

Cullen Valley Mine

*Environmental Noise Monitoring
Quarter 4 2018*

*Prepared for
Castlereagh Coal*



Noise and Vibration Analysis and Solutions

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Cullen Valley Mine

Environmental Noise Monitoring Quarter 4 2018

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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 to conduct a noise survey around Cullen Valley Mine (CVM), an open cut coal mine north west of Lithgow.

A modification to the development consent was issued to Lithgow Coal Company in December 2004 (DA-200-5-2003) for the continuation of open cut mining activities. Schedule 4, Conditions 2 to 8 of the consent gives details of the noise requirements. Cullen Valley Mine also operates in accordance with EPL 10341. Noise requirements are detailed in L4 of the licence.

Given that the site is currently under care and maintenance, monitoring was not undertaken during the evening period as there are no activities occurring at this time. Although noise monitoring was carried out during the day period, given the site is on significantly reduced operations, there is unlikely to be any off-site noise. Therefore the monitoring program has been modified slightly to take this into account. The duration of each day measurement was 10 minutes if no site noise was heard, whereas when mining was audible; the measurement duration was increased to 15 minutes.

Attended monitoring was conducted in accordance with Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. During this survey attended monitoring was undertaken once at each measurement location during the day period.

Environmental noise monitoring was conducted around Cullen Valley Mine during the day period of 26 November 2018. Cullen Valley Mine complied with the consent $L_{Aeq,15\text{minute}}$ noise limits at all locations during Quarter 4 2018 monitoring. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Castlereagh Coal to conduct a noise survey around Cullen Valley Mine (CVM), an open cut coal mine north west of Lithgow.

Environmental noise monitoring was conducted around Cullen Valley Mine during the day period of 26 November 2018. There were five monitoring locations.

Given that the site is currently under care and maintenance, monitoring was not undertaken during the evening period as there are no activities occurring at this time. Although noise monitoring was carried out during the day period, given the site is on significantly reduced operations, there is unlikely to be any off-site noise. Therefore the monitoring program has been modified slightly to take this into account. The duration of each day measurement was 10 minutes if no site noise was heard, whereas when mining was audible; the measurement duration was increased to 15 minutes.

1.2 Noise Monitoring Locations

There were five monitoring locations during this survey as detailed in Table 1.1 and shown on Figure 1.

Table 1.1: ATTENDED NOISE MONITORING LOCATIONS

Descriptor	Owner	Monitoring Location
Red Springs	R. & B. Grabham	'Red Springs', Red Springs Road
Hillcroft	R. Dickens	'Hillcroft', Red Springs Road
Forest Lodge	R. Larkin	'Forest Lodge', Red Springs Road
Doble Gate	Doble	2775 Castlereagh Highway
Tilley	A. Tilley	Driveway of 2541 Castlereagh Highway

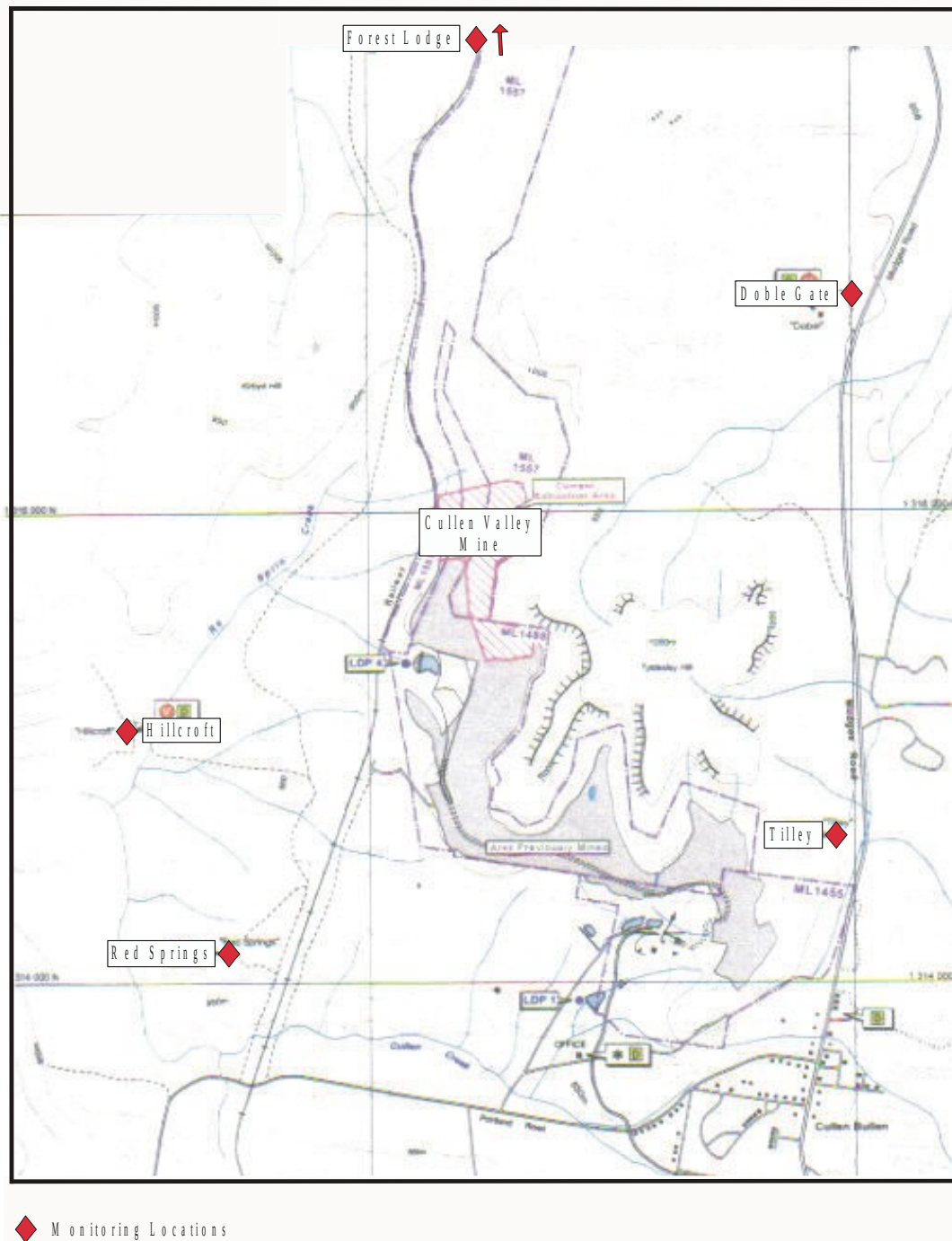


Figure 1: Cullen Valley Mine Attended Noise Monitoring Locations

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
$L_{A1,1\text{minute}}$	The noise level which is exceeded for 1 per cent of the specified time period of 1 minute
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_{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_{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.
Stability Class	Stability class or category indicating atmospheric stability.
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 CONSENTS AND CRITERIA

This section discusses the relevant regulatory approvals relating to noise monitoring and assessment for the Cullen Valley Mine. The relevant conditions relating to noise from the development consent and Environmental Protection Licence (EPL) are reproduced in Appendix A.

2.1 Project Specific Criteria

2.1.1 Development Consent

Lithgow Coal Company obtained development consent in December 2004 (DA-200-5-2003) for the continuation of open cut mining activities. Schedule 4, Conditions 2 to 8 of the consent details the noise requirements. Noise limits as described under the Cullen Valley Mine Development Consent are detailed in Table 2.1.

Table 2.1: CULLEN VALLEY MINE DEVELOPMENT CONSENT NOISE LIMITS, dB

Descriptor	Day	Evening	Night	
	L _{Aeq,15minute}	L _{Aeq,15minute}	L _{Aeq,15minute}	L _{A1,1minute}
Red Springs	37	35	35	45
Hillcroft	35	35	35	45
Forest Lodge	40	40	38	45
Doble Gate	43	38	35	45
Tilley	43	38	35	45

Land acquisition criteria are detailed in Table 2.2.

Table 2.2: CULLEN VALLEY MINE LAND ACQUISITION CRITERIA, dB

Descriptor	Day	Evening/Night
	L _{Aeq,15minute}	L _{Aeq,15minute}
Red Springs	42	40
Hillcroft	40	40
Doble Gate	43	40
Tilley	43	40

The noise criteria in Table 2.1 and Table 2.2 apply under meteorological conditions of:

- Wind speed up to 3 metres per second at 10 metres above ground level; and
- Temperature inversion conditions of up to 3 degrees Celsius per 100 metres, and wind speeds of up to 2 metres per second at 10 metres above ground level.

2.1.2 EPA Licence

Cullen Valley Mine operates in accordance with EPL 10341. Noise requirements are detailed in L4 of the licence (see Appendix A). Noise limits as described in the Cullen Valley Mine EPL are detailed in Table 2.3.

Table 2.3: CULLEN VALLEY MINE EPL NOISE LIMITS, dB

Descriptor	Mining Condition	Day	Evening	Night	
		L _{Aeq,15minute}	L _{Aeq,15minute}	L _{Aeq,15minute}	L _{A1,1minute}
Red Springs	Mining east of railway line	35	35	35	45
Red Springs	Mining west of railway line	43	38	35	45
Hillcroft	Mining east of railway line	35	35	35	45
Hillcroft	Mining west of railway line	43	38	35	45
Forest Lodge	-	40	40	40	45
Doble Gate	-	43	38	35	45
Tilley	-	43	38	35	45

The noise criteria in Table 2.3 apply under all meteorological conditions except for the following:

- Wind speeds greater than 3 metres per second at 10 metres above ground level; and
- Stability category F temperature inversion conditions and wind speeds greater than 2 metres per second at 10 metres above ground level; or
- Stability category G temperature inversion conditions.

Cullen Valley Mine has been mining east of the railway line, but is currently under care and maintenance.

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 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 noise where the level suddenly drops/increases several times during the assessment period, with a noticeable change in source noise level of at least 5 dB(A); for example, equipment cycling on and off. The intermittency correction is not intended to be applied to changes in noise level due to meteorology.

There were no intermittent noise sources from site during the survey as defined in the NPfI.

2.2.2 Low-Frequency Noise

As defined in the NPfI:

Low frequency noise is noise with an unbalanced spectrum and containing major components within the low-frequency range (10 – 160 Hz) of the frequency spectrum.

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 Overview

Attended monitoring was conducted at three sites in accordance with Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. Atmospheric condition measurement was also undertaken.

As per condition L4.4 of Cullen Valley's EPL, meteorological data has been sourced from the Cullen Valley Mine weather station.

3.2 Attended Noise Monitoring

Given the site is on care and maintenance, the duration of each day measurement was generally 10 minutes. The exceptions were when mining was audible; the duration of these measurements was increased to 15 minutes. During this survey attended monitoring was undertaken once at each measurement location during the day period.

Attended monitoring is preferred to the use of noise loggers when determining compliance with prescribed limits; it allows an accurate determination of the contribution, if any, to measured noise levels by the source of interest (in this case Cullen Valley Mine).

As indicated in section L5.2 of the EPL, modifying factors from Section 4 of the INP, now the NPfI, should be implemented where applicable. Tonality and low-frequency from Cullen Valley Mine were assessed by analysis of the measured L_{Aeq} spectrum.

If the exact contribution of the source of interest 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 NPfI (e.g. measure closer and back calculate) to determine a value for reporting.

Therefore, 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 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.

3.3 Modifying Factors

Years of monitoring have indicated that noise levels from mining operations, particularly those measured at significant distances from the source are relatively continuous and broad spectrum. Given this, noise levels from Cullen Valley Mine at the monitoring locations are unlikely to be intermittent or tonal.

Assessment of low-frequency modifying factors is necessary when application of the maximum correction could potentially result in an exceedance of the relevant site-only L_{Aeq} criterion. Low-frequency analysis is therefore undertaken for measurements in this report where:

- meteorological conditions resulted in criteria being applicable;
- contributions from Cullen Valley Mine were audible and directly measurable, such that the site-only L_{Aeq} was not "NM" or less than a maximum cut off value (e.g. "<20 dB" or "<30dB");
- contributions from Cullen Valley Mine were within 5 dB of the relevant L_{Aeq} criterion, as 5 dB is the maximum penalty that can be applied by low-frequency modifying factors; and
- Cullen Valley Mine was the dominant low-frequency noise source.

All measurements meeting these conditions were evaluated for possible low-frequency penalty applicability in accordance with the NPfL.

3.4 Attended Monitoring Equipment

The equipment detailed in Table 3.1 were used to measure environmental noise levels. Calibration certificates are provided in Appendix B.

Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	1070590	25/06/2020
Pulsar 106 acoustic calibrator	79631	30/03/2019

4 RESULTS

4.1 Total Measured Noise Levels

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

Table 4.1: MEASURED NOISE LEVELS – QUARTER 4 2018¹

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
Red Springs	26/11/2018 11:38	66	49	41	34	40	30	26	58
Hillcroft	26/11/2018 11:58	59	45	34	27	33	25	23	48
Forest Lodge	26/11/2018 12:36	54	42	35	29	33	25	23	57
Doble Gate	26/11/2018 13:02	61	58	53	45	49	36	29	60
Tilley	26/11/2018 13:20	82	79	71	51	67	38	32	73

Notes:

1. Levels in this table are not necessarily the result of activity at Cullen Valley Mine.

4.2 Modifying Factors

Measured Cullen Valley Mine only levels were assessed for the applicability of modifying factors in accordance with the EPA's NPfL.

There were no intermittent or tonal noise sources, as defined in the NPfL, audible from site during the survey. None of the measurements satisfied the conditions outlined in Section 3.3 when assessing low-frequency noise.

Therefore no further assessment of modifying factors was undertaken.

4.3 Development Consent Criteria and Weather Conditions

Table 4.2 and Table 4.3 detail L_{Aeq,15minute} noise levels from Cullen Valley Mine in the absence of other noise sources. Criteria are then applied if weather conditions are in accordance with the mine's development consent.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY CULLEN VALLEY MINE AGAINST CONSENT IMPACT ASSESSMENT CRITERIA – QUARTER 4 2018

Location	Start Date and Time	Wind Speed m/s ¹	VTG °C/100m ¹	L_{Aeq} Consent Criterion dB	Criterion Applies? ²	CVM L_{Aeq} dB ^{3,4}	Exceedance ^{4,5}	Notes
Red Springs	26/11/2018 11:38	2.4	-2.0	37	Yes	IA	Nil	CVM was inaudible. Birds, breeze and an aircraft generated the measured levels.
Hillcroft	26/11/2018 11:58	1.7	-2.0	35	Yes	IA	Nil	CVM was inaudible. Birds, breeze and an aircraft generated the measured levels.
Forest Lodge	26/11/2018 12:36	1.5	-2.0	40	Yes	IA	Nil	CVM was inaudible. Birds and breeze generated the measured levels.
Doble Gate	26/11/2018 13:02	1.1	-2.0	43	Yes	IA	Nil	CVM was inaudible. Road traffic generated the measured levels.
Tilley	26/11/2018 13:20	2.5	-2.0	43	Yes	IA	Nil	CVM was inaudible. Road traffic generated the measured levels.

Notes:

1. Meteorological data has been sourced from the Cullen Valley Mine weather station.
2. Noise emission limits apply the following meteorological conditions:
 - Wind speed up to 3 metres per second at 10 metres above ground level; and
 - Temperature inversion conditions of up to 3 degrees Celsius per 100 metres, and wind speeds of up to 2 metres per second at 10 metres above ground level;
3. These are results for Cullen Valley Mine in the absence of all other noise sources. NM denotes audible but not measurable, IA denotes inaudible;
4. Bold results in red are those greater than the relevant criterion (if applicable); and
5. NA in exceedance column means atmospheric conditions outside specified in the development consent and so criterion is not applicable.

Table 4.3L_{Aeq,15mintue} GENERATED BY CULLEN VALLEY MINE AGAINST CONSENT LAND ACQUISITION CRITERIA – QUARTER 4 2018

Location ¹	Start Date and Time	Wind Speed m/s ²	VTG °C/100m ²	L _{Aeq} Consent Criterion dB	Criterion Applies? ³	CVM L _{Aeq} dB ^{4,5}	Exceedance ^{5,6}
Red Springs	26/11/2018 11:38	2.4	-2.0	42	Yes	IA	Nil
Hillcroft	26/11/2018 11:58	1.7	-2.0	40	Yes	IA	Nil
Doble Gate	26/11/2018 13:02	1.1	-2.0	43	Yes	IA	Nil
Tilley	26/11/2018 13:20	2.5	-2.0	43	Yes	IA	Nil

Notes:

1. No land acquisition criteria specified for Forest Lodge;
2. Meteorological data has been sourced from the Cullen Valley Mine weather station;
3. Noise emission limits apply the following meteorological conditions:
 - Wind speed up to 3 metres per second at 10 metres above ground level; and
 - Temperature inversion conditions of up to 3 degrees Celsius per 100 metres, and wind speeds of up to 2 metres per second at 10 metres above ground level;
4. These are results for Cullen Valley Mine in the absence of all other noise sources. NM denotes audible but not measurable, IA denotes inaudible;
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.

4.4 EPL Criteria and Weather Conditions

Table 4.4 details $L_{Aeq,15\text{minute}}$ noise levels from Cullen Valley Mine in the absence of other noise sources. Criteria are then applied if weather conditions are in accordance with the mine's EPL.

Table 4.4: $L_{Aeq,15\text{minute}}$ GENERATED BY CULLEN VALLEY MINE AGAINST EPL CRITERIA - QUARTER 4 2018

Location	Start Date and Time	Wind Speed m/s ¹	Stability Class ¹	L_{Aeq} EPL Criterion dB	Criterion Applies? ²	CVM L_{Aeq} dB ^{3,4}	Exceedance ^{4,5}
Red Springs	26/11/2018 11:38	2.4	A	35	Yes	IA	Nil
Hillcroft	26/11/2018 11:58	1.7	A	35	Yes	IA	Nil
Forest Lodge	26/11/2018 12:36	1.5	A	40	Yes	IA	Nil
Doble Gate	26/11/2018 13:02	1.1	A	43	Yes	IA	Nil
Tilley	26/11/2018 13:20	2.5	A	43	Yes	IA	Nil

Notes:

1. Meteorological data has been sourced from the Cullen Valley Mine weather station;
2. Noise emission limits are excluded for wind speeds greater than 3 metres per second at 10 metres above ground level, stability category F temperature inversion conditions and wind speeds greater than 2 metres per second at 10 metres above ground level, and stability category G temperature inversion conditions;
3. These are results for Cullen Valley Mine in the absence of all other noise sources. NM denotes audible but not measurable, IA denotes inaudible;
4. Bold results in red are those greater than the relevant criterion (if applicable); and
5. NA in exceedance column means atmospheric conditions outside conditions specified in EPL and so criterion is not applicable.

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.5. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.5: MEASURED ATMOSPHERIC CONDITIONS – QUARTER 4 2018

Location	Start Date and Time	Temperature °C	Wind Speed m/s	Wind Direction	Cloud Cover 1/8s
Red Springs	26/11/2018 11:38	24	2.2	220	5
Hillcroft	26/11/2018 11:58	22	0.4	200	5
Forest Lodge	26/11/2018 12:36	22	1.1	170	6
Doble Gate	26/11/2018 13:02	24	0.0	-	6
Tilley	26/11/2018 13:20	24	0.8	170	5

Meteorological data sourced from the Cullen Valley Mine weather station is used to determine compliance with criteria.

5 SUMMARY OF COMPLIANCE

Environmental noise monitoring was conducted around Cullen Valley Mine during the day period of 26 November 2018. There were five monitoring locations.

Given that the site is currently under care and maintenance, monitoring was not undertaken during the evening period as there are no activities occurring at this time. Although noise monitoring was carried out during the day period, given the site is on significantly reduced operations, there is unlikely to be any off-site noise. Therefore the monitoring program has been modified slightly to take this into account. The duration of each day measurement was 10 minutes if no site noise was heard, whereas when mining was audible; the measurement duration was increased to 15 minutes.

Cullen Valley Mine complied with the consent $L_{Aeq,15\text{minute}}$ noise limits at all locations during Quarter 4 2018 monitoring. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Development consent (DA-200-5-2003) applies to the Cullen Valley operation. The noise section is reproduced below.

A.1 CULLEN VALLEY MINE DEVELOPMENT CONSENT

Schedule 4 – Specific Environmental Conditions

NOISE

Noise Limits

2. ²The Applicant shall ensure that the noise generated by the development does not exceed the noise limits in Table 1 at any privately-owned residence.

Day	Evening	Night		Land Descriptor
L _{Aeq} (15minute)		L _{A1} (1minute)		
43	38	35	45	<ul style="list-style-type: none">RyanTesorieroFitzgeraldTilleyRed Springs (during mining to the west of the railway line)Hillcroft (during mining to the west of the railway line)DobsonWilliamsNorthey
40	40	38	45	Forest Lodge
37	35	35	45	Red Springs (during mining to the east of the railway line)
35	35	35	45	Hillcroft (during mining east of the railway line) and all other land (including vacant land)

Table 1: Noise Limits dB(A)

However, if the Applicant has a written noise agreement with any landowner, and a copy of this agreement has been forwarded to the Department and DEC, then the Applicant may exceed the noise limits in Table 1 for the landowner's land in accordance with the terms of the noise agreement.

Note: For more information on the individually named properties in Table 1 see Appendix 3.

Additional Noise Mitigation - Forest Lodge

3. Upon receiving a written request from the landowner, the Applicant shall investigate (and subsequently implement) all reasonable and feasible measures to mitigate the noise impacts of the development on the residence identified as Forest Lodge in the map in Appendix 3, in consultation with the landowner, and to the satisfaction of the Director-General.

Continuous Improvement

4. The Applicant shall:

- (a) investigate ways to reduce the noise generated by the development;
- (b) implement best practice noise mitigation measures at the development; and
- (c) report on these investigations and the implementation of any new noise mitigation measures at the development in the AEMR.

Land Acquisition Criteria

5. If the noise generated by the development exceeds the criteria in Table 2, the Applicant shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in Conditions 3-5 of Schedule 5.

Day	Evening	Night	Land Descriptor
<i>L_{Aeq}(15minute)</i>			
43	40	40	<ul style="list-style-type: none"> • Ryan • Tesoriero • Fitzgerald • Tilley • Red Springs (during mining to the west of the railway line) • Hillcroft (during mining to the west of the railway line) • Dobson • Williams • Northey
42	40	40	Red Springs (during mining to the east of the railway line)
40	40	40	Hillcroft (during mining east of the railway line) and all other land (including vacant land)

Table 2: Land acquisition criteria dB(A)

Notes:

1. For more information on the individually named properties in Table 2 see Appendix 3.
2. Noise from the development is to be measured at the most affected point or within the residential boundary or at the most affected point within 30m of the dwelling (rural situations) where the dwelling is more than 30m from the boundary to determine compliance with the $L_{Aeq}(15\text{minute})$ noise limits in Table 1 and 2.
3. For the purpose of noise measures required for this condition, the $L_{Aeq}(15\text{minute})$ noise level must be measured or computed at the nearest or most affected residence over a period of 15 minutes using "FAST" response on the sound level meter. For the purpose of the noise criteria for this condition, 5dB(A) must be added to the measured level if the noise is substantially tonal or impulsive in character.
4. Where it can be demonstrated that direct measurement of noise from the development is impractical, the DEC may accept alternative means of determining compliance. See Chapter 11 of the NSW Industrial Noise Policy.
5. The modification factors presented in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.
6. Noise from the development is to be measured at 1m from the dwelling façade to determine compliance with the $L_{A1}(1\text{minute})$ noise limits in Tables 1 and 2.
7. The noise emission limits identified in Condition 2 and 5 apply under meteorological conditions of:
 - ❖ Wind speed up to 3m/s at 10 metres above ground level; or
 - ❖ Temperature inversion conditions of up to 3°C/100m and wind speed up to 2m/s at 10 metres above the ground in accordance with the definitions provided in the Industrial Noise Policy; and
 - ❖ Temperature inversion conditions do not apply in conditions 2 and 5 where the noise limits are assessed at 43 $L_{Aeq}(15\text{minute})$.
8. Construction noise is considered to be operational noise for the purposes of this consent.

Noise Monitoring

6. ³Within 3 months of the date of this consent, unless otherwise approved by the DEC, the Applicant shall establish a continuous noise monitoring system adjacent to the meteorological weather station required under this consent. This system must be capable of recording L_{Amax} , L_{A1} , L_{A90} and L_{Aeq} noise levels in 15-minute statistical intervals. Unless otherwise agreed, the results of this monitoring must be reported to the DEC on a monthly basis, and included in the AEMR.
7. The Applicant shall undertake quarterly attended noise monitoring of the noise generated by the development at representative locations around the site to the satisfaction of the Director-General, and in general accordance with the NSW Industrial Noise Policy and AS1055-1997: Acoustics – Description and Measurement of Environmental, or its latest version.
8. Within 3 months of the date of this consent, the Applicant shall prepare (and then implement) a Noise Monitoring Program for the development in consultation with DEC, and to the satisfaction of the Director-General. This program must include a noise monitoring protocol for evaluating compliance with the criteria in Tables 1 and 2.

A.2 Cullen Valley Mine EPA Licence

Environment Protection Licence No. 10341 applies to Cullen Valley Mine. Noise requirements are detailed in L4 of the licence and are reproduced below.

L4 Noise limits

L4.1 Noise generated at the premises must not exceed the noise limits presented in the table below.

Locality and Location	Day - LAeq (15 minute)	Evening - LAeq (15 minute)	Night - LAeq (15 minute)	Night - LA1 (1 minute)
"Red Springs" (mining east of railway line)	35	35	35	45
"Red Springs" (mining west of railway line)	43	38	35	45
"Forest Lodge"	40	40	40	45
"Hillcroft" (mining east of railway line)	35	35	35	45
* "Red Springs" (mining west of railway line), "Hillcroft" (mining west of railway line), "Ryan", "Tesorio", "Fitzgerald", "Tilley", "Dobson", "Williams", "Northey"	43	38	35	45

L4.2 Where LAeq means the equivalent continuous noise level - the level of noise equivalent to the energy-average of noise levels occurring over a measurement period, and where;

- a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays;
- b) Evening is defined as the period 6pm to 10pm; and
- c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

Where the licensee has a written noise agreement with any landowner detailed above, the licensee may exceed the noise limits specified for the relevant location above in accordance with the terms of the noise agreement with that landowner.

L4.3 The noise limits set out in condition L4.1 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) Stability category F temperature inversion conditions and wind speeds greater than 2 metres/second at 10 metres above ground level; or
- c) Stability category G temperature inversion conditions.

L4.4 For the purpose of condition L4.3:

- a) Data recorded by the meteorological station identified as EPA Licence Point 5 must be used to determine meteorological conditions; and
- b) Temperature inversion conditions (stability category) are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the NSW Industrial Noise Policy.

L4.5 To determine compliance:

- a) with the Leq(15 minute) noise limits in condition L4.1, 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 L4.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.
- c) with the noise limits in condition L4.1, 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 L4.5(a) or L4.5(b).

L4.6 A non-compliance of L4.1 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 condition L4.5(a) and L4.5(b); and/or
- b) at a point other than the most affected point at a location.

L4.7 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.

APPENDIX

B CALIBRATION CERTIFICATES



**Acoustic
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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 C18363

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		Post-Test Atmospheric Conditions	
Ambient Temperature : 21.3°C		Ambient Temperature : 22.7°C	
Relative Humidity : 41.7%		Relative Humidity : 39.2%	
Barometric Pressure : 100.95kPa		Barometric Pressure : 100.89kPa	
Calibration Technician : Lucky Jaiswal		Secondary Check: Lewis Boorman	
Calibration Date : 25 Jun 2018		Report Issue Date : 25 Jun 2018	
Approved Signatory :		Juan Agüero	
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 61672-3:2013, 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 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2013.

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

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 - calibration.

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 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.

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