Cullen Valley Mine

Environmental Noise Monitoring

Quarter 1 2020

Prepared for

Castlereagh Coal

Global Acoustics

Noise and Vibration Analysis and Solutions

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Environmental Noise Monitoring
Quarter 1 2020

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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

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Appendices

1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Castlereagh Coal to conduct a quarterly noise survey of operations at Cullen Valley Mine (CVM), an open cut coal mine north-west of Lithgow. The purpose of the survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

Attended environmental noise monitoring described in this report was undertaken during the day period of 2 March 2020 at five monitoring locations around CVM.

The site is currently under care and maintenance, therefore monitoring was not undertaken during the evening or night periods, as there are no activities on site during at these times.

There is unlikely to be noise impact from site, as operations have been significantly reduced. 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 audible. If site activities were audible, the measurement duration was increased to 15 minutes.

1.2 Noise Monitoring Locations

Monitoring locations are detailed in Table 1.1 and shown in Figure 1. It should be noted that Figure 1 shows the actual monitoring position, not the location of residences.

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

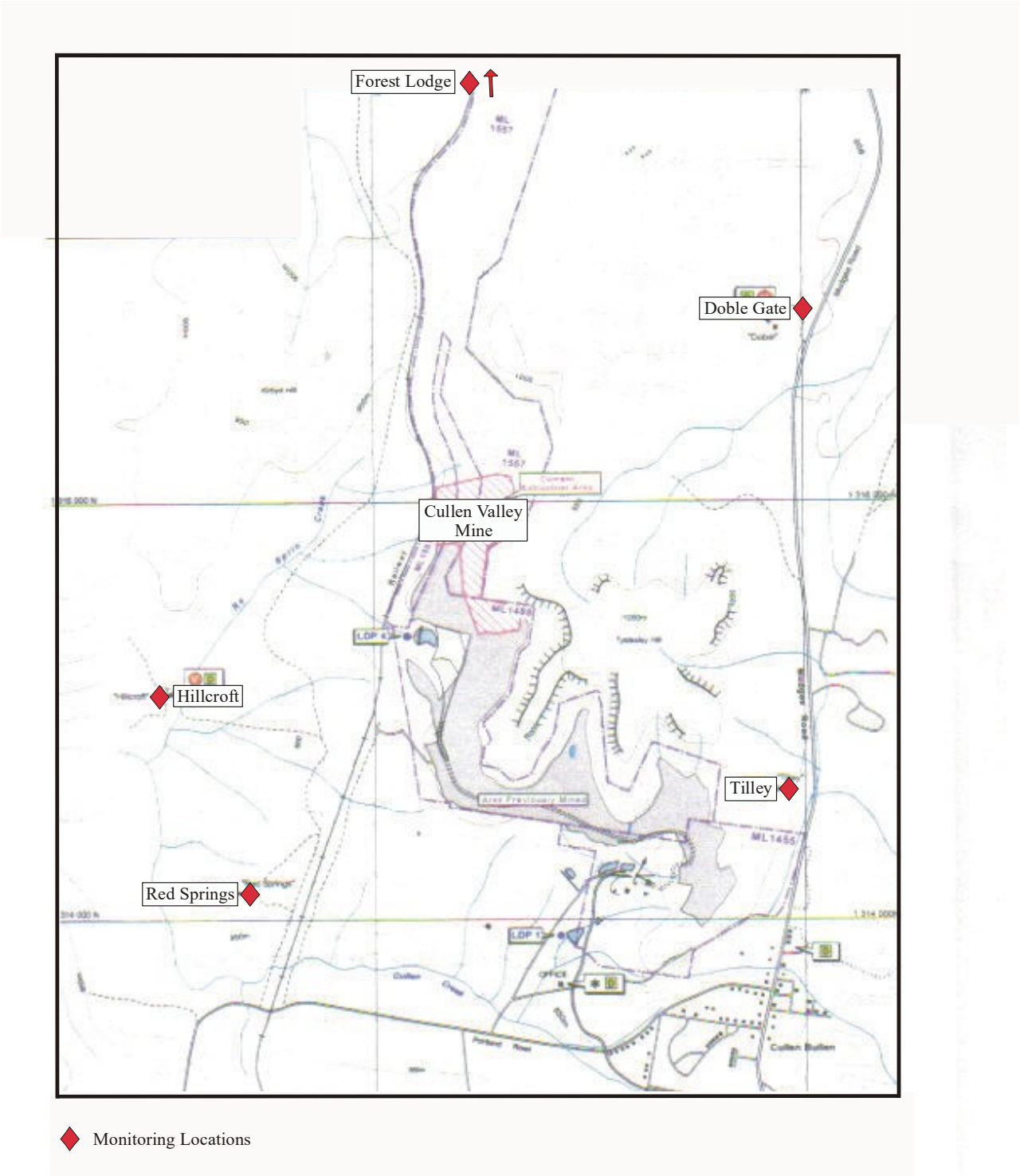

Figure 1: Cullen Valley Mine Attended Noise Monitoring Locations

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
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise.
L_{Amax}	The maximum A-weighted noise level over a time period.
L_{A1}	The noise level which is exceeded for 1 per cent of the time.
$L_{A1,1minute}$	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.
L_{Aeq}	The average noise A-weighted energy during a measurement period.
L_{A50}	The noise level which is exceeded for 50 per cent of the time and the median noise level during a measurement period.
L_{A90}	The level exceeded for 90 percent of the time. 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.
L_{Ceq}	The average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
SC	Stability class (or category) is determined from measured wind speed and either sigma-theta or VTG.
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, 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 REGULATOR REQUIREMENTS AND NOISE CRITERIA

2.1 Development Consent

The most current development consent associated with activities at CVM is DA-200-5-2003 (December 2004). Schedule 4 of the consent details specific conditions relating to noise generated by CVM. Relevant sections of the consent are reproduced in Appendix A.

Noise limits provided in the consent are detailed in Table 2.1.

Table 2.1: CVM DEVELOPMENT CONSENT NOISE CRITERIA, 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: CVM 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 (F stability class), and wind speeds of up to 2 metres per second at 10 metres above ground level.

2.2 Environment Protection Licence

CVM holds Environment Protection Licence (EPL) No. 10341 issued by the Environment Protection Authority (EPA), most recently on 14 May 2015. Noise requirements are detailed in L4 of the EPL. Relevant sections of the EPL are reproduced in Appendix A.

Noise limits provided in the EPL are detailed in Table 2.3.

Table 2.3: CVM EPL NOISE CRITERIA, 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.

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

2.3 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.

2.3.1 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.

2.3.2 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 environmental noise monitoring was conducted in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. Meteorological data was obtained from the CVM automatic weather station (AWS) which allowed correlation of atmospheric parameters with measured noise levels.

3.2 Attended Noise Monitoring

During this survey, monthly attended monitoring was undertaken during the day period at each location. The duration of each day measurement was 10 minutes if no site noise was audible. If site activities were audible, the measurement duration was increased to 15 minutes. Atmospheric condition measurement was also undertaken at each monitoring location.

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

This survey presents noise levels gathered during attended monitoring that 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 CVM's contribution, if any, to measured levels. At each receptor location, CVM's $L_{Aeq,15minute}$ and $L_{A1,1minute}$ (in the absence of any other noise) was measured directly, where possible, or, determined by frequency analysis.

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 descriptors in accordance with Section 7.1 of the NPfI. 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 (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, nor 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.

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, or L_{Amax}, received from the site during the entire measurement period (i.e. the highest level of the worst minute during the 15 minute measurement).

Often extraneous noise events (for example, road traffic pass-bys and dogs) interfere with the measurement of site noise levels in the frequency range of interest. Where required, the analyser is paused during these occurrences to aid in quantification of the site only $L_{Aeq,15minute}$ level.

3.3 Meteorological Conditions

The sigma-theta method outlined in the NPfI allows stability class to be determined from sigma-theta and wind speed data. However, temperature inversion gradient (VTG) cannot be determined by this method. Consequently, stability class prevailing during each measurement has been assessed against the stability class that corresponds with the consent VTG to determine whether noise criteria were applicable.

3.4 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 CVM 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 CVM 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 CVM 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
- CVM was the only low-frequency noise source.

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

3.5 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	01070590	25/06/2020
Pulsar 106 acoustic calibrator	79631	22/01/2021

4 RESULTS

4.1 Total Measured Noise Levels

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 Section 4.3 of this report.

Table 4.1: MEASURED NOISE LEVELS – QUARTER 1 2020[1]

Location	Start Date and Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
Red Springs	02/03/2020 13:38	54	50	47	44	42	37	33
Hillcroft	02/03/2020 14:01	53	46	44	41	40	36	33
Forest Lodge	02/03/2020 14:31	71	52	43	44	35	32	28
Doble Gate	02/03/2020 15:18	66	62	57	52	47	33	26
Tilley	02/03/2020 15:37	78	73	65	61	50	38	34

Notes:

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

4.2 Modifying Factors

Measured site-only levels were assessed for the applicability of modifying factors in accordance with the EPA's NPfI.

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

None of the measurements satisfied the conditions outlined in Section 3.4 when assessing low-frequency noise. Therefore no further assessment of modifying factors was undertaken.

4.3 Attended Noise Monitoring

4.3.1 Development Consent Monitoring

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

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY CVM AGAINST CONSENT NOISE CRITERIA – QUARTER 1 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Consent Criterion L_{Aeq} dB	Criterion Applies? [2]	CVM L_{Aeq} dB [2,3]	Exceedance [3,4]	Notes
Red Springs	02/03/2020 13:38	3.3	A	37	No	IA	NA	CVM was inaudible. Breeze in foliage generated the measured levels. A tractor and birds were also noted.
Hillcroft	02/03/2020 14:01	3.0	A	35	No	IA	NA	CVM was inaudible. Breeze in foliage and birds generated the measured levels. Insects were also noted.
Forest Lodge	02/03/2020 14:31	3.6	A	40	No	IA	NA	CVM was inaudible. Breeze in foliage and cows generated the measured levels. Birds and dogs were also noted.
Doble Gate	02/03/2020 15:18	2.2	A	43	Yes	IA	Nil	CVM was inaudible. Road traffic generated the measured levels. Birds and breeze in foliage were also noted.
Tilley	02/03/2020 15:37	2.3	A	43	Yes	IA	Nil	CVM was inaudible. Road traffic generated the measured levels. Birds, insects and breeze in foliage were also noted.

Notes:

1. *Meteorological data has been sourced from the CVM AWS;*
2. *Noise emission limits apply the following meteorological conditions:*
   - *Wind speed up to 3 metres per second at 10 metres above ground level; and*
   - *Stability class F temperature inversion conditions and wind speeds of up to 2 metres per second at 10 metres above ground level;*
3. *Site-only $L_{Aeq,15minute}$ attributed to CVM, including modifying factors if applicable;*
4. *Bold results in red indicate exceedance of the relevant criterion (if applicable); and*
5. *NA in exceedance column means atmospheric conditions outside specified in the consent, therefore criterion was not applicable.*

Table 4.3 $L_{Aeq,15mintue}$ GENERATED BY CVM AGAINST CONSENT LAND ACQUISITION CRITERIA – QUARTER 1 2020

Location [1]	Start Date and Time	Wind Speed m/s	Stability Class	Consent Criterion L_{Aeq} dB	Criterion Applies? [2]	CVM L_{Aeq} dB [3,4]	Exceedance [4,5]
Red Springs	02/03/2020 13:38	3.3	A	42	No	IA	NA
Hillcroft	02/03/2020 14:01	3.0	A	40	No	IA	NA
Doble Gate	02/03/2020 15:18	2.2	A	43	Yes	IA	Nil
Tilley	02/03/2020 15:37	2.3	A	43	Yes	IA	Nil

Notes:

1. *No land acquisition criteria specified for Forest Lodge;*
2. *Noise emission limits apply the following meteorological conditions:*
   - *Wind speed up to 3 metres per second at 10 metres above ground level; and*
   - *Stability class F temperature inversion conditions and wind speeds of up to 2 metres per second at 10 metres above ground level;*
3. *Site-only $L_{Aeq,15minute}$ attributed to CVM, including modifying factors if applicable;*
4. *Bold results in red indicate exceedance of the relevant criterion (if applicable); and*
5. *NA in exceedance column means atmospheric conditions outside conditions specified in the consent, therefore criterion was not applicable.*

4.4 EPL Monitoring

Table 4.4 details $L_{Aeq,15minute}$ 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 EPL.

Table 4.4: $L_{Aeq,15minute}$ GENERATED BY CVM AGAINST EPL NOISE CRITERIA - QUARTER 1 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	L_{Aeq} EPL Criterion dB	Criterion Applies? [1]	CVM L_{Aeq} dB [2,3]	Exceedance [3,4]
Red Springs	02/03/2020 13:38	3.3	A	35	No	IA	NA
Hillcroft	02/03/2020 14:01	3.0	A	35	No	IA	NA
Forest Lodge	02/03/2020 14:31	3.6	A	40	No	IA	NA
Doble Gate	02/03/2020 15:18	2.2	A	43	Yes	IA	Nil
Tilley	02/03/2020 15:37	2.3	A	43	Yes	IA	Nil

Notes:

1. *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;*
2. *Site-only $L_{Aeq,15minute}$ attributed to CVM, including modifying factors if applicable;*
3. *Bold results in red indicate exceedance of the relevant criterion (if applicable); and*
4. *NA in exceedance column means atmospheric conditions outside conditions specified in EPL, therefore criterion was 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, hail, or wind speeds above 5 m/s at microphone height.

Table 4.5: MEASURED ATMOSPHERIC CONDITIONS – QUARTER 1 2020

Location	Start Date and Time	Temperature ° C	Wind Speed m/s	Wind Direction ° Magnetic North[1]	Cloud Cover 1/8s
Red Springs	02/03/2020 13:38	31	1.4	310	7
Hillcroft	02/03/2020 14:01	34	0.7	200	4
Forest Lodge	02/03/2020 14:31	31	1.9	270	6
Doble Gate	02/03/2020 15:18	31	1.6	130	6
Tilley	02/03/2020 15:37	33	0.4	330	7

Notes:

1. *"-" denotes calm conditions at 1.8 metres.*

Meteorological data used for compliance assessment is sourced from the CVM AWS.

5 SUMMARY

Global Acoustics was engaged by Castlereagh Coal to conduct a quarterly noise survey of operations at CVM, an open cut coal mine north-west of Lithgow. The purpose of the survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

Attended environmental noise monitoring described in this report was undertaken during the day period of 2 March 2020 at five monitoring locations around CVM. The site is currently under care and maintenance, therefore monitoring was not undertaken during the evening or night periods, as there are no activities on site during at these times.

CVM complied with noise limits at all locations during Quarter 1 2020 monitoring. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

APPENDIX

A REGULATOR DOCUMENTS

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. [2]The 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	• 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
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
$L_{Aeq(15minute)}$			
43	40	40	• 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 $L_{Aeq(15minute)}$ noise limits in Table 1 and 2.
3. For the purpose of noise measures required for this condition, the $L_{Aeq(15minute)}$ 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 $L_{A1(1minute)}$ 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 3oC/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 $L_{Aeq(15minute)}$.
8. Construction noise is considered to be operational noise for the purposes of this consent.

Noise Monitoring

6. [3]Within 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 Environment Protection Licence

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 occuring over a measurment 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 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 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 Aguero

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.

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.

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

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

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 60942-2017

Calibration Certificate

Calibration Number C19029

Client Details	Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thornton NSW 2322
Equipment Tested/ Model Number :	Pulsar Model 106
Instrument Serial Number :	79631

Atmospheric Conditions

Ambient Temperature :	23.1°C
Relative Humidity :	58.2%
Barometric Pressure :	99.49kPa

Calibration Technician :	Charlie Neil	**Secondary Check:**	Lewis Boorman
Calibration Date :	22 Jan 2019	**Report Issue Date :**	24 Jan 2019

Approved Signatory : Ken Williams

Characteristic Tested	Result
Generated Sound Pressure Level	*Pass*
Frequency Generated	*Pass*
Total Distortion	*Pass*

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	94.3	1000.38

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2017 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*	*±0.2°C*
Frequency	*±0.01%*	*Relative Humidity*	*±2.4%*
Distortion	*±0.5%*	*Barometric Pressure*	*±0.013kPa*

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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