. Atmospheric condition data is routinely recorded on a site-by-site basis to show conditions during the monitoring period. The wind speed, direction and temperature were measured at 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – AUGUST 2017

Location	Start Date And Time	Temperature °C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	09/08/2017 23:18	5	0.0	-	7
N13	10/08/2017 01:15	10	0.7	230	2
N14	09/08/2017 23:45	8	0.0	-	6
N15	09/08/2017 22:59	5	0.0	-	7
N16	09/08/2017 22:33	11	0.0	-	7
N17	09/08/2017 22:04	8	0.0	-	0
N18	10/08/2017 00:18	5	0.0	-	0

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. “-” denotes calm conditions at 1.8 metres.

Data obtained concurrently by the WCP meteorological station is provided in Table 4.8 and is used to determine compliance with specified noise criteria.

Table 4.8: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees ^{2,4}	Lapse Rate Degrees / 100 metres ³
2017/08/09 22:00:00	0.0	-	4.6
2017/08/09 22:15:00	0.0	-	5.0
2017/08/09 22:30:00	0.0	-	4.4
2017/08/09 22:45:00	0.6	350	4.6
2017/08/09 23:00:00	0.0	-	3.4
2017/08/09 23:15:00	0.0	-	4.4
2017/08/09 23:30:00	0.0	-	4.2
2017/08/09 23:45:00	0.0	-	4.2
2017/08/10 00:00:00	0.0	-	4.6
2017/08/10 00:15:00	0.0	-	5.4
2017/08/10 00:30:00	0.7	1	5.6
2017/08/10 00:45:00	0.0	-	3.8
2017/08/10 01:00:00	0.0	-	4.4
2017/08/10 01:15:00	0.0	-	4.2
2017/08/10 01:30:00	0.0	-	3.8
2017/08/10 01:45:00	0.0	-	3.4
2017/08/10 02:00:00	0.0	-	3.8
2017/08/10 02:15:00	0.7	346	2.8
2017/08/10 02:30:00	0.0	-	2.6

Notes:

1. Data supplied by WCP; and
2. Lapse rate sourced from the WCP inversion tower.

5 DISCUSSION

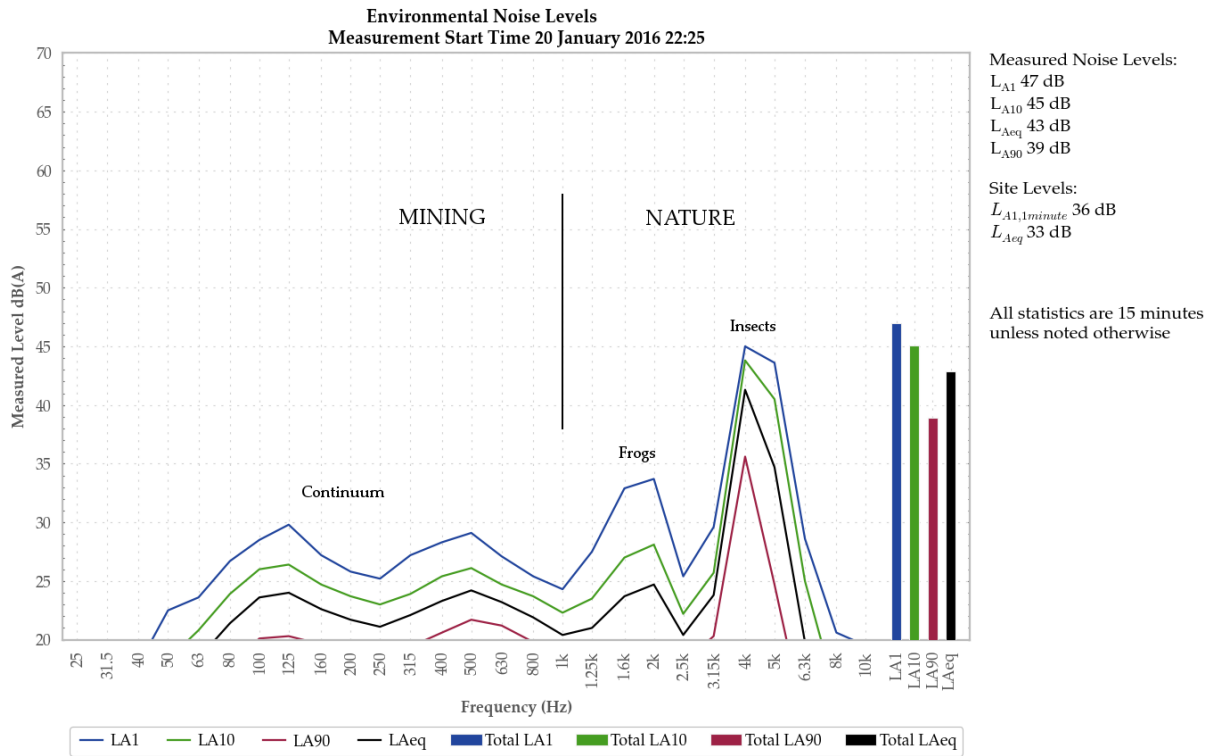
5.1 Noted Noise Sources

Table 4.1 to Table 4.5 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. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

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 Figure 3 to Figure 9 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 cut-off frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq} .



5.1.1 N6, 09 August 2017

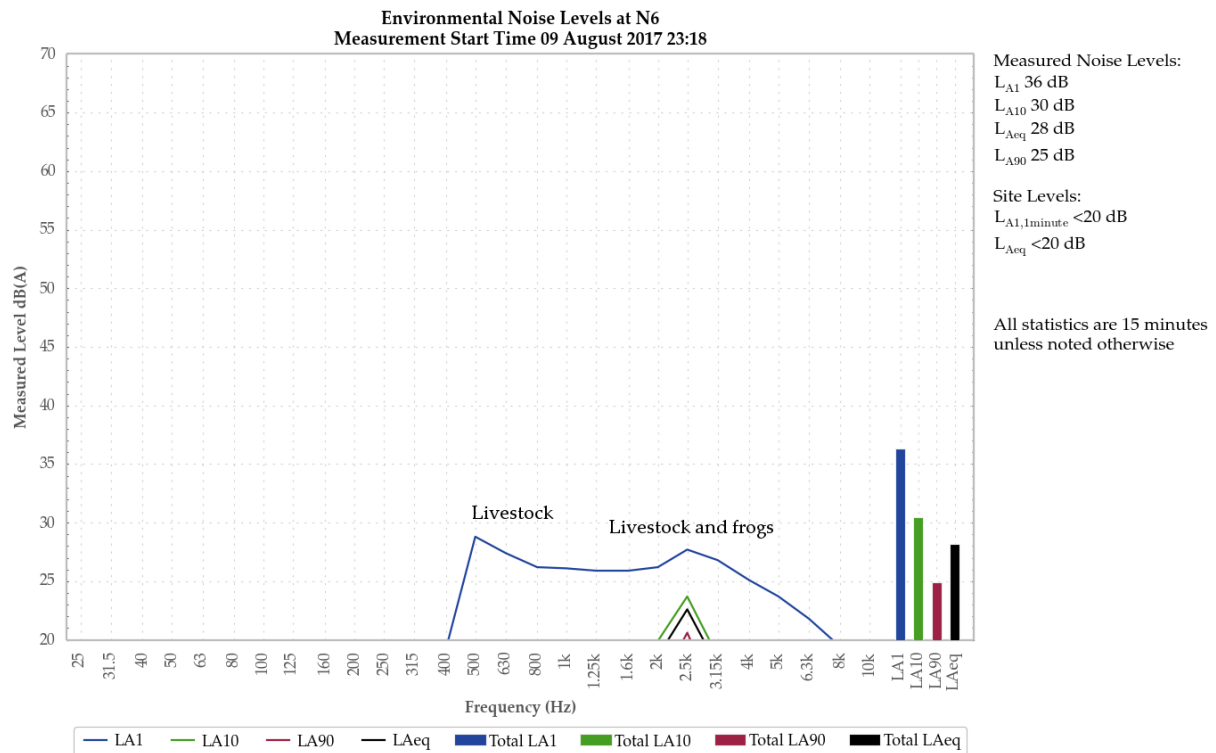


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

A low-level continuum from WCP was audible throughout the measurement generating the site only LAeq and LA1,1minute of less than 20 dB.

Livestock generated the measured LA1. Frogs primarily generated the measured LA10, LAeq and LA90. WCP continuum contributed to the measured LA90.

Dogs were also noted.

5.1.2 N13, 10 August 2017

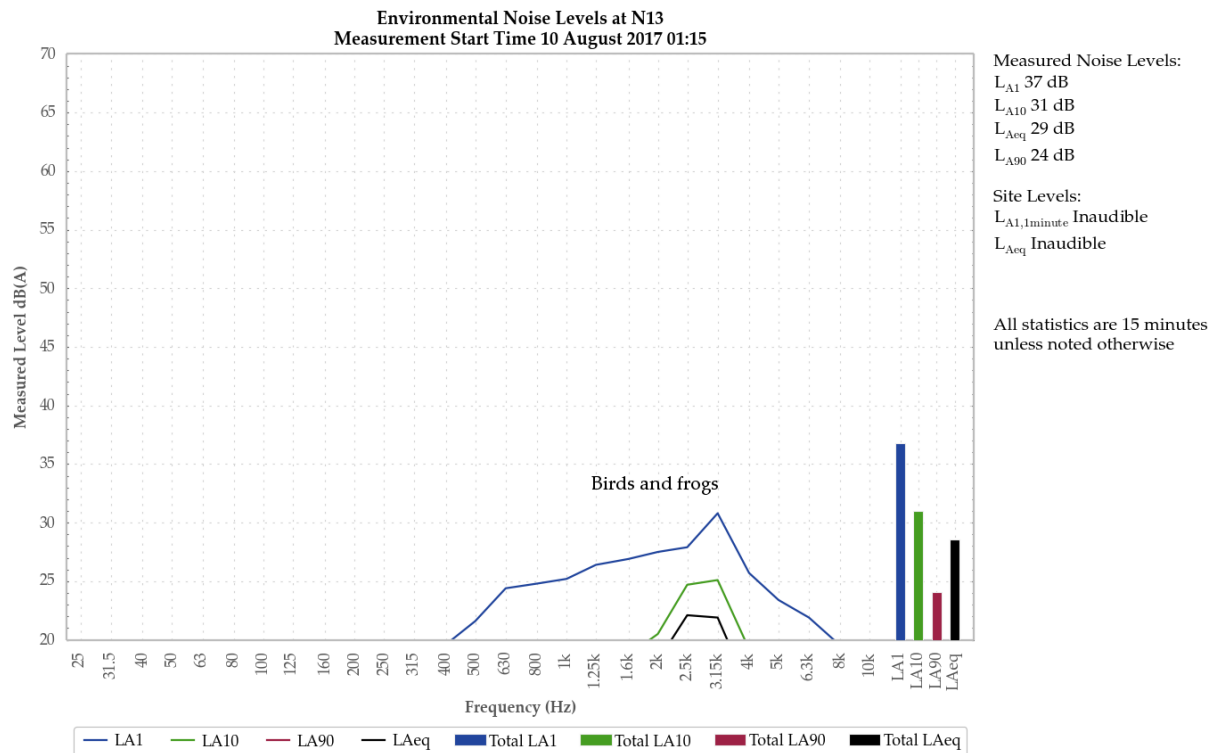


Figure 4: Environmental Noise Levels - N13, 'Coonaroo' off Moolarben Road

WCP was in audible.

Birds and frogs generated the measured LA1. Frogs generated the measured LA10 and LAeq. A continuum from another mine and frogs generated the measured LA90.

5.1.3 N14, 09 August 2017

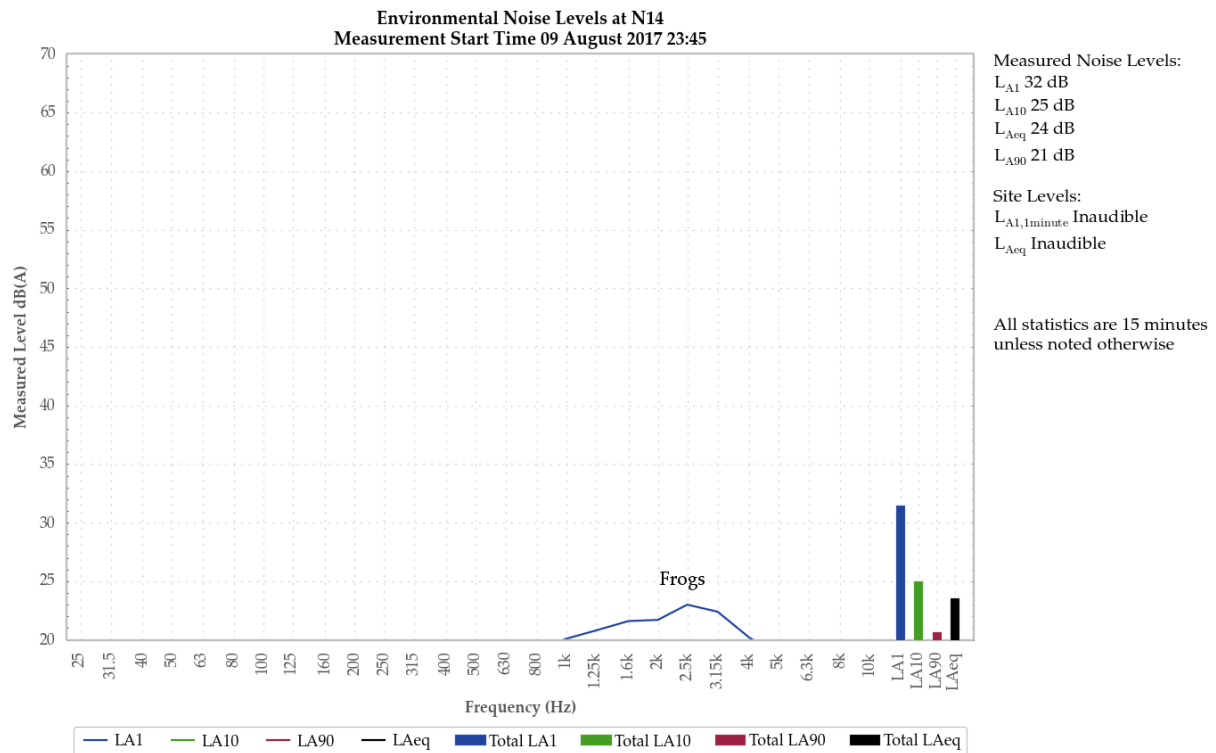


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

WCP was inaudible.

Frogs generated the measured LA1, LA10 and LAeq. A local continuum and frogs generated the measured LA90.

5.1.4 N15, 09 August 2017

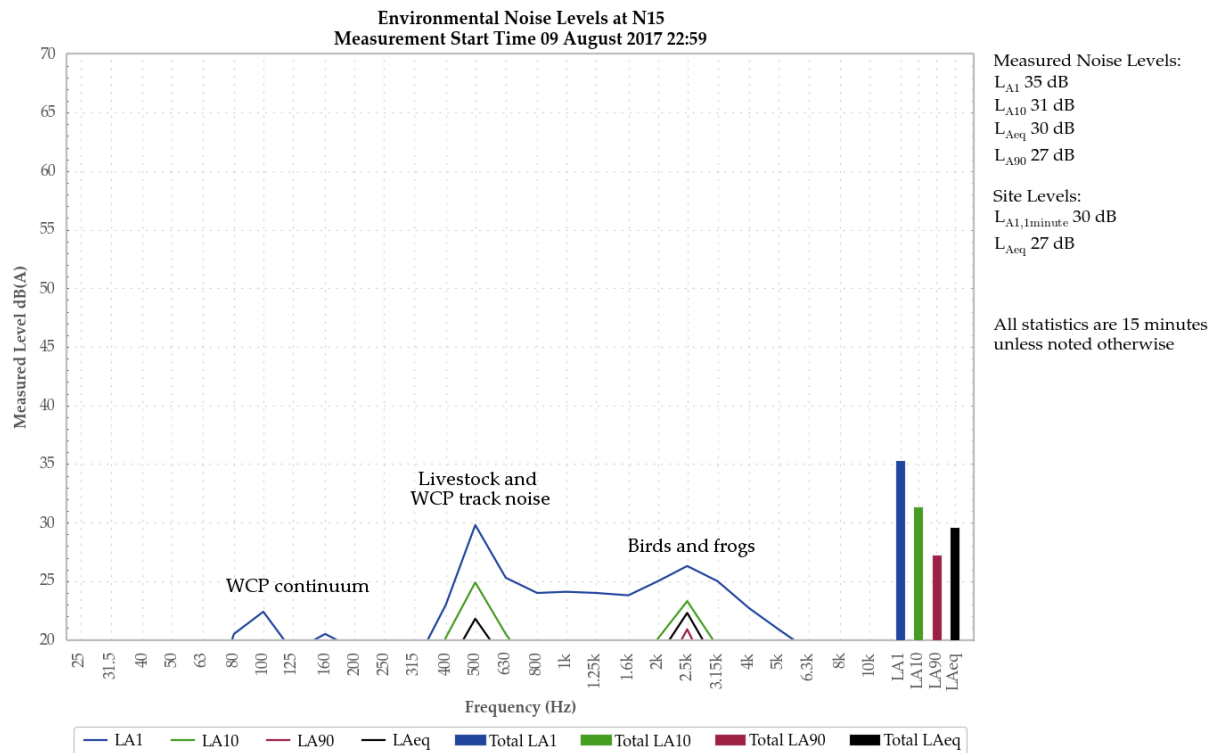


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

An engine continuum from WCP was audible throughout the measurement generating the site only LAeq of 27 dB. Track noise generated the site only LA1,1minute of 30 dB.

Livestock and birds primarily generated the measured LA1. WCP and frogs generated the measured LA10, LAeq and LA90.

5.1.5 N16, 09 August 2017

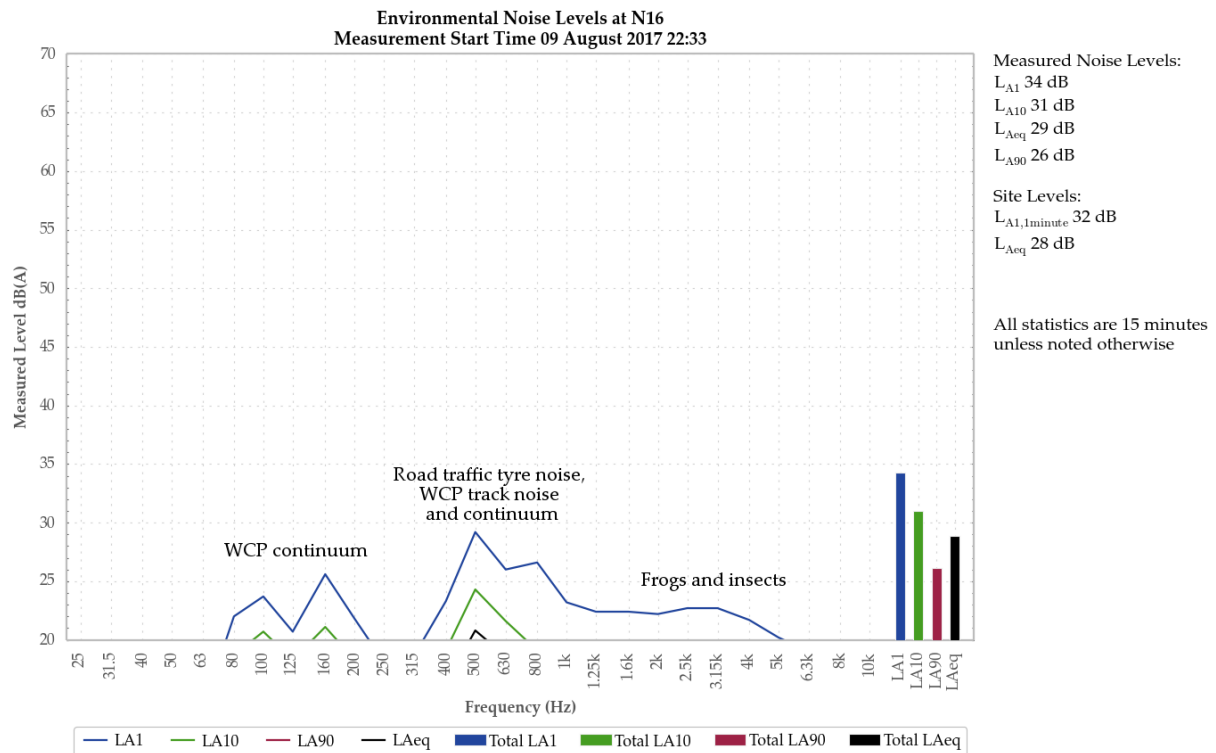


Figure 7: Environmental Noise Levels – N16, Araluen Road, off Ulan-Wollar Road

An engine continuum was audible throughout the measurement generating the site only LAeq of 28 dB. Track noise generated the site only LA1,1minute of 32 dB.

Road traffic and WCP track noise generated the measured LA1. WCP generated the measured LA10, LAeq and LA90.

Frogs and insects were also noted.

5.1.6 N17, 09 August 2017

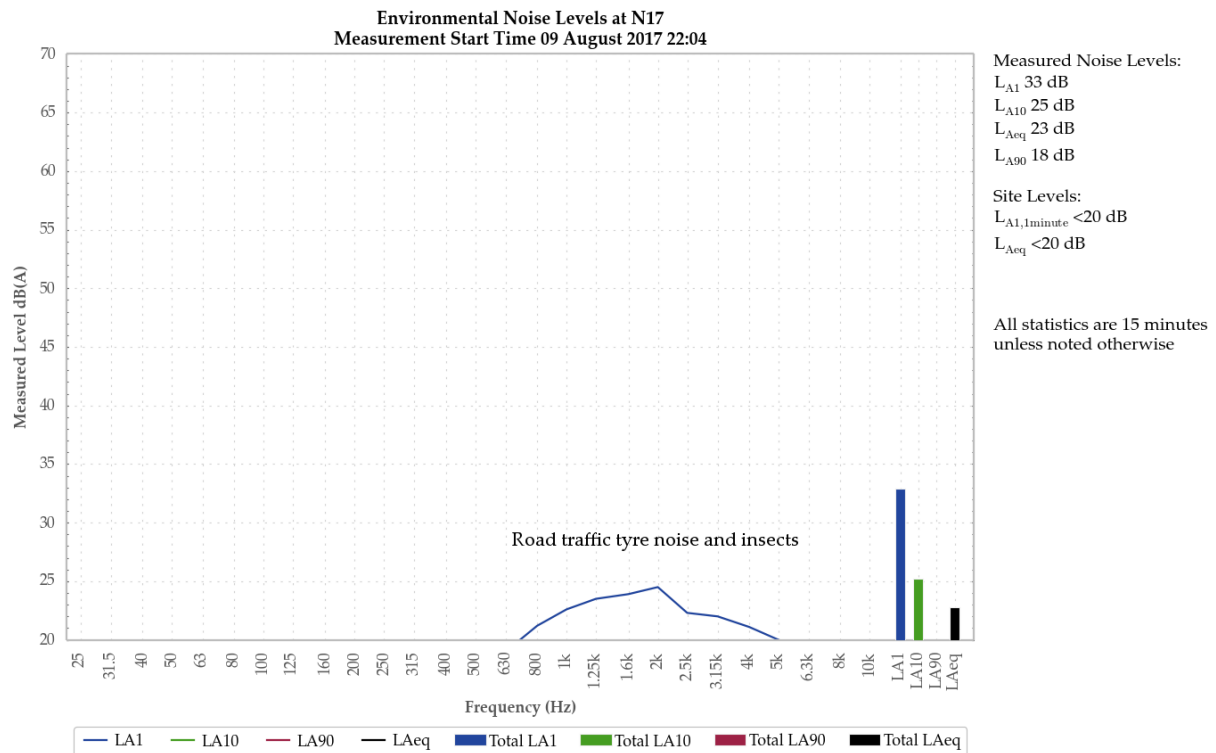


Figure 8: Environmental Noise Levels - N17, Mogo Road, off Araluen Road

A low-level continuum from WCP was audible during the measurement generating the site only LAeq and LA1,1minute of less than 20 dB.

Road traffic tyre noise and insects primarily generated the measured LA1 and LA10. Insects and WCP continuum generated the measured LAeq and LA90. The noise floor of the sound level meter contributed to the measured LA90.

5.1.7 N18, 10 August 2017

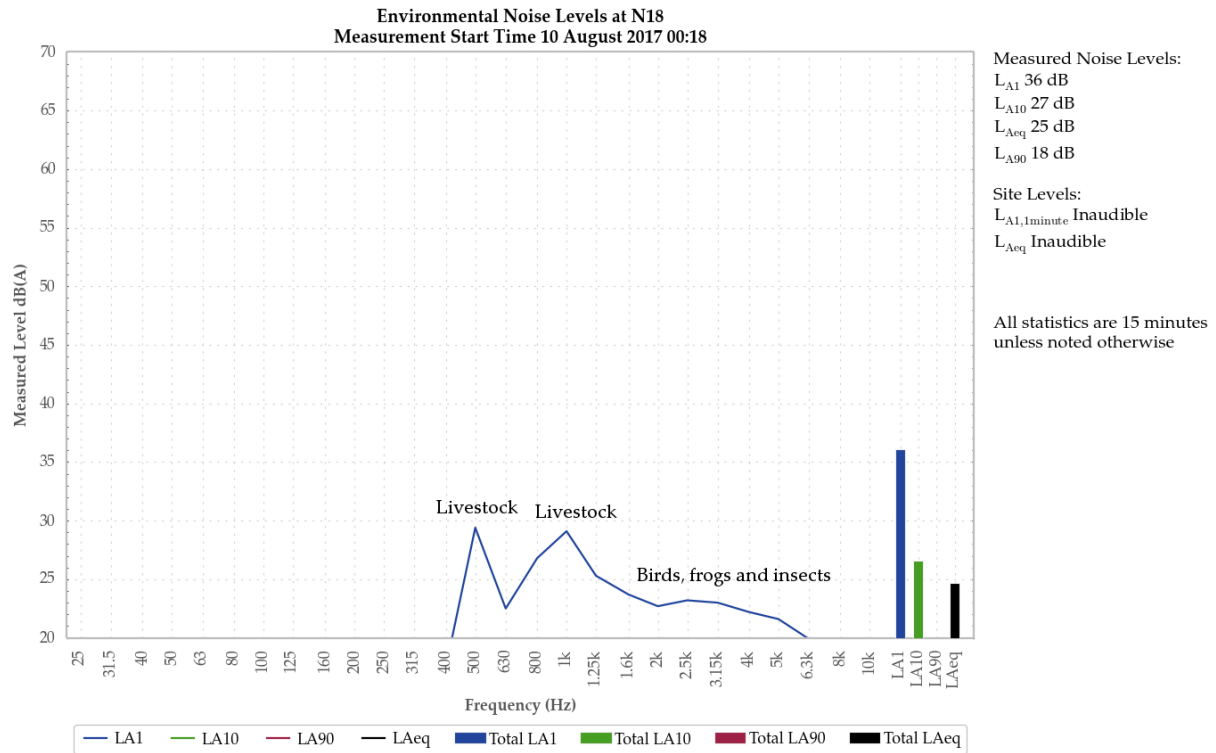


Figure 9: Environmental Noise Levels, N18 - Barigan Road, Barigan Valley

WCP was inaudible.

Livestock generated the measured LA1 and contributed to the measured LAeq. Frogs and insects primarily generated the measured LA10, LAeq and LA90. The noise floor of the sound level meter contributed to the measured LA90.

Birds were also noted.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 9/10 August 2017. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the August 2017 monitoring period.

6.2 Low Frequency Assessment

During the August 2017 survey WCP complied with the relevant limits using the Broner, INP and ING methods of assessing low frequency. No further assessment of low frequency noise was required.

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APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Project Approval

SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

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 5 – 6 of schedule 4.

Table 1: Land subject to acquisition upon request

30 – Gaffney

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

NOISE

Noise 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 at the other specified locations.

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)
135	38	38	38	45
129 and 137	37	37	37	45
69	36	36	36	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		40 (internal) When in use		-
900 – St Laurence O’Toole Catholic Church				
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 10 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

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; and
- 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.

Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

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

Table 3: Land subject to additional noise mitigation upon request

<i>Receiver ID</i>
<i>69, 129, 135 and 137</i>

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

Operating Conditions

4. The Proponent shall:
 - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
 - (b) operate a comprehensive noise management system that uses a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day to day planning of mining operations, and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this approval;
 - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the project is complying with the relevant conditions of this approval, and publish these monitoring results on its website, to the satisfaction of the Director-General.

Noise Management Plan

5. The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
- (a) be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this approval; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this approval and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

APPENDIX 8 STATEMENT OF COMMITMENTS

Operational Noise

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) temperature inversion conditions greater than 3°C/100m

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Director-General directs otherwise.
5. Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

A.2 Environmental 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 January 2017.

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)
Wollar village	36	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
All other privately owned land (outside the village of Wollar)	35	35	35	45

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

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 3°C/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
- c) Temperature inversion conditions greater than 3°C/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.

R4 Other reporting conditions

R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the second round of quarterly monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:

- a) an assessment of compliance with noise limits presented in Condition L5.1; and
- b) an outline of any management actions taken within the monitoring period to address any exceedences of the limits contained in Condition L5.1.

A.3 Noise Monitoring Program

The relevant sections of the noise monitoring program for WCP dated May 2016 are reproduced below.

6 Noise Monitoring Program

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 4**. Unattended or real-time monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake attended monitoring at up to seven locations (**Table 5, Figure 3 and Figure 4**). Real-time units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 5: Noise Related Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Araluen Rd	N16	Attended Noise	778787.4	6417418.7	Location based on the nearest community structure to the East of the Mine
Mogo Rd	N17	Attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Barrigan Valley²	N18	Attended Noise	780033.3	6398618.1	DP&E Recommendation (MOD5) – Location approximately 20 km to the south of the Mine
WCPL Rail Loop		Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions

Wollar Village		Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine
Araluen Rd		Real-Time Noise - Fixed	778856.4	6417401.3	Location based on the nearest non-mine owned residence to the East of the Mine
Wandoona³		Real-Time Noise - Mobile	777684.4	6414786.2	Location based on the nearest non-mine owned residence to the South-East of the Mine

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 5** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&E and the EPA.

6.3 Attended Noise Monitoring

6.3.1 Purpose

Attended noise monitoring will be used to evaluate compliance against the Noise Criteria detailed in **Table 4**.

6.3.2 Summary

Attended noise will be undertaken in accordance with **Table 6**.

Table 6: Attended Noise Monitoring Summary

Element	Description
Locations	As per Table 5, Figure 3 and Figure 4
Period	Night-time period (10 pm-7 am) being the most sensitive time period for noise.
Frequency	12 times per year and on one night per month

6.3.3 Methodology

Attended noise monitoring will be undertaken as outlined in **Table 6** by an independent acoustic consultant in accordance with the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the noise criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not

exceed the Noise Criteria, as defined in **Table 4**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA₁ measurement will be undertaken at 1 m from the dwelling façade and the LA_{eq} measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

6.3.5 Evaluation of Compliance

Tables 7 and 8 summarises the definition used by WCPL in this NMP for the evaluation of compliance with the Project Approval. The reporting requirements and actions that WCPL will take in the event of an exceedance or non-compliance are detailed in Figure 5 and Section 6.3.7.

Table 7: Definition of an Exceedance

Term	Definition
Exceedance	An exceedance is deemed to have occurred when an attended noise monitoring result, taken in accordance with the INP and Project Approval, exceeds the Noise Criteria in Table 4 . The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6).
Non-compliance	A non-compliance is deemed to have occurred when a second attended noise monitoring result, taken within 75 minutes of an exceedance and in accordance with the INP and Project Approval, exceeds the Noise Criteria in Table 4 for a second time. The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6). Reporting requirements for a non-compliance are detailed in Section 6.3.7 .

6.3.6 Favourable Meteorological Conditions

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 3°C/100m.

Except for wind speed at microphone height, the data used for determining meteorological conditions will be that recorded by the meteorological station located on the Mine site.

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

6.3.7 Response to Non-Compliance or Exceedance

Where any non-compliance of the Noise Criteria has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the non-compliance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (**Section 9.1**);
- Implement remediation measures as directed by the Director-General; and
- Review and, if necessary, revise this Management Plan (**Section 10**), to the satisfaction of the Director-General.

APPENDIX

B CALIBRATION CERTIFICATES



**Acoustic
Research
Labs Pty Ltd**

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Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013

Calibration Certificate

Calibration Number C17126

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 30131882
Microphone Serial Number : 04739
Pre-amplifier Serial Number : 11942

Pre-Test Atmospheric Conditions
Ambient Temperature : 22.4°C
Relative Humidity : 55.6%
Barometric Pressure : 99.91kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 22.6°C
Relative Humidity : 58.1%
Barometric Pressure : 99.85kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 14/03/2017

Secondary Check: Riley Cooper
Report Issue Date : 15/03/2017

Approved Signatory :

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	Pass	17: Level linearity incl. the level range control	Pass
13: Electrical Sig. tests of frequency weightings	Pass	18: Toneburst response	Pass
14: Frequency and time weightings at 1 kHz	Pass	19: C Weighted Peak Sound Level	Pass
15: Long Term Stability	Pass	20: Overload Indication	Pass
16: Level linearity on the reference level range	Pass	21: High Level Stability	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement -			
Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	±0.16dB	Temperature	±0.05°C
12.5kHz	±0.2dB	Relative Humidity	±0.46%
16kHz	±0.29dB	Barometric Pressure	±0.017kPa
Electrical Tests			
31.5 Hz to 20 kHz	±0.12dB		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

PAGE 1 OF 1



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**Sound Calibrator
IEC 60942-2004**

Calibration Certificate

Calibration Number C17127

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Pulsar 105
Instrument Serial Number : 78226

Atmospheric Conditions

Ambient Temperature : 22.3°C
Relative Humidity : 55.6%
Barometric Pressure : 99.9kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 14/03/2017
Secondary Check: Riley Cooper
Report Issue Date : 15/03/2017

Approved Signatory :  Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
5.2.2: Generated Sound Pressure Level	Pass	5.3.2: Frequency Generated	Pass
5.2.3: Short Term Fluctuation	Pass	5.5: Total Distortion	Pass

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	94.1	1000.32

The sound calibrator has been shown to conform to the class 1 requirements for periodic testing, described in Annex B of IEC 60942:2004 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement - Environmental Conditions

Specific Tests		Environmental Conditions	
Generated SPL	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
Distortion	±0.5%		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

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The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

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PAGE 1 OF 1

Wilpinjong Coal

*Environmental Noise Monitoring
September 2017*

*Prepared for
Wilpinjong Coal Pty Ltd*



Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring September 2017

Reference: 17360_R01

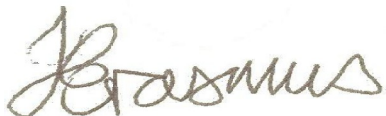
Report date: 11 October 2017

Prepared for

Wilpinjong Coal Pty Ltd
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Prepared by

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Prepared: Jonathan Erasmus
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Environmental Scientist (Acoustics)

Global Acoustics Pty Ltd ~ Environmental noise modelling 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 Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

A modification (MOD7) to the WCP consent was approved in 2016. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

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 night measurement was 15 minutes. Results of monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at seven locations during the night period of 21/22 September 2017. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Operational Noise Assessment

WCP complied with relevant noise limits at all monitoring locations during the September 2017 monitoring.

Low Frequency Assessment

During the September 2017 survey, WCP complied with the relevant limits using the Broner, INP and ING methods of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at seven locations during the night period of 21/22 September 2017. Figure 1 shows the monitoring locations.

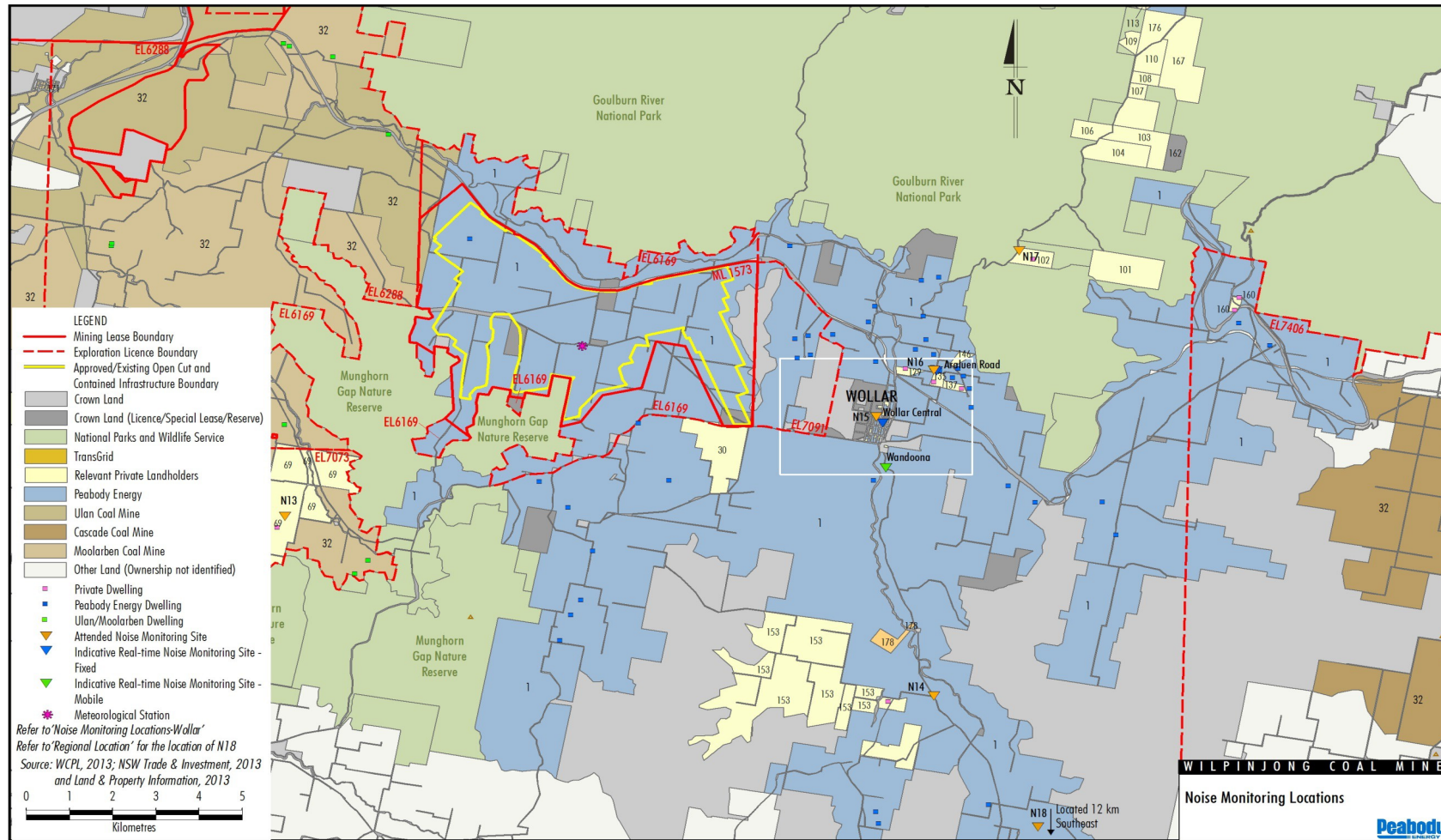
The purpose of the attended noise monitoring survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were seven 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: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road
N14	'Tichular', intersection of Tichular and Barigan Roads
N15	Track off Barigan Street near Wollar School, Wollar Village
N16	Araluen Road, off Ulan-Wollar Road
N17	Mogo Road, off Araluen Road
N18	Barigan Road, Barigan Valley



WIL-11-10 NMP2013_2010

Figure 1: WCP Attended Noise Monitoring Locations

1.3 Terminology & Abbreviations

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

Table 1.2: TERMINOLOGY & ABBREVIATIONS

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
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
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, but could not be quantified
Day	This is the period 7:00am to 6:00pm
Evening	This is the period 6:00pm to 10:00pm
Night	This is the period 10:00pm to 7:00am

2 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in August 2016. The relevant noise conditions from the project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in January 2017. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in May 2016. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Approval Criteria and Weather Conditions

Criteria detailed in Table 2.1 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with Wilpinjong Coal Project.

Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor/ Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- a) wind speeds greater than 3 m/s at 10m above ground level;
- b) temperature inversion conditions between 1.5°C and 3°C/100m and wind speeds greater than 2 m/s at 10m Barrigan above ground level; or
- c) temperature inversion conditions greater than 3°C/00m.

2.5 EPL Criteria and Weather Conditions

Criteria detailed in Table 2.2 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with WCP.

Table 2.2: WCP - PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor/ Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

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 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.

2.6 Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

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.

2.6.1 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.

2.6.2 Low Frequency Noise

INP Method

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 site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more.*

Broner Method

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 site only C-weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

dING Method

Whilst the INP is the current document for assessment of industrial noise impact in NSW, the EPA has recently published the Draft Industrial Noise Guideline (dING), which is currently under review after a period of public consultation. The dING contains an alternate method of assessing low frequency noise to the INP, which is:

Measure/assess C-weighted and A-weighted $L_{eq,T}$ levels over the same time period. The low frequency noise modifying factor correction is to be applied where the C-A level exceeds 15 dB and:

- *where any of the 1/3 octave noise levels in Table C2 are exceeded by **up to** 5 dB and cannot be mitigated, a 2 dBA positive adjustment to measured A weighted levels applies for the evening/night period; and*
- *where any of the 1/3 octave noise levels in Table C2 are exceeded by **more than** 5 dB and cannot be mitigated, a 5 dBA positive adjustment to measured A weighted levels applies for the evening/night period and a 2 dBA positive adjustment applies for the daytime period.*

Table C2 of the dING is reproduced below:

Table C2: One-third octave low frequency noise thresholds

Hz/dB(Z)	One-third octave $L_{Zeq,15minute}$ threshold level												
f,Hz	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

Note: dB(z) = decibel (Z-weighted); f,Hz = frequency in Hertz; Hz/dB(Z) = hertz per decibel (Z-weighted). For the assessment of low frequency noise, care should be taken to select a wind screen that has wind-induced noise characteristics at least 10 dB below the threshold values in Table C2 for wind speeds up to 5 metres per second. It is likely that high performance larger diameter wind screens (nominally 175 mm) will be required to achieve this performance (Hessler et.al. 2008). In any case, the performance of the wind screen and wind speeds at which data will be excluded needs to be stated.

Low frequency noise shall be assessed under the meteorological conditions under which noise limits would apply.

Measurements should be made between 1.2 and 1.5 metres above ground level unless otherwise approved through a planning instrument (consent/approval) or Environment Protection Licence and at locations nominated in the development consent or license.

2.6.3 Low Frequency Assessment Methods

Low frequency assessment methods are detailed in Table 2.3.

Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFYING FACTOR TRIGGERS

Assessment Method	Calculation Method
Broner, 2010	Site only L_{Ceq}
INP	Site only L_{Ceq} minus site only L_{Aeq}
dING	1. Site only L_{Ceq} minus site only L_{Aeq} 2. One third octave low frequency noise threshold

Triggers and penalties associated with each method are outlined in Section 2.6.2.

3 METHODOLOGY

3.1 Assessment Method

Attended monitoring was conducted in accordance with the EPA INP guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken. Monitoring is undertaken once per month at each location. The duration of each measurement was 15 minutes.

Attended monitoring during this reporting period was undertaken by Jonathan Erasmus.

If the exact contribution from WCP cannot be established, due to masking by other noise sources in a similar frequency range, but site noise levels are observed to be well below (more than 5 dB lower than) any relevant criterion, a maximum estimate of the potential contribution of the site might be made based on other measured site-only noise levels, for example, L_{A10} , L_{A50} or L_{A90} . This is generally expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may also be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means some noise was audible but could not be quantified. If site noise was NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the INP (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted as NM in this report are due to one or more of the following reasons:

- site noise levels were extremely low and unlikely, in many cases, to be even noticed;
- site noise levels were masked by another relatively loud noise source that is characteristic of the environment (e.g. breeze in foliage or continuous road traffic noise) that cannot be eliminated by moving closer; and/or
- it was not feasible or reasonable to employ INP methods such as move closer and back calculate. Cases may include, but are not limited to, rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

A measurement of $L_{A1,1\text{minute}}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or $L_{A\text{max}}$, received from the site 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 $L_{A1,1\text{minute}}$ 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 noise from WCP was assessed by analysis of the measured L_{Aeq} spectrum.

3.2 Attended Noise 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: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	00370304	16/11/2018
Larson Davis Cal150 acoustic calibrator	3333	30/09/2018

4 RESULTS

4.1 Attended Noise Monitoring

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. 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 2017¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	21/09/2017 23:18	50	42	39	30	34	21	18	54
N13	22/09/2017 01:17	54	31	25	18	24	16	15	43
N14	21/09/2017 23:44	50	42	32	26	30	24	22	47
N15	21/09/2017 23:00	47	37	32	23	28	19	17	37
N16	21/09/2017 22:35	46	35	27	21	25	18	16	38
N17	21/09/2017 22:04	47	30	24	19	22	17	15	38
N18	22/09/2017 00:18	43	30	22	16	20	14	13	25

Note:

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

4.2 Project Approval and Weather Conditions

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines approval. Modifying factors are considered in Section 4.4.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – SEPTEMBER 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	21/09/2017 23:18	0.0	-1.0	35	Yes	IA	Nil
N13	22/09/2017 01:17	0.7	-1.0	36	Yes	IA	Nil
N14	21/09/2017 23:44	0.0	3.0	35	Yes	IA	Nil
N15	21/09/2017 23:00	0.5	0.5	35	Yes	IA	Nil
N16	21/09/2017 22:35	0.0	4.1	37	No	<20	NA
N17	21/09/2017 22:04	0.0	4.1	35	No	IA	NA
N18	22/09/2017 00:18	0.6	0.5	35	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

Table 4.3: $L_{A1,1\text{minute}}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – SEPTEMBER 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{A1,1\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	21/09/2017 23:18	0.0	-1.0	45	Yes	IA	Nil
N13	22/09/2017 01:17	0.7	-1.0	45	Yes	IA	Nil
N14	21/09/2017 23:44	0.0	3.0	45	Yes	IA	Nil
N15	21/09/2017 23:00	0.5	0.5	45	Yes	IA	Nil
N16	21/09/2017 22:35	0.0	4.1	45	No	<20	NA
N17	21/09/2017 22:04	0.0	4.1	45	No	IA	NA
N18	22/09/2017 00:18	0.6	0.5	45	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

4.3 EPL and Weather Conditions

Table 4.4 and Table 4.5 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines EPL.

Table 4.4: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – SEPTEMBER 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	21/09/2017 23:18	0.0	-1.0	35	Yes	IA	Nil
N13	22/09/2017 01:17	0.7	-1.0	36	Yes	IA	Nil
N14	21/09/2017 23:44	0.0	3.0	35	No	IA	NA
N15	21/09/2017 23:00	0.5	0.5	35	Yes	IA	Nil
N16	21/09/2017 22:35	0.0	4.1	37	No	<20	NA
N17	21/09/2017 22:04	0.0	4.1	35	No	IA	NA
N18	22/09/2017 00:18	0.6	0.5	35	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

Table 4.5: $L_{A1,1minute}$ GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – SEPTEMBER 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{A1,1min}$ dB ^{4,5}	Exceedance ⁶
N6	21/09/2017 23:18	0.0	-1.0	45	Yes	IA	Nil
N13	22/09/2017 01:17	0.7	-1.0	45	Yes	IA	Nil
N14	21/09/2017 23:44	0.0	3.0	45	No	IA	NA
N15	21/09/2017 23:00	0.5	0.5	45	Yes	IA	Nil
N16	21/09/2017 22:35	0.0	4.1	45	No	<20	NA
N17	21/09/2017 22:04	0.0	4.1	45	No	IA	NA
N18	22/09/2017 00:18	0.6	0.5	45	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable or criterion not specified.

4.4 Low Frequency Assessment

Low frequency results for each monitoring location are presented in Table 4.6.

Table 4.6: LOW FREQUENCY NOISE MODIFYING FACTOR ASSESSMENT – SEPTEMBER 2017

Location	Start Date and Time	INP		Broner		dING	
		Result ^{1 5} L _{Ceq} - L _{Aeq} dB	Penalty dB	Result ^{2 5} L _{Ceq} dB	Penalty dB	Result ^{3 5} Max exceedance of ref spectrum dB	Penalty dB
N6	21/09/2017 23:18	NA	0	NA	0	NA	0
N13	22/09/2017 01:17	NA	0	NA	0	NA	0
N14	21/09/2017 23:44	NA	0	NA	0	NA	0
N15	21/09/2017 23:00	NA	0	NA	0	NA	0
N16	21/09/2017 22:35	NA	0	NA	0	NA	0
N17	21/09/2017 22:04	NA	0	NA	0	NA	0
N18	22/09/2017 00:18	NA	0	NA	0	NA	0

Notes:

1. Low frequency modifying factor trigger is $L_{Ceq} - L_{Aeq} \geq 15$ dB as per the INP;
2. Night L_{Ceq} modifying factor trigger is L_{Ceq} 60 dB as per Broner (2010);
3. Low frequency modifying factor trigger is comparison of measured spectrum against a reference spectrum as per the dING;
4. Bold results and penalties in red are where the relevant modifying factor trigger was exceeded;
5. Where it is not possible to determine the site only result due to the presence of other low frequency noise sources occurring during the measurement, or where site only level is 5 dB or more less than criterion, this is noted as NA (not available) and no further assessment has been undertaken; and
6. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m. No further low frequency assessment undertaken where criterion do not apply due to meteorological conditions.

As detailed in Table 4.6, there were no low frequency correction triggers applied. No further analysis of low frequency noise was required.

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator at each location using a Kestrel hand-held weather meter is shown in Table 4.7. Atmospheric condition data is routinely recorded on a site-by-site basis to show conditions during the monitoring period. The wind speed, direction and temperature were measured at 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – SEPTEMBER 2017

Location	Start Date And Time	Temperature °C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	21/09/2017 23:18	18	0.0	-	0
N13	22/09/2017 01:17	13	0.0	-	0
N14	21/09/2017 23:44	10	1.6	160	0
N15	21/09/2017 23:00	6	0.5	190	0
N16	21/09/2017 22:35	10	0.0	-	0
N17	21/09/2017 22:04	15	0.0	-	0
N18	22/09/2017 00:18	7	0.0	-	0

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained concurrently by the WCP meteorological station is provided in Table 4.8 and is used to determine compliance with specified noise criteria.

Table 4.8: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees ^{2,4}	Lapse Rate Degrees / 100 metres ³
21/09/2017 22:00	0.0	-	3.0
21/09/2017 22:15	0.0	-	4.1
21/09/2017 22:30	0.0	-	3.0
21/09/2017 22:45	0.0	-	4.1
21/09/2017 23:00	0.0	-	3.0
21/09/2017 23:15	0.5	337	0.5
21/09/2017 23:30	0.0	-	-1.0
21/09/2017 23:45	0.7	307	0.5
22/09/2017 00:00	0.0	-	3.0
22/09/2017 00:15	0.0	-	-1.0
22/09/2017 00:30	0.6	299	0.5
22/09/2017 00:45	0.0	-	0.5
22/09/2017 01:00	0.0	-	3.0
22/09/2017 01:15	0.0	-	3.0
22/09/2017 01:30	0.7	296	-1.0
22/09/2017 01:45	0.5	291	0.5
22/09/2017 02:00	0.0	-	3.0
22/09/2017 02:15	0.0	-	-1.0
22/09/2017 02:30	0.0	-	3.0

Notes:

1. Data supplied by WCP; and
2. Lapse rate sourced from the WCP inversion tower.

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 to Table 4.5 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. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

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 Figure 3 to Figure 9 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 cut-off frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq} .

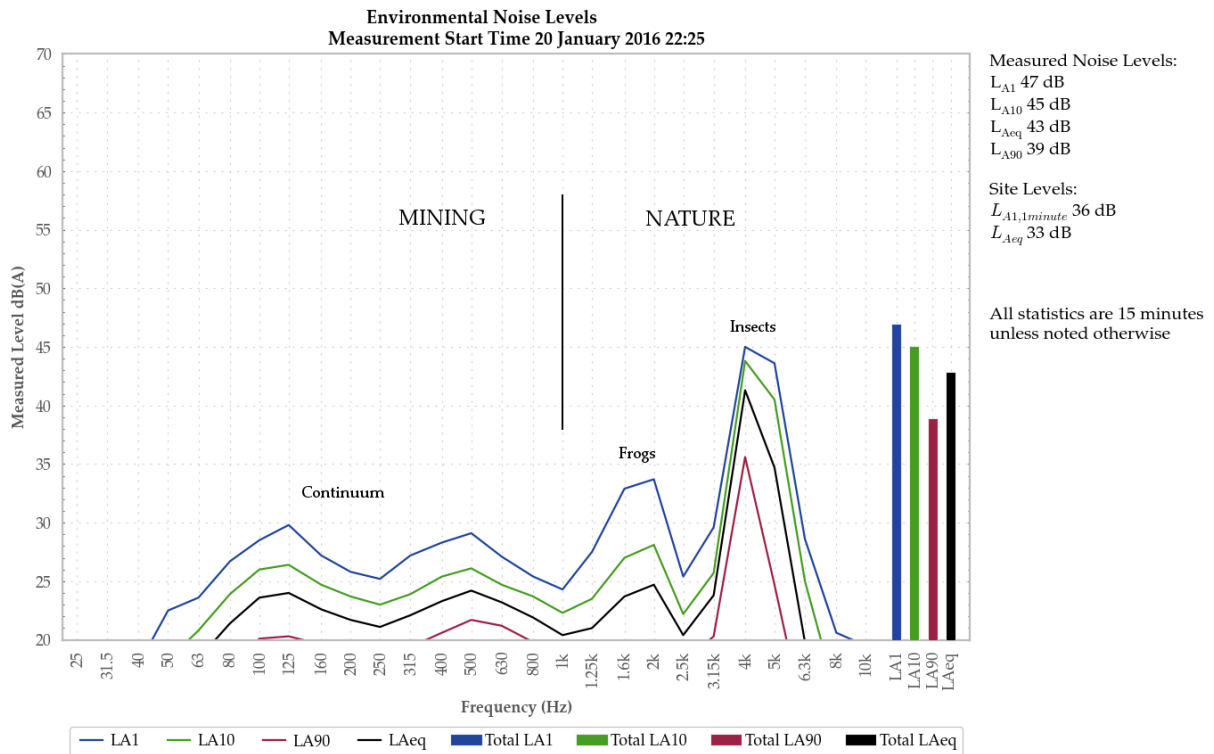


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6, 21 September 2017

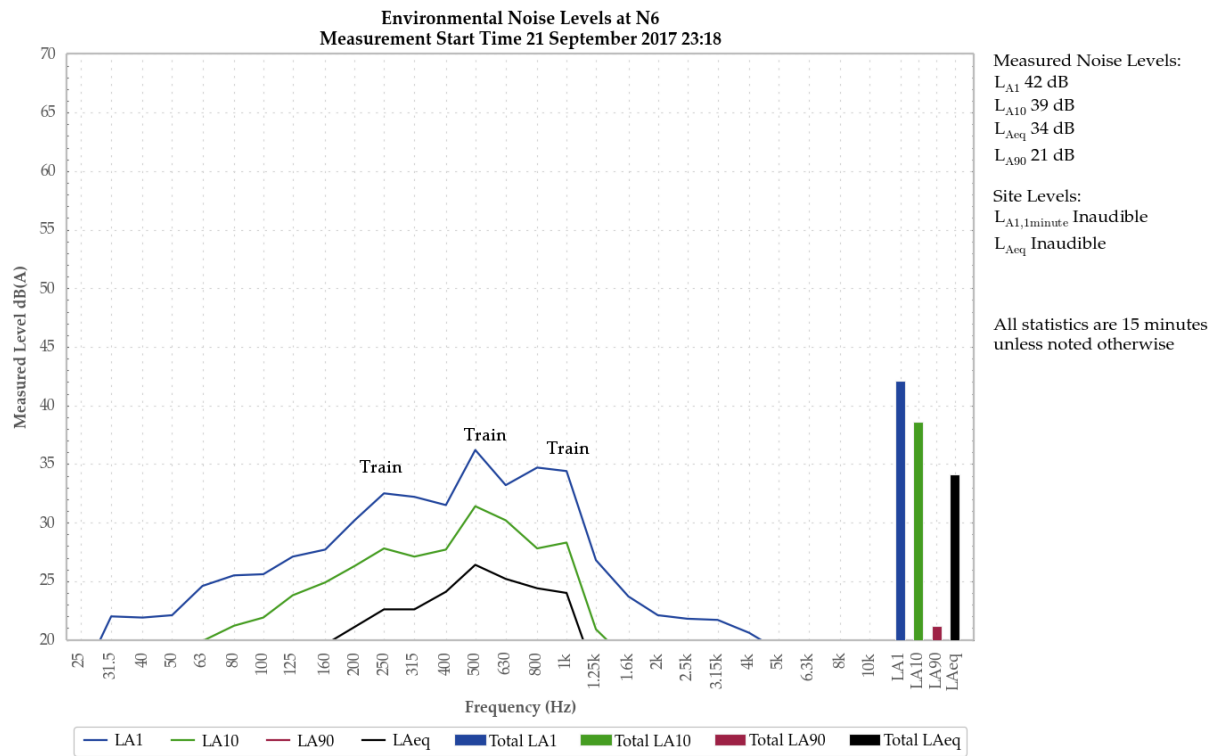


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

WCP was inaudible.

A train generated the measured LA1, LA10, and LAeq.

Livestock, road traffic, and dogs were also noted.

5.1.2 N13, 22 September 2017

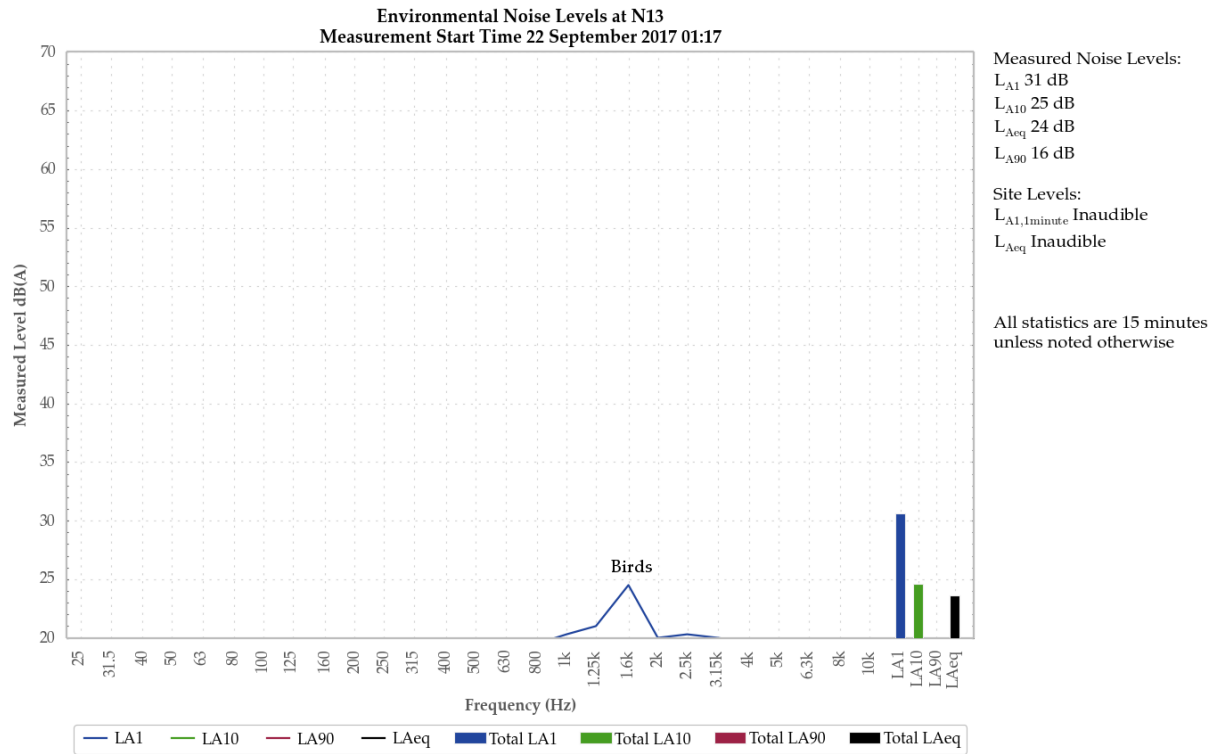


Figure 4: Environmental Noise Levels - N13, 'Coonaroo' off Moolarben Road

WCP was inaudible.

Birds generated the measured L_{A1}. A local continuum, frogs, and insects generated the measured L_{A10}, L_{Aeq}, and L_{A90}.

5.1.3 N14, 21 September 2017

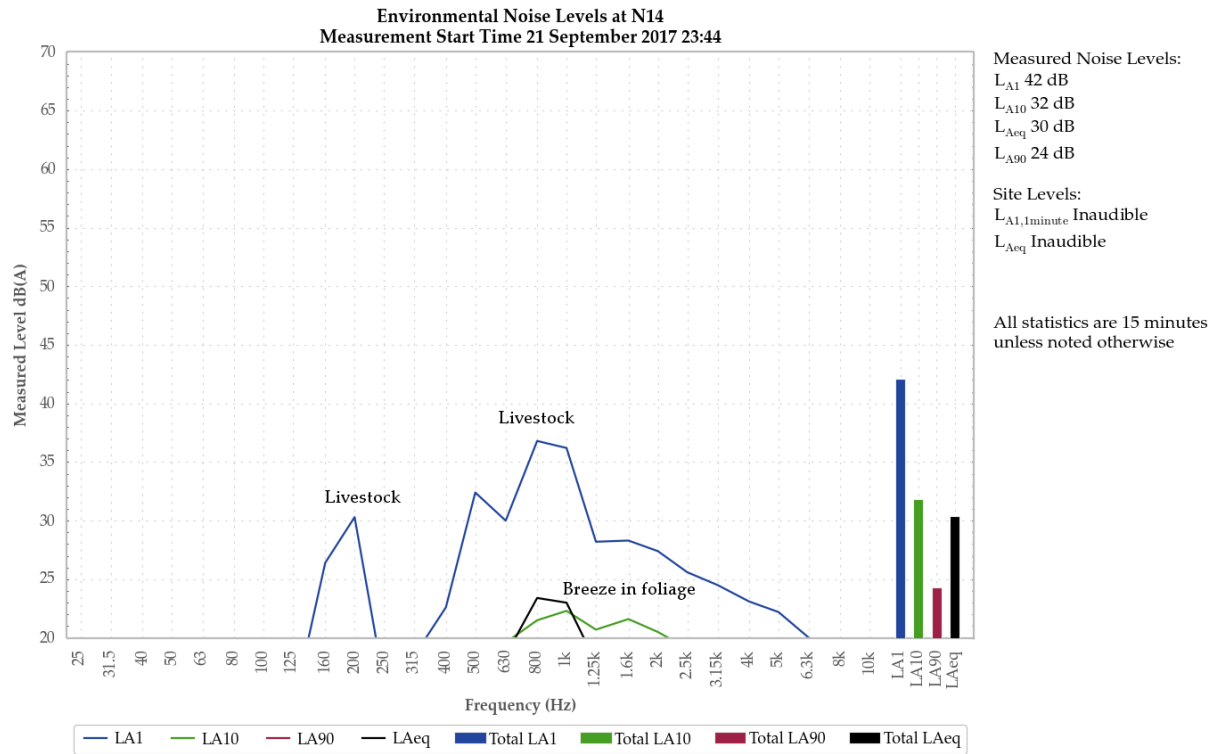


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

WCP was inaudible.

Livestock generated the measured L_{A1} and primarily generated the measured L_{Aeq}. Breeze in foliage generated the measured L_{A10} and contributed to the measured L_{Aeq}. Frogs and insects generated the measured L_{A90}.

A local continuum was also noted.

5.1.4 N15, 21 September 2017

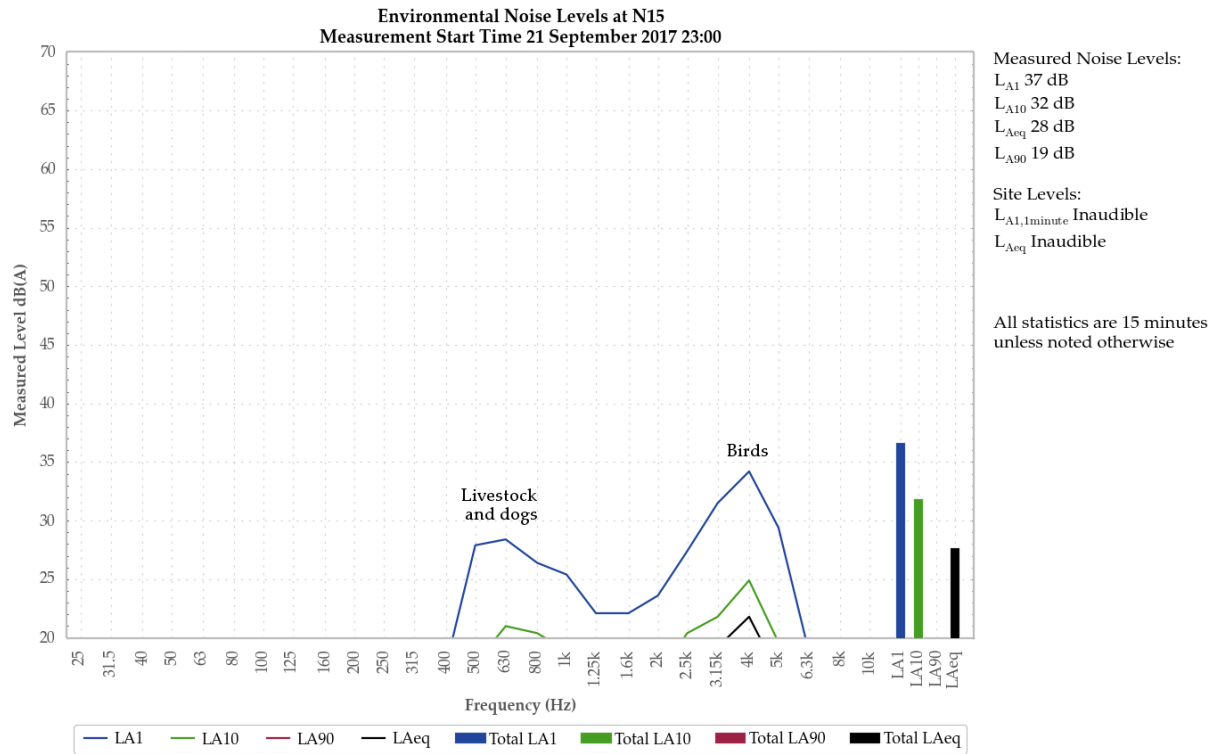


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

WCP was inaudible.

Birds, livestock, and dogs generated the measured L_{A1}. Birds generated the measured L_{A10} and L_{Aeq}. Frogs, insects, and the noise floor of the sound level meter generated the measured L_{A90}.

An aircraft was also noted.

5.1.5 N16, 21 September 2017

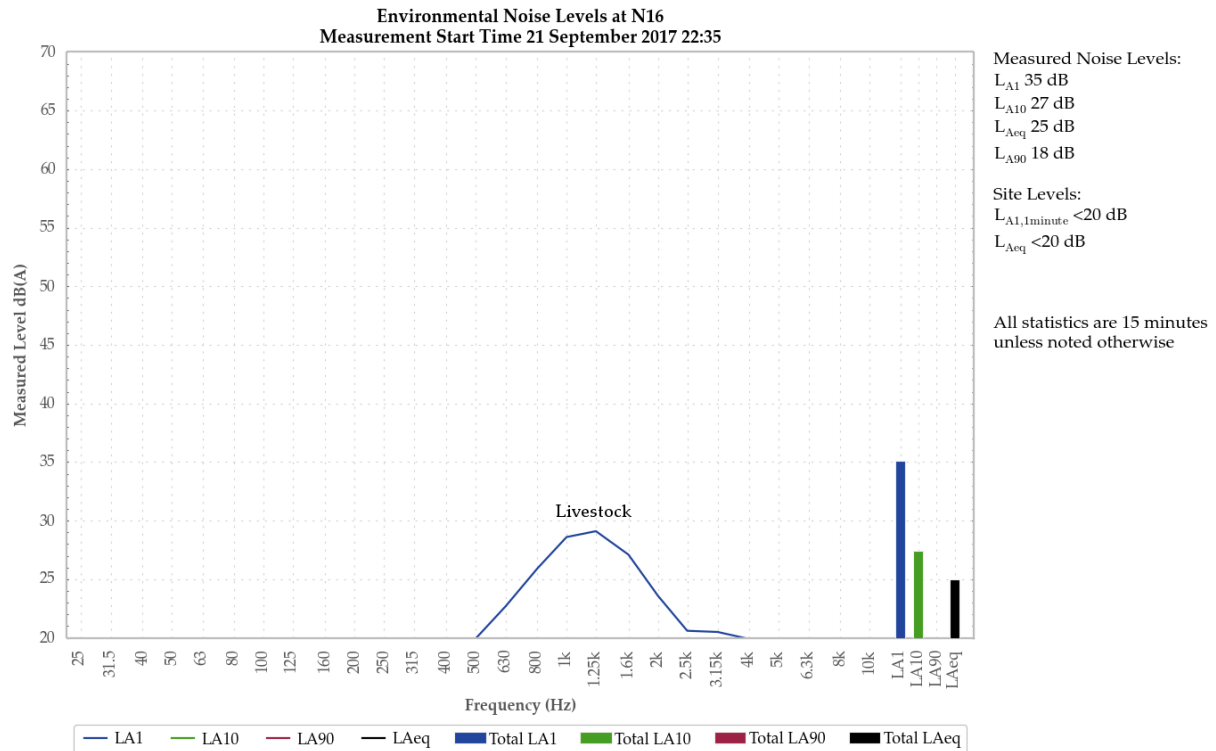


Figure 7: Environmental Noise Levels - N16, Araluen Road, off Ulan-Wollar Road

A low-level continuum from WCP was audible during the measurement generating a site only LAeq and LA1,1minute of less than 20 dB.

Livestock generated the measured LA1 and LAeq. Road traffic tyre noise generated the measured LA10. The noise floor of the sound level meter generated the measured LA90.

5.1.6 N17, 21 September 2017

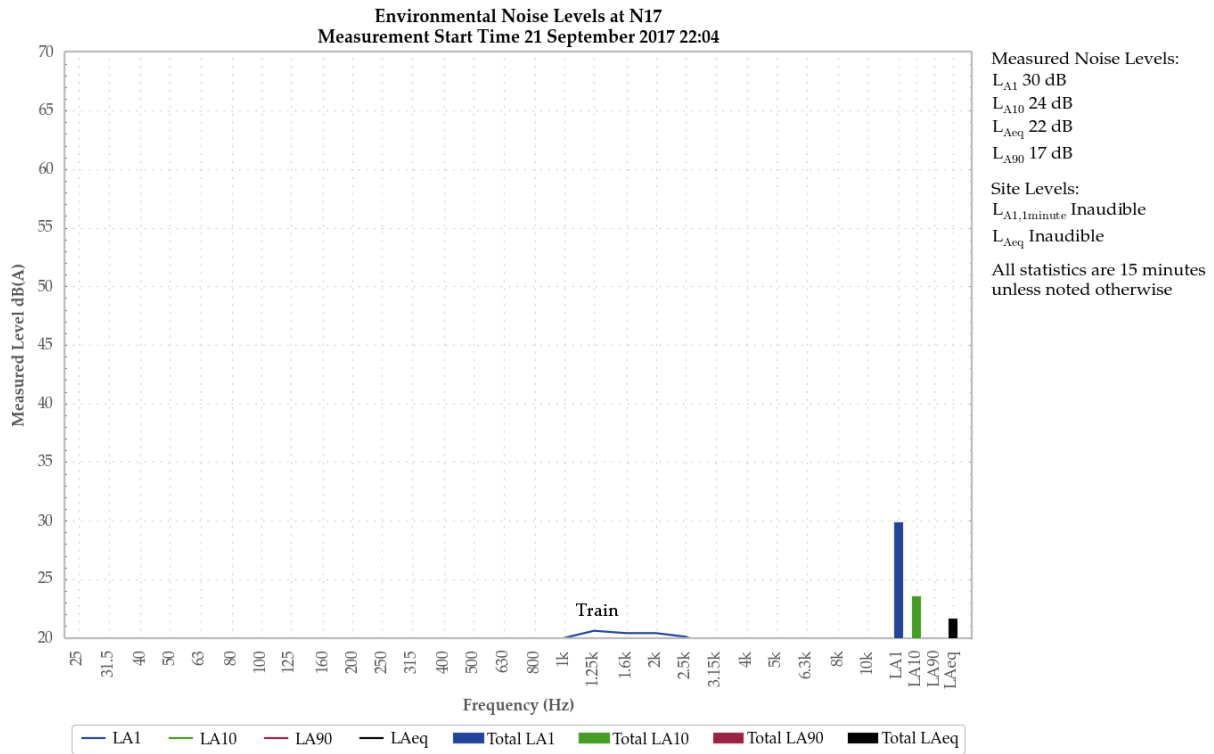


Figure 8: Environmental Noise Levels - N17, Mogo Road, off Araluen Road

WCP was inaudible.

A train horn generated the measured L_{A1}. An aircraft generated the measured L_{A10}. A train was primarily responsible for the measured L_{Aeq}. The noise floor of the sound level meter contributed to the L_{Aeq} and generated the measured L_{A90}.

5.1.7 N18, 22 September 2017

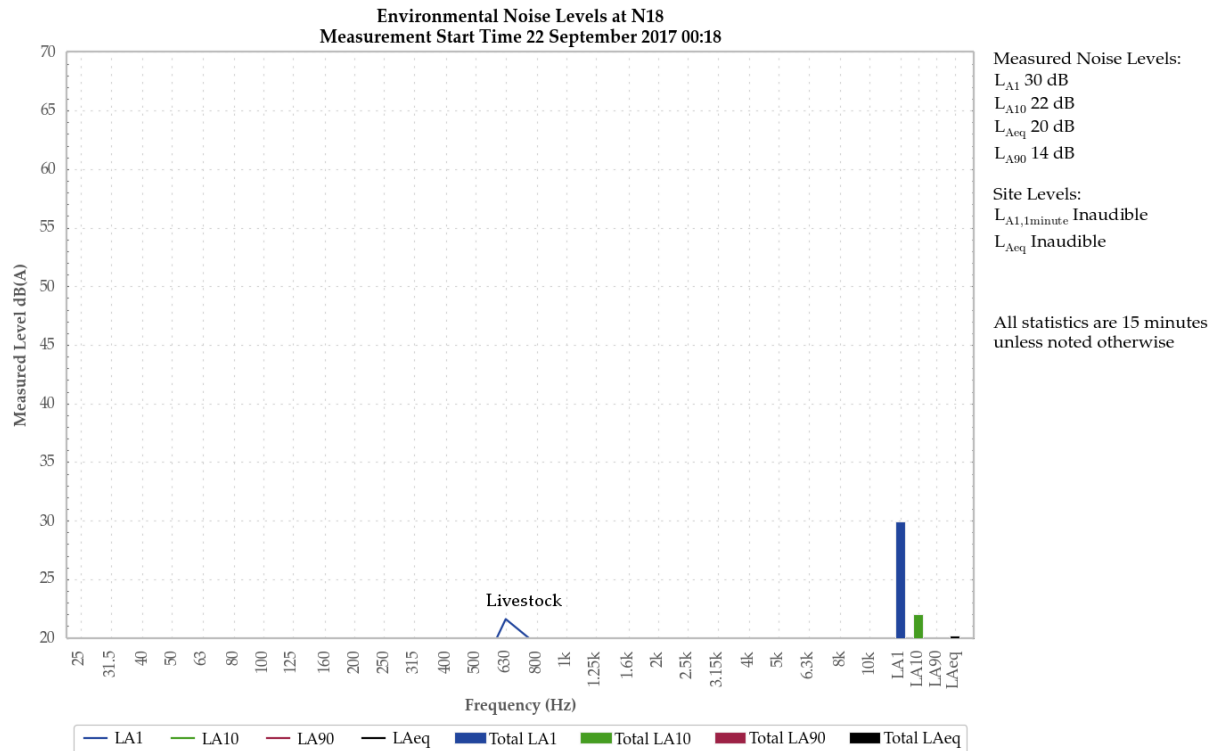


Figure 9: Environmental Noise Levels, N18 - Barigan Road, Barigan Valley

WCP was inaudible.

Livestock generated the measured LA1. Birds contributed to the measured LA10 and LAeq. The noise floor of the sound level meter contributed to the LA10 and LAeq and generated the measured LA90.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 21/22 September 2017. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

6.1 Operational Noise Assessment

Wilpinjong Coal Project complied with noise limits at the monitoring locations during the September 2017 monitoring period.

6.2 Low Frequency Assessment

During the September 2017 survey WCP complied with the relevant limits using the Broner, INP and ING methods of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Project Approval

SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

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 5 – 6 of schedule 4.

Table 1: Land subject to acquisition upon request

30 – Gaffney

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

NOISE

Noise 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 at the other specified locations.

Table 2: Noise Impact assessment criteria dB(A)

Location	Day	Evening	Night	
	<i>L_{Aeq}(15 minute)</i>	<i>L_{Aeq}(15 minute)</i>	<i>L_{Aeq}(15 minute)</i>	<i>LA1(1 minute)</i>
135	38	38	38	45
129 and 137	37	37	37	45
69	36	36	36	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		40 (internal) When in use		-
900 – St Laurence O’Toole Catholic Church				
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 10 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

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; and
- 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.

Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

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

Table 3: Land subject to additional noise mitigation upon request

Receiver ID
69, 129, 135 and 137

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

Operating Conditions

4. The Proponent shall:
 - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
 - (b) operate a comprehensive noise management system that uses a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day to day planning of mining operations, and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this approval;
 - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the project is complying with the relevant conditions of this approval, and publish these monitoring results on its website, to the satisfaction of the Director-General.

Noise Management Plan

5. The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
- (a) be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this approval; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this approval and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

APPENDIX 8 STATEMENT OF COMMITMENTS

Operational Noise

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) temperature inversion conditions greater than 3°C/100m

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Director-General directs otherwise.
5. Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

A.2 Environmental 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 January 2017.

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)
Wollar village	36	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
All other privately owned land (outside the village of Wollar)	35	35	35	45

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

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 3°C/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
- c) Temperature inversion conditions greater than 3°C/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.

R4 Other reporting conditions

R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the second round of quarterly monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:

- a) an assessment of compliance with noise limits presented in Condition L5.1; and
- b) an outline of any management actions taken within the monitoring period to address any exceedences of the limits contained in Condition L5.1.

A.3 Noise Monitoring Program

The relevant sections of the noise monitoring program for WCP dated May 2016 are reproduced below.

6 Noise Monitoring Program

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 4**. Unattended or real-time monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake attended monitoring at up to seven locations (**Table 5, Figure 3 and Figure 4**). Real-time units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 5: Noise Related Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Araluen Rd	N16	Attended Noise	778787.4	6417418.7	Location based on the nearest community structure to the East of the Mine
Mogo Rd	N17	Attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Barrigan Valley²	N18	Attended Noise	780033.3	6398618.1	DP&E Recommendation (MOD5) – Location approximately 20 km to the south of the Mine
WCPL Rail Loop		Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions

Wollar Village		Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine
Araluen Rd		Real-Time Noise - Fixed	778856.4	6417401.3	Location based on the nearest non-mine owned residence to the East of the Mine
Wandoona³		Real-Time Noise - Mobile	777684.4	6414786.2	Location based on the nearest non-mine owned residence to the South-East of the Mine

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 5** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&E and the EPA.

6.3 Attended Noise Monitoring

6.3.1 Purpose

Attended noise monitoring will be used to evaluate compliance against the Noise Criteria detailed in **Table 4**.

6.3.2 Summary

Attended noise will be undertaken in accordance with **Table 6**.

Table 6: Attended Noise Monitoring Summary

Element	Description
Locations	As per Table 5 , Figure 3 and Figure 4
Period	Night-time period (10 pm-7 am) being the most sensitive time period for noise.
Frequency	12 times per year and on one night per month

6.3.3 Methodology

Attended noise monitoring will be undertaken as outlined in **Table 6** by an independent acoustic consultant in accordance with the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the noise criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not exceed the Noise Criteria, as defined in **Table 4**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA₁ measurement will be undertaken at 1 m from the dwelling façade and the LA_{eq} measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

6.3.5 Evaluation of Compliance

Tables 7 and **8** summarises the definition used by WCPL in this NMP for the evaluation of compliance with the Project Approval. The reporting requirements and actions that WCPL will take in the event of an exceedance or non-compliance are detailed in **Figure 5** and **Section 6.3.7**.

Table 7: Definition of an Exceedance

Term	Definition
Exceedance	An exceedance is deemed to have occurred when an attended noise monitoring result, taken in accordance with the INP and Project Approval, exceeds the Noise Criteria in Table 4 . The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6).
Non-compliance	A non-compliance is deemed to have occurred when a second attended noise monitoring result, taken within 75 minutes of an exceedance and in accordance with the INP and Project Approval, exceeds the Noise Criteria in Table 4 for a second time. The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6). Reporting requirements for a non-compliance are detailed in Section 6.3.7 .

6.3.6 Favourable Meteorological Conditions

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 3°C/100m.

Except for wind speed at microphone height, the data used for determining meteorological conditions will be that recorded by the meteorological station located on the Mine site.

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

6.3.7 Response to Non-Compliance or Exceedance

Where any non-compliance of the Noise Criteria has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the non-compliance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (**Section 9.1**);
- Implement remediation measures as directed by the Director-General; and
- Review and, if necessary, revise this Management Plan (**Section 10**), to the satisfaction of the Director-General.

APPENDIX

B CALIBRATION CERTIFICATES



Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2006
Calibration Certificate

Calibration Number C16643

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 00370304
Microphone Serial Number : 10421
Pre-amplifier Serial Number : 60313

Pre-Test Atmospheric Conditions
Ambient Temperature : 22.2°C
Relative Humidity : 46.6%
Barometric Pressure : 99.95kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 22.4°C
Relative Humidity : 44.5%
Barometric Pressure : 99.95kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 16/11/2016

Secondary Check: Sandra Minto
Report Issue Date : 17/11/2016

Approved Signatory :

Juan Agüero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10: Self-generated noise	Pass	14: Level linearity on the reference level range	Pass
11: Acoustical tests of a frequency weighting	Pass	15: Level linearity incl. the level range control	Pass
12: Electrical tests of frequency weightings	Pass	16: Toneburst response	Pass
13: Frequency and time weightings at 1 kHz	Pass	17: Peak C sound level	Pass
		18: Overload Indication	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3.2006, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2.2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1.2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1.2002.

Least Uncertainties of Measurement - Environmental Conditions			
Acoustic Tests		Temperature	±0.05°C
31.5 Hz to 8kHz	±0.12dB	Relative Humidity	±0.46%
12.5kHz	±0.18dB	Barometric Pressure	±0.017kPa
16kHz	±0.31dB		
Electrical Tests			
31.5 Hz to 20 kHz	±0.12dB		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172. Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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**Acoustic
Research
Labs Pty Ltd**

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Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
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Sound Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C16526

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : LarsonDavis Cal150
Instrument Serial Number : 3333

Atmospheric Conditions

Ambient Temperature : 21.8°C
Relative Humidity : 38.1%
Barometric Pressure : 97.74kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 30/09/2016

Secondary Check: Riley Cooper
Report Issue Date : 04/10/2016

Approved Signatory :

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
5.2.2: Generated Sound Pressure Level	Pass	5.3.2: Frequency Generated	Pass
5.2.3: Short Term Fluctuation	Pass	5.5: Total Distortion	Pass

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	94.1	1000.04
Measured Output	114.0	1000.0	113.9	1000.05

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2004 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -

Specific Tests	Least Uncertainties of Measurement -	Environmental Conditions	Least Uncertainties of Measurement -
Generated SPL	±0.09dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
Distortion	±0.5%		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.

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Wilpinjong Coal

*Environmental Noise Monitoring
October 2017*

*Prepared for
Wilpinjong Coal Pty Ltd*



Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring October 2017

Reference: 17411_R01_Draft01

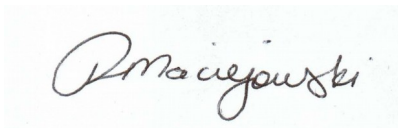
Report date: 9 November 2017

Prepared for

Wilpinjong Coal Pty Ltd
Locked Bag 2005
Mudgee NSW 2850

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322



Prepared: Ronni Maciejowski
Acoustics Consultant



QA Review: Katie Weekes
Environmental Scientist (Acoustics)

Global Acoustics Pty Ltd ~ Environmental noise modelling 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 Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

The current WCP development consent was approved in April 2017. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

Attended monitoring was conducted in accordance with the documents detailed above, the NSW Environment Protection Authority (EPA) 'Noise Policy for Industry' (NPfI) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. The duration of each night measurement was 15 minutes. Results of monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 30/31 October 2017. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Operational Noise Assessment

WCP complied with relevant noise limits at all monitoring locations during the October 2017 monitoring.

Low Frequency Assessment

During the October 2017 survey, WCP complied with the relevant limits using the NPfI method of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 30/31 October 2017. Figure 1 shows the monitoring locations.

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

1.2 Monitoring Locations

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

Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road, Moolarben
N14	'Tichular', intersection of Tichular and Barigan Roads, Tichular
N15	Track off Barigan Street near Wollar Public School, Wollar Village
N17	Mogo Road, off Araluen Road, Wollar
N19	Mogo Road, Mogo
N20	Ringwood Road, off Wollar Road, Wollar
N21	'Wandoona', Barigan Road, Wollar

1.3 Terminology & Abbreviations

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

Table 1.2: TERMINOLOGY & ABBREVIATIONS

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
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
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, but could not be quantified
Day	This is the period 7:00am to 6:00pm
Evening	This is the period 6:00pm to 10:00pm
Night	This is the period 10:00pm to 7:00am

2 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

Approval was granted for the Wilpinjong Extension Project (SSD-6764) in April 2017, which covers all current operations and has now replaced the previous consent (05-0021). The relevant noise conditions from the current project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in January 2017. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in June 2017. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Approval Criteria and Weather Conditions

Criteria detailed in Table 2.1 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with WCP.

Table 2.1: WCP PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church	36	37	37/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	37	37/45
N17 ²	Mogo Road, off Araluen Road	36	36	38/45
N19	Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

1. N6 noise limits have been assumed to be as detailed for 'Wollar Village – Residential' in the PA, as the church is no longer a place of worship; and
2. N17 noise limits have been determined based on the assumption that N17 is property 102 in accordance with Appendix 5 Figure 1 of Development Consent SSD-6764.

In accordance with the NMP, as detailed in Appendix 6 of the WCP Extension project approval (SSD-6764), noise criteria apply under all meteorological conditions except for the following:

- a) wind speeds greater than 3 m/s at 10m above ground level;
- b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or
- c) stability category G temperature inversion conditions.

2.5 EPL Criteria and Weather Conditions

Criteria detailed in Table 2.2 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with WCP.

Table 2.2: WCP - PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church, Wollar Village	36	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N19	Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

1. Noise limits for N6 have been assumed to be those listed for 'Wollar Village' in Section L5.1 of the EPL, as it falls within the village of Wollar.

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 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.

2.6 Modifying Factors

The EPA 'Noise Policy for Industry' (Npfi, 2017) was approved for use in NSW in October 2017, and supersedes the EPA's Industrial Noise Policy (INP, 2000). Assessment and reporting of modifying factors is to be carried out in accordance with Fact Sheet C of the NPfi.

NPfi modifying factors, as they are applicable to mining noise, are described in more detail below.

2.6.1 Tonality and Intermittent Noise

As defined in the NPfi:

Tonal noise contains a prominent frequency and is characterised by a definite pitch.

Intermittent noise is characterised by the level suddenly dropping/increasing several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only and is not intended to be applied to changes in noise level due to meteorology.

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 noise as defined in the NPfi.

2.6.2 Low Frequency Noise

NPfi Method

The NPfi contains the current method of assessing low frequency noise, which is a 2 step process as detailed below:

Measure/assess source contribution C-weighted and A-weighted $L_{eq,T}$ levels over the same time period. The low frequency noise modifying factor correction is to be applied where the C-A level is 15 dB or more and:

- where any of the 1/3 octave noise levels in Table C2 are exceeded by **up to and including** 5 dB and cannot be mitigated, a 2 dBA positive adjustment to measured A weighted levels applies for the evening/night period; and*
- where any of the 1/3 octave noise levels in Table C2 are exceeded by **more than** 5 dB and cannot be mitigated, a 5 dBA positive adjustment to measured A weighted levels applies for the evening/night period and a 2 dBA positive adjustment applies for the daytime period.*

Table C2 and associated notes from the NPfI is reproduced below:

Table C2: One-third octave low-frequency noise thresholds.

Hz/dB(Z)	One-third octave $L_{Zeq,15min}$ threshold level												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

Notes:

- dB(Z) = decibel (Z frequency weighted).
- For the assessment of low-frequency noise, care should be taken to select a wind screen that can protect the microphone from wind-induced noise characteristics at least 10 dB below the threshold values in Table C2 for

wind speeds up to 5 metres per second. It is likely that high performance larger diameter wind screens (nominally 175 mm) will be required to achieve this performance (Hessler, 2008). In any case, the performance of the wind screen and wind speeds at which data will be excluded needs to be stated.

- Low-frequency noise corrections only apply under the standard and/or noise-enhancing meteorological conditions.
- Where a receiver location has had architectural acoustic treatment applied (including alternative means of mechanical ventilation satisfying the Building Code of Australia) by a proponent, as part of consent requirements or as a private negotiated agreement, alternative external low-frequency noise assessment criteria may be proposed to account for the higher transmission loss of the building façade.
- Measurements should be made between 1.2 and 1.5 metres above ground level unless otherwise approved through a planning instrument (consent/approval) or environment protection licence, and at locations nominated in the development consent or licence.

3 METHODOLOGY

3.1 Assessment Method

Attended monitoring was conducted in accordance with the EPA's NPfI and Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken. Monitoring is undertaken once per month at each location. The duration of each measurement was 15 minutes.

Attended monitoring during this reporting period was undertaken by Ryan Bruniges and Amanda Borserio.

If the exact contribution from WCP cannot be established, due to masking by other noise sources in a similar frequency range, but site noise levels are observed to be well below (more than 5 dB lower than) any relevant criterion, a maximum estimate of the potential contribution of the site might be made based on other measured site-only noise levels, for example, L_{A10} , L_{A50} or L_{A90} . This is generally expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may also be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means some noise was audible but could not be quantified. If site noise was NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per section 7.1 of the NPfI (e.g. measuring at an intermediate location and using relevant calculation) to determine a value for reporting.

All sites noted as NM in this report are due to one or more of the following reasons:

- site noise levels were extremely low and unlikely, in many cases, to be even noticed;
- site noise levels were masked by another relatively loud noise source that is characteristic of the environment (e.g. breeze in foliage or continuous road traffic noise) that cannot be eliminated by moving closer; and/or
- it was not feasible or reasonable to employ NPfI methods such as using an intermediate location. Cases may include, but are not limited to, rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

A measurement of $L_{A1,1\text{minute}}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or $L_{A\text{max}}$, received from the site 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 $L_{A1,1\text{minute}}$ 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.

Low frequency noise has been assessed using the NPfI method, detailed in Section 2.6 of this report.

3.2 Attended Noise 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: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	00701424	05/06/2019
Rion NA-28 sound level analyser	30131882	14/03/2019
Pulsar 105 acoustic calibrator	78226	14/03/2019
Pulsar 106 acoustic calibrator	74813	05/06/2019

4 RESULTS

4.1 Attended Noise Monitoring

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. 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 – OCTOBER 2017¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	30/10/2017 23:43	51	44	41	38	39	35	32	62
N13	31/10/2017 00:49	48	38	34	31	32	29	27	58
N14	30/10/2017 22:06	63	55	50	44	46	38	35	73
N15	31/10/2017 00:04	59	53	49	41	44	30	26	58
N17	31/10/2017 00:38	45	35	32	26	28	24	20	38
N19	31/10/2017 01:07	44	35	32	23	28	20	18	41
N20	30/10/2017 23:11	49	46	42	38	39	35	31	64
N21	30/10/2017 22:35	57	55	51	45	47	38	35	67

Note:

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

4.2 Project Approval and Weather Conditions

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 project approval. Modifying factors are considered in Section 4.4 of this report.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – OCTOBER 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	30/10/2017 23:43	5.2	D	37	No	IA	NA
N13	31/10/2017 00:49	3.6	D	35	No	IA	NA
N14	30/10/2017 22:06	5.4	D	35	No	IA	NA
N15	31/10/2017 00:04	3.6	D	37	No	IA	NA
N17	31/10/2017 00:38	3.6	D	38	No	IA	NA
N19	31/10/2017 01:07	3.2	D	35	No	<20	NA
N20	30/10/2017 23:11	5.1	D	35	No	IA	NA
N21	30/10/2017 22:35	6.8	D	35	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

Table 4.3: $L_{A1,1minute}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – OCTOBER 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{A1,1min}$ dB ^{4,5}	Exceedance ⁶
N6	30/10/2017 23:43	5.2	D	45	No	IA	NA
N13	31/10/2017 00:49	3.6	D	45	No	IA	NA
N14	30/10/2017 22:06	5.4	D	45	No	IA	NA
N15	31/10/2017 00:04	3.6	D	45	No	IA	NA
N17	31/10/2017 00:38	3.6	D	45	No	IA	NA
N19	31/10/2017 01:07	3.2	D	45	No	<20	NA
N20	30/10/2017 23:11	5.1	D	45	No	IA	NA
N21	30/10/2017 22:35	6.8	D	45	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

4.3 EPL and Weather Conditions

Table 4.4 and Table 4.5 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines EPL.

Table 4.4: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – OCTOBER 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	30/10/2017 23:43	5.2	-1.2	35	No	IA	NA
N13	31/10/2017 00:49	3.6	-1.0	35	No	IA	NA
N14	30/10/2017 22:06	5.4	-1.0	35	No	IA	NA
N15	31/10/2017 00:04	3.6	-1.2	35	No	IA	NA
N17	31/10/2017 00:38	3.6	-1.0	35	No	IA	NA
N19	31/10/2017 01:07	3.2	-1.0	35	No	<20	NA
N20	30/10/2017 23:11	5.1	-1.2	35	No	IA	NA
N21	30/10/2017 22:35	6.8	-1.2	35	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions except for the following: wind speeds greater than 3 m/s at 10 metres above ground level; or temperature inversion conditions up to 3°C/100m and wind speeds greater than 2 m/s at 10 metres above ground level; or temperature inversion conditions greater than 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in EPL and so criterion is not applicable.

Table 4.5: *L_{A1,1minute}* GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – OCTOBER 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP <i>L_{A1,1min}</i> dB ^{4,5}	Exceedance ⁶
N6	30/10/2017 23:43	5.2	-1.2	45	No	IA	NA
N13	31/10/2017 00:49	3.6	-1.0	45	No	IA	NA
N14	30/10/2017 22:06	5.4	-1.0	45	No	IA	NA
N15	31/10/2017 00:04	3.6	-1.2	45	No	IA	NA
N17	31/10/2017 00:38	3.6	-1.0	45	No	IA	NA
N19	31/10/2017 01:07	3.2	-1.0	45	No	<20	NA
N20	30/10/2017 23:11	5.1	-1.2	45	No	IA	NA
N21	30/10/2017 22:35	6.8	-1.2	45	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions except for the following: wind speeds greater than 3 m/s at 10 metres above ground level; or temperature inversion conditions up to 3°C/100m and wind speeds greater than 2 m/s at 10 metres above ground level; or temperature inversion conditions greater than 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in EPL and so criterion is not applicable.

4.4 Low Frequency Assessment

Low frequency results for each monitoring location are presented in Table 4.6.

Table 4.6: LOW FREQUENCY NOISE MODIFYING FACTOR ASSESSMENT – OCTOBER 2017

Location	Start Date and Time	Measured Site Only L _{Aeq} dB	Site Only L _{Ceq} dB ⁴	Site Only L _{Ceq} - L _{Aeq} dB ^{1,4}	Result ^{2,3,4} Max exceedance of ref spectrum dB	Penalty dB ⁵
N6	30/10/2017 23:43	IA	NA	NA	NA	0
N13	31/10/2017 00:49	IA	NA	NA	NA	0
N14	30/10/2017 22:06	IA	NA	NA	NA	0
N15	31/10/2017 00:04	IA	NA	NA	NA	0
N17	31/10/2017 00:38	IA	NA	NA	NA	0
N19	31/10/2017 01:07	<20	NA	NA	NA	0
N20	30/10/2017 23:11	IA	NA	NA	NA	0
N21	30/10/2017 22:35	IA	NA	NA	NA	0

Notes:

1. As per Npfl, if $L_{Ceq} - L_{Aeq} \geq 15$ dB further assessment of low frequency noise required as detailed in Section 2.6.2 of this report;
2. As per Npfl, compare measured spectrum against reference spectrum to determine if the low frequency modifying factor is triggered and application of penalty is required;
3. Bold results and penalties in red are where the relevant modifying factor trigger was exceeded;
4. Where it is not possible to determine the site only result due to the presence of other low frequency noise sources occurring during the measurement, or where site only level is 5 dB or more less than criterion, this is noted as NA (not available) and no further assessment has been undertaken; and
5. In accordance with the project approval, noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions. Assessment of low frequency assessment was not undertaken where criterion do not apply due to meteorological conditions outside these parameters.

As detailed in Table 4.6, there were no low frequency correction penalties applied and no further analysis of low frequency noise was required.

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator at each location using a Kestrel hand-held weather meter is shown in Table 4.7. Atmospheric condition data is routinely recorded on a site-by-site basis to show conditions during the monitoring period. The wind speed, direction and temperature were measured at 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – OCTOBER 2017

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	30/10/2017 23:43	NA	NA	NA	NA
N13	31/10/2017 00:49	12	2.9	210	2
N14	30/10/2017 22:06	13	3.9	180	5
N15	31/10/2017 00:04	14	1.8	160	4
N17	31/10/2017 00:38	15	-	-	3
N19	31/10/2017 01:07	15	0.3	170	0
N20	30/10/2017 23:11	15	2.2	220	0
N21	30/10/2017 22:35	15	3.4	180	6

Notes:

1. *Wind speed and direction measured at 1.8 metres;*
2. *“-” denotes calm conditions at 1.8 metres; and*
3. *‘NA’ indicates data not available.*

Data obtained concurrently by the WCP meteorological station is provided in Table 4.8 and is used to determine compliance with specified noise criteria.

Table 4.8: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees	Lapse Rate Degrees / 100 metres²
30/10/2017 22:00	5.2	213	-1.0
30/10/2017 22:15	5.4	220	-1.0
30/10/2017 22:30	5.4	215	-1.2
30/10/2017 22:45	6.8	209	-1.2
30/10/2017 23:00	7.4	208	-1.2
30/10/2017 23:15	6.2	205	-1.2
30/10/2017 23:30	5.1	206	-1.2
30/10/2017 23:45	5.0	199	-1.2
31/10/2017 00:00	5.2	201	-1.2
31/10/2017 00:15	3.6	204	-1.2
31/10/2017 00:30	3.9	200	-1.2
31/10/2017 00:45	4.0	204	-1.2
31/10/2017 01:00	3.6	201	-1.0
31/10/2017 01:15	3.2	184	-1.0
31/10/2017 01:30	3.9	195	-1.2
31/10/2017 01:45	3.8	195	-1.0
31/10/2017 02:00	3.5	209	-1.0

Notes:

1. Data supplied by WCP; and
2. Lapse rate calculated using data sourced from WCP inversion tower.

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 to Table 4.5 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. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

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 Figure 3 to Figure 9 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 cut-off frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq} .

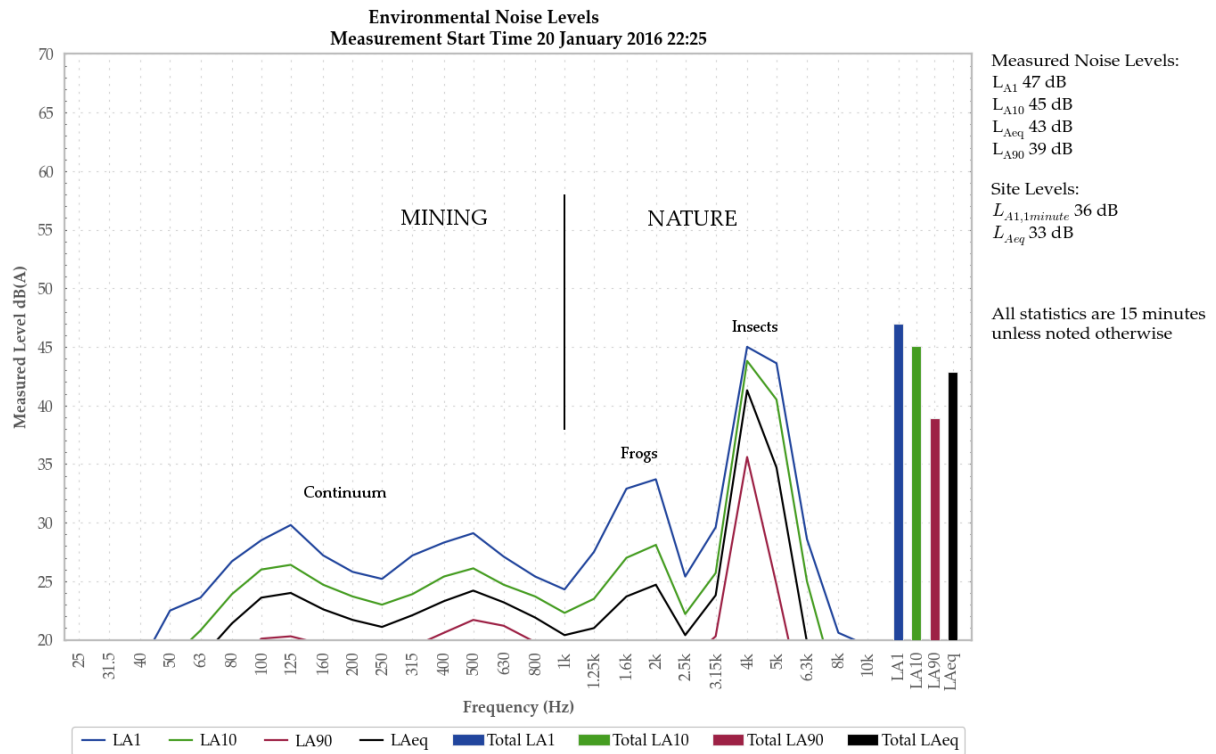


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6, 30 October 2017

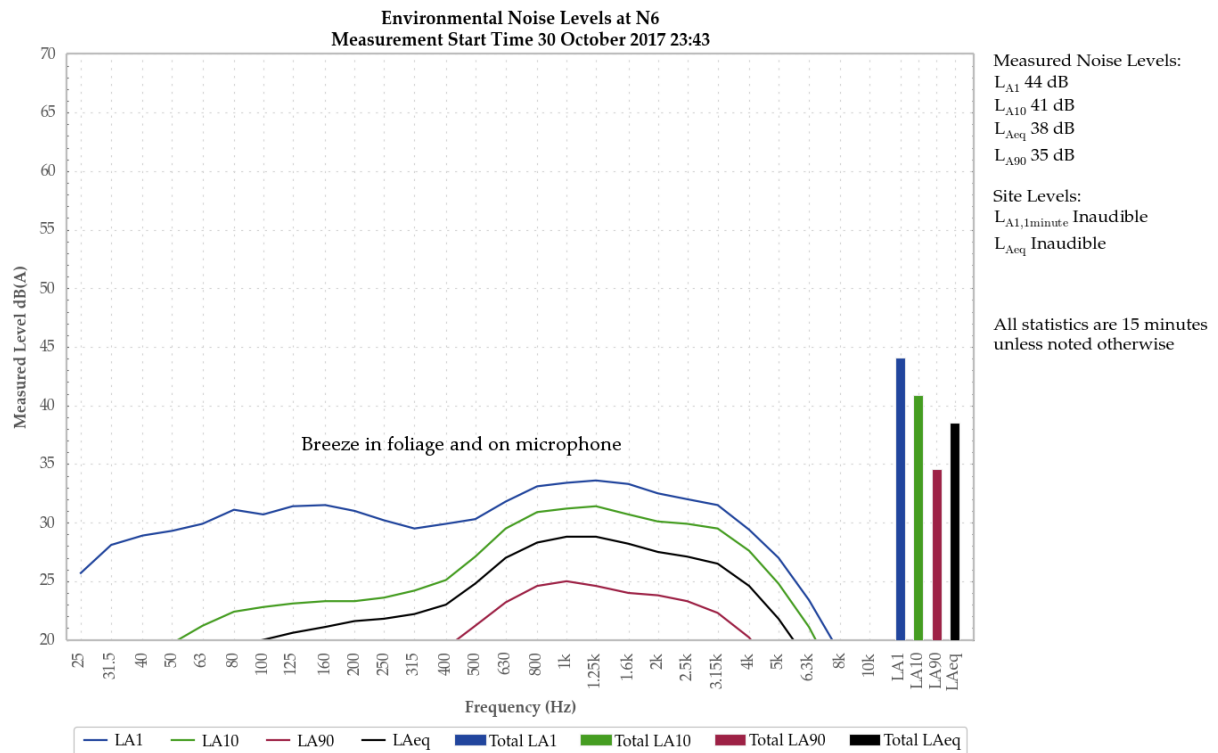


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

WCP was inaudible.

Breeze in foliage and breeze on the microphone generated all measured levels.

5.1.2 N13, 31 October 2017

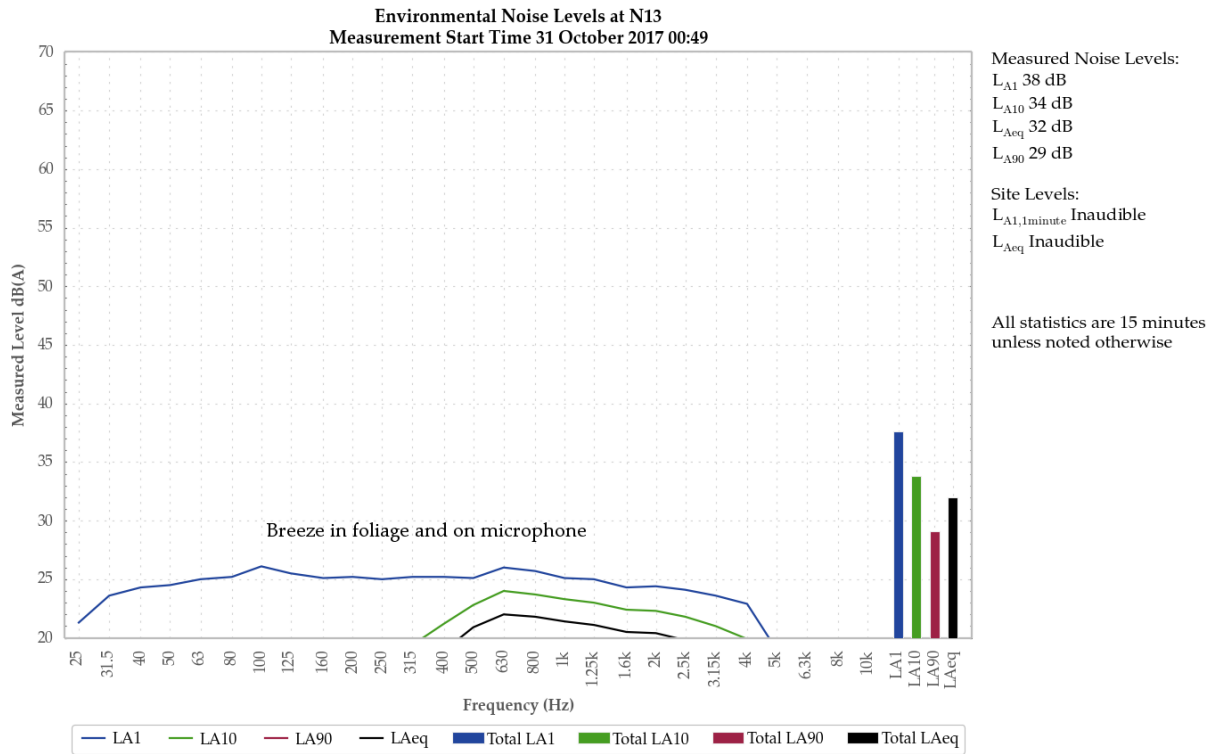


Figure 4: Environmental Noise Levels – N13, 'Coonaroo' off Moolarben Road

WCP was inaudible.

Breeze in foliage and breeze on the microphone generated all measured levels.

Frogs were also noted.

5.1.3 N14, 30 October 2017

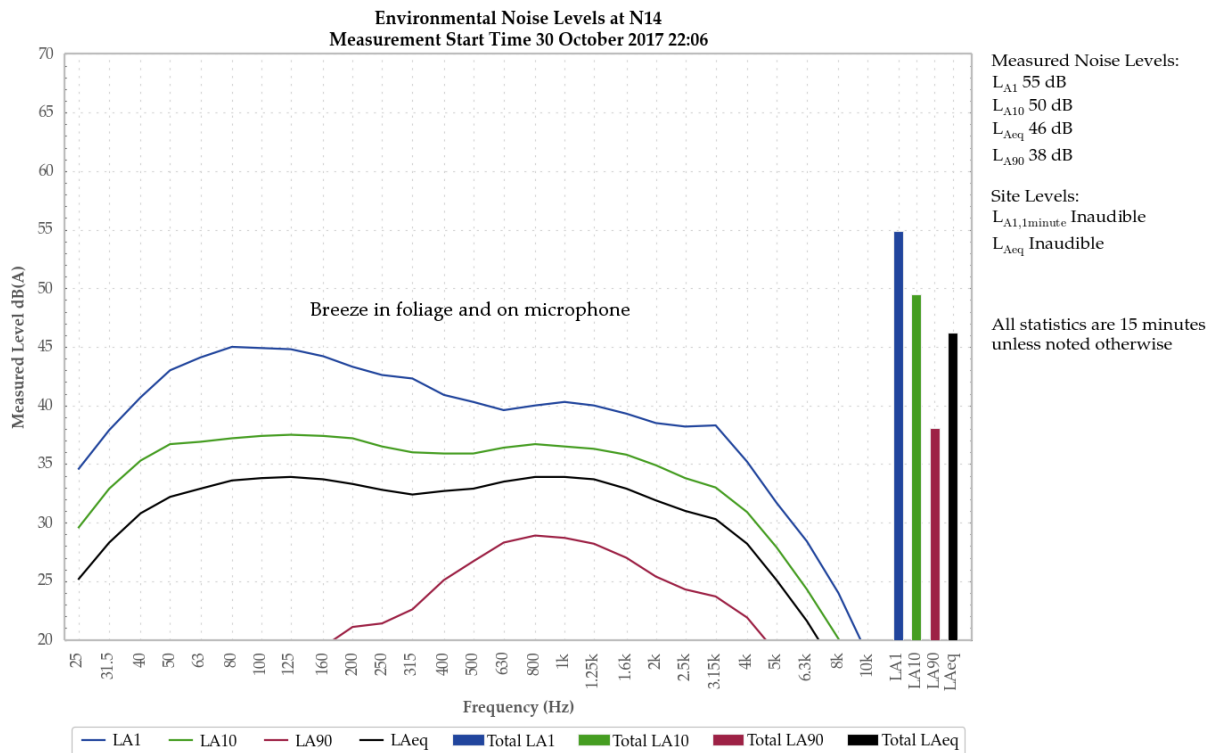


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

WCP was inaudible.

Breeze in foliage and breeze on the microphone generated all measured levels.

Insects were also noted.

5.1.4 N15, 31 October 2017

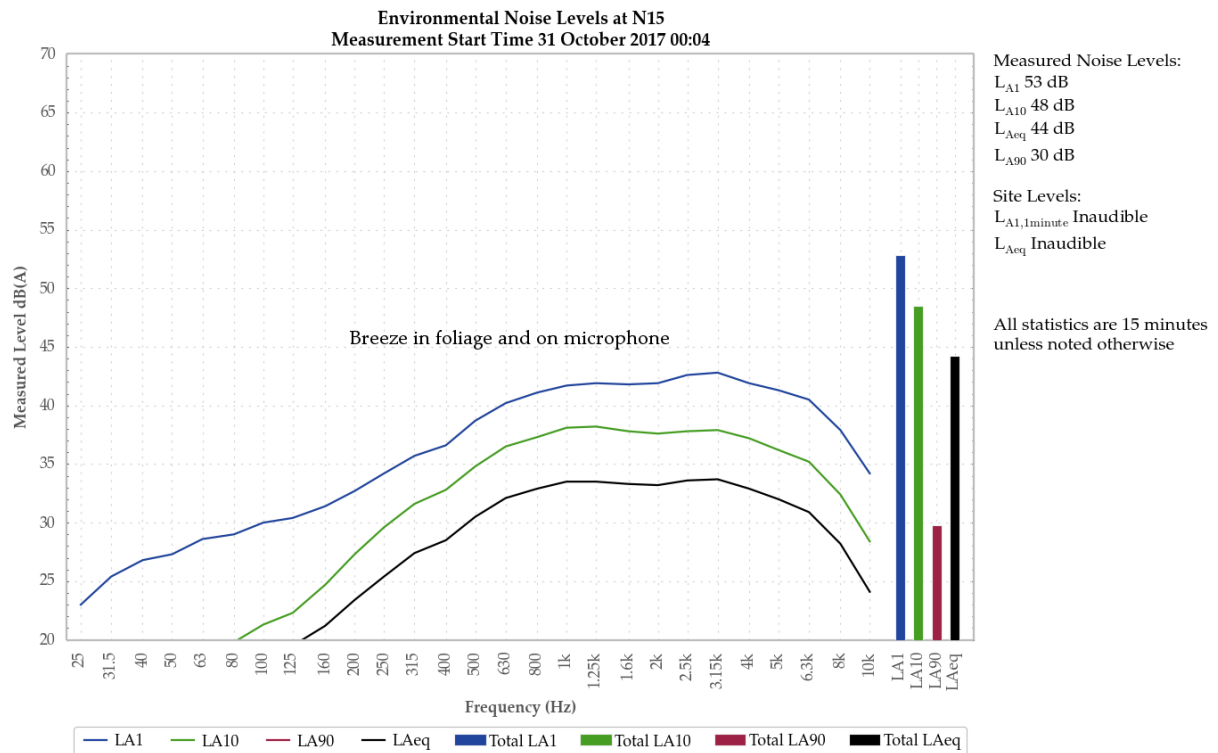


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

WCP was inaudible.

Breeze in foliage and breeze on the microphone generated all measured levels.

An aircraft was also noted.

5.1.5 N17, 31 October 2017

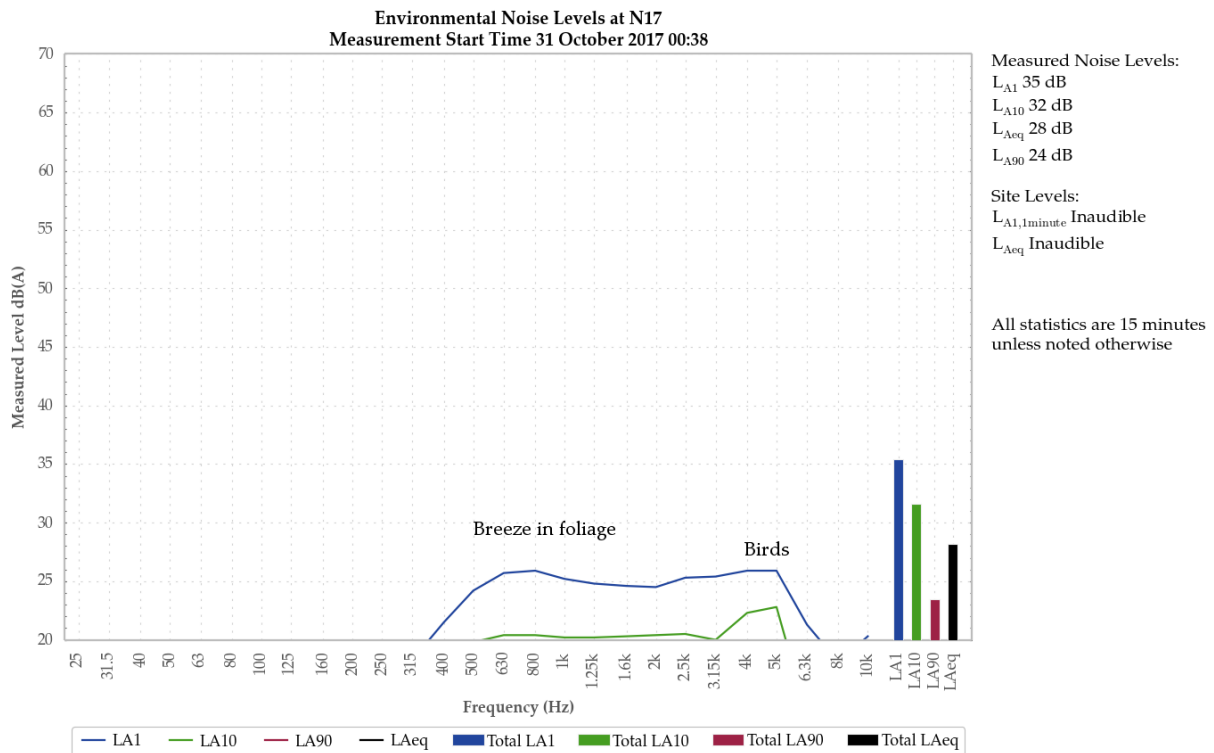


Figure 7: Environmental Noise Levels – N17 Mogo Road, off Araluen Road

WCP was inaudible.

Birds and breeze in foliage generated the measured LA1, LA10 and LAeq. Breeze in foliage generated the measured LA90.

Bats were also noted.

5.1.6 N19, 31 October 2017

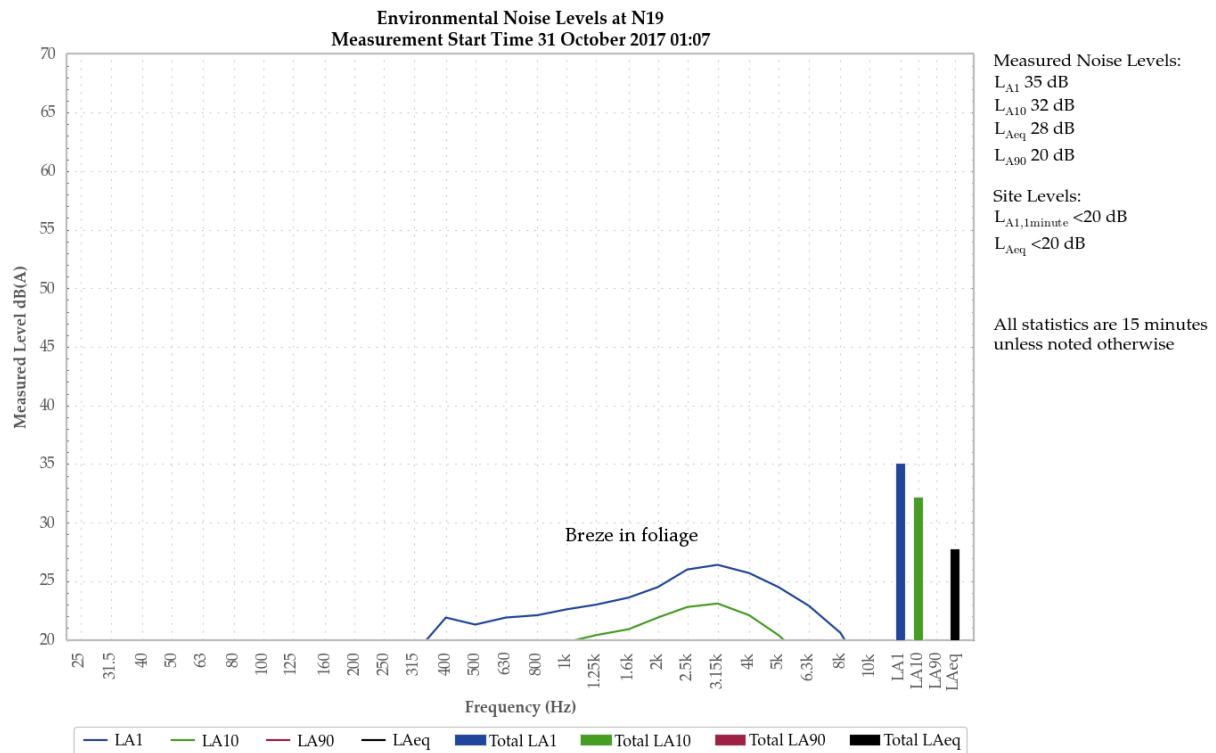


Figure 8: Environmental Noise Levels – N19, Mogo Road

A very low-level continuum from WCP was audible at times generating the site only LAeq and LA1,1minute of less than 20 dB.

Breeze in foliage generated all measured levels.

Breeze on the microphone and bats were also noted.

5.1.7 N20, 30 October 2017

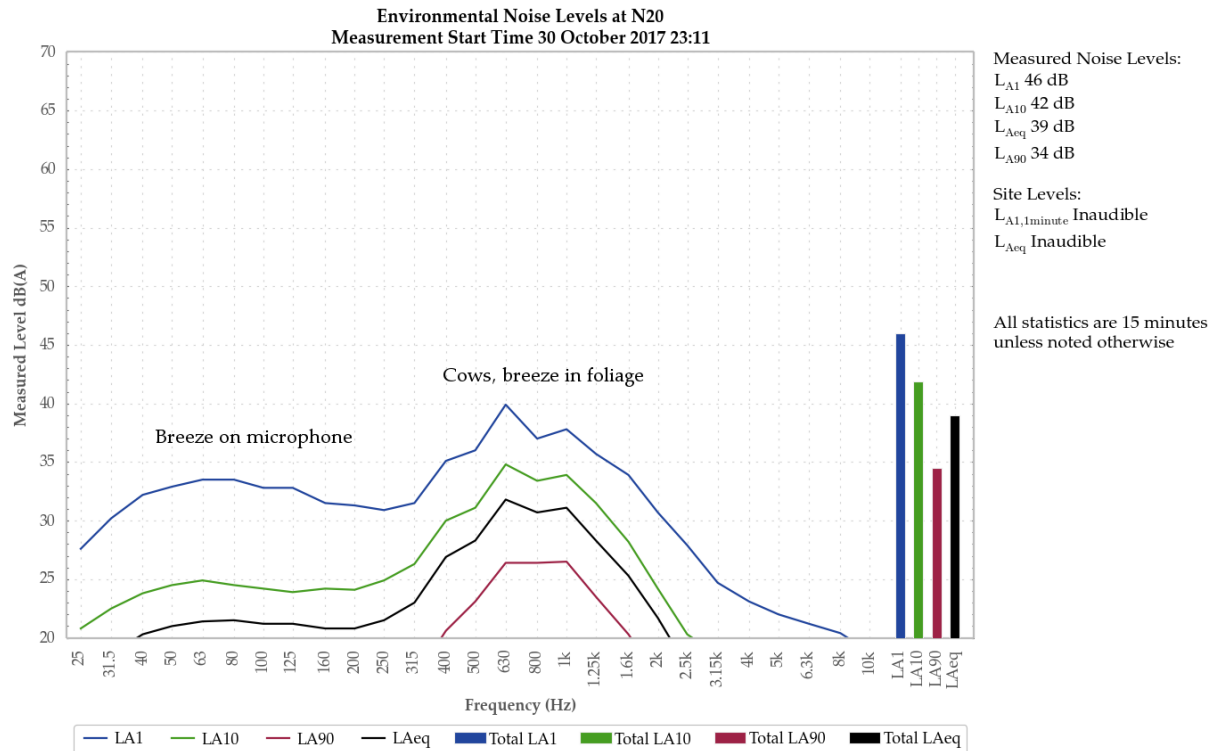


Figure 9: Environmental Noise Levels, N20 – Ringwood Road

WCP was inaudible.

Cows and breeze in foliage primarily generated the measured L_{A1}, L_{A10} and L_{Aeq} and were responsible for the L_{A90}. Breeze on the microphone was a minor contributor to the measured L_{A10} and L_{Aeq}.

5.1.8 N21, 30 October 2017

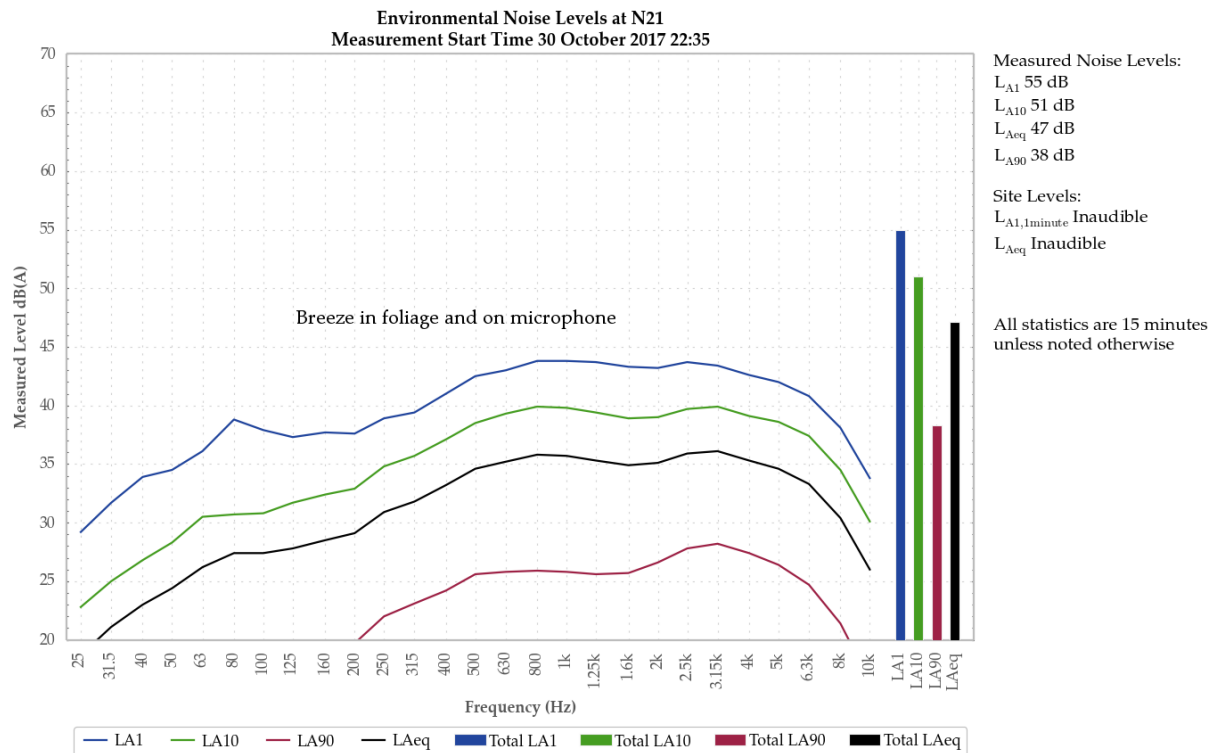


Figure 10: Environmental Noise Levels, N21 – 'Wandoona', Barigan Road

WCP was inaudible.

Breeze in foliage and breeze on the microphone generated all measured levels.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 30/31 October 2017. Attended noise monitoring was conducted at eight sites. The duration of all measurements was 15 minutes.

6.1 Operational Noise Assessment

Wilpinjong Coal Project complied with noise limits at the monitoring locations during the October 2017 monitoring period.

6.2 Low Frequency Assessment

During the October 2017 survey WCP complied with the relevant limits using the NPfI method of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Extension Project Approval (SSD-6764)

NOISE

Noise Criteria

3. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 3 at any residence on privately-owned land or at the other specified locations.

Table 3: Noise criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{A1}(1 \text{ minute})$
102	36	36	38	45
Wollar Village – Residential	36	37	37	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	40 (internal) When in use			-
900 – St Laurence O'Toole Catholic Church				

Note: To interpret the locations referred to in Table 3, see the applicable figures in Appendix 5.

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy* (as may be updated from time to time). Appendix 6 sets out the meteorological conditions under which these criteria apply along with any modifications to the *NSW Industrial Noise Policy* and the requirements for evaluating compliance with these criteria.

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

Operating Conditions

4. The Applicant must:
 - (a) implement all reasonable and feasible measures to minimise the construction, operational, low frequency, road and rail noise of the development;
 - (b) operate a comprehensive noise management system that uses a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day to day planning of mining operations, and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this consent;
 - (c) minimise the noise impacts of the development during meteorological conditions when the noise limits in this consent do not apply (see Appendix 6);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this consent.

Noise Management Plan

5. Prior to carrying out any development under this consent, unless the Secretary agrees otherwise, the Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:
 - (a) be prepared in consultation with the EPA;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this consent; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this consent and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.
6. The Applicant must implement the approved Noise Management Plan for the development.

APPENDIX 6 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 3 of schedule 3 are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) stability category G temperature inversion conditions.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Secretary directs otherwise.
5. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

6. The assessment of excessive levels of low frequency noise generated by the mine shall be as follows:
 Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:
- where any of the 1/3 octave noise levels in Table 6-1 are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
 - where any of the 1/3 octave noise levels in Table 6-1 are exceeded by more than 5dB and cannot be mitigated, a 5 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period and a 2dB positive adjustment applies for the daytime period.

Table 6-1: One-third octave low frequency noise thresholds

Hz/dB(Z)	One-third octave $L_{Zeq,15minute}$ threshold level												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

A.2 Environmental 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 January 2017.

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)
Wollar village	36	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
All other privately owned land (outside the village of Wollar)	35	35	35	45

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

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:

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

R4 Other reporting conditions

- R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the second round of quarterly monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:
- a) an assessment of compliance with noise limits presented in Condition L5.1; and
 - b) an outline of any management actions taken within the monitoring period to address any exceedences of the limits contained in Condition L5.1.

A.3 Noise Monitoring Program

The relevant sections of the noise monitoring program for WCP dated June 2017 are reproduced below.

WCPL utilise a combination of operator-attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria from Development Consent (SSD-6467). Operator-attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 6**. Unattended real-time noise monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Operator-attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake operator-attended noise monitoring as identified in **Table 7 (Figure 3 and Figure 4)**. Real-time noise monitoring units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 7: Noise Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Operator-attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Operator-attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Operator-attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Operator-attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Mogo Rd	N17	Operator-attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Mogo Rd	N19	Operator-attended Noise	782644.5	6424151.1	Location based on the nearest and residential community structure to the North-East of the Mine

Location	Site	Type	Easting ⁺	Northing ⁺	Justification
Ringwood Road	N20	Operator-attended Noise	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine.
Wandoona	N21	Operator-attended Noise	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP in May 2017.
WCPL Rail Loop	-	Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions
Wollar Village ⁴	-	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine N15 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Mogo Rd ⁴	-	Real-Time Noise - Fixed	782644.5	6424151.1	Location based on the nearest non-mine owned residence to the East of the Mine N19 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Ringwood Road	-	Real-Time Noise - Fixed	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine. N20 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Wandoona ³	-	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP. N21 operator-attended Noise Monitoring (validation of real-time noise monitoring)

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.
4. Where continuous monitors are located at compliance locations (e.g. privately owned receivers), WCPL will conduct a review of the identification/characterisation of mine-related noise by the real-time monitoring system at that location by comparing against observed mine-related noise identified during operator-attended monitoring (i.e. validate the identification of mine related noise and filtering of extraneous noise sources by the real-time system). Refer to **Section 6.5**.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 7** with consideration to the above criteria. WCPL will update this NMP, in consultation with DP&E and the EPA.

6.3.3 Methodology

Operator-attended noise monitoring will be undertaken at the locations and frequency as outlined in **Table 8** by an independent acoustic consultant and guided by the requirements of the INP (EPA, 2000) and AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'. Routine operator-attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the Noise Criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not exceed the Noise Criteria, as defined in **Table 6**, then the result will be recorded and the attended noise monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria, then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) Upon confirming the exceedances are deemed a non-compliance in accordance with the **Figure 5**, WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance (**Section 9.0**).

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional operator-attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:

- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by more than 5dB and cannot be mitigated, a 5 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period and a 2dB positive adjustment applies for the daytime period.

Table 9 One-third Octave Low Frequency Noise Thresholds

Hz/dB(Z)	One-third octave LZeq,15minute threshold level												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

6.3.6 Applicable Meteorological Conditions

The Noise Criteria in **Table 6** are to be applied under all meteorological conditions except for the following:

- Wind speeds greater than 3 m/s at 10 m above ground level; or
- Stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
- Stability category G temperature inversion conditions.

APPENDIX

B CALIBRATION CERTIFICATES



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**Sound Level Meter
IEC 61672-3:2013**

Calibration Certificate

Calibration Number C17248

Client Details	Global Acoustics Pty Ltd 12/16 Huntigdale Drive Thornton NSW 2322
Equipment Tested/ Model Number :	Rion NA-28
Instrument Serial Number :	00701424
Microphone Serial Number :	01916
Pre-amplifier Serial Number :	01463
Pre-Test Atmospheric Conditions	Post-Test Atmospheric Conditions
Ambient Temperature : 24.3°C	Ambient Temperature : 24.4°C
Relative Humidity : 40%	Relative Humidity : 39.5%
Barometric Pressure : 100.05kPa	Barometric Pressure : 100kPa
Calibration Technician : Vicky Jaiswal	Secondary Check: Nick Williams
Calibration Date : 05/06/2017	Report Issue Date : 06/06/2017
Approved Signatory :	Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	Pass	17: Level linearity incl. the level range control	Pass
13: Electrical Sig. tests of frequency weightings	Pass	18: Toneburst response	Pass
14: Frequency and time weightings at 1 kHz	Pass	19: C Weighted Peak Sound Level	Pass
15: Long Term Stability	Pass	20: Overload Indication	Pass
16: Level linearity on the reference level range	Pass	21: High Level Stability	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement -			
Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	±0.16dB	Temperature	±0.05°C
12.5kHz	±0.2dB	Relative Humidity	±0.46%
16kHz	±0.29dB	Barometric Pressure	±0.017kPa
Electrical Tests			
31.5 Hz to 20 kHz	±0.12dB		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025.

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Sound Level Meter
IEC 61672-3.2013

Calibration Certificate

Calibration Number C17126

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 30131882
Microphone Serial Number : 04739
Pre-amplifier Serial Number : 11942

Pre-Test Atmospheric Conditions
Ambient Temperature : 22.4°C
Relative Humidity : 55.6%
Barometric Pressure : 99.91kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 22.6°C
Relative Humidity : 58.1%
Barometric Pressure : 99.85kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 14/03/2017

Secondary Check: Riley Cooper
Report Issue Date : 15/03/2017

Approved Signatory :

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	Pass	17: Level linearity incl. the level range control	Pass
13: Electrical Sig. tests of frequency weightings	Pass	18: Toneburst response	Pass
14: Frequency and time weightings at 1 kHz	Pass	19: C Weighted Peak Sound Level	Pass
15: Long Term Stability	Pass	20: Overload Indication	Pass
16: Level linearity on the reference level range	Pass	21: High Level Stability	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement - Environmental Conditions			
Acoustic Tests		Temperature	±0.05°C
31.5 Hz to 8kHz	±0.16dB	Relative Humidity	±0.46%
12.5kHz	±0.2dB	Barometric Pressure	±0.017kPa
16kHz	±0.29dB		
Electrical Tests			
31.5 Hz to 20 kHz	±0.12dB		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.



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**Sound Calibrator
IEC 60942-2004**

Calibration Certificate

Calibration Number C17249

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322


Equipment Tested/ Model Number : Pulsar 106
Instrument Serial Number : 74813

Atmospheric Conditions

Ambient Temperature : 24.3°C
Relative Humidity : 38.9%
Barometric Pressure : 99.96kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017

Secondary Check: Nick Williams
Report Issue Date : 06/06/2017

Approved Signatory :  Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
5.2.2: Generated Sound Pressure Level	Pass	5.3.2: Frequency Generated	Pass
5.2.3: Short Term Fluctuation	Pass	5.5: Total Distortion	Pass

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	93.8	1000.33

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2004 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
Distortion	±0.5%		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

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Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

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Sound Calibrator

IEC 60942-2004

Calibration Certificate

Calibration Number C17127

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Pulsar 105
Instrument Serial Number : 78226

Atmospheric Conditions

Ambient Temperature : 22.3°C
Relative Humidity : 55.6%
Barometric Pressure : 99.9kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 14/03/2017
Secondary Check: Riley Cooper
Report Issue Date : 15/03/2017

Approved Signatory :  Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
5.2.2: Generated Sound Pressure Level	Pass	5.3.2: Frequency Generated	Pass
5.2.3: Short Term Fluctuation	Pass	5.5: Total Distortion	Pass

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	94.1	1000.32

The sound calibrator has been shown to conform to the class 1 requirements for periodic testing, described in Annex B of IEC 60942:2004 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
Distortion	±0.5%		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.



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Wilpinjong Coal

*Environmental Noise
Monitoring*

November 2017

Prepared for

Wilpinjong Coal Pty Ltd



Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring November 2017

Reference: 17453_R01_Draft01
Report date: 12 December 2017

Prepared for

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Prepared by

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Global Acoustics Pty Ltd ~ Environmental noise modelling 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 Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

The current WCP development consent was approved in April 2017. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

Attended monitoring was conducted in accordance with the documents detailed above, the NSW Environment Protection Authority (EPA) 'Noise Policy for Industry' (NPfI) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. The duration of each night measurement was 15 minutes. Results of monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 15/16 November 2017. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Operational Noise Assessment

WCP complied with relevant noise limits at all monitoring locations during the November 2017 monitoring.

Low Frequency Assessment

During the November 2017 survey, WCP complied with the relevant limits using the NPfI method of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 15/16 November 2017. Figure 1 shows the monitoring locations.

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

1.2 Monitoring Locations

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

Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road, Moolarben
N14	'Tichular', intersection of Tichular and Barigan Roads, Tichular
N15	Track off Barigan Street near Wollar Public School, Wollar Village
N17	Mogo Road, off Araluen Road, Wollar
N19	North Mogo Road, Mogo
N20	Ringwood Road, off Wollar Road, Wollar
N21	'Wandoona', Barigan Road, Wollar

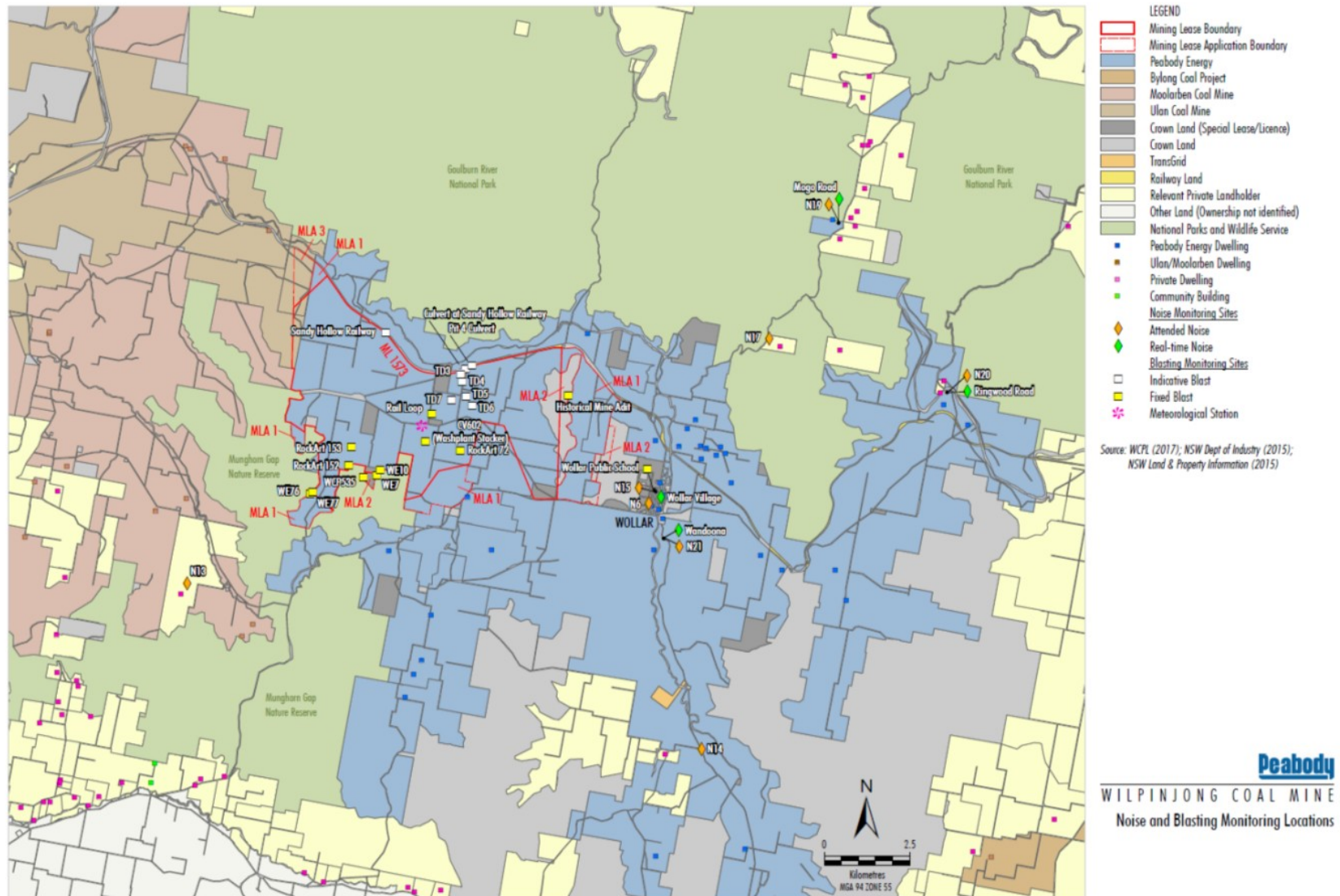


Figure 1: WCP Attended Noise Monitoring Locations (Source: WCP NMP, 2017)

1.3 Terminology & Abbreviations

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

Table 1.2: TERMINOLOGY & ABBREVIATIONS

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
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
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, but could not be quantified
Day	This is the period 7:00am to 6:00pm
Evening	This is the period 6:00pm to 10:00pm
Night	This is the period 10:00pm to 7:00am

2 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

Approval was granted for the Wilpinjong Extension Project (SSD-6764) in April 2017, which covers all current operations and has now replaced the previous consent (05-0021). The relevant noise conditions from the current project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in January 2017. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in June 2017. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Approval Criteria and Weather Conditions

Criteria detailed in Table 2.1 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with WCP.

Table 2.1: WCP PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church	36	37	37/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	37	37/45
N17 ²	Mogo Road, off Araluen Road	36	36	38/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

1. N6 noise limits have been assumed to be as detailed for 'Wollar Village – Residential' in the PA, as the church is no longer a place of worship; and
2. N17 noise limits have been determined based on the assumption that N17 is property 102 in accordance with Appendix 5 Figure 1 of Development Consent SSD-6764.

In accordance with the NMP, as detailed in Appendix 6 of the WCP Extension project approval (SSD-6764), noise criteria apply under all meteorological conditions except for the following:

- a) wind speeds greater than 3 m/s at 10m above ground level;
- b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or
- c) stability category G temperature inversion conditions.

2.1 EPL Criteria and Weather Conditions

Criteria detailed in Table 2.2 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with WCP.

Table 2.2: WCP - PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church, Wollar Village	36	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

1. Noise limits for N6 have been assumed to be those listed for 'Wollar Village' in Section L5.1 of the EPL, as it falls within the village of Wollar.

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 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.

2.2 Modifying Factors

The EPA 'Noise Policy for Industry' (Npfi, 2017) was approved for use in NSW in October 2017, and supersedes the EPA's Industrial Noise Policy (INP, 2000). Assessment and reporting of modifying factors is to be carried out in accordance with Fact Sheet C of the NPfi.

NPfi modifying factors, as they are applicable to mining noise, are described in more detail below.

2.2.1 Tonal and Intermittent Noise

As defined in the NPfi:

Tonal noise contains a prominent frequency and is characterised by a definite pitch.

Intermittent noise is characterised by the level suddenly dropping/increasing several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only and is not intended to be applied to changes in noise level due to meteorology.

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 noise as defined in the NPfi.

2.2.2 Low Frequency Noise

NPfi Method

The NPfi contains the current method of assessing low frequency noise, which is a 2 step process as detailed below:

Measure/assess source contribution C-weighted and A-weighted $L_{eq,T}$ levels over the same time period. The low frequency noise modifying factor correction is to be applied where the C-A level is 15 dB or more and:

- where any of the 1/3 octave noise levels in Table C2 are exceeded by **up to and including** 5 dB and cannot be mitigated, a 2 dBA positive adjustment to measured A weighted levels applies for the evening/night period; and*
- where any of the 1/3 octave noise levels in Table C2 are exceeded by **more than** 5 dB and cannot be mitigated, a 5 dBA positive adjustment to measured A weighted levels applies for the evening/night period and a 2 dBA positive adjustment applies for the daytime period.*

Table C2 and associated notes from the NPfI is reproduced below:

Table C2: One-third octave low-frequency noise thresholds.

Hz/dB(Z)	One-third octave $L_{Zeq,15min}$ threshold level												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

Notes:

- dB(Z) = decibel (Z frequency weighted).
- For the assessment of low-frequency noise, care should be taken to select a wind screen that can protect the microphone from wind-induced noise characteristics at least 10 dB below the threshold values in Table C2 for

wind speeds up to 5 metres per second. It is likely that high performance larger diameter wind screens (nominally 175 mm) will be required to achieve this performance (Hessler, 2008). In any case, the performance of the wind screen and wind speeds at which data will be excluded needs to be stated.

- Low-frequency noise corrections only apply under the standard and/or noise-enhancing meteorological conditions.
- Where a receiver location has had architectural acoustic treatment applied (including alternative means of mechanical ventilation satisfying the Building Code of Australia) by a proponent, as part of consent requirements or as a private negotiated agreement, alternative external low-frequency noise assessment criteria may be proposed to account for the higher transmission loss of the building façade.
- Measurements should be made between 1.2 and 1.5 metres above ground level unless otherwise approved through a planning instrument (consent/approval) or environment protection licence, and at locations nominated in the development consent or licence.

3 METHODOLOGY

3.1 Assessment Method

Attended monitoring was conducted in accordance with the EPA's NPfI and Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken. Monitoring is undertaken once per month at each location. The duration of each measurement was 15 minutes.

Attended monitoring during this reporting period was undertaken by Ryan Bruniges and Jesse Tribby.

If the exact contribution from WCP cannot be established, due to masking by other noise sources in a similar frequency range, but site noise levels are observed to be well below (more than 5 dB lower than) any relevant criterion, a maximum estimate of the potential contribution of the site might be made based on other measured site-only noise levels, for example, L_{A10} , L_{A50} or L_{A90} . This is generally expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may also be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means some noise was audible but could not be quantified. If site noise was NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per section 7.1 of the NPfI (e.g. measuring at an intermediate location and using relevant calculation) to determine a value for reporting.

All sites noted as NM in this report are due to one or more of the following reasons:

- site noise levels were extremely low and unlikely, in many cases, to be even noticed;
- site noise levels were masked by another relatively loud noise source that is characteristic of the environment (e.g. breeze in foliage or continuous road traffic noise) that cannot be eliminated by moving closer; and/or
- it was not feasible or reasonable to employ NPfI methods such as using an intermediate location. Cases may include, but are not limited to, rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

A measurement of $L_{A1,1\text{minute}}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or $L_{A\text{max}}$, received from the site 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 $L_{A1,1\text{minute}}$ 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.

Low frequency noise has been assessed using the NPfI method, detailed in Section 2.2 of this report.

3.2 Attended Noise 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: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	00701424	05/06/2019
Rion NA-28 sound level analyser	30131882	14/03/2019
Pulsar 105 acoustic calibrator	78226	14/03/2019
Pulsar 106 acoustic calibrator	74813	05/06/2019

4 RESULTS

4.1 Attended Noise Monitoring

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. 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 – NOVEMBER 2017¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	16/11/2017 01:06	53	48	32	26	34	23	20	37
N13	16/11/2017 01:16	47	41	37	34	35	31	27	49
N14	16/11/2017 00:14	47	38	32	25	29	23	20	42
N15	15/11/2017 23:00	51	40	36	33	34	25	22	44
N17	15/11/2017 22:32	52	46	44	43	43	40	32	48
N19	15/11/2017 22:00	55	50	49	47	47	44	41	51
N20	15/11/2017 23:33	47	37	35	33	33	30	25	52
N21	16/11/2017 00:45	44	27	22	19	21	18	16	35

Note:

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

4.2 Project Approval and Weather Conditions

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 project approval. Modifying factors are considered in Section 4.4 of this report.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – NOVEMBER 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	16/11/2017 01:06	1.8	E	35	Yes	<20	Nil
N13	16/11/2017 01:16	2.2	E	35	Yes	28	Nil
N14	16/11/2017 00:14	2.1	E	35	Yes	20	Nil
N15	15/11/2017 23:00	2.4	E	35	Yes	IA	Nil
N17	15/11/2017 22:32	2.6	E	35	Yes	IA	Nil
N19	15/11/2017 22:00	2.7	E	35	Yes	IA	Nil
N20	15/11/2017 23:33	1.5	E	35	Yes	IA	Nil
N21	16/11/2017 00:45	2.2	E	35	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

Table 4.3: $L_{A1,1minute}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – NOVEMBER 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{A1,1min}$ dB ^{4,5}	Exceedance ⁶
N6	16/11/2017 01:06	1.8	E	45	Yes	<20	Nil
N13	16/11/2017 01:16	2.2	E	45	Yes	33	Nil
N14	16/11/2017 00:14	2.1	E	45	Yes	22	Nil
N15	15/11/2017 23:00	2.4	E	45	Yes	IA	Nil
N17	15/11/2017 22:32	2.6	E	45	Yes	IA	Nil
N19	15/11/2017 22:00	2.7	E	45	Yes	IA	Nil
N20	15/11/2017 23:33	1.5	E	45	Yes	IA	Nil
N21	16/11/2017 00:45	2.2	E	45	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

4.3 EPL and Weather Conditions

Table 4.4 and Table 4.5 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines EPL.

Table 4.4: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – NOVEMBER 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	16/11/2017 01:06	1.8	-0.5	35	Yes	<20	Nil
N13	16/11/2017 01:16	2.2	-0.5	35	Yes	28	Nil
N14	16/11/2017 00:14	2.1	0.0	35	Yes	20	Nil
N15	15/11/2017 23:00	2.4	-0.2	35	Yes	IA	Nil
N17	15/11/2017 22:32	2.6	-0.2	35	Yes	IA	Nil
N19	15/11/2017 22:00	2.7	0.0	35	Yes	IA	Nil
N20	15/11/2017 23:33	1.5	0.2	35	Yes	IA	Nil
N21	16/11/2017 00:45	2.2	-0.3	35	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions except for the following: wind speeds greater than 3 m/s at 10 metres above ground level; or temperature inversion conditions up to 3°C/100m and wind speeds greater than 2 m/s at 10 metres above ground level; or temperature inversion conditions greater than 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in EPL and so criterion is not applicable.

Table 4.5: *L_{A1,1minute}* GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – NOVEMBER 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP <i>L_{A1,1min}</i> dB ^{4,5}	Exceedance ⁶
N6	16/11/2017 01:06	1.8	-0.5	45	Yes	<20	Nil
N13	16/11/2017 01:16	2.2	-0.5	45	Yes	33	Nil
N14	16/11/2017 00:14	2.1	0.0	45	Yes	22	Nil
N15	15/11/2017 23:00	2.4	-0.2	45	Yes	IA	Nil
N17	15/11/2017 22:32	2.6	-0.2	45	Yes	IA	Nil
N19	15/11/2017 22:00	2.7	0.0	45	Yes	IA	Nil
N20	15/11/2017 23:33	1.5	0.2	45	Yes	IA	Nil
N21	16/11/2017 00:45	2.2	-0.3	45	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions except for the following: wind speeds greater than 3 m/s at 10 metres above ground level; or temperature inversion conditions up to 3°C/100m and wind speeds greater than 2 m/s at 10 metres above ground level; or temperature inversion conditions greater than 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in EPL and so criterion is not applicable.

4.4 Low Frequency Assessment

Low frequency results for each monitoring location are presented in Table 4.6.

Table 4.6: LOW FREQUENCY NOISE MODIFYING FACTOR ASSESSMENT – NOVEMBER 2017

Location	Start Date and Time	Measured Site Only L _{Aeq} dB	Site Only L _{Ceq} dB ⁴	Site Only L _{Ceq} - L _{Aeq} dB ^{1,4}	Result ^{2,3,4} Max exceedance of ref spectrum dB	Penalty dB ⁵
N6	16/11/2017 01:06	<20	NA	NA	NA	0
N13	16/11/2017 01:16	28	44	16	Nil	0
N14	16/11/2017 00:14	20	NA	NA	NA	0
N15	15/11/2017 23:00	IA	NA	NA	NA	0
N17	15/11/2017 22:32	IA	NA	NA	NA	0
N19	15/11/2017 22:00	IA	NA	NA	NA	0
N20	15/11/2017 23:33	IA	NA	NA	NA	0
N21	16/11/2017 00:45	IA	NA	NA	NA	0

Notes:

1. As per Npfl, if $L_{Ceq} - L_{Aeq} \geq 15$ dB further assessment of low frequency noise required as detailed in Section 2.2.2 of this report;
2. As per Npfl, compare measured spectrum against reference spectrum to determine if the low frequency modifying factor is triggered and application of penalty is required;
3. Bold results and penalties in red are where the relevant modifying factor trigger was exceeded;
4. Where it is not possible to determine the site only result due to the presence of other low frequency noise sources occurring during the measurement this is noted as NA (not available) and no further assessment has been undertaken; and
5. In accordance with the project approval, noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions. Assessment of low frequency assessment was not undertaken where criterion do not apply due to meteorological conditions outside these parameters.

As detailed in Table 4.6, there were no low frequency correction penalties applied and no further analysis of low frequency noise was required.

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator at each location using a Kestrel hand-held weather meter is shown in Table 4.7. Atmospheric condition data is routinely recorded on a site-by-site basis to show conditions during the monitoring period. The wind speed, direction and temperature were measured at 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – NOVEMBER 2017

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	16/11/2017 01:06	20	0.7	90	0
N13	16/11/2017 01:16	19	0.7	60	7
N14	16/11/2017 00:14	21	0.0	0	0
N15	15/11/2017 23:00	21	0.0	0	0
N17	15/11/2017 22:32	22	0.7	105	0
N19	15/11/2017 22:00	22	1.5	110	0
N20	15/11/2017 23:33	21	1.3	100	0
N21	16/11/2017 00:45	20	0.0	0	0

Notes:

1. Wind speed and direction measured at 1.8 metres;
2. "-" denotes calm conditions at 1.8 metres; and
3. 'NA' indicates data not available.

Data obtained concurrently by the WCP meteorological station is provided in Table 4.8 and is used to determine compliance with specified noise criteria.

Table 4.8: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees	Lapse Rate Degrees / 100 metres²
15/11/2017 20:45	1.8	52	0.3
15/11/2017 21:00	3.2	62	0.0
15/11/2017 21:15	3.8	66	-0.2
15/11/2017 21:30	4.2	77	-0.2
15/11/2017 21:45	3.7	69	-0.3
15/11/2017 22:00	3.5	67	-0.2
15/11/2017 22:00	3.5	67	-0.2
15/11/2017 22:15	2.7	76	0.0
15/11/2017 22:30	3.0	81	-0.2
15/11/2017 22:45	2.6	91	-0.2
15/11/2017 23:00	2.9	90	-0.3
15/11/2017 23:15	2.4	80	-0.2
15/11/2017 23:30	1.9	64	0.2
15/11/2017 23:45	1.5	33	0.2
16/11/2017 00:00	1.3	34	0.3
16/11/2017 00:15	1.6	49	0.2
16/11/2017 00:30	2.1	60	0.0

Notes:

1. *Data supplied by WCP; and*
2. *Lapse rate calculated using data sourced from WCP inversion tower.*

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 to Table 4.5 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. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

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 Figure 3 to Figure 9 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 cut-off frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq} .

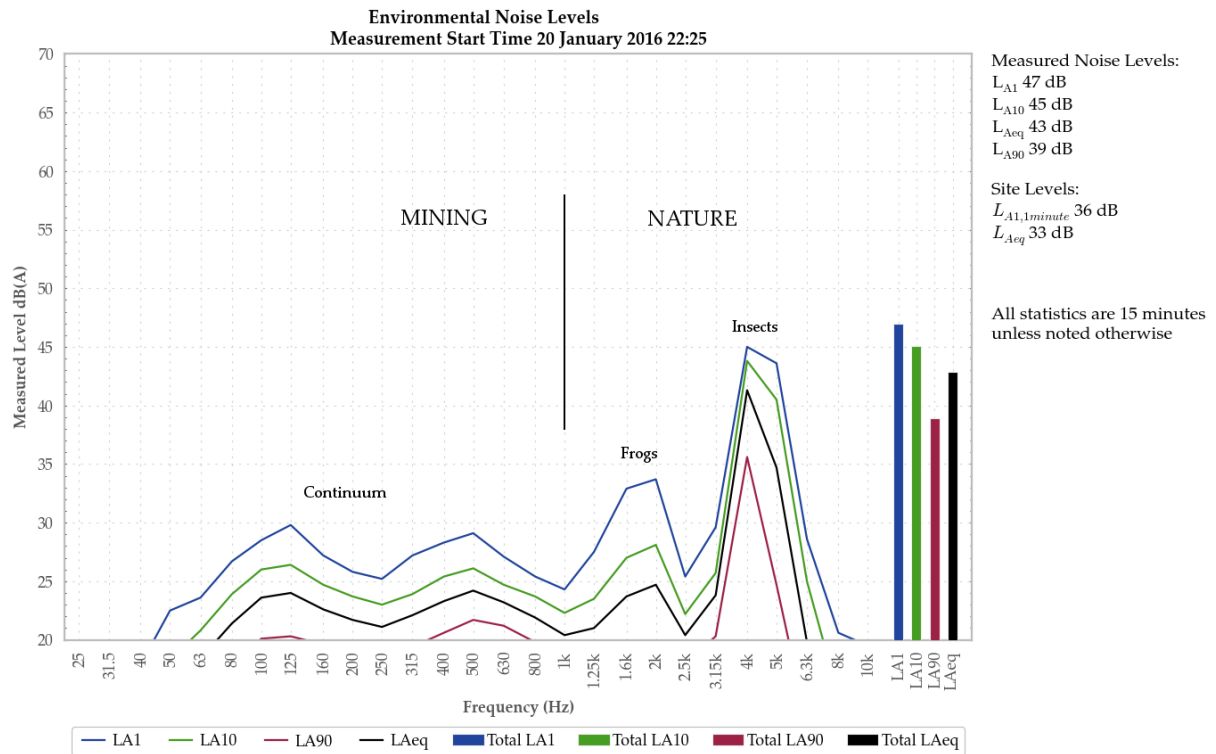


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6, 16 November 2017

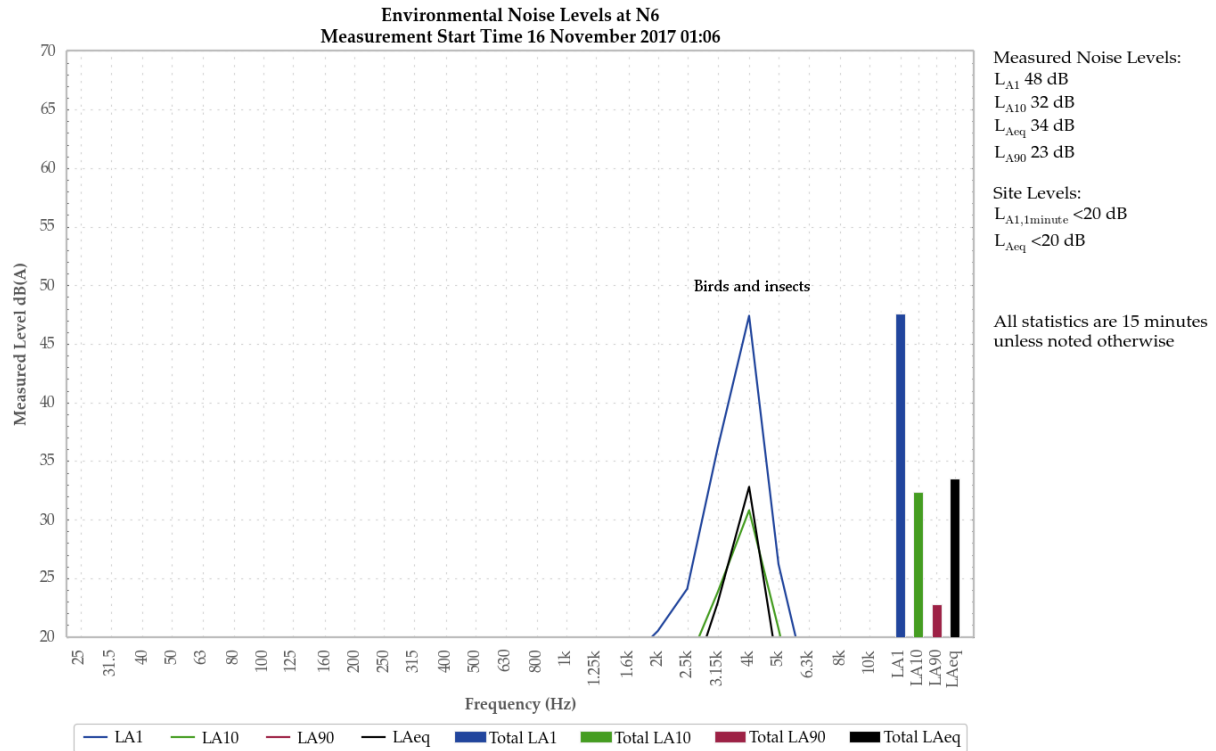


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

A low-level continuum from WCP was audible, generating the site only LAeq and LA1,1minute of less than 20 dB.

Birds were responsible for the measured LA1. Insects generated the measured LA10 and LAeq. Breeze in foliage was responsible for the measured LA90.

5.1.2 N13, 16 November 2017

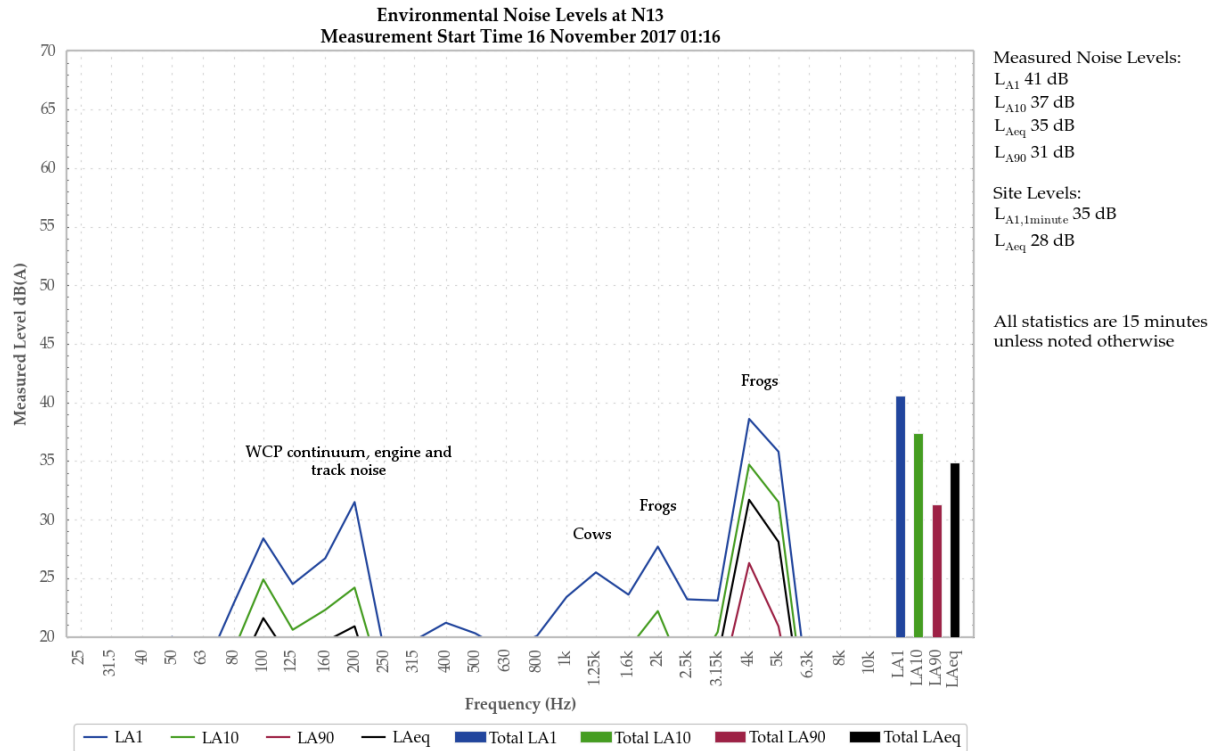


Figure 4: Environmental Noise Levels – N13, 'Coonaroo' off Moolarben Road

A continuum, track and engine noise from WCP were audible and generated the site only L_{Aeq} of 28 dB. A surge in engine noise generated the site only L_{A1,1minute} of 35 dB.

Frogs generated the measured L_{A1}, and were primarily responsible for the measured L_{A10}, L_{Aeq} and L_{A90}. The continuum from WCP was a minor contributor to the measured L_{A10}, L_{Aeq} and L_{A90}.

Cows were also noted.

5.1.3 N14, 16 November 2017

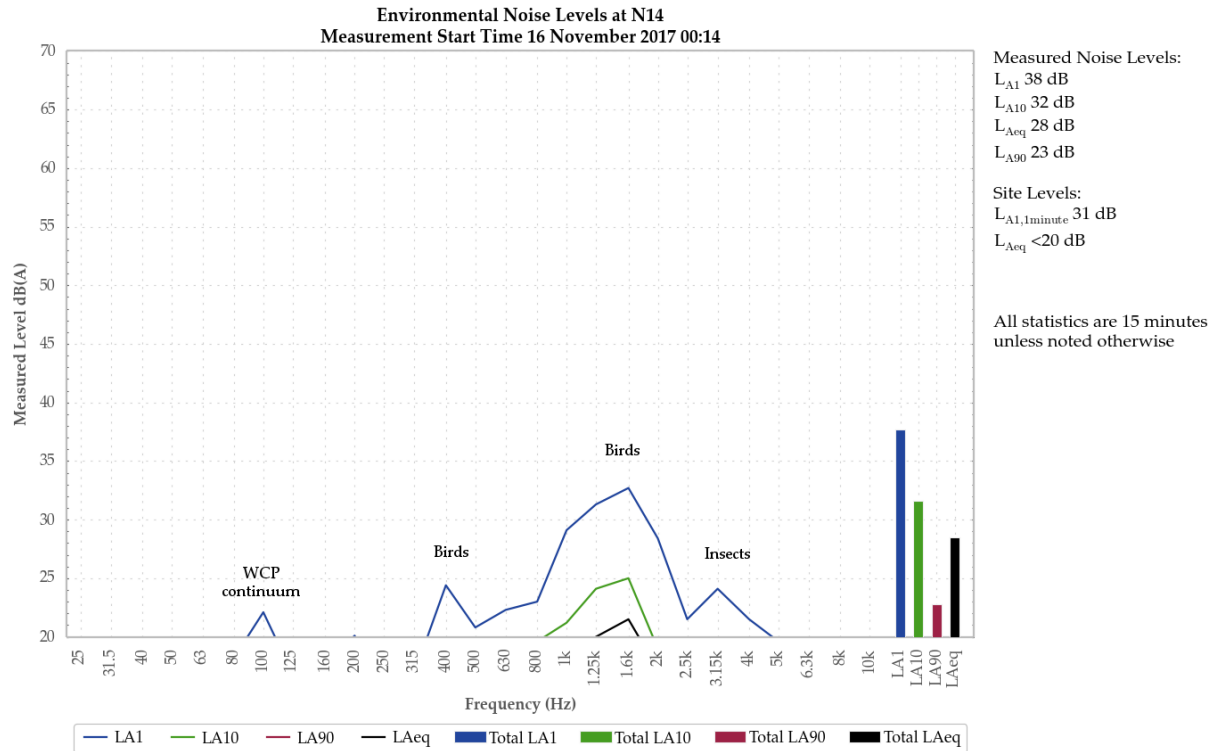


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

A low-level continuum from WCP was audible during the measurement and generated the site only LAeq of less than 20 dB. An impact noise was audible once and generated the site only LA1,1minute of 31 dB.

Birds generated measured levels.

Bats were also noted.

5.1.4 N15, 15 November 2017

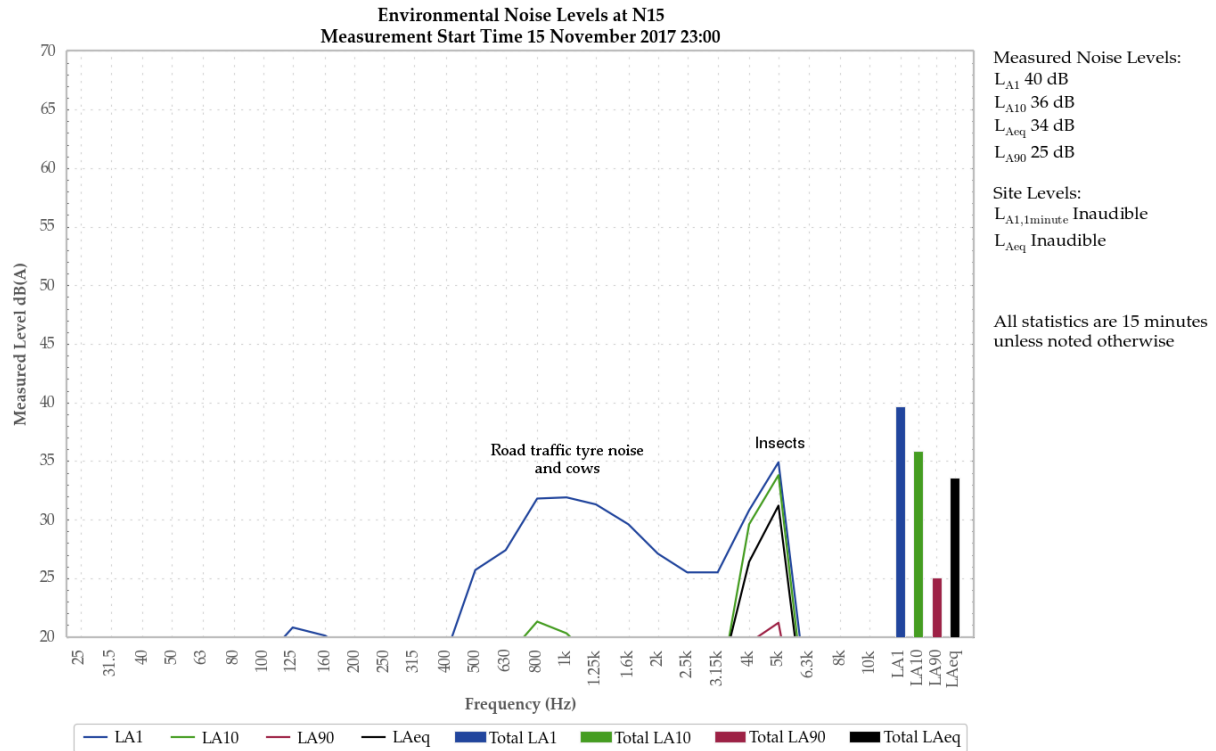


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

WCP was inaudible.

Insects were primarily responsible for measured levels.

Road traffic tyre noise, cows, a train, train horn, and bats were also noted.

5.1.5 N17, 15 November 2017

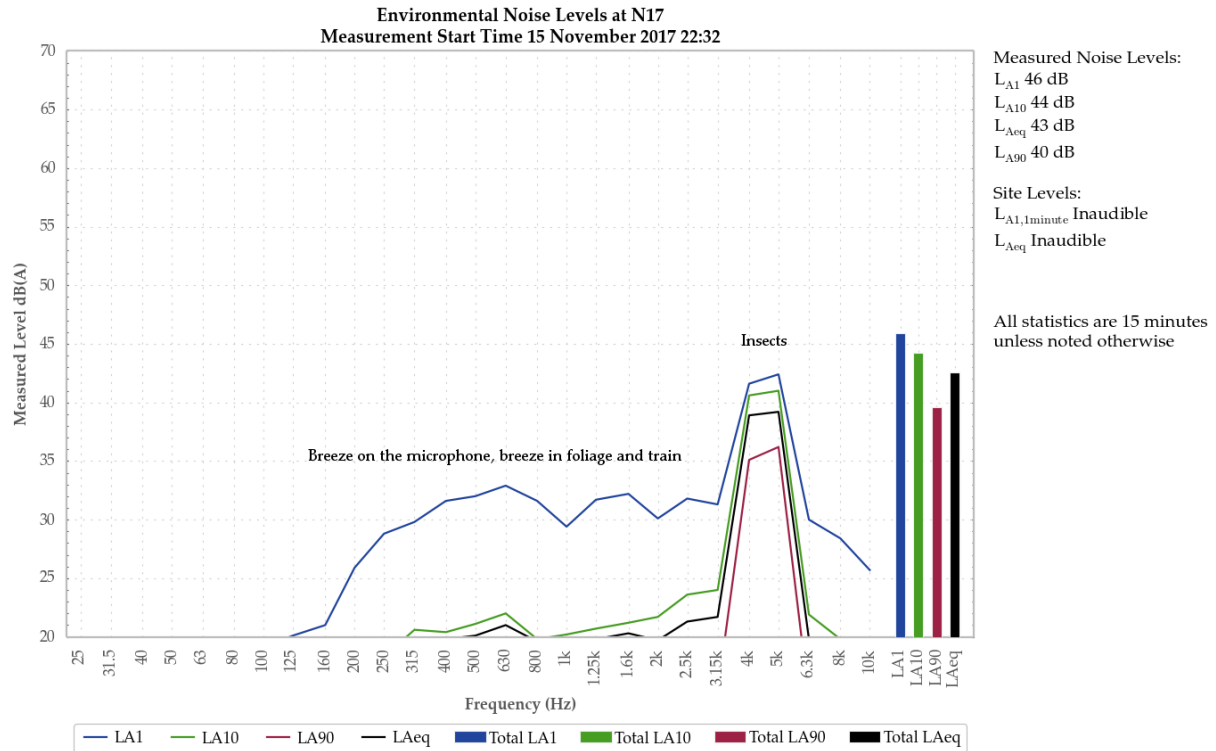


Figure 7: Environmental Noise Levels – N17 Mogo Road, off Araluen Road

WCP was inaudible.

Insects were responsible for measured levels.

Breeze in foliage, breeze on the microphone, an aircraft, and a distant train were also noted.

5.1.6 N19, 15 November 2017

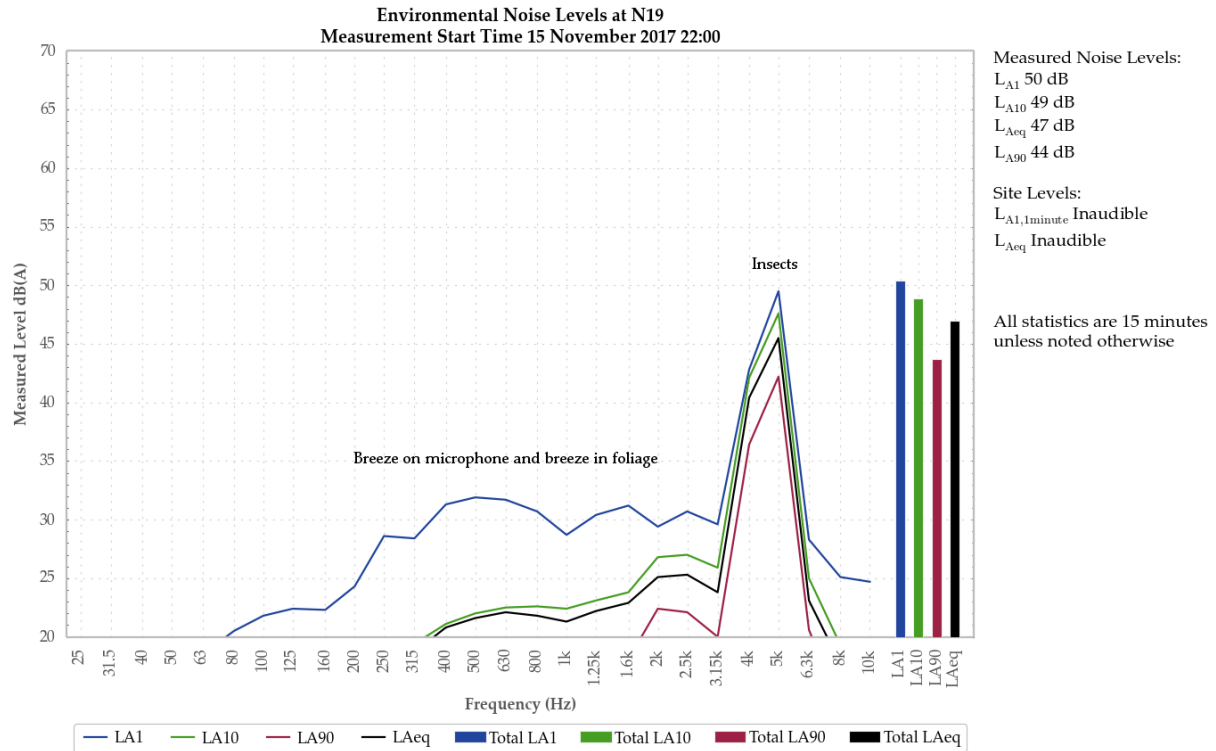


Figure 8: Environmental Noise Levels – N19, Upper Mogo Road

WCP was inaudible.

Insects were responsible for measured levels.

Breeze in foliage and breeze on the microphone were also noted.

5.1.7 N20, 15 November 2017

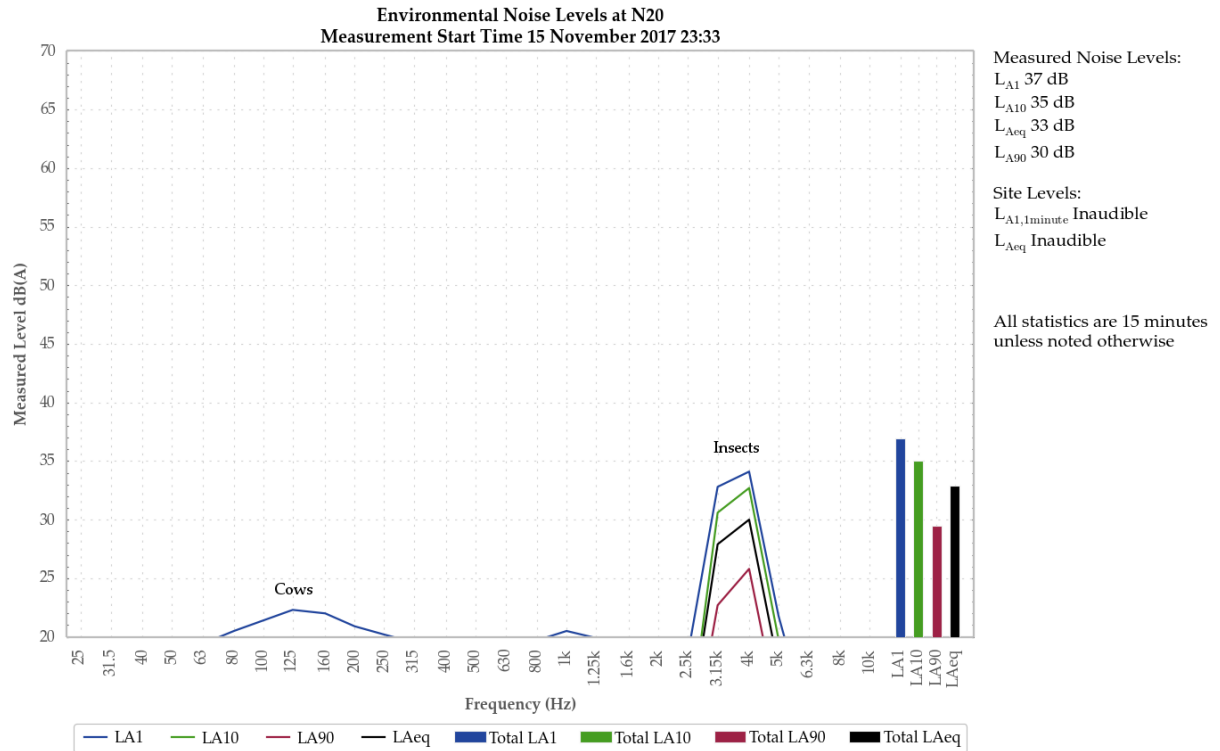


Figure 9: Environmental Noise Levels, N20 – Ringwood Road

WCP was inaudible.

Insects were responsible for measured levels.

Cows, breeze in foliage and breeze on the microphone were also noted.

5.1.8 N21, 16 November 2017

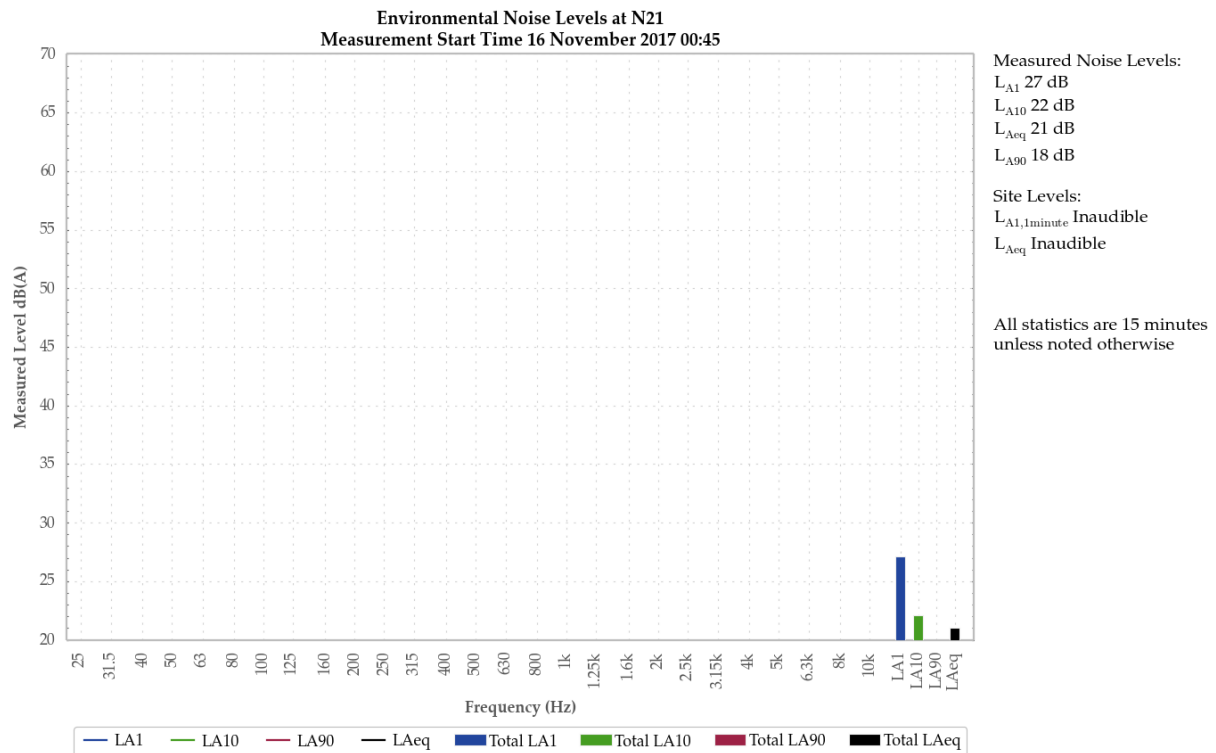


Figure 10: Environmental Noise Levels, N21 – 'Wandoona', Barigan Road

WCP was inaudible.

The floor of the sound level meter was primarily responsible for measured levels. Birds generated the measured LA1.

Insects, and cows were also noted.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 15/16 November 2017. Attended noise monitoring was conducted at eight sites. The duration of all measurements was 15 minutes.

6.1 Operational Noise Assessment

Wilpinjong Coal Project complied with noise limits at the monitoring locations during the November 2017 monitoring period.

6.2 Low Frequency Assessment

During the November 2017 survey WCP complied with the relevant limits using the NPfI method of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Extension Project Approval (SSD-6764)

NOISE

Noise Criteria

3. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 3 at any residence on privately-owned land or at the other specified locations.

Table 3: Noise criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{A1}(1 \text{ minute})$
102	36	36	38	45
Wollar Village – Residential	36	37	37	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	40 (internal) When in use			-
900 – St Laurence O'Toole Catholic Church				

Note: To interpret the locations referred to in Table 3, see the applicable figures in Appendix 5.

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy* (as may be updated from time to time). Appendix 6 sets out the meteorological conditions under which these criteria apply along with any modifications to the *NSW Industrial Noise Policy* and the requirements for evaluating compliance with these criteria.

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

Operating Conditions

4. The Applicant must:
 - (a) implement all reasonable and feasible measures to minimise the construction, operational, low frequency, road and rail noise of the development;
 - (b) operate a comprehensive noise management system that uses a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day to day planning of mining operations, and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this consent;
 - (c) minimise the noise impacts of the development during meteorological conditions when the noise limits in this consent do not apply (see Appendix 6);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this consent.

Noise Management Plan

5. Prior to carrying out any development under this consent, unless the Secretary agrees otherwise, the Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:
 - (a) be prepared in consultation with the EPA;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this consent; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this consent and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.
6. The Applicant must implement the approved Noise Management Plan for the development.

APPENDIX 6 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 3 of schedule 3 are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) stability category G temperature inversion conditions.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Secretary directs otherwise.
5. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

6. The assessment of excessive levels of low frequency noise generated by the mine shall be as follows:
 Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:
- where any of the 1/3 octave noise levels in Table 6-1 are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
 - where any of the 1/3 octave noise levels in Table 6-1 are exceeded by more than 5dB and cannot be mitigated, a 5 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period and a 2dB positive adjustment applies for the daytime period.

Table 6-1: One-third octave low frequency noise thresholds

Hz/dB(Z)	One-third octave $L_{Zeq,15minute}$ threshold level												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

A.2 Environmental 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 January 2017.

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)
Wollar village	36	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
All other privately owned land (outside the village of Wollar)	35	35	35	45

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

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 3°C/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
- c) Temperature inversion conditions greater than 3°C/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.

R4 Other reporting conditions

R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the second round of quarterly monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:

- a) an assessment of compliance with noise limits presented in Condition L5.1; and
- b) an outline of any management actions taken within the monitoring period to address any exceedences of the limits contained in Condition L5.1.

A.3 Noise Monitoring Program

The relevant sections of the noise monitoring program for WCP dated June 2017 are reproduced below.

WCPL utilise a combination of operator-attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria from Development Consent (SSD-6467). Operator-attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 6**. Unattended real-time noise monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Operator-attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake operator-attended noise monitoring as identified in **Table 7 (Figure 3 and Figure 4)**. Real-time noise monitoring units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 7: Noise Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Operator-attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Operator-attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Operator-attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Operator-attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Mogo Rd	N17	Operator-attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Mogo Rd	N19	Operator-attended Noise	782644.5	6424151.1	Location based on the nearest and residential community structure to the North-East of the Mine

Location	Site	Type	Easting ⁺	Northing ⁺	Justification
Ringwood Road	N20	Operator-attended Noise	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine.
Wandoona	N21	Operator-attended Noise	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP in May 2017.
WCPL Rail Loop	-	Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions
Wollar Village ⁴	-	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine N15 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Mogo Rd ⁴	-	Real-Time Noise - Fixed	782644.5	6424151.1	Location based on the nearest non-mine owned residence to the East of the Mine N19 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Ringwood Road	-	Real-Time Noise - Fixed	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine. N20 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Wandoona ³	-	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP. N21 operator-attended Noise Monitoring (validation of real-time noise monitoring)

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.
4. Where continuous monitors are located at compliance locations (e.g. privately owned receivers), WCPL will conduct a review of the identification/characterisation of mine-related noise by the real-time monitoring system at that location by comparing against observed mine-related noise identified during operator-attended monitoring (i.e. validate the identification of mine related noise and filtering of extraneous noise sources by the real-time system). Refer to **Section 6.5**.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 7** with consideration to the above criteria. WCPL will update this NMP, in consultation with DP&E and the EPA.

6.3.3 Methodology

Operator-attended noise monitoring will be undertaken at the locations and frequency as outlined in **Table 8** by an independent acoustic consultant and guided by the requirements of the INP (EPA, 2000) and AS 1055.1-1997 '*Acoustics – Description and measurement of environmental noise – General procedures*'. Routine operator-attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the Noise Criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not exceed the Noise Criteria, as defined in **Table 6**, then the result will be recorded and the attended noise monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria, then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) Upon confirming the exceedances are deemed a non-compliance in accordance with the **Figure 5**, WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance (**Section 9.0**).

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional operator-attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:

- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by more than 5dB and cannot be mitigated, a 5 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period and a 2dB positive adjustment applies for the daytime period.

Table 9 One-third Octave Low Frequency Noise Thresholds

Hz/dB(Z)	One-third octave LZeq,15minute threshold level												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

6.3.6 Applicable Meteorological Conditions

The Noise Criteria in **Table 6** are to be applied under all meteorological conditions except for the following:

- Wind speeds greater than 3 m/s at 10 m above ground level; or
- Stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
- Stability category G temperature inversion conditions.

APPENDIX

B CALIBRATION CERTIFICATES



**Acoustic
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Level 7 Building 2 423 Pennant Hills Rd
 Pennant Hills NSW AUSTRALIA 2120
 Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
 www.acousticresearch.com.au

Sound Level Meter
 IEC 61672-3:2013

Calibration Certificate

Calibration Number C17248

Client Details Global Acoustics Pty Ltd
 12/16 Huntingdale Drive
 Thornton NSW 2322

Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 00701424
Microphone Serial Number : 01916
Pre-amplifier Serial Number : 01463

Pre-Test Atmospheric Conditions
Ambient Temperature : 24.3°C
Relative Humidity : 40%
Barometric Pressure : 100.05kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 24.4°C
Relative Humidity : 39.5%
Barometric Pressure : 100kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017

Secondary Check: Nick Williams
Report Issue Date : 06/06/2017

Approved Signatory :

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	Pass	17: Level linearity incl. the level range control	Pass
13: Electrical Sig. tests of frequency weightings	Pass	18: Toneburst response	Pass
14: Frequency and time weightings at 1 kHz	Pass	19: C Weighted Peak Sound Level	Pass
15: Long Term Stability	Pass	20: Overload Indication	Pass
16: Level linearity on the reference level range	Pass	21: High Level Stability	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement -			
Acoustic Tests	31.5 Hz to 8kHz	±0.16dB	Environmental Conditions
	12.5kHz	±0.2dB	
	16kHz	±0.29dB	
Electrical Tests	31.5 Hz to 20 kHz	±0.12dB	Temperature
			Relative Humidity
			Barometric Pressure

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.



Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
 Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.



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**Sound Level Meter
IEC 61672-3.2013**

Calibration Certificate

Calibration Number C17126

Client Details Global Acoustics Pty Ltd
 12/16 Huntingdale Drive
 Thornton NSW 2322

Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 30131882
Microphone Serial Number : 04739
Pre-amplifier Serial Number : 11942

Pre-Test Atmospheric Conditions
Ambient Temperature : 22.4°C
Relative Humidity : 55.6%
Barometric Pressure : 99.91kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 22.6°C
Relative Humidity : 58.1%
Barometric Pressure : 99.85kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 14/03/2017

Secondary Check: Riley Cooper
Report Issue Date : 15/03/2017

Approved Signatory :

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	Pass	17: Level linearity incl. the level range control	Pass
13: Electrical Sig. tests of frequency weightings	Pass	18: Toneburst response	Pass
14: Frequency and time weightings at 1 kHz	Pass	19: C Weighted Peak Sound Level	Pass
15: Long Term Stability	Pass	20: Overload Indication	Pass
16: Level linearity on the reference level range	Pass	21: High Level Stability	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement - Environmental Conditions			
Acoustic Tests		Temperature	±0.05°C
31.5 Hz to 8kHz	±0.16dB	Relative Humidity	±0.46%
12.5kHz	±0.2dB	Barometric Pressure	±0.017kPa
16kHz	±0.29dB		
Electrical Tests			
31.5 Hz to 20 kHz	±0.12dB		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

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Sound Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C17127


Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Pulsar 105
Instrument Serial Number : 78226

Atmospheric Conditions

Ambient Temperature : 22.3°C
Relative Humidity : 55.6%
Barometric Pressure : 99.9kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 14/03/2017
Secondary Check: Riley Cooper
Report Issue Date : 15/03/2017

Approved Signatory :  Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
5.2.2: Generated Sound Pressure Level	Pass	5.3.2: Frequency Generated	Pass
5.2.3: Short Term Fluctuation	Pass	5.5: Total Distortion	Pass

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	94.1	1000.32

The sound calibrator has been shown to conform to the class 1 requirements for periodic testing, described in Annex B of IEC 60942:2004 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
Distortion	±0.5%		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.



Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025.

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Sound Calibrator

IEC 60942-2004

Calibration Certificate

Calibration Number C17249


Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Pulsar 106
Instrument Serial Number : 74813

Atmospheric Conditions

Ambient Temperature : 24.3°C
Relative Humidity : 38.9%
Barometric Pressure : 99.96kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017
Secondary Check: Nick Williams
Report Issue Date : 06/06/2017

Approved Signatory :  Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
5.2.2: Generated Sound Pressure Level	Pass	5.3.2: Frequency Generated	Pass
5.2.3: Short Term Fluctuation	Pass	5.5: Total Distortion	Pass

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	93.8	1000.33

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2004 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
Distortion	±0.5%		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

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Wilpinjong Coal

*Environmental Noise
Monitoring*

December 2017

Prepared for

Wilpinjong Coal Pty Ltd



Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring December 2017

Reference: 17478_R01

Report date: 30 December 2017

Prepared for

Wilpinjong Coal Pty Ltd
Locked Bag 2005
Mudgee NSW 2850

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322



Prepared: Amanda Borserio
Acoustic Consultant



QA Review: Robert Kirwan
Acoustic Consultant

Global Acoustics Pty Ltd ~ Environmental noise modelling 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 Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

The current WCP development consent was approved in April 2017. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

Attended monitoring was conducted in accordance with the documents detailed above, the NSW Environment Protection Authority (EPA) 'Noise Policy for Industry' (NPfI) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. The duration of each night measurement was 15 minutes. Results of monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 7/8 December 2017. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Operational Noise Assessment

WCP complied with relevant noise limits at all monitoring locations during the December 2017 monitoring.

Low Frequency Assessment

During the December 2017 survey, WCP complied with the relevant limits where meteorological conditions applied using the NPfI method of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 7/8 December 2017. Figure 1 shows the monitoring locations.

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

1.2 Monitoring Locations

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

Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O’Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road, Moolarben
N14	'Tichular', intersection of Tichular and Barigan Roads, Tichular
N15	Track off Barigan Street near Wollar Public School, Wollar Village
N17	Mogo Road, off Araluen Road, Wollar
N19	North Mogo Road, Mogo
N20	Ringwood Road, off Wollar Road, Wollar
N21	'Wandoona', Barigan Road, Wollar

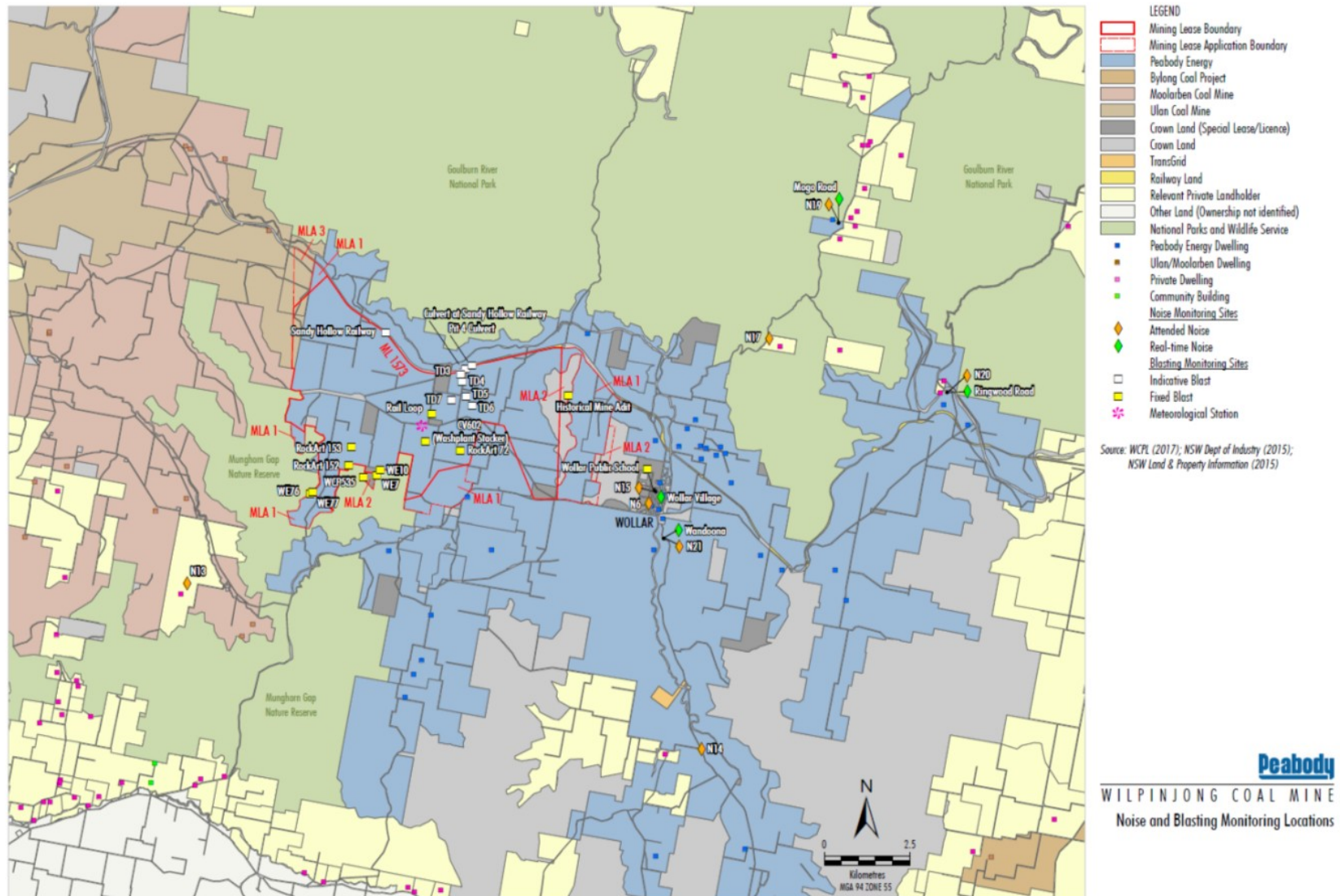


Figure 1: WCP Attended Noise Monitoring Locations (Source: WCP NMP, 2017)

1.3 Terminology & Abbreviations

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

Table 1.2: TERMINOLOGY & ABBREVIATIONS

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
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
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VIG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, but could not be quantified
Day	This is the period 7:00am to 6:00pm
Evening	This is the period 6:00pm to 10:00pm
Night	This is the period 10:00pm to 7:00am

2 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

Approval was granted for the Wilpinjong Extension Project (SSD-6764) in April 2017, which covers all current operations and has now replaced the previous consent (05-0021). The relevant noise conditions from the current project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in January 2017. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in June 2017. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Approval Criteria and Weather Conditions

Criteria detailed in Table 2.1 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with WCP.

Table 2.1: WCP PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day LAeq,15minute	Evening LAeq,15minute	Night LAeq,15minute/ LA1,1minute
N6 ¹	St Laurence O'Toole Catholic Church	36	37	37/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	37	37/45
N17 ²	Mogo Road, off Araluen Road	36	36	38/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

1. N6 noise limits have been assumed to be as detailed for 'Wollar Village – Residential' in the PA, as the church is no longer a place of worship; and
2. N17 noise limits have been determined based on the assumption that N17 is property 102 in accordance with Appendix 5 Figure 1 of Development Consent SSD-6764.

In accordance with the NMP, as detailed in Appendix 6 of the WCP Extension project approval (SSD-6764), noise criteria apply under all meteorological conditions except for the following:

- a) wind speeds greater than 3 m/s at 10m above ground level;
- b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or
- c) stability category G temperature inversion conditions.

2.1 EPL Criteria and Weather Conditions

Criteria detailed in Table 2.2 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with WCP.

Table 2.2: WCP - PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church, Wollar Village	36	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

1. Noise limits for N6 have been assumed to be those listed for 'Wollar Village' in Section L5.1 of the EPL, as it falls within the village of Wollar.

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 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.

2.2 Modifying Factors

The EPA 'Noise Policy for Industry' (Npfi, 2017) was approved for use in NSW in October 2017, and supersedes the EPA's Industrial Noise Policy (INP, 2000). Assessment and reporting of modifying factors is to be carried out in accordance with Fact Sheet C of the NPfi.

NPfi modifying factors, as they are applicable to mining noise, are described in more detail below.

2.2.1 Tonal and Intermittent Noise

As defined in the NPfi:

Tonal noise contains a prominent frequency and is characterised by a definite pitch.

Intermittent noise is characterised by the level suddenly dropping/increasing several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only and is not intended to be applied to changes in noise level due to meteorology.

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 noise as defined in the NPfi.

2.2.2 Low Frequency Noise

NPfi Method

The NPfi contains the current method of assessing low frequency noise, which is a 2 step process as detailed below:

Measure/assess source contribution C-weighted and A-weighted $L_{eq,T}$ levels over the same time period. The low frequency noise modifying factor correction is to be applied where the C-A level is 15 dB or more and:

- where any of the 1/3 octave noise levels in Table C2 are exceeded by **up to and including** 5 dB and cannot be mitigated, a 2 dBA positive adjustment to measured A weighted levels applies for the evening/night period; and*
- where any of the 1/3 octave noise levels in Table C2 are exceeded by **more than** 5 dB and cannot be mitigated, a 5 dBA positive adjustment to measured A weighted levels applies for the evening/night period and a 2 dBA positive adjustment applies for the daytime period.*

Table C2 and associated notes from the NPfI is reproduced below:

Table C2: One-third octave low-frequency noise thresholds.

Hz/dB(Z)	One-third octave $L_{Zeq,15min}$ threshold level												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

Notes:

- dB(Z) = decibel (Z frequency weighted).
- For the assessment of low-frequency noise, care should be taken to select a wind screen that can protect the microphone from wind-induced noise characteristics at least 10 dB below the threshold values in Table C2 for

wind speeds up to 5 metres per second. It is likely that high performance larger diameter wind screens (nominally 175 mm) will be required to achieve this performance (Hessler, 2008). In any case, the performance of the wind screen and wind speeds at which data will be excluded needs to be stated.

- Low-frequency noise corrections only apply under the standard and/or noise-enhancing meteorological conditions.
- Where a receiver location has had architectural acoustic treatment applied (including alternative means of mechanical ventilation satisfying the Building Code of Australia) by a proponent, as part of consent requirements or as a private negotiated agreement, alternative external low-frequency noise assessment criteria may be proposed to account for the higher transmission loss of the building façade.
- Measurements should be made between 1.2 and 1.5 metres above ground level unless otherwise approved through a planning instrument (consent/approval) or environment protection licence, and at locations nominated in the development consent or licence.

3 METHODOLOGY

3.1 Assessment Method

Attended monitoring was conducted in accordance with the EPA's NPfI and Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken. Monitoring is undertaken once per month at each location. The duration of each measurement was 15 minutes.

Attended monitoring during this reporting period was undertaken by Amanda Borserio.

If the exact contribution from WCP cannot be established, due to masking by other noise sources in a similar frequency range, but site noise levels are observed to be well below (more than 5 dB lower than) any relevant criterion, a maximum estimate of the potential contribution of the site might be made based on other measured site-only noise levels, for example, L_{A10} , L_{A50} or L_{A90} . This is generally expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may also be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means some noise was audible but could not be quantified. If site noise was NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per section 7.1 of the NPfI (e.g. measuring at an intermediate location and using relevant calculation) to determine a value for reporting.

All sites noted as NM in this report are due to one or more of the following reasons:

- site noise levels were extremely low and unlikely, in many cases, to be even noticed;
- site noise levels were masked by another relatively loud noise source that is characteristic of the environment (e.g. breeze in foliage or continuous road traffic noise) that cannot be eliminated by moving closer; and/or
- it was not feasible or reasonable to employ NPfI methods such as using an intermediate location. Cases may include, but are not limited to, rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

A measurement of $L_{A1,1\text{minute}}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or $L_{A\text{max}}$, received from the site 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 $L_{A1,1\text{minute}}$ 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.

Low frequency noise has been assessed using the NPfI method, detailed in Section 2.2 of this report.

3.2 *Attended Noise 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: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	1070590	28/06/2018
Pulsar 106 acoustic calibrator	79631	30/03/2019

4 RESULTS

4.1 Attended Noise Monitoring

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. 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 2017¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	8/12/2017 2:06	41	34	31	28	29	26	24	42
N13	8/12/2017 2:50	47	39	34	28	31	26	23	52
N14	8/12/2017 1:13	45	41	39	32	35	25	22	50
N15	7/12/2017 23:17	54	42	38	34	36	31	26	50
N17	7/12/2017 22:31	56	47	42	40	41	39	36	50
N19	7/12/2017 22:02	50	49	49	47	47	45	43	46
N20	8/12/2017 0:31	46	35	33	30	31	29	26	35
N21	8/12/2017 1:46	42	34	30	28	29	27	25	51

Note:

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

4.2 Project Approval and Weather Conditions

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 project approval. Modifying factors are considered in Section 4.4 of this report.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – DECEMBER 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	8/12/2017 2:06	0.5	G	35	No	<30	NA
N13	8/12/2017 2:50	0.6	G	35	No	IA	NA
N14	8/12/2017 1:13	0.8	G	35	No	<25	NA
N15	7/12/2017 23:17	0.0	G	35	No	34	NA
N17	7/12/2017 22:31	0.6	G	35	No	<20	NA
N19	7/12/2017 22:02	0.0	G	35	No	IA	NA
N20	8/12/2017 0:31	0.5	G	35	No	IA	NA
N21	8/12/2017 1:46	0.7	G	35	No	28	NA

Notes:

1. Wind speed is sourced from WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

Table 4.3: *L_{A1,1minute}* GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – DECEMBER 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP <i>L_{A1,1min}</i> dB ^{4,5}	Exceedance ⁶
N6	8/12/2017 2:06	0.5	G	45	No	<30	NA
N13	8/12/2017 2:50	0.6	G	45	No	IA	NA
N14	8/12/2017 1:13	0.8	G	45	No	<25	NA
N15	7/12/2017 23:17	0.0	G	45	No	44	NA
N17	7/12/2017 22:31	0.6	G	45	No	<20	NA
N19	7/12/2017 22:02	0.0	G	45	No	IA	NA
N20	8/12/2017 0:31	0.5	G	45	No	IA	NA
N21	8/12/2017 1:46	0.7	G	45	No	36	NA

Notes:

1. Wind speed is sourced from WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

4.3 EPL and Weather Conditions

Table 4.4 and Table 4.5 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ 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 mines EPL.

Table 4.4: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – DECEMBER 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	8/12/2017 2:06	0.5	11.6	35	No	<30	NA
N13	8/12/2017 2:50	0.6	6.6	35	No	IA	NA
N14	8/12/2017 1:13	0.8	7.2	35	No	<25	NA
N15	7/12/2017 23:17	0.0	6.6	35	No	34	NA
N17	7/12/2017 22:31	0.6	7.8	35	No	<20	NA
N19	7/12/2017 22:02	0.0	9.6	35	No	IA	NA
N20	8/12/2017 0:31	0.5	7.2	35	No	IA	NA
N21	8/12/2017 1:46	0.7	7.4	35	No	28	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions except for the following: wind speeds greater than 3 m/s at 10 metres above ground level; or temperature inversion conditions up to 3°C/100m and wind speeds greater than 2 m/s at 10 metres above ground level; or temperature inversion conditions greater than 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in EPL and so criterion is not applicable.

Table 4.5: *L_{A1,1minute}* GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – DECEMBER 2017

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP <i>L_{A1,1min}</i> dB ^{4,5}	Exceedance ⁶
N6	8/12/2017 2:06	0.5	11.6	45	No	<30	NA
N13	8/12/2017 2:50	0.6	6.6	45	No	IA	NA
N14	8/12/2017 1:13	0.8	7.2	45	No	<25	NA
N15	7/12/2017 23:17	0.0	6.6	45	No	44	NA
N17	7/12/2017 22:31	0.6	7.8	45	No	<20	NA
N19	7/12/2017 22:02	0.0	9.6	45	No	IA	NA
N20	8/12/2017 0:31	0.5	7.2	45	No	IA	NA
N21	8/12/2017 1:46	0.7	7.4	45	No	36	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions except for the following: wind speeds greater than 3 m/s at 10 metres above ground level; or temperature inversion conditions up to 3°C/100m and wind speeds greater than 2 m/s at 10 metres above ground level; or temperature inversion conditions greater than 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in EPL and so criterion is not applicable.

4.4 Low Frequency Assessment

Low frequency results for each monitoring location are presented in Table 4.6.

Table 4.6: LOW FREQUENCY NOISE MODIFYING FACTOR ASSESSMENT – DECEMBER 2017

Location	Start Date and Time	Measured Site Only L _{Aeq} dB	Site Only L _{Ceq} dB ^{4,5}	Site Only L _{Ceq} - L _{Aeq} dB ^{1,4}	Result ^{2,3,4} Max exceedance of ref spectrum dB	Penalty dB ⁵
N6	8/12/2017 2:06	<30	NR	NR	NR	0
N13	8/12/2017 2:50	IA	NR	NR	NR	0
N14	8/12/2017 1:13	<25	NR	NR	NR	0
N15	7/12/2017 23:17	34	NR	NR	NR	0
N17	7/12/2017 22:31	<20	NR	NR	NR	0
N19	7/12/2017 22:02	IA	NR	NR	NR	0
N20	8/12/2017 0:31	IA	NR	NR	NR	0
N21	8/12/2017 1:46	28	NR	NR	NR	0

Notes:

1. As per NPfI, if $L_{Ceq} - L_{Aeq} \geq 15$ dB further assessment of low frequency noise required as detailed in Section 2.2.2 of this report;
2. As per NPfI, compare measured spectrum against reference spectrum to determine if the low frequency modifying factor is triggered and application of penalty is required;
3. Bold results and penalties in red are where the relevant modifying factor trigger was exceeded;
4. Where it is not possible to determine the site only result due to the presence of other low frequency noise sources occurring during the measurement this is noted as NA (not available) and no further assessment has been undertaken; and
5. In accordance with the project approval, noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions. Assessment of low frequency assessment was not undertaken where criterion do not apply due to meteorological conditions outside these parameters and results marked as NR (not required).

During the December 2017 survey, WCP complied with the relevant limits where meteorological conditions applied using the NPfI method of assessing low frequency. No further assessment of low frequency noise was required.

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator at each location using a Kestrel hand-held weather meter is shown in Table 4.7. Atmospheric condition data is routinely recorded on a site-by-site basis to show conditions during the monitoring period. The wind speed, direction and temperature were measured at 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – DECEMBER 2017

Location	Start Date And Time	Temperature °C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	8/12/2017 2:06	15	0.0	-	2
N13	8/12/2017 2:50	20	0.7	240	2
N14	8/12/2017 1:13	17	0.0	-	1
N15	7/12/2017 23:17	17	0.0	-	0
N17	7/12/2017 22:31	18	0.0	-	0
N19	7/12/2017 22:02	20	0.0	-	0
N20	8/12/2017 0:31	14	0.0	-	1
N21	8/12/2017 1:46	14	0.9	200	3

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained concurrently by the WCP meteorological station is provided in Table 4.8 and is used to determine compliance with specified noise criteria.

Table 4.8: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees	Lapse Rate Degrees / 100 metres ²
7/12/2017 21:30	0.0	0	7.4
7/12/2017 21:45	0.0	0	9.6
7/12/2017 22:00	0.0	0	10.2
7/12/2017 22:15	0.0	0	9.6
7/12/2017 22:30	0.0	0	9.4
7/12/2017 22:45	0.6	324	7.8
7/12/2017 23:00	0.7	214	6.8
7/12/2017 23:15	0.0	0	6.0
7/12/2017 23:30	0.0	0	6.6
7/12/2017 23:45	0.0	0	7.4
8/12/2017 0:00	0.2	272	7.8
8/12/2017 0:15	0.7	339	7.6
8/12/2017 0:30	0.0	0	7.4
8/12/2017 0:45	0.5	344	7.2
8/12/2017 1:00	0.7	344	8.2
8/12/2017 1:15	0.7	305	8.8
8/12/2017 1:30	0.8	285	7.2
8/12/2017 1:45	0.5	296	7.4
8/12/2017 2:00	0.7	254	7.4
8/12/2017 2:15	0.5	312	11.6
8/12/2017 2:30	0.6	56	7.8
8/12/2017 2:45	0.7	227	4.8
8/12/2017 3:00	0.6	125	6.6
8/12/2017 3:15	0.0	0	6.6
8/12/2017 3:30	0.0	0	6.4
8/12/2017 3:45	0.0	0	6.6
8/12/2017 4:00	1.0	318	5.6

Notes:

1. Data supplied by WCP; and
2. Lapse rate calculated using data sourced from WCP inversion tower.

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 to Table 4.5 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. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

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 Figure 3 to Figure 10 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 cut-off frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq} .

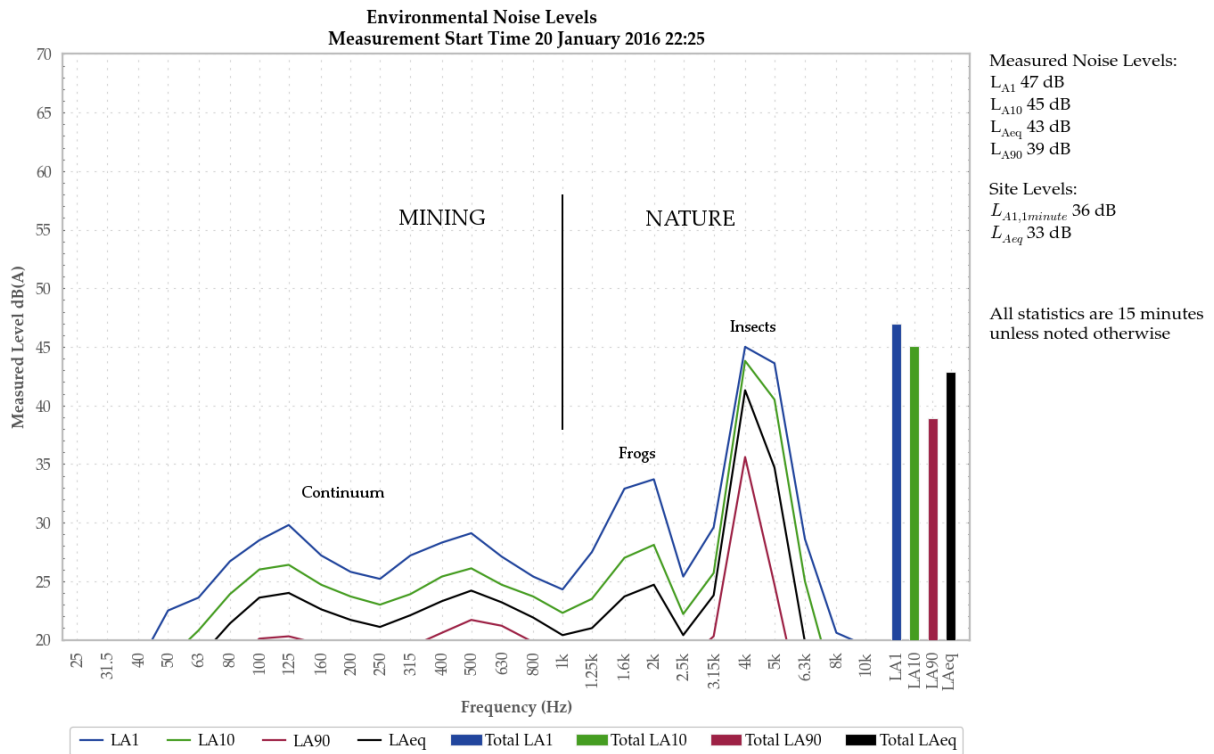


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6, 8 December 2017

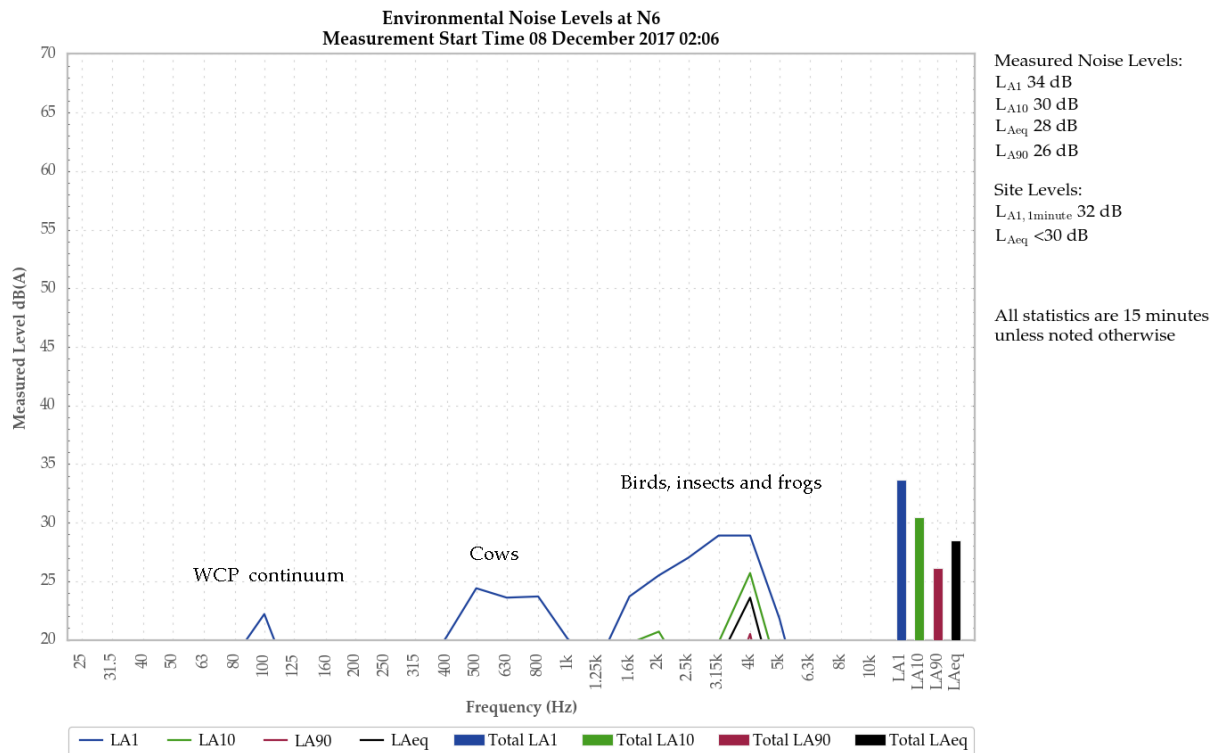


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

A low-level continuum from WCP was audible throughout the measurement, generating the site only LAeq of less than 30 dB. A surge in the continuum generated the site only LA1,1minute of 32 dB.

Insects and frogs primarily generated the measured levels. Birds and cows contributed to the measured LA1.

Bats were also noted.

5.1.2 N13, 8 December 2017

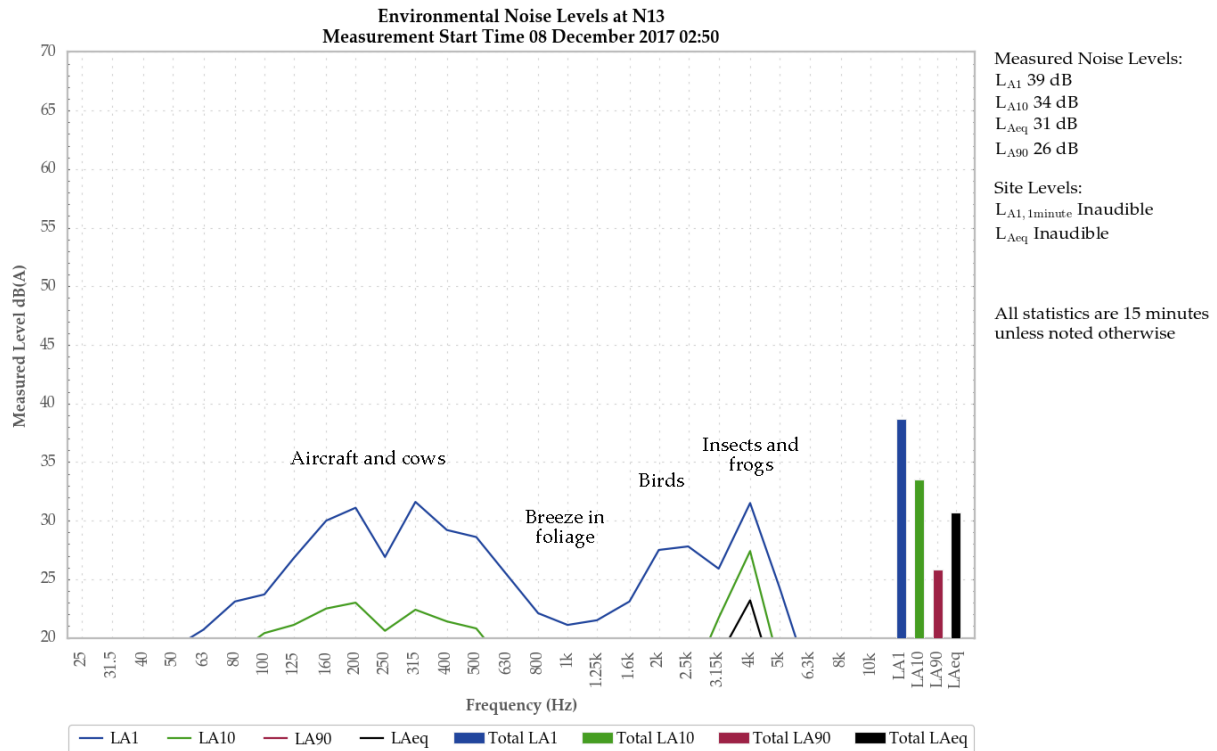


Figure 4: Environmental Noise Levels - N13, 'Coonaroo' off Moolarben Road

WCP was inaudible.

Aircraft, cows, insects and frogs generated the measured L_{A1}. Insects and frogs generated the measured L_{A10}, L_{Aeq} and L_{A90}.

Breeze, birds and continuum from another mine were also noted.

5.1.3 N14, 8 December 2017

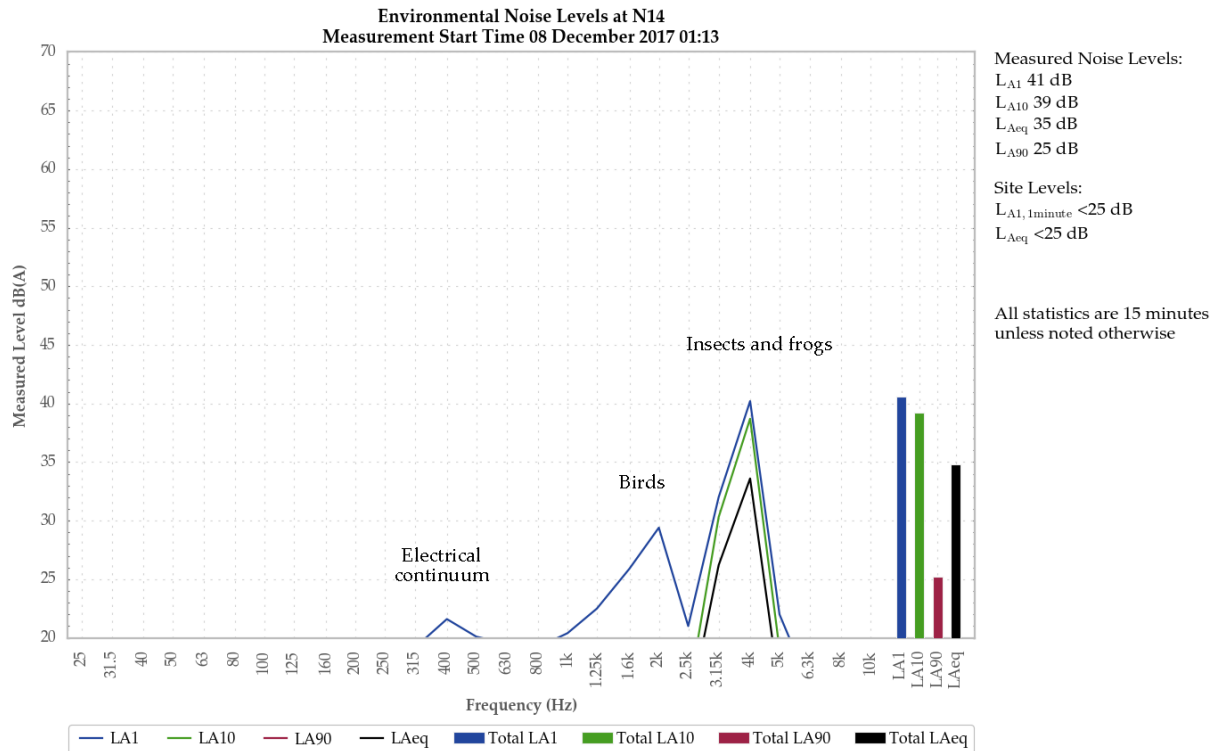


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

A low-level continuum from WCP was audible during some of the measurement and generated the site only LAeq and LA1,1minute of less than 25 dB.

Insects and frogs generated the measured levels.

Birds, cows and an electrical continuum were also noted.

5.1.4 N15, 7 December 2017

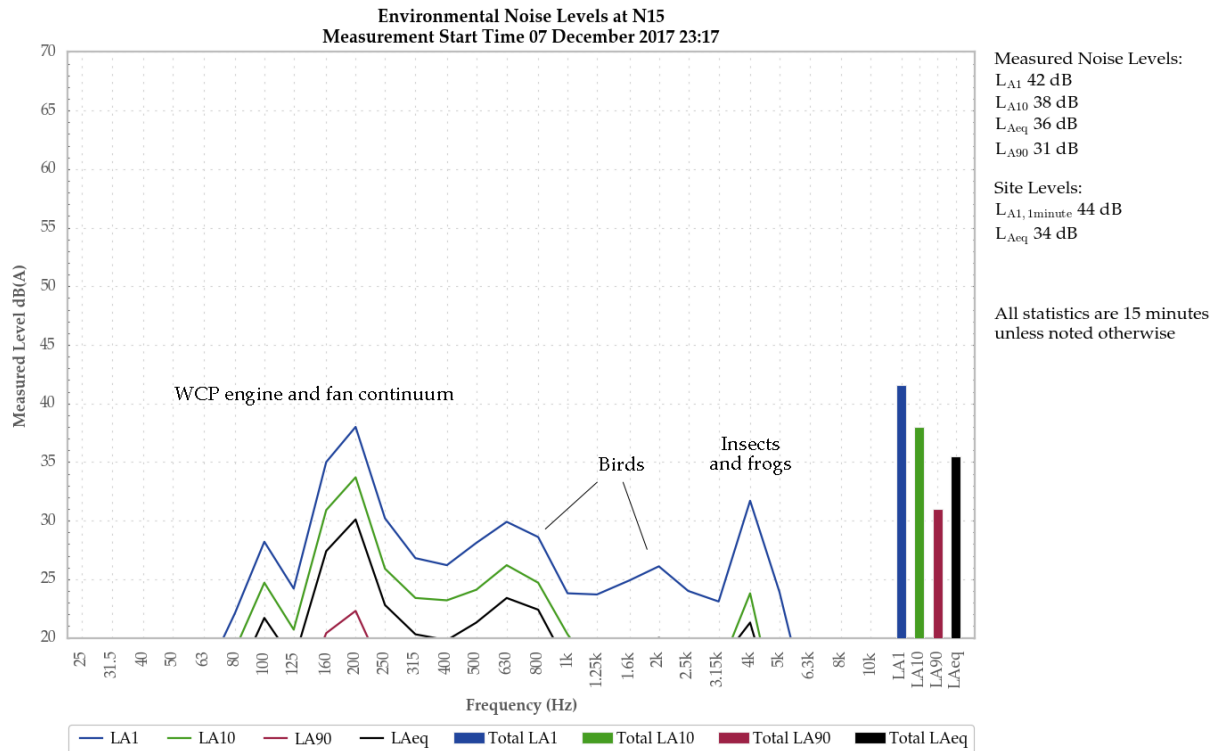


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

WCP was audible as engine and fan continuum throughout the measurement generating the site only L_{Aeq} of 34 dB. A surge in the continuum generated the site only L_{A1,1minute} of 44 dB. A low level horn and impact noise were also noted.

WCP was primarily responsible for the measured levels. Birds, insects and frogs contributed to some measured levels.

Dogs, owls, cows and bats were also noted.

5.1.5 N17, 7 December 2017

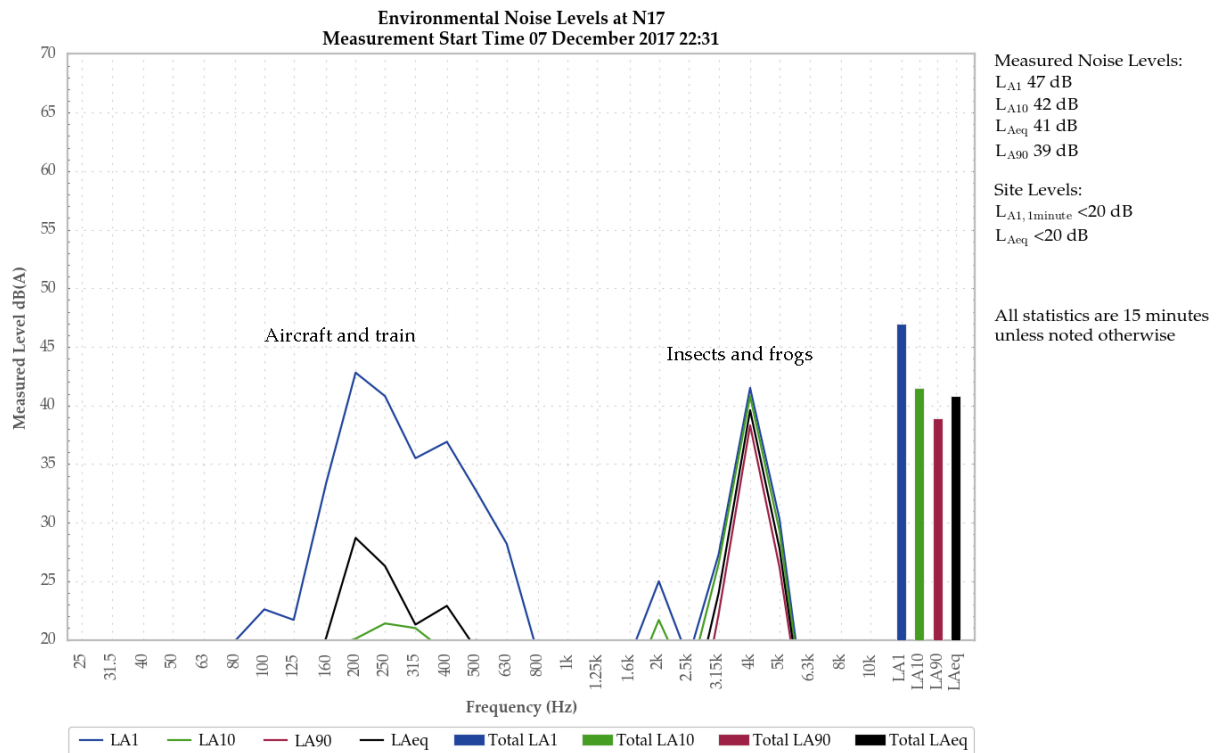


Figure 7: Environmental Noise Levels - N17 Mogo Road, off Araluen Road

WCP was audible as a low level continuum during some of the measurement, generating the site only LAeq and LA1,1minute of less than 20 dB.

Insects were primarily responsible for the measured levels. An aircraft contributed to the measured LA1.

A distant train was also noted.

5.1.6 N19, 7 December 2017

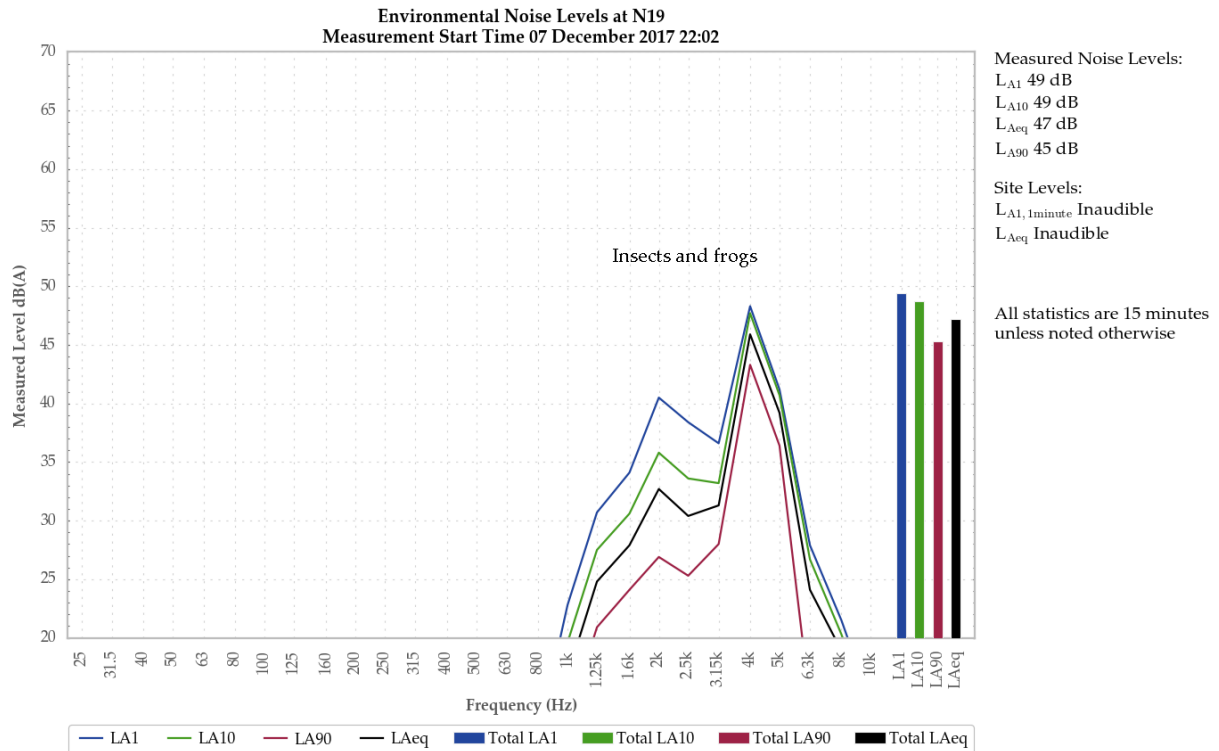


Figure 8: Environmental Noise Levels - N19, Upper Mogo Road

WCP was inaudible.

Insects and frogs were responsible for the measured levels.

5.1.7 N20, 8 December 2017

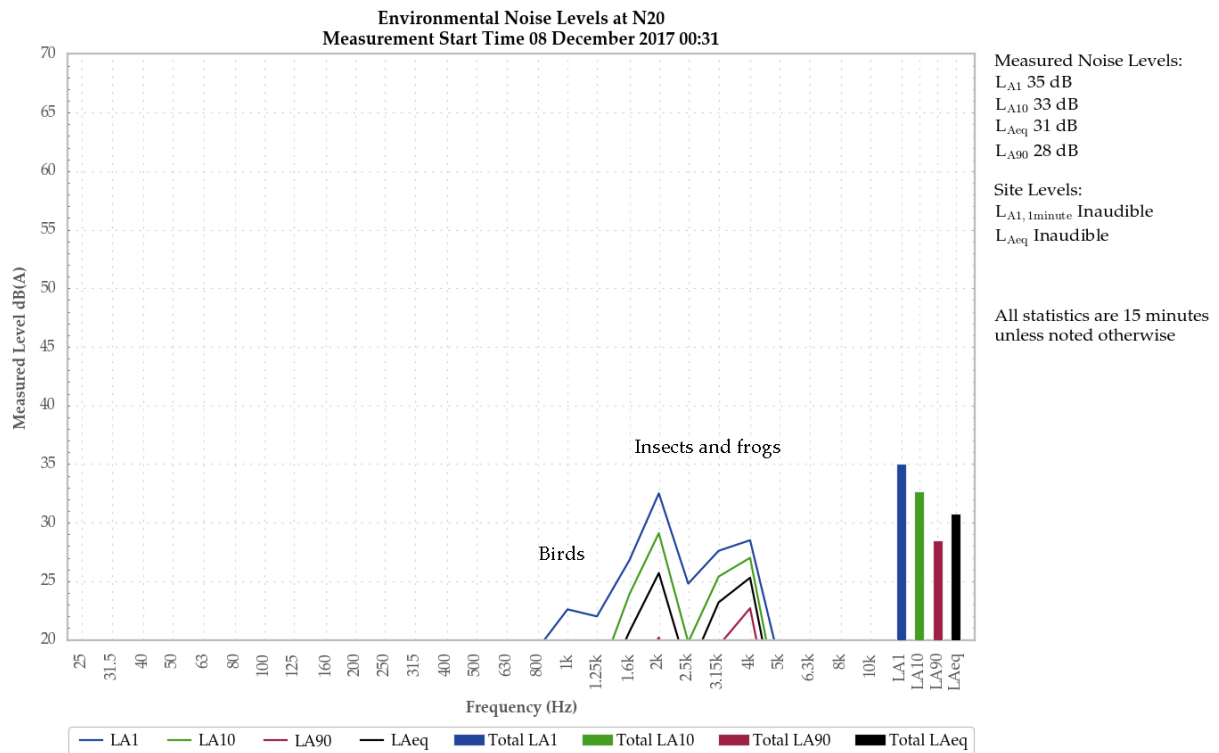


Figure 9: Environmental Noise Levels, N20 - Ringwood Road

WCP was inaudible.

Insects and frogs were responsible for the measured levels.

Birds, dogs, road traffic noise, bats and cows were also noted.

5.1.8 N21, 8 December 2017

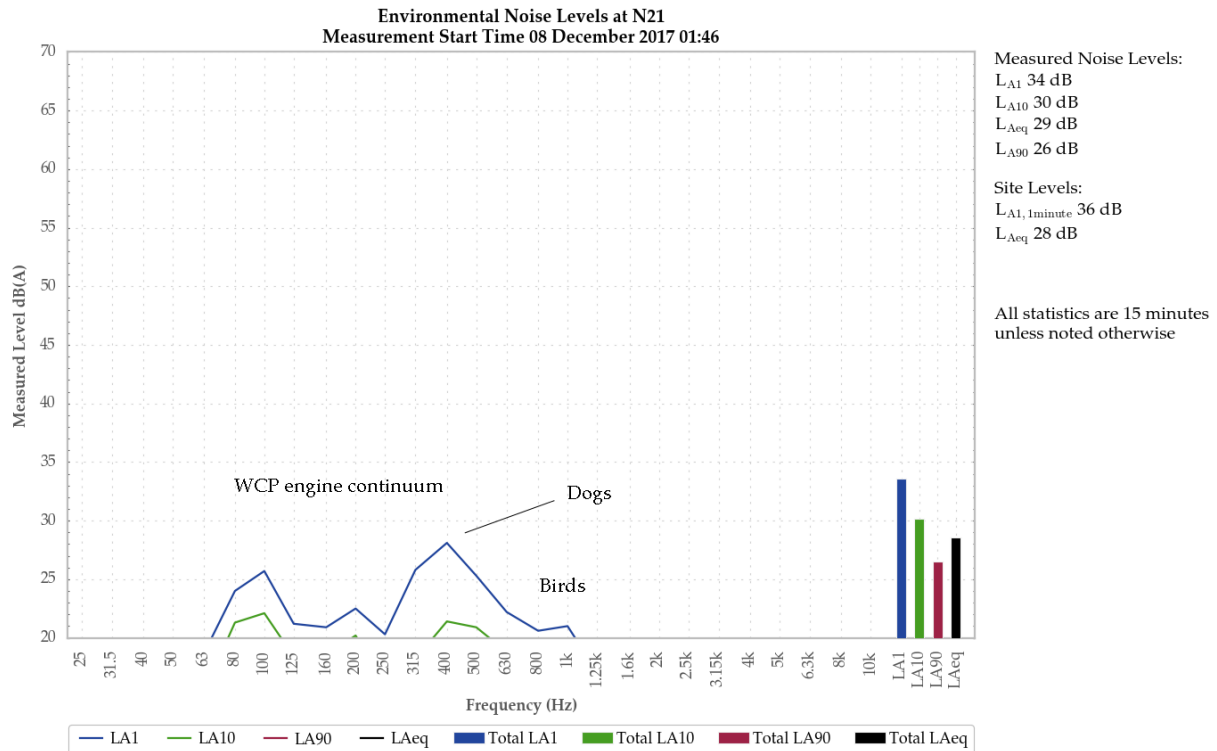


Figure 10: Environmental Noise Levels, N21 - 'Wandoona', Barigan Road

WCP was audible as engine continuum throughout the measurement, generating the site only LAeq of 28 dB. A surge in the continuum generated the site only LA1,1minute of 36 dB. Track noise was also noted.

Dogs were primarily responsible for the measured LA1 and contributed to the measured LAeq. WCP was primarily responsible for the measured LA10, LAeq and LA90 and contributed to the measured LA1.

Insects, frogs, birds and cows were also noted.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 7/8 December 2017. Attended noise monitoring was conducted at eight sites. The duration of all measurements was 15 minutes.

6.1 Operational Noise Assessment

Wilpinjong Coal Project complied with noise limits at the monitoring locations during the December 2017 monitoring period.

6.2 Low Frequency Assessment

During the December 2017 survey, WCP complied with the relevant limits where meteorological conditions applied using the NPfI method of assessing low frequency. No further assessment of low frequency noise was required.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Extension Project Approval (SSD-6764)

NOISE

Noise Criteria

3. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 3 at any residence on privately-owned land or at the other specified locations.

Table 3: Noise criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{A1}(1 \text{ minute})$
102	36	36	38	45
Wollar Village – Residential	36	37	37	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	40 (internal) When in use			-
900 – St Laurence O'Toole Catholic Church				

Note: To interpret the locations referred to in Table 3, see the applicable figures in Appendix 5.

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy* (as may be updated from time to time). Appendix 6 sets out the meteorological conditions under which these criteria apply along with any modifications to the *NSW Industrial Noise Policy* and the requirements for evaluating compliance with these criteria.

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

Operating Conditions

4. The Applicant must:
 - (a) implement all reasonable and feasible measures to minimise the construction, operational, low frequency, road and rail noise of the development;
 - (b) operate a comprehensive noise management system that uses a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day to day planning of mining operations, and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this consent;
 - (c) minimise the noise impacts of the development during meteorological conditions when the noise limits in this consent do not apply (see Appendix 6);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this consent.

Noise Management Plan

5. Prior to carrying out any development under this consent, unless the Secretary agrees otherwise, the Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:
 - (a) be prepared in consultation with the EPA;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this consent; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this consent and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.
6. The Applicant must implement the approved Noise Management Plan for the development.

APPENDIX 6 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 3 of schedule 3 are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) stability category G temperature inversion conditions.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Secretary directs otherwise.
5. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

6. The assessment of excessive levels of low frequency noise generated by the mine shall be as follows:
 Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:
- where any of the 1/3 octave noise levels in Table 6-1 are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
 - where any of the 1/3 octave noise levels in Table 6-1 are exceeded by more than 5dB and cannot be mitigated, a 5 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period and a 2dB positive adjustment applies for the daytime period.

Table 6-1: One-third octave low frequency noise thresholds

Hz/dB(Z)	One-third octave $L_{Zeq,15minute}$ threshold level												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

A.2 Environmental 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 January 2017.

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)
Wollar village	36	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
All other privately owned land (outside the village of Wollar)	35	35	35	45

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

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 3°C/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
- c) Temperature inversion conditions greater than 3°C/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.

R4 Other reporting conditions

- R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the second round of quarterly monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:
- a) an assessment of compliance with noise limits presented in Condition L5.1; and
 - b) an outline of any management actions taken within the monitoring period to address any exceedences of the limits contained in Condition L5.1.

A.3 Noise Monitoring Program

The relevant sections of the noise monitoring program for WCP dated June 2017 are reproduced below.

WCPL utilise a combination of operator-attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria from Development Consent (SSD-6467). Operator-attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 6**. Unattended real-time noise monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Operator-attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake operator-attended noise monitoring as identified in **Table 7 (Figure 3 and Figure 4)**. Real-time noise monitoring units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 7: Noise Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Operator-attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Operator-attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Operator-attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Operator-attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Mogo Rd	N17	Operator-attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Mogo Rd	N19	Operator-attended Noise	782644.5	6424151.1	Location based on the nearest and residential community structure to the North-East of the Mine

Location	Site	Type	Easting ⁺	Northing ⁺	Justification
Ringwood Road	N20	Operator-attended Noise	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine.
Wandoona	N21	Operator-attended Noise	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP in May 2017.
WCPL Rail Loop	-	Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions
Wollar Village ⁴	-	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine N15 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Mogo Rd ⁴	-	Real-Time Noise - Fixed	782644.5	6424151.1	Location based on the nearest non-mine owned residence to the East of the Mine N19 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Ringwood Road	-	Real-Time Noise - Fixed	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine. N20 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Wandoona ³	-	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP. N21 operator-attended Noise Monitoring (validation of real-time noise monitoring)

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.
4. Where continuous monitors are located at compliance locations (e.g. privately owned receivers), WCPL will conduct a review of the identification/characterisation of mine-related noise by the real-time monitoring system at that location by comparing against observed mine-related noise identified during operator-attended monitoring (i.e. validate the identification of mine related noise and filtering of extraneous noise sources by the real-time system). Refer to **Section 6.5**.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 7** with consideration to the above criteria. WCPL will update this NMP, in consultation with DP&E and the EPA.

6.3.3 Methodology

Operator-attended noise monitoring will be undertaken at the locations and frequency as outlined in **Table 8** by an independent acoustic consultant and guided by the requirements of the INP (EPA, 2000) and AS 1055.1-1997 '*Acoustics – Description and measurement of environmental noise – General procedures*'. Routine operator-attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the Noise Criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not exceed the Noise Criteria, as defined in **Table 6**, then the result will be recorded and the attended noise monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria, then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) Upon confirming the exceedances are deemed a non-compliance in accordance with the **Figure 5**, WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance (**Section 9.0**).

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional operator-attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:

- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by more than 5dB and cannot be mitigated, a 5 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period and a 2dB positive adjustment applies for the daytime period.

Table 9 One-third Octave Low Frequency Noise Thresholds

Hz/dB(Z)	One-third octave LZeq,15minute threshold level												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

6.3.6 Applicable Meteorological Conditions

The Noise Criteria in **Table 6** are to be applied under all meteorological conditions except for the following:

- Wind speeds greater than 3 m/s at 10 m above ground level; or
- Stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
- Stability category G temperature inversion conditions.

APPENDIX

B CALIBRATION CERTIFICATES



**Acoustic
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www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3:2006

Calibration Certificate

Calibration Number C16323

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 01070590
Microphone Serial Number : 08184
Pre-amplifier Serial Number : 52329

Pre-Test Atmospheric Conditions
Ambient Temperature : 21.4°C
Relative Humidity : 37.5%
Barometric Pressure : 100.19kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 21.4°C
Relative Humidity : 37.5%
Barometric Pressure : 100.23kPa

Calibration Technician : Calvin
Simpfendorfer
Calibration Date : 28/06/2016

Secondary Check: Riley Cooper
Report Issue Date : 30/06/2016

Approved Signatory :

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10: Self-generated noise	Pass	14: Level linearity on the reference level range	Pass
11: Acoustical tests of a frequency weighting	Pass	15: Level linearity incl. the level range control	Pass
12: Electrical tests of frequency weightings	Pass	16: Toneburst response	Pass
13: Frequency and time weightings at 1 kHz	Pass	17: Peak C sound level	Pass
		18: Overload Indication	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement -			
Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	±0.12dB	Temperature	±0.05°C
12.5kHz	±0.18dB	Relative Humidity	±0.46%
16kHz	±0.31dB	Barometric Pressure	±0.017kPa
Electrical Tests			
31.5 Hz to 20 kHz	±0.12dB		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.

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**Sound Calibrator
IEC 60942-2004**

Calibration Certificate

Calibration Number C17149

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Pulsar 106
Instrument Serial Number : 79631

Atmospheric Conditions
Ambient Temperature : 21.9°C
Relative Humidity : 54.6%
Barometric Pressure : 98.84kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 30/03/2017
Secondary Check: Riley Cooper
Report Issue Date : 31/03/2017

Approved Signatory :

Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
5.2.2: Generated Sound Pressure Level	Pass	5.3.2: Frequency Generated	Pass
5.2.3: Short Term Fluctuation	Pass	5.5: Total Distortion	Pass

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	94.1	1000.38

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2004 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -			
Specific Tests		Environmental Conditions	
Generated SPL	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
Distortion	±0.5%		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.



Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

PAGE 1 OF 1

Wilpinjong Coal

Attended and Real-time Noise Monitoring Comparison 2017

*Prepared for
Wilpinjong Coal Pty Ltd*



Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Attended and Real-time Noise Monitoring Comparison 2017

Reference: 18060_R01

Report date: 5 March 2018

Prepared for

Wilpinjong Coal Pty Ltd
Locked Bag 2005
Mudgee NSW 2850

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322



Prepared: Jason Cameron
Acoustics Technician



QA Review: Jeremy Welbourne
Acoustics Consultant

Global Acoustics Pty Ltd ~ Environmental noise modelling 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

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to compare real-time and attended noise monitoring data for Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Attended environmental noise monitoring was conducted monthly for WCP during 2017. The purpose of this assessment was to compare attended noise measurements taken in Wollar Village, Mogo Road, Ringwood Road and Wandoona to the nearby Sentinex units. Monitoring at Mogo Road, Ringwood Road, and Wandoona commenced in October 2017.

Noise monitoring described in this report was undertaken during the nights of 22/23 January, 22/23 February, 9/10 March, 5/6 April, 16/17 May, 20/21 June, 12/13 July, 9/10 August, 21/22 September, 30/31 October, 15/16 November and 7/8 December 2017.

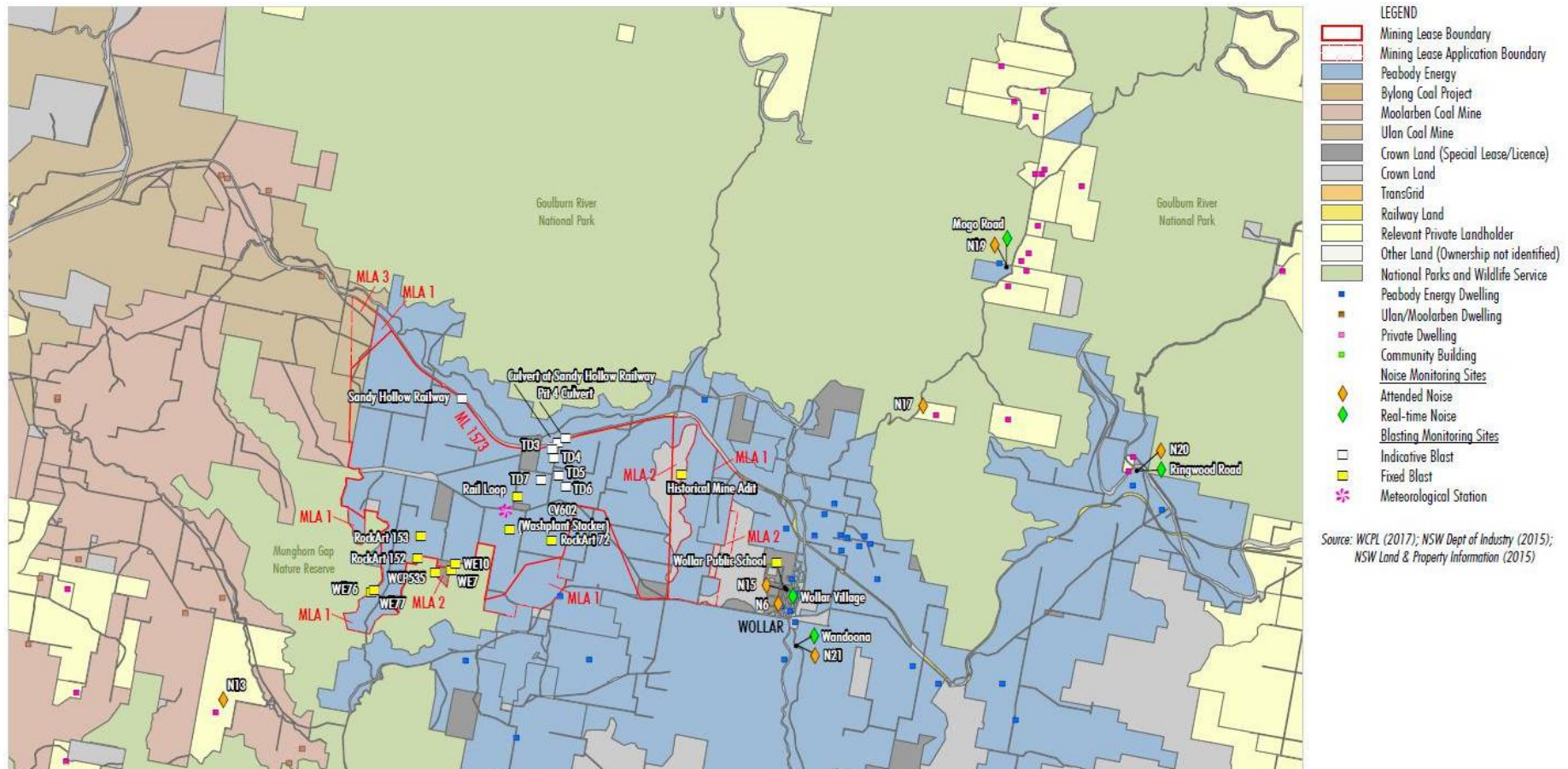
Attended monitoring was conducted in accordance with the Environment Protection Authority (EPA) guidelines and Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise'. The duration of each night measurement was 15 minutes.

1.2 Noise Monitoring Locations

There were 4 attended monitoring locations during this survey and 4 Sentinex locations, as listed in Table 1.1. WCP operations and monthly compliance noise monitoring sites are shown in Figure 1. The real-time and attended monitoring sites are shown in more detail in Figure 2 to Figure 5. It should be noted that these figures show the actual monitoring positions, not the location of residences.

Table 1.1: NOISE CORRELATION MONITORING LOCATIONS

Report Descriptor	Monitoring Location
N15	Attended monitoring location, track off Barigan Street near Wollar School, Wollar Village
N19	Attended monitoring location, Mogo Road, off Araluen Road
N20	Attended monitoring location, Ringwood Road
N21	Attended monitoring location, Wandoona
SX30	Sentinex real-time monitoring station, Ringwood Road
SX31	Sentinex real-time monitoring station, Wandoona
SX32	Sentinex real-time monitoring station, Mogo Road
SX33	Sentinex real-time monitoring station, Wollar Village



Source: Wilpinjong Coal Pty Ltd

Figure 1: Location plan

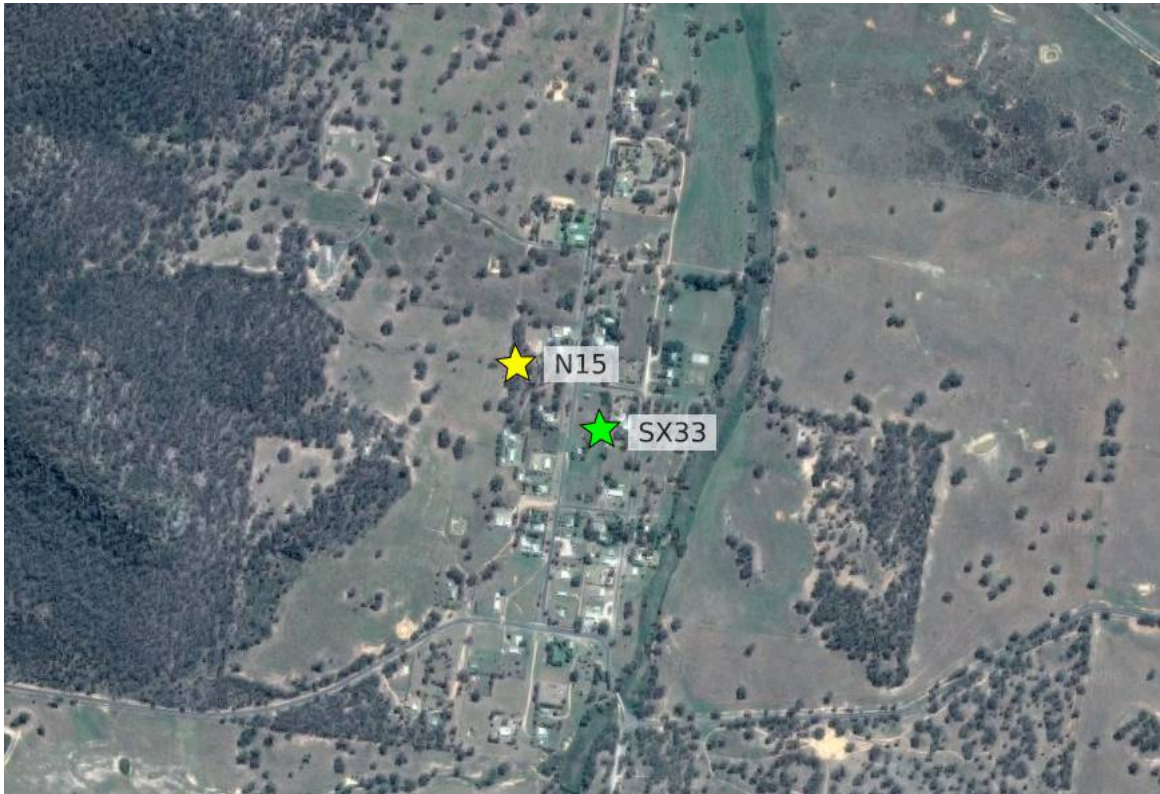


Figure 2: Wollar Village monitoring locations assessed in this report



Figure 3: Mogo Road monitoring locations assessed in this report

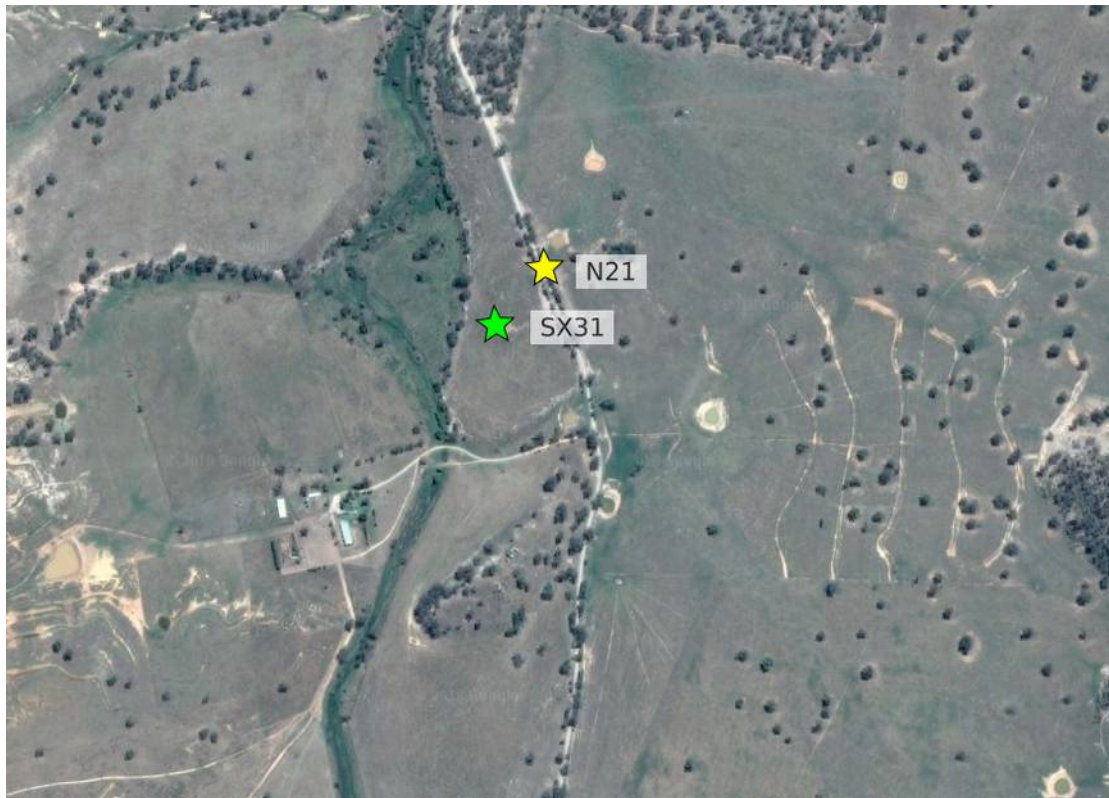


Figure 4: Wandoona monitoring locations assessed in this report



Figure 5: Ringwood Road monitoring locations assessed in this report

1.3 Terminology & Abbreviations

The definition of some terms and abbreviations, which may be used in this report, are provided in Table 1.2

Table 1.2: TERMINOLOGY & ABBREVIATIONS

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 percent 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 percent 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
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
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. Estimated from wind speed and sigma theta data
Stability Class	Stability class category determined from VTG as outlined in the INP
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location
NM	Not Measurable. If site noise is noted as NM or <30 dB, this means some noise was audible but could not be quantified
Day	This is the period 7:00am to 6:00pm
Evening	This is the period 6:00pm to 10:00pm
Night	This is the period 10:00pm to 7:00am

2 METHODOLOGY

2.1 Overview

All noise monitoring conducted for this report was in accordance with the Environment Protection Authority (EPA) guidelines, Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken during attended monitoring.

2.2 Attended Noise Monitoring

Attended noise measurements were taken concurrently at the following locations:

- N15, Wollar Village and Sentinex unit SX33;
- N19, Mogo Road and Sentinex unit SX32;
- N20, Ringwood Road and Sentinex unit SX30; and
- N21, Wandoona and Sentinex unit SX31.

Mining noise levels (15 minute L_{Aeq} levels) were determined during attended monitoring and used for comparison between locations. Attended monitoring was not commenced on the 15 minute period so data could not be directly compared to concurrent Sentinex data. Data from the Sentinex unit that provided the largest overlap with each attended monitoring period was selected and is considered sufficient for the purpose of this survey.

$L_{A1,1minute}$ mining noise levels, tonality and low frequency noise are regularly assessed as part of compliance monitoring for WCP, but have not been included in this report, as its purpose is one of correlation rather than compliance.

The terms "Inaudible" (IA), "Not measurable" (NM) or "Less than 25 dB" (<25 dB) may be used in this report. When site noise is noted as IA then there was no site noise audible at the monitoring location.

However, if site noise is noted as NM or <25 dB, this means some noise was audible but could not be quantified. In the case of very low site levels, we do not consider it 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). All site values NM or <25 dB in this report are due to low absolute values.

3 RESULTS

A summary of attended monitoring data and that measured by the corresponding Sentinex (omni-directional) is shown in Table 3.1. Low pass (<630 Hz) LAeq and LA90 are typically good indicators of mining noise levels.

Table 3.1: REAL-TIME AND ATTENDED NOISE LEVELS, WOLLAR VILLAGE 2017 (dB)

Attended Start Date and Time	Sentinex Start Date and Time	Sentinex Data ¹			Attended measurement
		LAeq	Low pass (<630Hz) LAeq	Low pass (<630Hz) LA90	WCP LAeq
22/01/2017 23:42	22/01/2017 23:45	41	38	17	IA
22/02/2017 23:27	22/02/2017 23:30	33	23	15	IA
09/03/2017 22:57	09/03/2017 23:00	31	30	18	IA
05/04/2017 23:58	06/04/2017 00:00	48	23	21	IA
16/05/2017 23:36	16/05/2017 23:30	42	40	16	IA
20/06/2017 23:52	20/06/2017 23:45	46	44	27	<30
12/07/2017 23:16	12/07/2017 23:15	47	46	23	IA
09/08/2017 22:59	09/08/2017 23:00	37	28	26	27
21/09/2017 23:00	21/09/2017 23:00	31	27	19	IA
31/10/2017 00:04	31/10/2017 00:00	43	40	30	IA
15/11/2017 23:00	15/11/2017 23:00	31	25	16	IA
07/12/2017 23:17	07/12/2017 23:15	45	41	32	34

Notes:

- Levels in this table from Sentinex units are not necessarily the result of activity at WCP.

Table 3.2: REAL-TIME AND ATTENDED NOISE LEVELS, MOGO ROAD 2017 (dB)

Attended Start Date and Time	Sentinex Start Date and Time	Sentinex Data ¹			Attended measurement
		LAeq	Low pass (<630Hz) LAeq	Low pass (<630Hz) LA90	WCP LAeq
31/10/2017 01:07	31/10/2017 01:00	45	43	30	<20
15/11/2017 22:00	15/11/2017 22:00	36	35	27	IA
07/12/2017 22:02	07/12/2017 22:00	33	29	27	IA

Notes:

- Levels in this table from Sentinex units are not necessarily the result of activity at WCP.

Table 3.3: REAL-TIME AND ATTENDED NOISE LEVELS, RINGWOOD ROAD 2017 (dB)

Attended Start Date and Time	Sentinex Start Date and Time	Sentinex Data ¹			Attended measurement
		LAeq	Low pass (<630Hz) LAeq	Low pass (<630Hz) LA90	WCP LAeq
30/10/2017 23:11	30/10/2017 23:15	44	41	35	IA
15/11/2017 23:33	15/11/2017 23:30	38	22	20	IA
08/12/2017 00:31	08/12/2017 00:30	35	25	22	IA

Notes:

1. Levels in this table from Sentinex units are not necessarily the result of activity at WCP.

Table 3.4: REAL-TIME AND ATTENDED NOISE LEVELS, WANDOONA 2017 (dB)

Attended Start Date and Time	Sentinex Start Date and Time	Sentinex Data ¹			Attended measurement
		LAeq	Low pass (<630Hz) LAeq	Low pass (<630Hz) LA90	WCP LAeq
30/10/2017 22:35	30/10/2017 22:30	52	51	40	IA
16/11/2017 00:45	16/11/2017 00:45	24	21	18	IA
08/12/2017 01:46	08/12/2017 01:45	32	32	30	28

Notes:

1. Levels in this table from Sentinex units are not necessarily the result of activity at WCP.

4 SUMMARY

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to compare real-time and attended noise monitoring data for Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Attended environmental noise monitoring was conducted monthly for WCP during 2017. The purpose of this assessment was to compare attended noise measurements to nearby Sentinex units. Comparison of attended and real-time noise data indicates Sentinex low-pass L_{A90} data best correlates with mining noise levels determined during attended monitoring. It should be noted that mining noise was often inaudible or audible at low levels at Wollar Village during attended monitoring in 2017. However, the correlation outcome statement is based on the fact that measured low-pass L_{Aeq} are, at times, higher than the relevant criterion for mining noise, while, at the same time, the low-pass L_{A90} was not.

Global Acoustics Pty Ltd

21 March 2018

Wilpinjong Coal Pty Ltd
Locked Bag 2005
Mudgee NSW 2850
Attention: Stephen Bragg

Dear Stephen,

Regarding: Noise data trends

1 INTRODUCTION

This letter provides a review of attended noise data gathered around the Wilpinjong Coal Project since 2013. The purpose of this is to address a requirement of the relevant site approval that analysis of this data is required to identify trends.

Also provided is some supporting information to put in context the difficulty in evaluating the data as required.

2 MINING NOISE

Below are some specific characteristics of mining noise at distant receptors (as is typical for open cut mining):

1. Most receptors are located a considerable distance from mine sites with regard to noise propagation (greater than 1000 metres);
2. Mining noise is typically inaudible during the day period, particularly once the ground heats up (daytime is not usually a problem period);
3. Received levels of mining noise usually varies greatly from one night to the next at any receptor location; and
4. Different meteorological conditions from one night to the next are the primary cause of different received levels at receptors (received levels vary a lot because of different weather conditions, not because of changes to operations).

3 VARIABILITY AND LIMITED DATA AVAILABILITY

What must be considered carefully in any analysis of noise data is that variability in received level at distant receptors is primarily due to atmospheric effects, which themselves are rather variable.

To conduct the most valid comparison of received mining noise it would be ideal that atmospheric conditions are the same for all measurements. That way, the change in level should most likely then be due primarily to changes in activity or equipment at site.

However, attended data is gathered on a more or less random basis, and, at relatively infrequent intervals. Of course, real-time data is gathered continuously but is subject to influence by other sources and so is not the most accurate measure of mining noise only. The nature of attended monitoring is such that results can vary from the site being completely inaudible, audible but not measurable, through to directly quantifiable. Of course only samples where the site is quantifiable can be used for any kind of trend analysis, but as can be seen in the following section, this does not result in enough data (in one case no data) for any statistically significant evaluation.

4 DATA

Below are graphs of data (site was quantifiable) for all sites that we've monitored at for a total period of more than 3 years. We have not attempted to evaluate this information to any further extent, such as like for like atmospheric conditions, on the basis that the total data set is already too limited. No attempt has been made either to trend this for the same reasons.

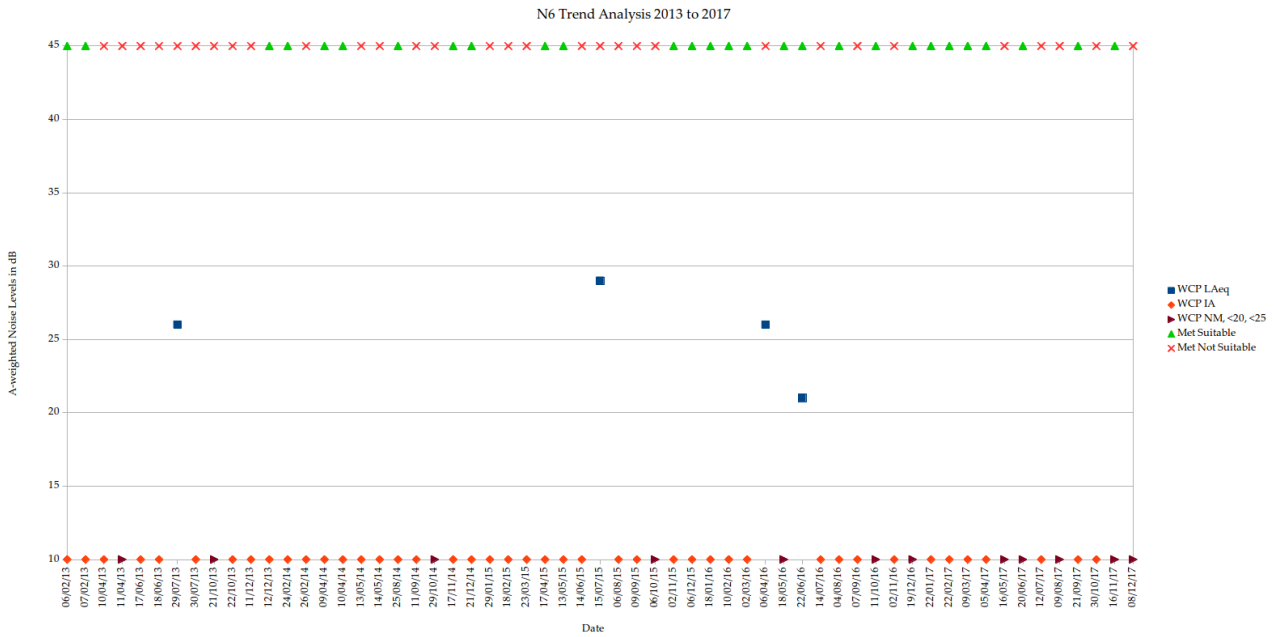


Figure 1: Location N6

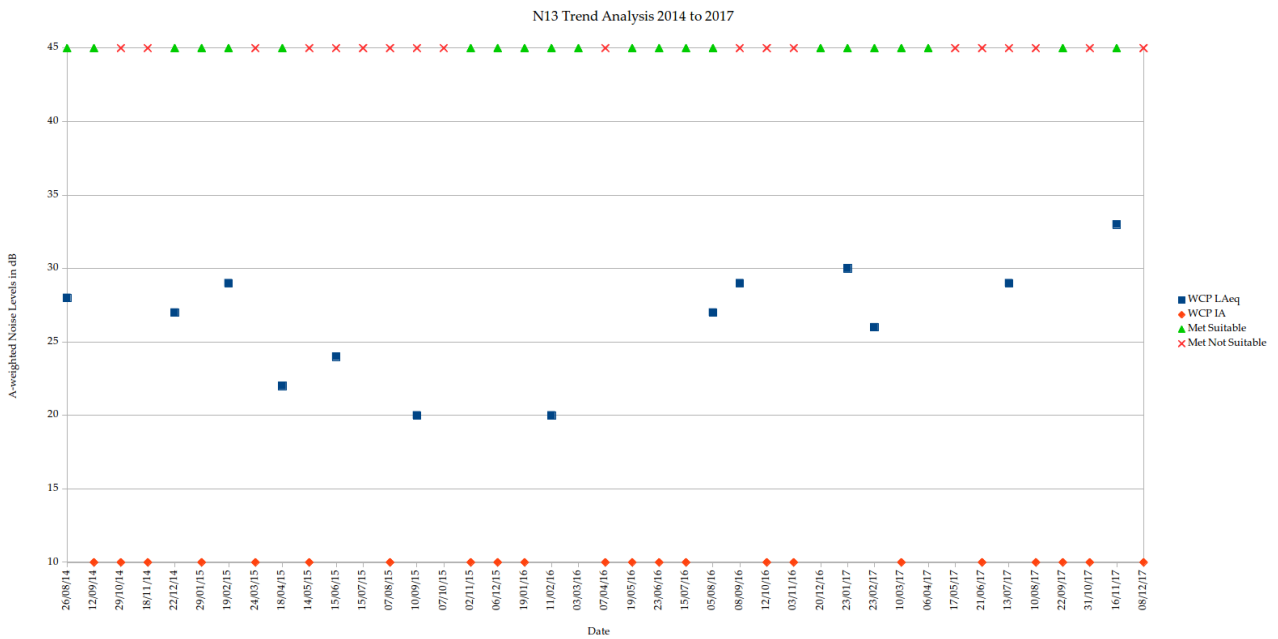


Figure 2: Location N13

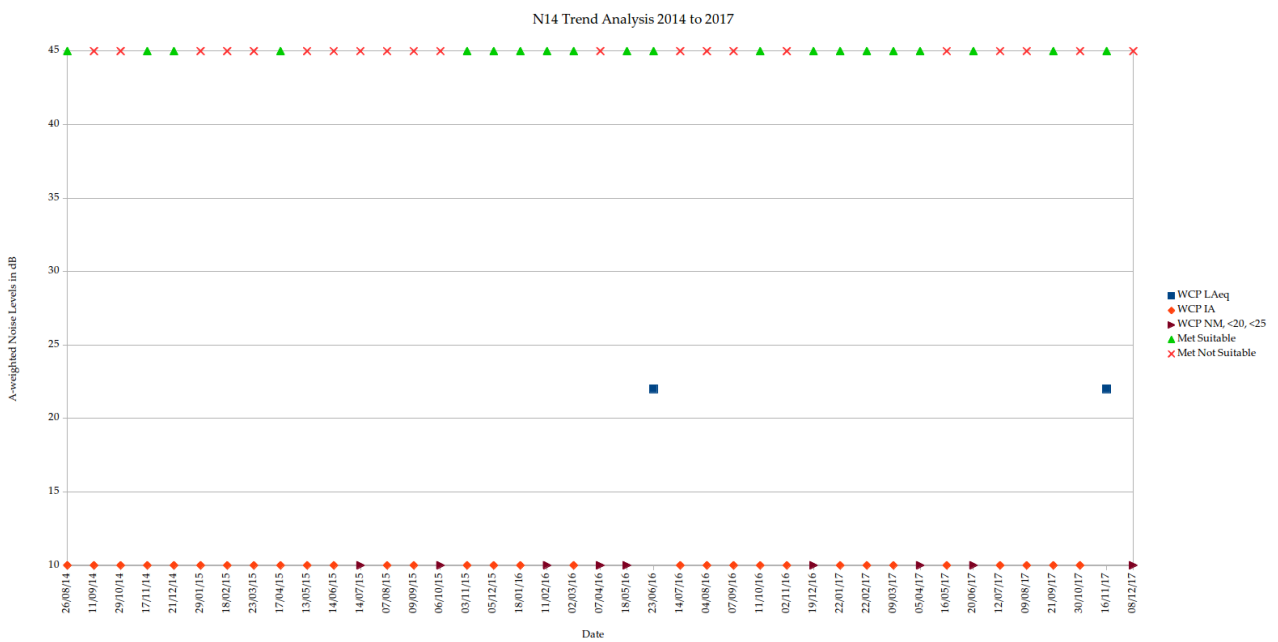


Figure 3: Location N14

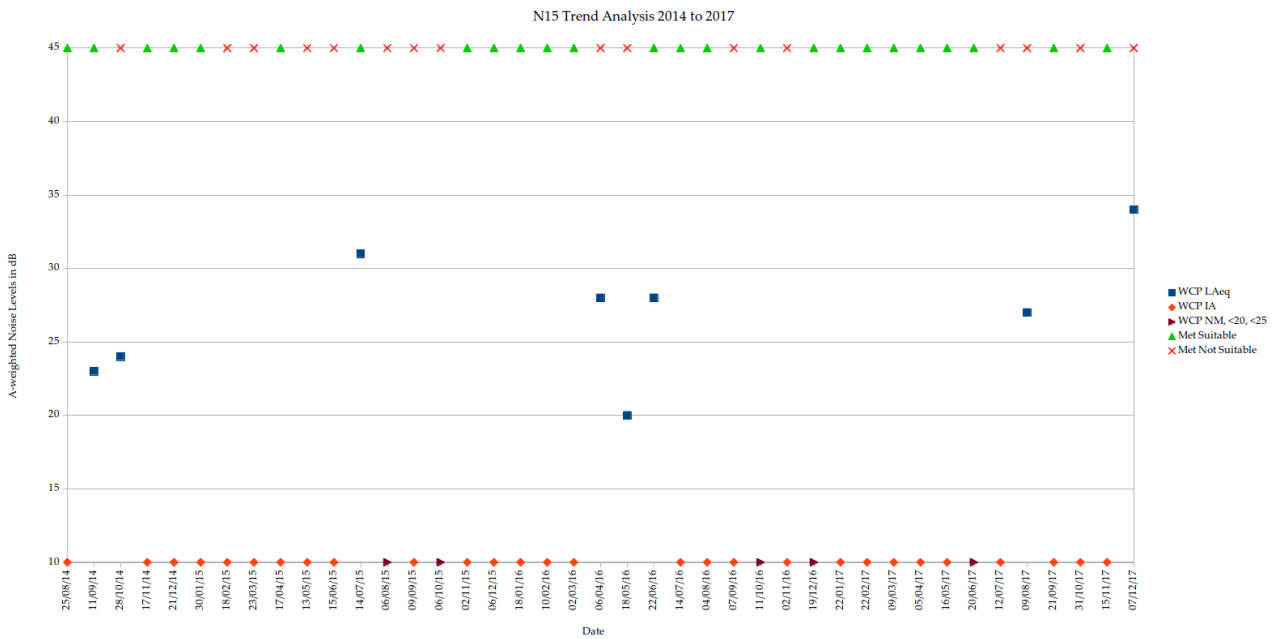


Figure 4: Location N15

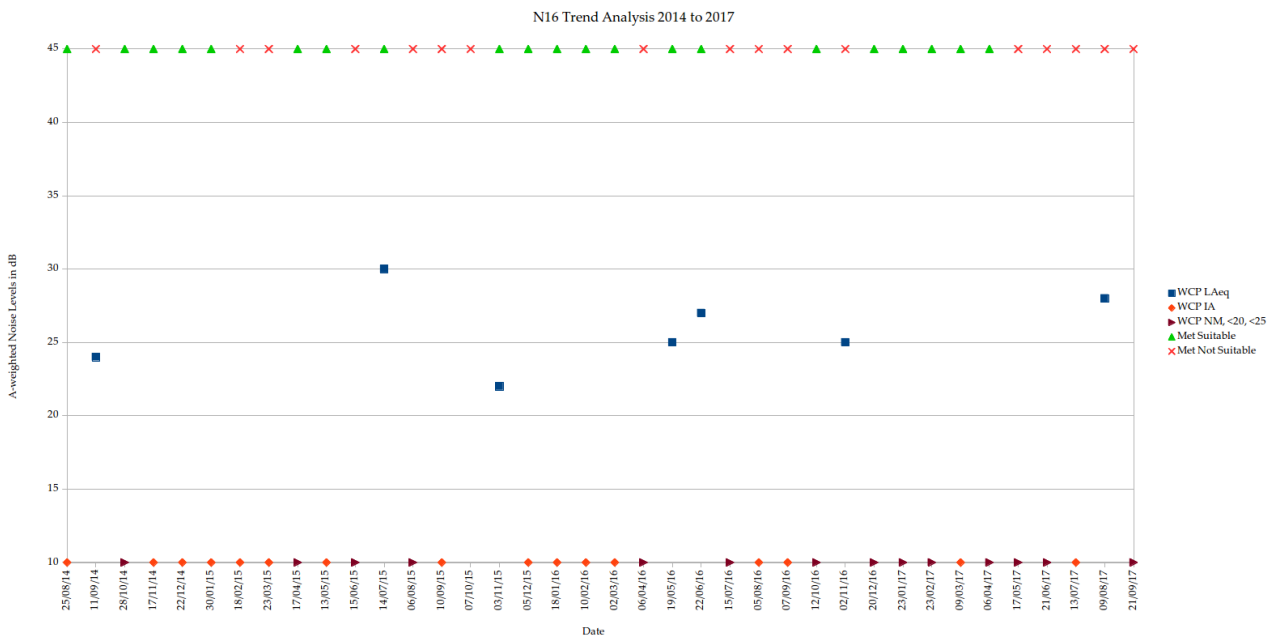


Figure 5: Location N16

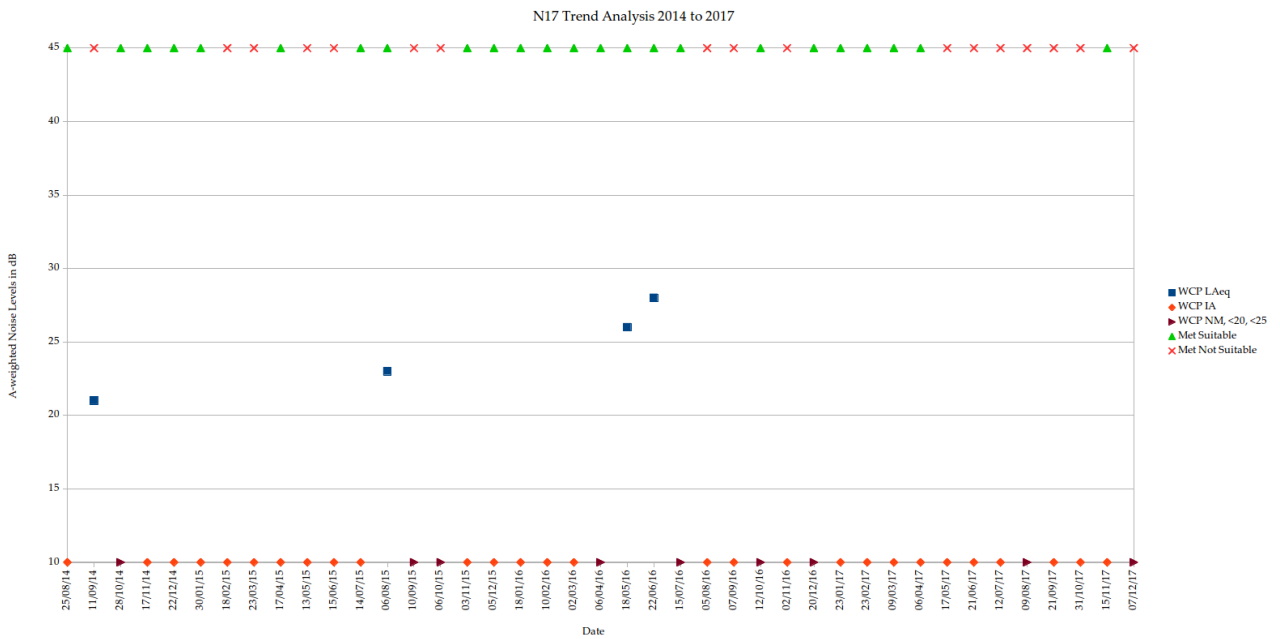


Figure 6: Location N17

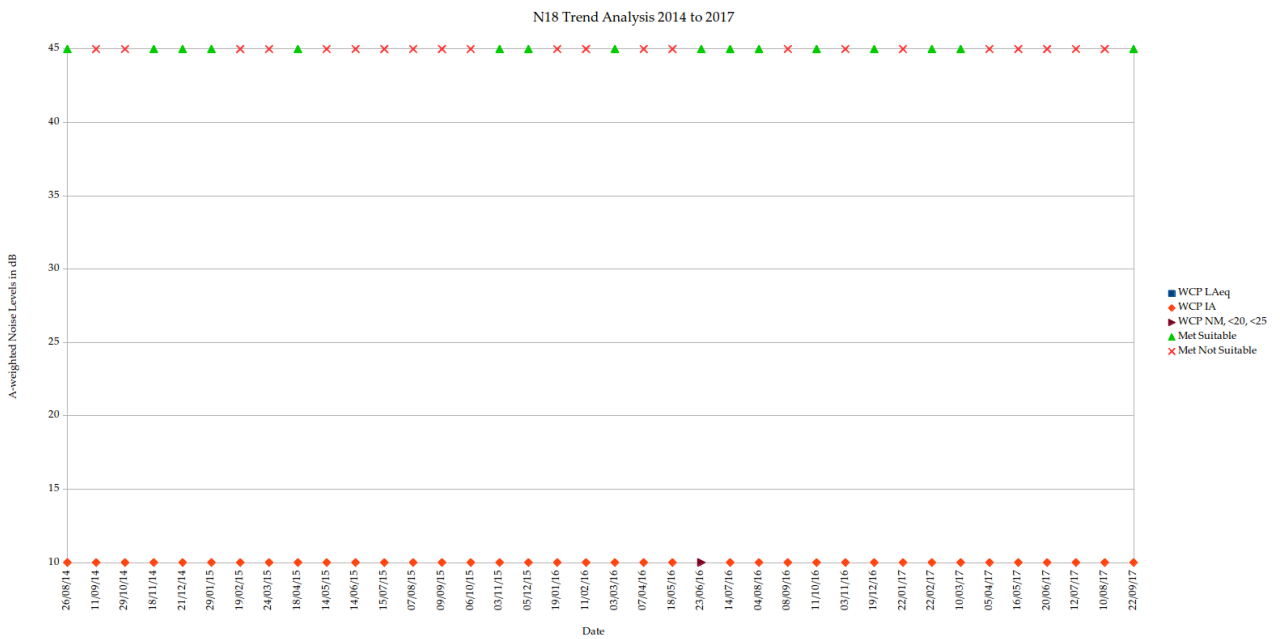
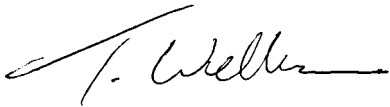


Figure 7: Location N18

5 CLOSURE

I trust this information meets your requirements. If you have any questions or need further details please contact me.



Prepared: Tony Welbourne
Director



QA review: Jeremy Welbourne
Senior Consultant