Rix's Creek Coal Mine

Environmental Noise Monitoring

April 2019

Prepared for

Rix's Creek Pty Ltd

Global Acoustics

Noise and Vibration Analysis and Solutions

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

Rix's Creek Coal Mine

Environmental Noise Monitoring
April 2019

Reference: 19103_R01
Report date: 6 June 2019

Prepared for
Rix's Creek Pty Ltd
PO Box 4
East Maitland NSW 2323

Prepared by
Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322

Prepared:	Jason Cameron Consultant	QA Review:	Robert Kirwan 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

Table of Contents

Appendices

1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Rix's Creek Mine to conduct a noise survey around their operations, situated less than 10 kilometres north-west of Singleton, NSW. The mine comprises the original Rix's Creek Mine (RCM), now known as Rix's Creek South (RCS), and the former Integra Open Cut Project Mine, now known as Rix's Creek North (RCN).

The purpose of the survey was to quantify and describe the acoustic environment around both operations and compare results with noise criteria outlined in the RCM Environment Protection Licence (EPL) 3391 and Noise Management Plan (NMP).

Environmental noise monitoring described in this report was undertaken during the night of 8 April 2019 with follow-up monitoring undertaken during the night of 15 April 2019.

1.2 Attended Noise Monitoring Locations

In accordance with the EPL and NMP, there are a total of ten monitoring locations as detailed in Table 1.1 and shown on Figure 1. It should be noted that this figure shows the actual monitoring position, not the location of residences. Monitoring is not always undertaken at all locations during each month. Further explanation is provided in Section 3.2 of this report.

Table 1.1: ATTENDED NOISE MONITORING LOCATIONS

Location Descriptor ID	EA Reference (RCN/RCS)[1]	Owner or Area	Monitoring Location
NM01	132/171	Bowman	End of Glennie Street, Camberwell
NM03	63/NA	Cherry	On property 893B Middle Falbrook Road, Middle Falbrook
NM04	19/12	Andrews	997 Bridgman Road, Bridgman
NM05	11/8	Ferraro	788 Bridgman Road, Obanvale
NM06	150/23	Bridgman Road	475 Bridgman Road, Obanvale
NM07	NA/61	Gardiner Circuit	McMahon Way, Singleton Heights
NM08	NA/152	Belmadar Way	Cnr Belmadar Way and Maison Dieu Road, Maison Dieu
NM10	NA/126	Long Point	265 Long Point Road, Long Point
NM11	NA/160	Maison Dieu	320 Maison Dieu Road, Maison Dieu
NM12	NA/168	Maison Dieu	Corner of Maison Dieu Rd and Shearer's Lane, Maison Dieu

Notes:

1. *NA indicates location was not included in the EA for that project.*

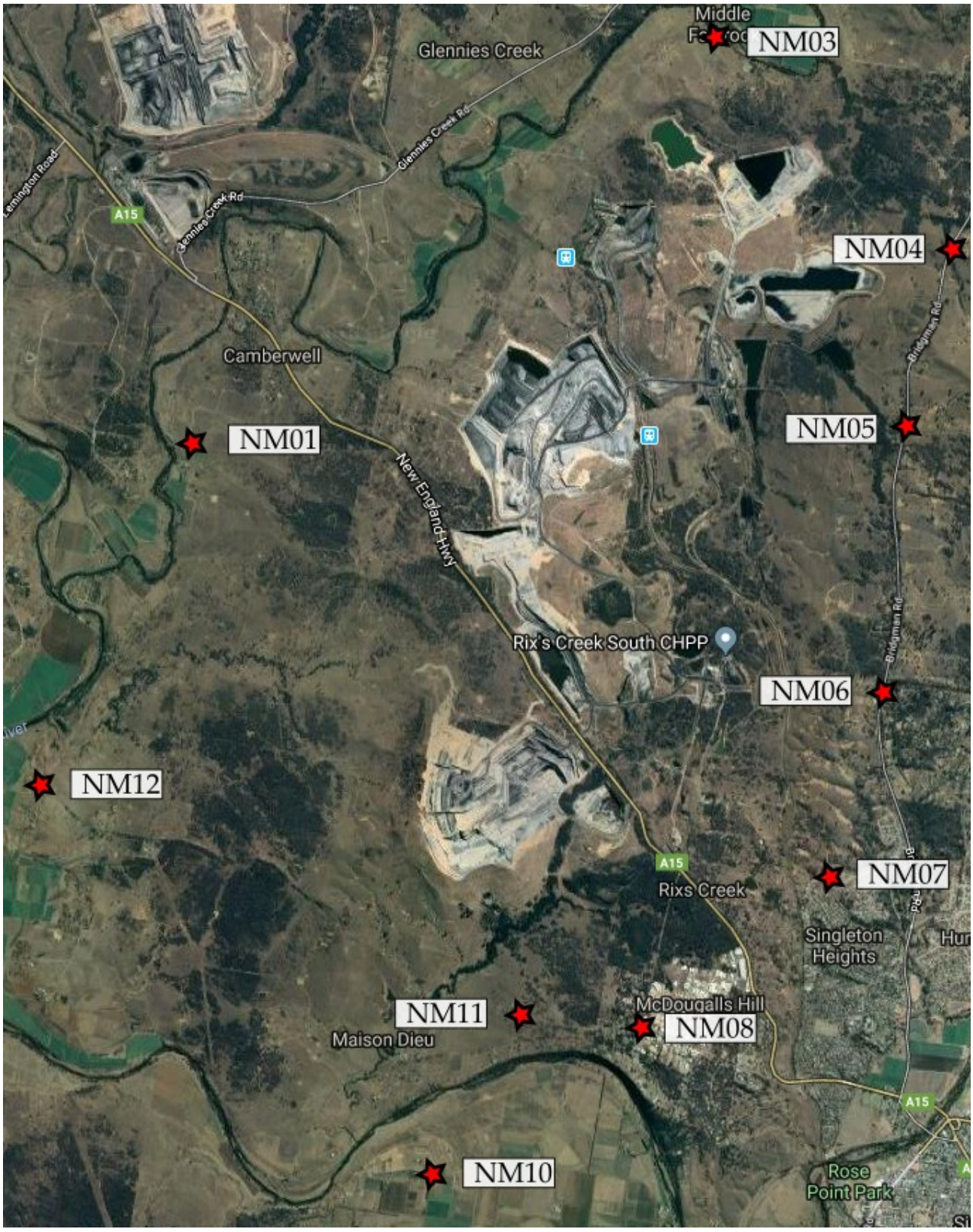


Figure 1: RCM Attended Noise Monitoring Locations

1.3 Terminology and Abbreviations

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

Table 1.2: TERMINOLOGY AND 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.
$L_{A1,1minute}$	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, 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.
SC	Stability class (or category) is determined from VTG and wind speed.
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 PROJECT CONSENT AND CRITERIA

2.1 Project Specific Criteria

An EIS submitted for the Rix's Creek Mine Continuation of Mining Project to DP&E in October 2015 provides recommended noise impact assessment criteria for receptors surrounding RCM, which are included in the most recent NMP for RCS.

In addition to RCS, RCM now also includes the former Integra open Cut (RCN) which operates under the Integra Coal Complex Project Approval (PA 08_0102) Modification 8, dated 3 April 2019.

Noise criteria for both operations are also provided in EPL 3391, dated 30 August 2017. However, the EPL is not an exact combination of the EIS, NMP, and approval documents. In some cases, more conservative criteria from the RCN project approval (as reproduced in the NMP) have been adopted. Relevant screenshots are shown in Appendix A.

Night criteria adopted for attended noise monitoring are detailed in Table 2.1, based on compliance criteria as per EPL 3391 and PA 08_0102 MOD 8. As stated in the Rix's Creek NMP, attended monitoring is to commence at 9pm, with results compared to all night period criteria.

Table 2.1: RIX'S CREEK NORTH AND SOUTH CRITERIA, dB

	Rix's Creek North (RCN) PA [1,2]		Rix's Creek South (RCS) EPL [1]	
Location Descriptor ID	**$L_{Aeq,15minute}$**	**$L_{A1,1minute}$**	**$L_{Aeq,15minute}$**	**$L_{A1,1minute}$**
NM01	38	48	40	48
NM03	40	45	40	45
NM04	37	49	37	49
NM05	41	47	41	47
NM06	36	48	42	47
NM07	NA	NA	40	45
NM08	NA	NA	40	47
NM10	NA	NA	40	47
NM11	NA	NA	40	47
NM12	NA	NA	40	47

Notes:

1. *Criteria applicable for the night period only (10:00pm to 7:00am), however, as stated in the Rix's Creek NMP, attended monitoring undertaken during the night will commence at 9:00pm; and*
2. *NA indicates criteria not applicable at that location, as it was not included in the relevant EA, EIS, or Project Approval.*

2.2 Meteorological Conditions

It is proposed that the met exclusion rules outlined in the EPL will be adopted in the revised NMP. The meteorological conditions outlined in the EPL, and which have been adopted to determine if criteria apply during attended monitoring are shown below:

> L3.4 The noise limits set out in condition L3.1 apply under all meteorological conditions except for the following:
>
> a) Wind speeds greater than 3 metres/second at 10 metres above the ground level;
> 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.

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.*

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

Noise monitoring was conducted at the monitoring locations in accordance with Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements.

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, RCM.

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 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 $L_{A1,1minute}$ 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).

3.2 Attended Noise Monitoring

Due to the number of and distance between monitoring locations in the EPL and NMP, it is not possible to determine compliance at each individual residence. As a result a risk-based assessment has been adopted where attended noise monitoring targets locations where operational noise from RCM is likely to be highest. Residences surrounding RCM have been grouped generally according to the locality and local acoustic environment. These groups are referenced in the relevant EAs as Noise Assessment Groups (NAG).

Compliance monitoring is undertaken in accordance with the following procedure outlined in the NMP:

> Compliance monitoring is to be conducted at locations indicated as being in the zone of meteorological enhancement by the predictive noise model. The procedure for determining which locations to monitor is as follows:
>
> 1. The acoustic consultant undertaking the monitoring will access the predictive model website for the site for the upcoming night shift. The model results will indicate graphically the predicted zone of meteorological enhancement;
> 2. A monitoring plan will be developed by the consultant for the upcoming night period. Locations are to include:
>   a. If a clear zone of meteorological enhancement is indicated, one location in the opposite direction to the zone of predicted enhancement, and, all locations located within the predicted zone of enhancement; and
>   b. If relatively neutral conditions are predicted with no clear zone of meteorological enhancement, the eight locations nearest the mine will be monitored. NM01, NM03 and NM10 would be excluded, as non-compliance at those locations in the absence of meteorological enhancement is unlikely due to distance from the Mine.
> 3. A minimum of six locations are to be monitored per night.
>
> Once monitoring commences, the consultant will apply best judgment to either proceed with the original monitoring plan, or a modified plan if monitoring results justify a change.

Other relevant sections of the NMP regarding attended noise monitoring are provided in Appendix A.

3.3 Meteorological Data

Multiple Automatic Weather Stations (AWS) are currently located within the RCM mining lease areas. Each complies with AS2923-1987 'Ambient Air – Guide for measurement of horizontal wind for air quality applications' and the NPfI. These automatic weather stations provide representative weather data for RCM including wind speed and direction, sigma theta, solar radiation, humidity, rainfall and temperature.

Wind speed, rain, and sigma theta data are used to determine the validity of noise monitoring results in accordance with the NPfI. Extreme temperature inversions are considered G-class inversions, as determined by use of sigma theta and wind speed to categorise inversion strength, in accordance with the NPfI.

As specified by the NMP, the AWS referenced in EPL 3391 shall be used to determine meteorological conditions and whether noise criteria are applicable for both RCN and RCS.

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 RCM 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 RCM 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 RCM 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
- RCM 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 Noise Monitoring Equipment

The equipment detailed in Table 3.1 was 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
Rion NA-28 sound level analyser	30131882	05/02/2021
Rion NA-28 sound level analyser	00370304	29/11/2020
Pulsar 106 acoustic calibrator	79631	22/01/2021
Pulsar 105 acoustic calibrator	78226	01/02/2021
Pulsar 106 acoustic calibrator	81334	22/11/2020

4 RESULTS

4.1 Weather Forecast and Monitoring Location Selection

On the night environmental monitoring was conducted, enhancement was predicted to the East and South-East during the monitoring period. As a result, check monitoring was conducted at NM01 to the West, followed by monitoring at NM04, NM05, NM06, NM07, NM08 and NM11.

4.2 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 Chapter 5 of this report.

Table 4.1: MEASURED NOISE LEVELS – APRIL 2019[1]

Location	Start Date and Time[2]	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{A50} dB	L_{Aeq} dB	L_{A90} dB	L_{Amin} dB	L_{Ceq} dB
NM01	08/04/2019 21:08	49	45	41	38	39	36	34	58
NM01	08/04/2019 21:23	53	47	42	40	41	38	35	59
NM04	08/04/2019 21:00	44	41	36	32	34	30	28	61
NM04	08/04/2019 21:15	49	43	36	33	35	31	29	61
NM05	08/04/2019 21:38	49	44	42	41	41	40	38	69
NM05	08/04/2019 22:01	46	43	42	40	40	39	37	69
NM05[3]	15/04/2019 22:27	37	35	34	31	32	30	27	57
NM06	08/04/2019 22:39	51	47	45	41	42	38	37	61
NM06	08/04/2019 22:55	59	51	43	38	41	36	34	61
NM07	08/04/2019 23:20	54	47	46	44	44	42	39	57
NM07	08/04/2019 23:35	50	48	47	45	46	44	40	57
NM08	08/04/2019 21:55	44	41	38	35	36	34	32	55
NM08	08/04/2019 22:10	47	44	38	35	36	33	31	57
NM11	08/04/2019 22:34	48	37	34	32	33	31	29	56
NM11	08/04/2019 22:49	42	39	37	35	36	34	31	58

Notes:

1. *Levels in this table are not necessarily the result of activity at RCM;*
2. *All measurements are 15 minutes duration; and*
3. *Follow-up monitoring.*

4.3 Modifying Factors

Measured RCM 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 either site during the survey.

One of the measurements for RCN satisfied the conditions outlined in Section 3.4 and was assessed for low-frequency modifying factors in Table 4.2.

None of the measurements for RCS satisfied the conditions outlined in Section 3.4 when assessing low-frequency noise.

Table 4.2: LOW-FREQUENCY MODIFYING FACTOR ASSESSMENT - APRIL 2019

Location	Start Date and Time	Measured RCN Only L_{Aeq} dB	Audible RCN Only L_{Ceq} dB	RCN Only $L_{Ceq} - L_{Aeq}$ dB[1]	Max exceedance of ref spectrum Result[2]	Penalty dB[2]
NM05	08/04/2019 22:01	39	59	20	7.9dB @ 50Hz	5

Notes:

1. *As per NPfI, if $L_{Ceq} - L_{Aeq} \geq 15$ dB further assessment of low- frequency noise required as detailed in Sections 2.3.2 and 3.4 of this report; and*
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.*

4.4 Attended Noise Monitoring

4.4.1 Rix's Creek North

Noise levels generated by activity at RCN are shown in Table 4.3 and Table 4.4. Table 4.3 compares measured levels with $L_{Aeq,15minute}$ project approval criteria. Criteria are then applied if weather conditions are in accordance with relevant limits. Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.3: $L_{Aeq,15minute}$ GENERATED BY RCN AGAINST PA CRITERIA – APRIL 2019

Location	Start Date and Time	Wind Speed m/s	Wind Direction	Stability Class[1]	$L_{Aeq,15min}$ Criterion dB[2]	Criterion Applies?[2,3]	RCN $L_{Aeq,15min}$ dB [4,5]	Modifying Factor from Table 4.2 dB	RCN $L_{Aeq,15min}$ with Modifying Factor dB[5]	Exceedance [2,5]
NM01	08/04/2019 21:08	2.0	336	E	38	Yes	IA	NA	NA	Nil
NM01	08/04/2019 21:23	2.5	337	E	38	Yes	IA	NA	NA	Nil
NM04	08/04/2019 21:00	2.8	349	E	37	Yes	30	NA	NA	Nil
NM04	08/04/2019 21:15	2.0	336	E	37	Yes	30	NA	NA	Nil
NM05	08/04/2019 21:38	3.2	338	D	41	No	40	NA	NA	NA
NM05	08/04/2019 22:01	2.8	318	D	41	Yes	39	5	44	3
NM05[6]	15/04/2019 22:27	2.2	123	F	41	No	IA	NA	NA	NA
NM06	08/04/2019 22:39	2.5	276	E	36	Yes	IA	NA	NA	Nil
NM06	08/04/2019 22:55	2.5	286	D	36	Yes	IA	NA	NA	Nil
NM07	08/04/2019 23:20	3.2	291	E	NA	NA	IA	NA	NA	NA
NM07	08/04/2019 23:35	3.2	283	E	NA	NA	IA	NA	NA	NA
NM08	08/04/2019 21:55	2.8	318	D	NA	NA	IA	NA	NA	NA
NM08	08/04/2019 22:10	2.8	309	F	NA	NA	IA	NA	NA	NA
NM11	08/04/2019 22:34	2.5	276	E	NA	NA	IA	NA	NA	NA

Location	Start Date and Time	Wind Speed m/s	Wind Direction	Stability Class[1]	$L_{Aeq,15min}$ Criterion dB[2]	Criterion Applies?[2,3]	RCN $L_{Aeq,15min}$ dB [4,5]	Modifying Factor from Table 4.2 dB	RCN $L_{Aeq,15min}$ with Modifying Factor dB[5]	Exceedance [2,5]
NM11	08/04/2019 22:49	2.2	277	D	NA	NA	IA	NA	NA	NA

Notes:

1. *Sigma theta data used to calculate Stability Class in accordance with procedures outlined in the NPfI;*
2. *NA in $L_{Aeq,15minute}$ criterion column means criterion not specified for this location, NA in criterion applies and exceedance columns mean atmospheric conditions outside conditions specified or limits not available for that location and so criterion is not applicable;*
3. *Noise limits apply under all meteorological conditions except for the following: wind speeds greater than 3 metres per second at 10 metres above the ground level; 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 inversions;*
4. *These are results for RCN 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. *Follow-up monitoring.*

Table 4.4 compares measured levels with RCN $L_{A1,1minute}$ project approval criteria. Criteria are then applied if weather conditions are in accordance with relevant limits.

Table 4.4: $L_{A1,1minute}$ GENERATED BY RCN AGAINST PA CRITERIA – APRIL 2019

Location	Start Date and Time	Wind Speed m/s	Wind Direction	Stability Class[1]	$L_{A1,1min}$ Criterion dB[2]	Criterion Applies?[2,3]	RCN $L_{A1,1min}$ dB [4,5]	Exceedance [2,5]
NM01	08/04/2019 21:08	2.0	336	E	48	Yes	IA	Nil
NM01	08/04/2019 21:23	2.5	337	E	48	Yes	IA	Nil
NM04	08/04/2019 21:00	2.8	349	E	49	Yes	36	Nil
NM04	08/04/2019 21:15	2.0	336	E	49	Yes	35	Nil
NM05	08/04/2019 21:38	3.2	338	D	47	No	45	NA
NM05	08/04/2019 22:01	2.8	318	D	47	Yes	45	Nil
NM05[6]	15/04/2019 22:27	2.2	123	F	47	No	IA	NA
NM06	08/04/2019 22:39	2.5	276	E	48	Yes	IA	Nil
NM06	08/04/2019 22:55	2.5	286	D	48	Yes	IA	Nil
NM07	08/04/2019 23:20	3.2	291	E	NA	NA	IA	NA
NM07	08/04/2019 23:35	3.2	283	E	NA	NA	IA	NA
NM08	08/04/2019 21:55	2.8	318	D	NA	NA	IA	NA
NM08	08/04/2019 22:10	2.8	309	F	NA	NA	IA	NA
NM11	08/04/2019 22:34	2.5	276	E	NA	NA	IA	NA
NM11	08/04/2019 22:49	2.2	277	D	NA	NA	IA	NA

Notes:

1. *Sigma theta data used to calculate Stability Class in accordance with procedures detailed in the NPfI;*
2. *NA in $L_{A1,1minute}$ criterion column means criterion not specified for this location, NA in criterion applies and exceedance columns mean atmospheric conditions outside conditions specified or limits not available for that location and so criterion is not applicable;*
3. *Noise limits apply under all meteorological conditions except for the following: wind speeds greater than 3 metres per second at 10 metres above the ground level; 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 inversions;*
4. *These are results for RCN 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. *Follow-up monitoring.*

4.4.2 Rix's Creek South

Noise levels generated by activity at RCS are shown in Table 4.5 and Table 4.6. Table 4.5 compares measured levels with $L_{Aeq,15minute}$ EPL criteria. Criteria are then applied if weather conditions are in accordance with relevant limits. Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.5: $L_{Aeq,15minute}$ GENERATED BY RCS AGAINST EPL CRITERIA – APRIL 2019

Location	Start Date and Time	Wind Speed m/s	Wind Direction	Stability Class[1]	$L_{Aeq,15min}$ Criterion dB[2]	Criterion Applies?[2,3]	RCS $L_{Aeq,15min}$ dB [4,5]	Exceedance [2,5]
NM01	08/04/2019 21:08	2.0	336	E	40	Yes	IA	Nil
NM01	08/04/2019 21:23	2.5	337	E	40	Yes	IA	Nil
NM04	08/04/2019 21:00	2.8	349	E	37	Yes	IA	Nil
NM04	08/04/2019 21:15	2.0	336	E	37	Yes	IA	Nil
NM05	08/04/2019 21:38	3.2	338	D	41	No	IA	NA
NM05	08/04/2019 22:01	2.8	318	D	41	Yes	IA	Nil
NM05[6]	15/04/2019 22:27	2.2	123	F	41	No	28	NA
NM06	08/04/2019 22:39	2.5	276	E	42	Yes	39	Nil
NM06	08/04/2019 22:55	2.5	286	D	42	Yes	38	Nil
NM07	08/04/2019 23:20	3.2	291	E	40	No	31	NA
NM07	08/04/2019 23:35	3.2	283	E	40	No	31	NA
NM08	08/04/2019 21:55	2.8	318	D	40	Yes	32	Nil
NM08	08/04/2019 22:10	2.8	309	F	40	No	32	NA
NM11	08/04/2019 22:34	2.5	276	E	40	Yes	31	Nil
NM11	08/04/2019 22:49	2.2	277	D	40	Yes	35	Nil

Notes:

1. *Sigma theta data used to calculate Stability Class in accordance with procedures detailed in the NPfI;*
2. *NA in $L_{Aeq,15minute}$ criterion column means criterion not specified for this location, NA in criterion applies and exceedance columns mean atmospheric conditions outside conditions specified or limits not available for that location and so criterion is not applicable;*
3. *Noise limits apply under all meteorological conditions except for the following: wind speeds greater than 3 metres per second at 10 metres above the ground level; 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 inversions;*
4. *These are results for RCS 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. *Follow-up monitoring.*

Table 4.6 compares measured levels with RCS $L_{A1,1minute}$ EPL criteria. Criteria are then applied if weather conditions are in accordance with relevant limits.

Table 4.6: $L_{A1,1minute}$ GENERATED BY RCS AGAINST EPL CRITERIA – APRIL 2019

Location	Start Date and Time	Wind Speed m/s	Wind Direction	Stability Class[1]	$L_{A1,1min}$ Criterion dB[2]	Criterion Applies?[2,3]	RCS $L_{A1,1min}$ dB [4,5]	Exceedance [2,5]
NM01	08/04/2019 21:08	2.0	336	E	48	Yes	IA	Nil
NM01	08/04/2019 21:23	2.5	337	E	48	Yes	IA	Nil
NM04	08/04/2019 21:00	2.8	349	E	49	Yes	IA	Nil
NM04	08/04/2019 21:15	2.0	336	E	49	Yes	IA	Nil
NM05	08/04/2019 21:38	3.2	338	D	47	No	IA	NA
NM05	08/04/2019 22:01	2.8	318	D	47	Yes	IA	Nil
NM05[6]	15/04/2019 22:27	2.2	123	F	47	No	34	NA
NM06	08/04/2019 22:39	2.5	276	E	47	Yes	42	Nil
NM06	08/04/2019 22:55	2.5	286	D	47	Yes	43	Nil
NM07	08/04/2019 23:20	3.2	291	E	45	No	38	NA
NM07	08/04/2019 23:35	3.2	283	E	45	No	38	NA
NM08	08/04/2019 21:55	2.8	318	D	47	Yes	34	Nil
NM08	08/04/2019 22:10	2.8	309	F	47	No	37	NA
NM11	08/04/2019 22:34	2.5	276	E	47	Yes	36	Nil
NM11	08/04/2019 22:49	2.2	277	D	47	Yes	40	Nil

Notes:

1. *Sigma theta data used to calculate Stability Class in accordance with procedures detailed in the NPfI;*
2. *NA in $L_{A1,1minute}$ criterion column means criterion not specified for this location, NA in criterion applies and exceedance columns mean atmospheric conditions outside conditions specified or limits not available for that location and so criterion is not applicable;*
3. *Noise limits apply under all meteorological conditions except for the following: wind speeds greater than 3 metres per second at 10 metres above the ground level; 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 inversions;*
4. *These are results for RCS 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. *Follow-up monitoring.*

4.5 Measured Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.7. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – APRIL 2019

Location	Start Date and Time	Temperature degrees C	Wind Speed m/s	Wind Direction Degrees[1]	Cloud Cover 1/8s
NM01	08/04/2019 21:08	19	0.0	-	0
NM01	08/04/2019 21:23	19	0.0	-	1
NM04	08/04/2019 21:00	23	0.5	50	1
NM04	08/04/2019 21:15	23	0.6	50	2
NM05	08/04/2019 21:38	22	0.0	-	3
NM05	08/04/2019 22:01	21	0.0	-	3
NM05[2]	15/04/2019 22:27	15	0.0	-	0
NM06	08/04/2019 22:39	23	0.0	-	4
NM06	08/04/2019 22:55	23	0.0	-	4
NM07	08/04/2019 23:20	21	0.0	-	3
NM07	08/04/2019 23:35	21	0.0	-	2
NM08	08/04/2019 21:55	23	0.0	-	2
NM08	08/04/2019 22:10	23	0.0	-	2
NM11	08/04/2019 22:34	21	0.0	-	6
NM11	08/04/2019 22:49	21	0.0	-	6

Notes:

1. *"-" indicates calm conditions; and*
2. *Follow-up monitoring.*

Weather station data from RCM is used to determine compliance with specified noise criteria.

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 to Table 4.6 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 RCM's contribution, if any, to measured levels. At each receptor location, RCM's $L_{Aeq,15minute}$ and $L_{A1,1minute}$ (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.

Other mines that may be audible at times are Ravensworth Complex, Hunter Valley Operations (HVO), Mount Thorley Warkworth (MTW), Ashton Coal and Wambo Coal mine (WCM).

From these observations summaries have been derived for each location in the following sections. Statistical 1/3 octave band analysis of environmental noise was undertaken, and the charts following in this section 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}.

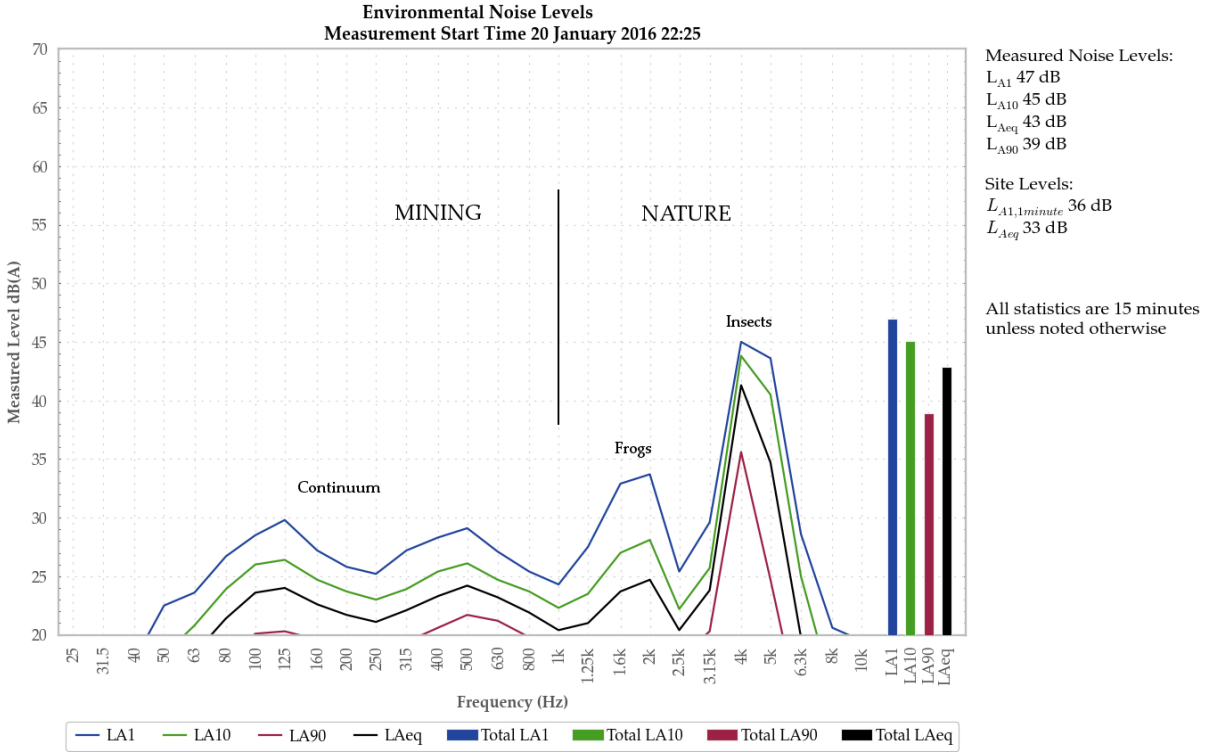


Figure 2: Sample graph (see Section 5.1 for explanation)

5.1.1 NM01

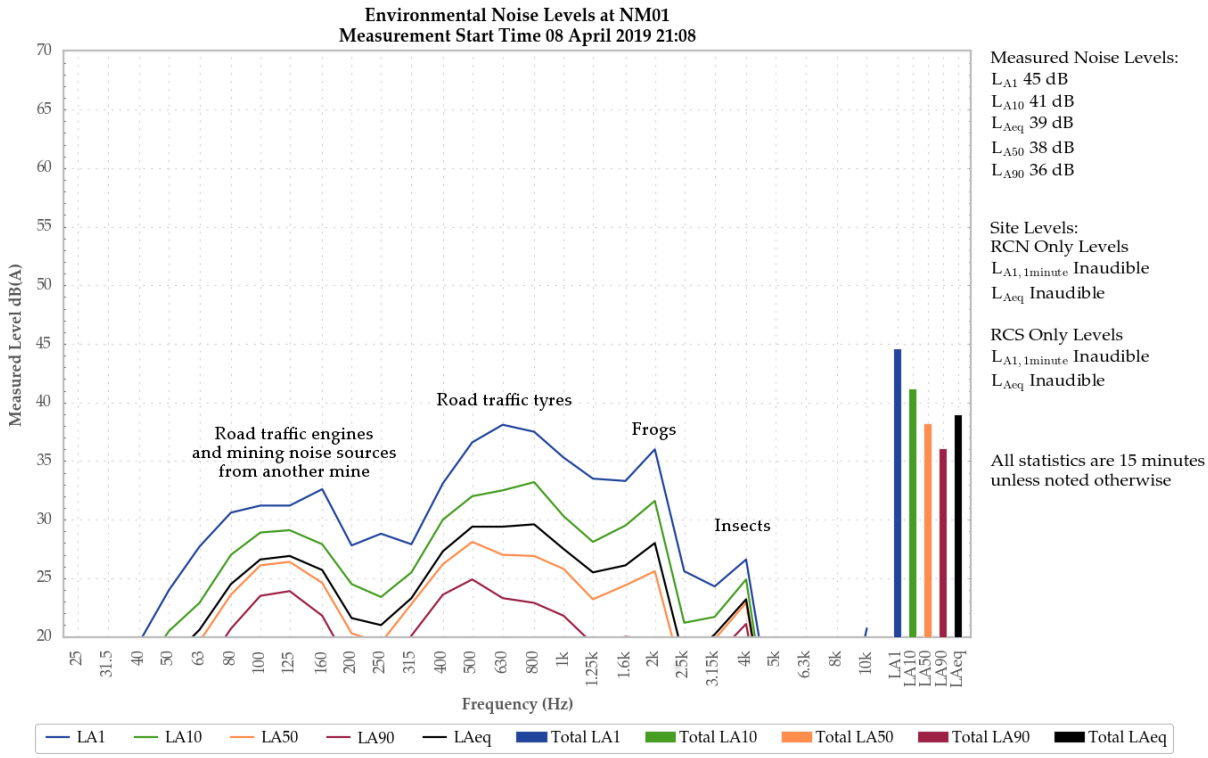


Figure 3: Environmental Noise Levels, NM01

RCM was inaudible.

Road traffic primarily generated the measured levels. Mining noise sources from another mine contributed to the measured L_{A50} and L_{A90}.

Frogs, insects and bats were also noted.

5.1.2 NM01

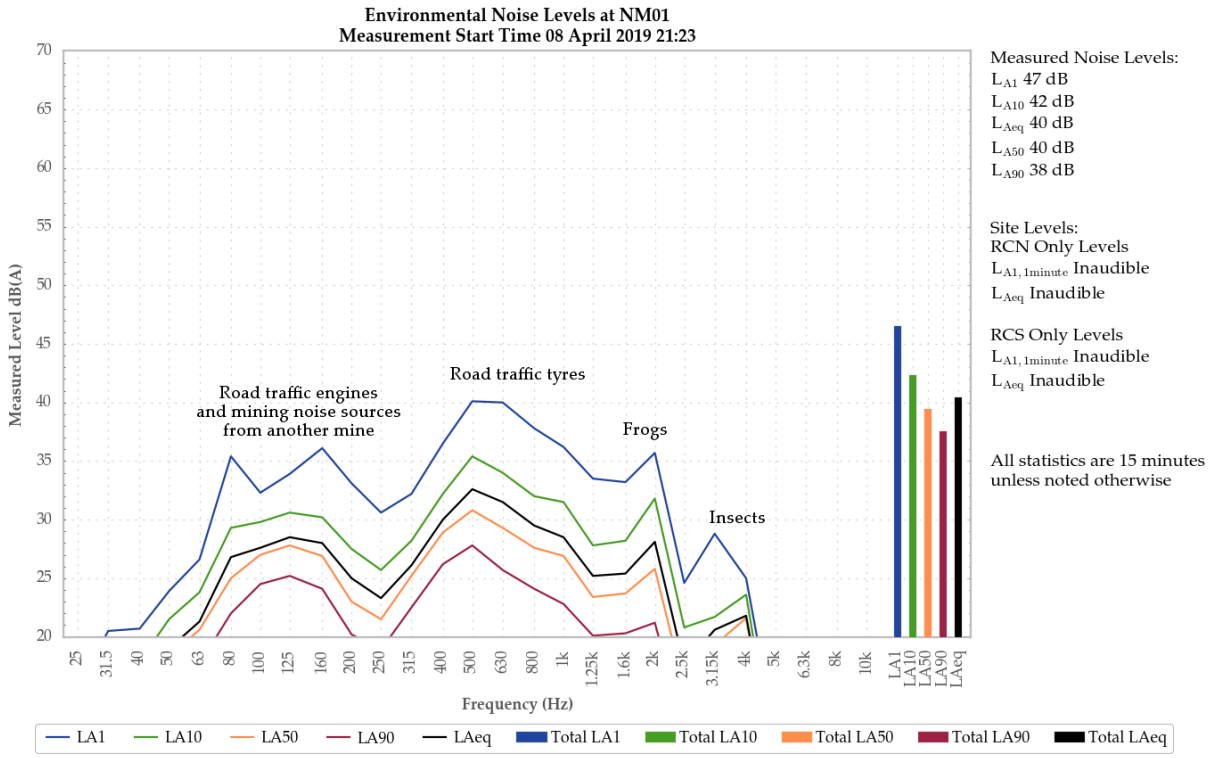


Figure 4: Environmental Noise Levels, NM01

RCM was inaudible.

Road traffic primarily generated the measured levels. Mining noise sources from another mine contributed to the measured L_{A50} and L_{A90}.

Frogs, insects, dogs and trains were also noted.

5.1.3 NM04

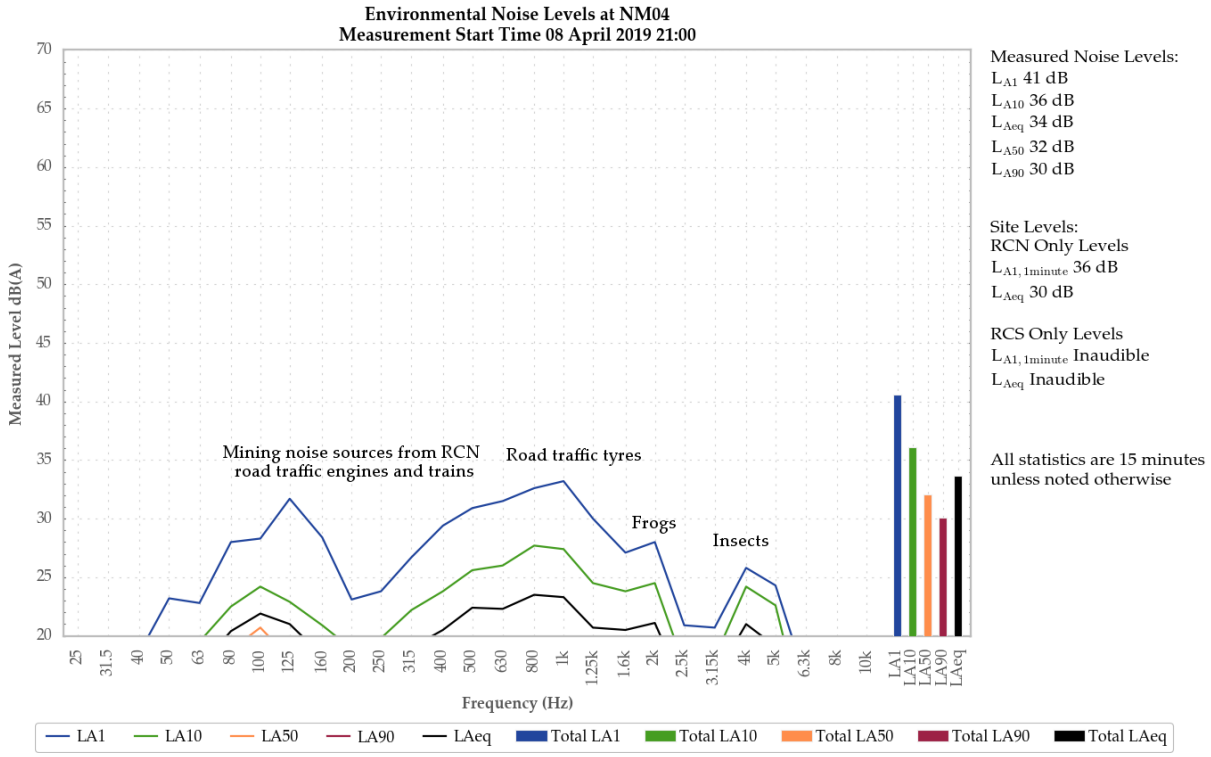


Figure 5: Environmental Noise Levels, NM04

A mining continuum from RCN was audible throughout the measurement, generating the site-only L_{Aeq} of 30 dB. Impacts generated the site-only $L_{A1,1minute}$ of 36 dB. Dozer track noise was also noted.

RCS was inaudible.

Road traffic was primarily responsible for the measured L_{A1}, and contributed to the measured L_{A10} and L_{Aeq}. The mining continuum from RCN contributed to the measured L_{A10}, L_{Aeq}, L_{A50} and L_{A90}. Frogs and insects contributed to the measured L_{A50} and L_{A90}.

Bats and a train were also noted.

5.1.4 NM04

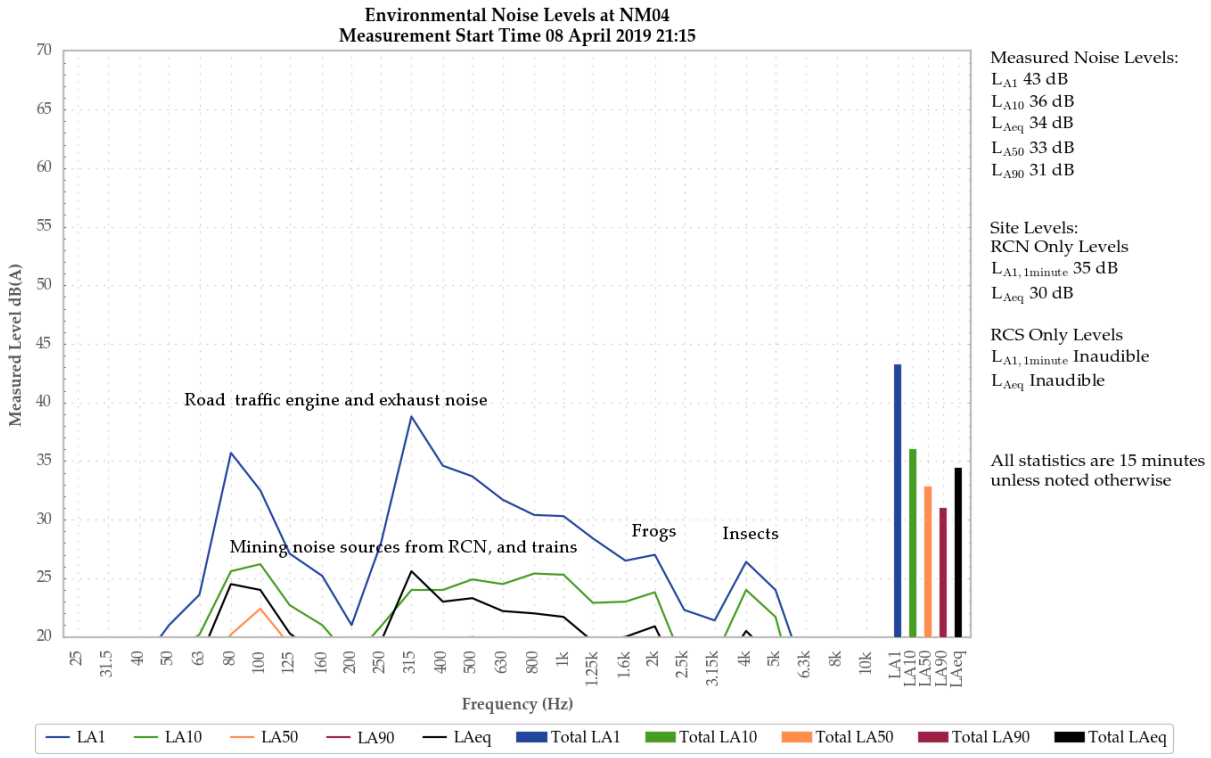


Figure 6: Environmental Noise Levels, NM04

A mining continuum from RCN was audible throughout the measurement, generating the site-only L_{Aeq} of 30 dB. Surges in the continuum generated the site-only $L_{A1,1minute}$ of 35 dB. Dozer track noise was also noted.

RCS was inaudible.

Road traffic was primarily responsible for the measured L_{A1}, and contributed to the measured L_{A10} and L_{Aeq}. Trains contributed to the L_{A10} and L_{Aeq}. The mining continuum from RCN contributed to the measured L_{A10}, L_{Aeq}, L_{A50} and L_{A90}. Frogs and insects contributed to the measured L_{A50} and L_{A90}.

Bats, dogs and an aircraft were also noted.

5.1.5 NM05

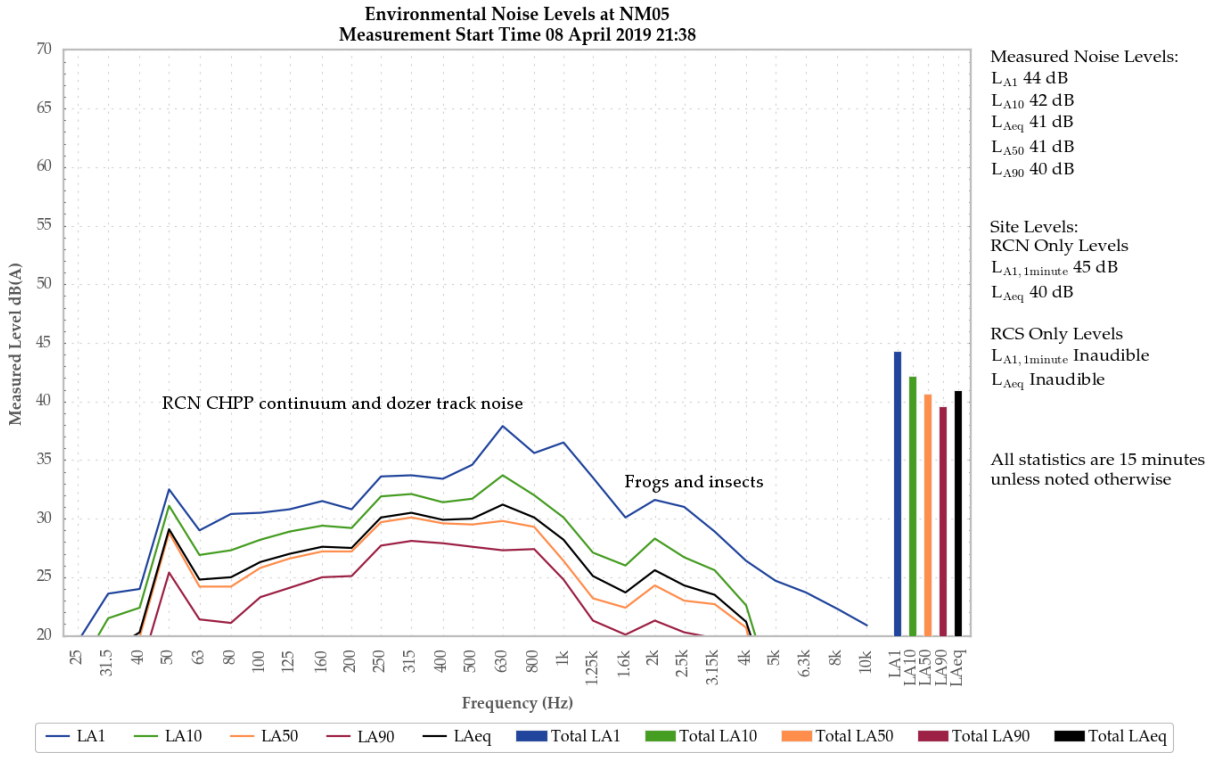


Figure 7: Environmental Noise Levels, NM05

A preparation plant continuum from RCN was audible throughout the measurement generating a site-only L_{Aeq} of 40 dB and the site-only $L_{A1,1minute}$ of 45 dB. Impacts, dozer track noise and reverse quackers were also noted.

RCS was inaudible.

The continuum from RCN was primarily responsible for measured levels. Frogs and insects contributed to the measured levels.

Bats were also noted.

5.1.6 NM05

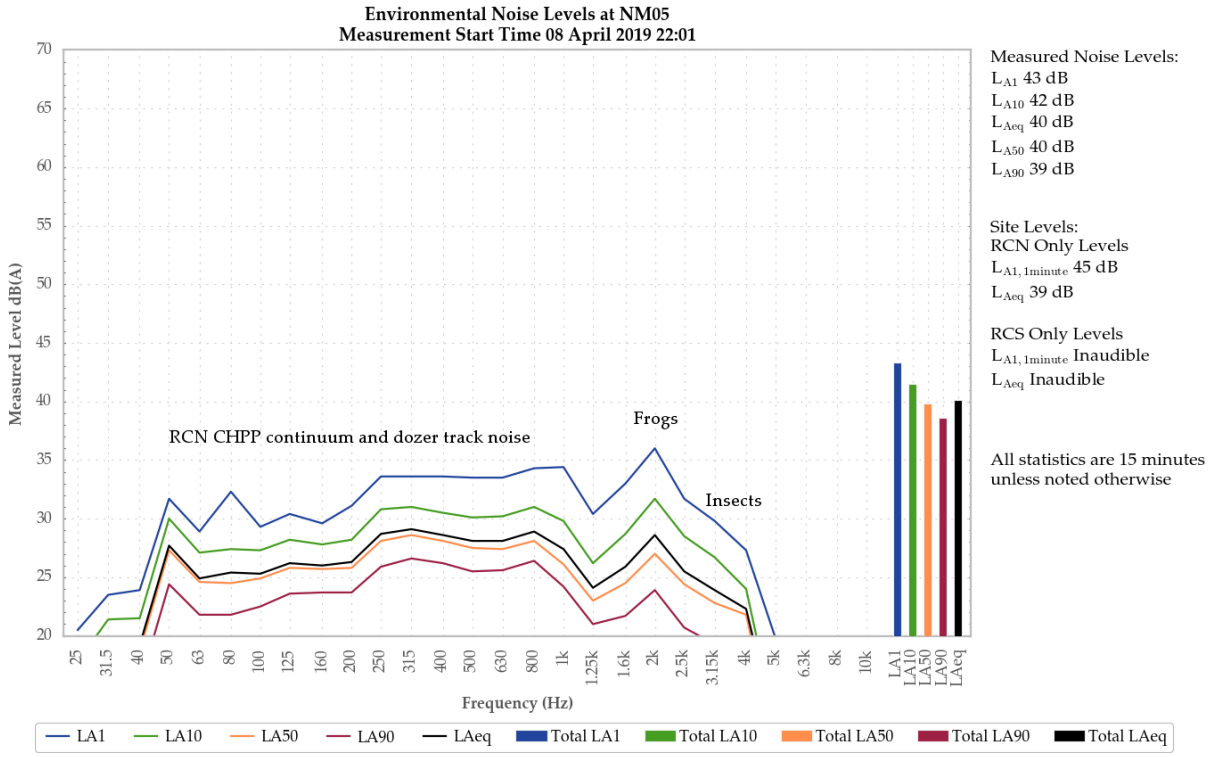


Figure 8: Environmental Noise Levels, NM05

A preparation plant continuum from RCN was audible throughout the measurement generating a site-only L_{Aeq} of 39 dB. Surges in the continuum generated the site-only $L_{A1,1minute}$ of 45 dB. Dozer track noise and reverse quackers were also noted.

RCS was inaudible.

The continuum from RCN was primarily responsible for measured levels. Frogs and insects contributed to the measured levels.

A trains horn was also noted.

5.1.7 NM05

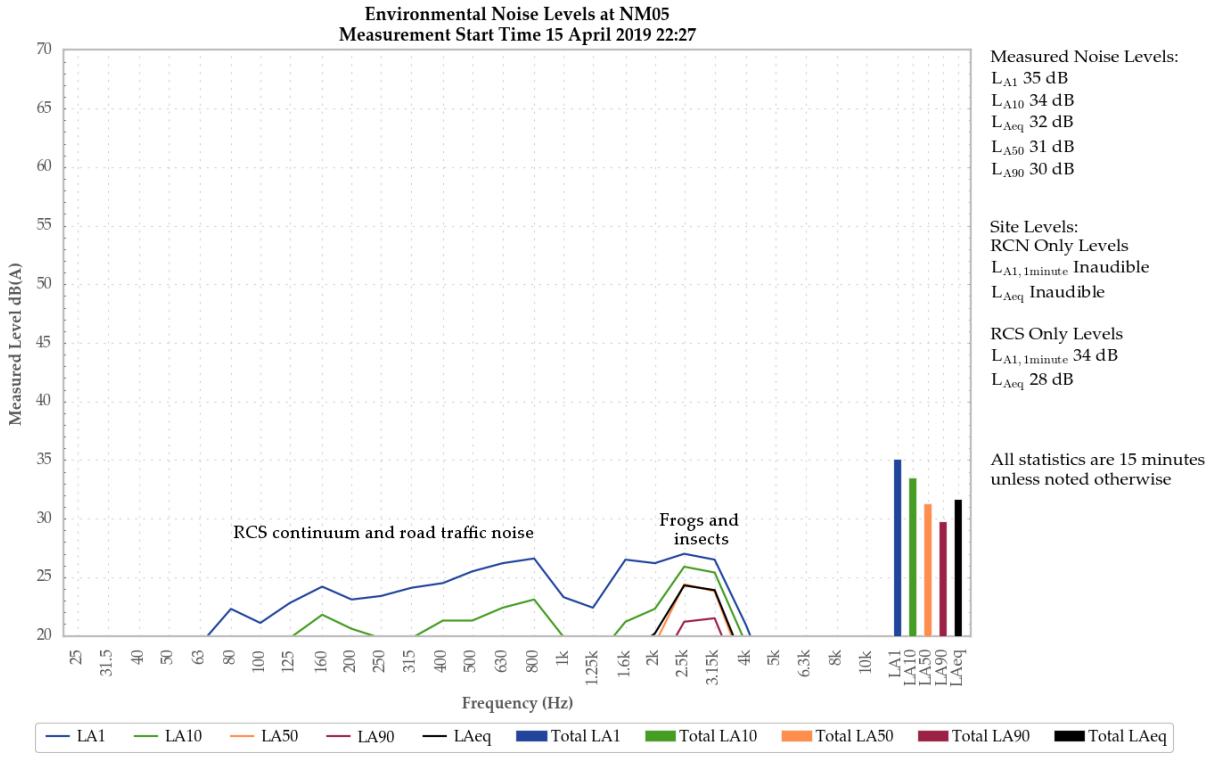


Figure 9: Environmental Noise Levels, NM05

RCN was inaudible.

A low level continuum from RCS was audible throughout the measurement, generating the site-only L_{Aeq} of 28 dB. Surges in the continuum generated the site-only $L_{A1,1minute}$ of 34 dB.

Frogs and insect primarily generated the measured levels. The continuum from RCS and road traffic contributed to the measured L_{A1} and L_{A10}.

5.1.8 NM06

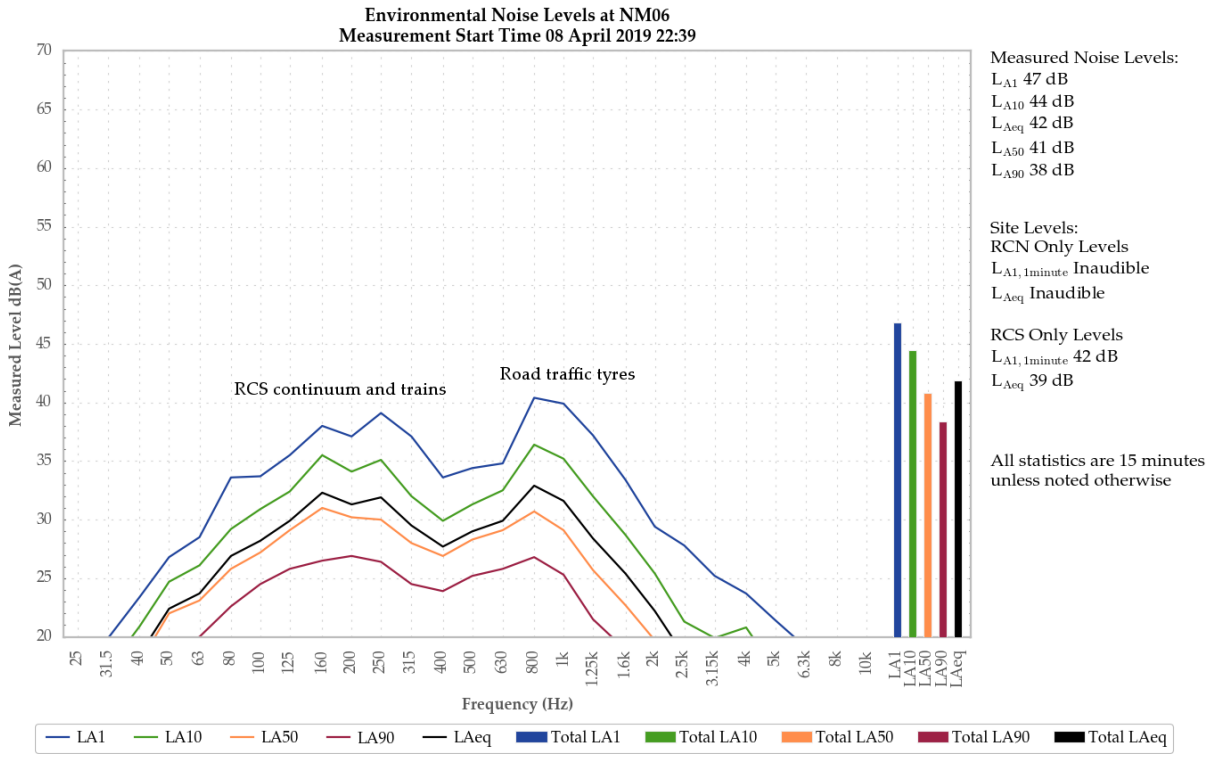


Figure 10: Environmental Noise Levels, NM06

RCN was inaudible.

A continuum from RCS was audible throughout the measurement, generating a site-only L_{Aeq} of 39 dB. Surges in the continuum generated a site-only $L_{A1,1minute}$ of 42 dB.

Trains, road traffic and the continuum from RCS were responsible for all measured levels.

Birds and insects were also noted.

5.1.9 NM06

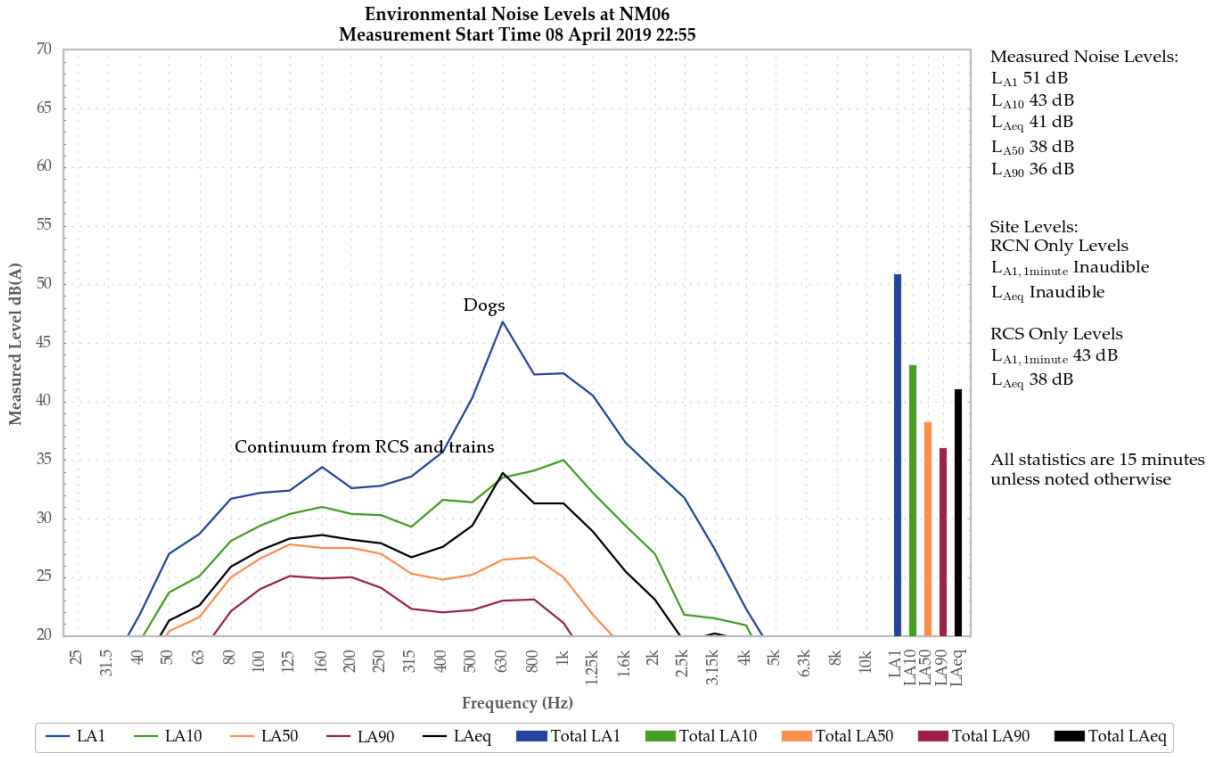


Figure 11: Environmental Noise Levels, NM06

RCN was inaudible.

A continuum from RCS was audible throughout the measurement, generating a site-only L_{Aeq} of 38 dB. Impacts generated a site-only $L_{A1,1minute}$ of 43 dB.

Dogs were primarily responsible for the measured L_{A1}, and contributed to the measured L_{A10} and L_{Aeq}. Trains and the continuum from RCS were responsible for the measured L_{A50} and L_{A90}, and contributed to the measured L_{A10} and L_{Aeq}.

Bats and insects were also noted.

5.1.10 NM07

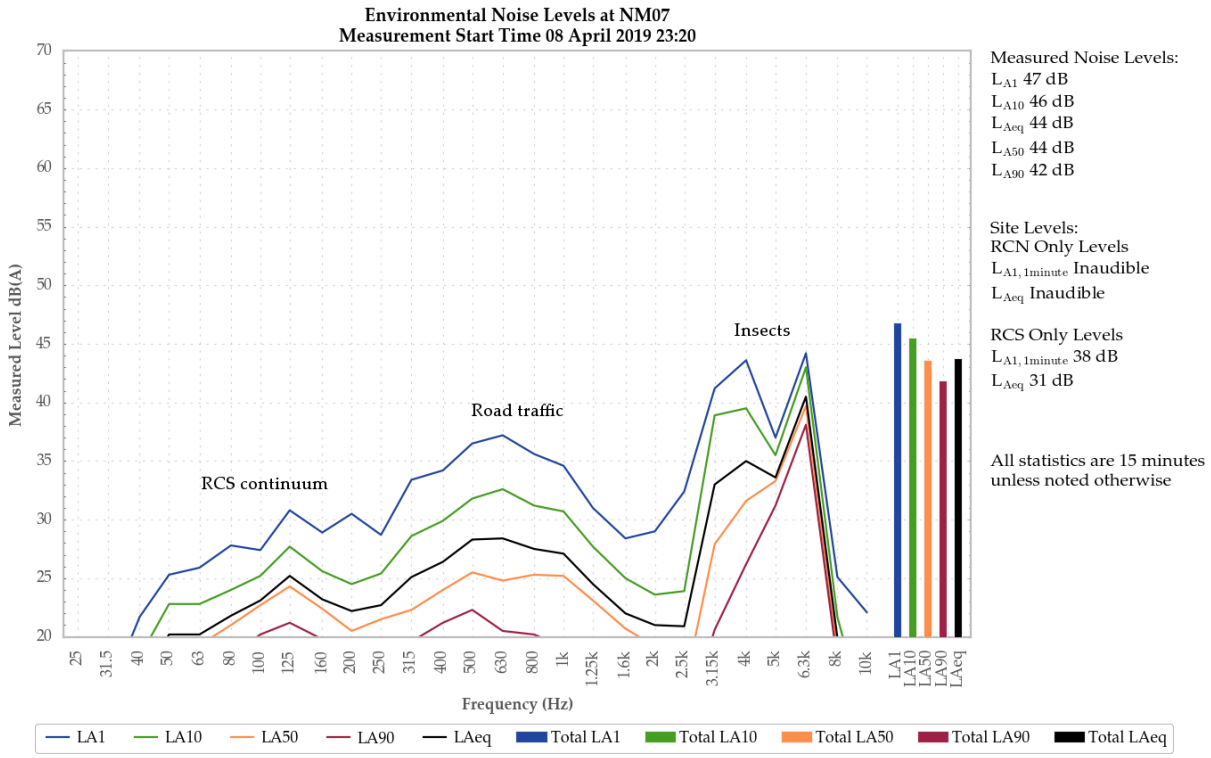


Figure 12: Environmental Noise Levels, NM07

RCN was inaudible.

A continuum from RCS was audible throughout the measurement, resulting in a site-only L_{Aeq} of 31 dB. Surges in the continuum generated the site-only $L_{A1,1minute}$ of 38 dB.

Insects were primarily responsible for all measured levels. Road traffic and the continuum from RCS were minor contributors to measured levels.

5.1.11 NM07

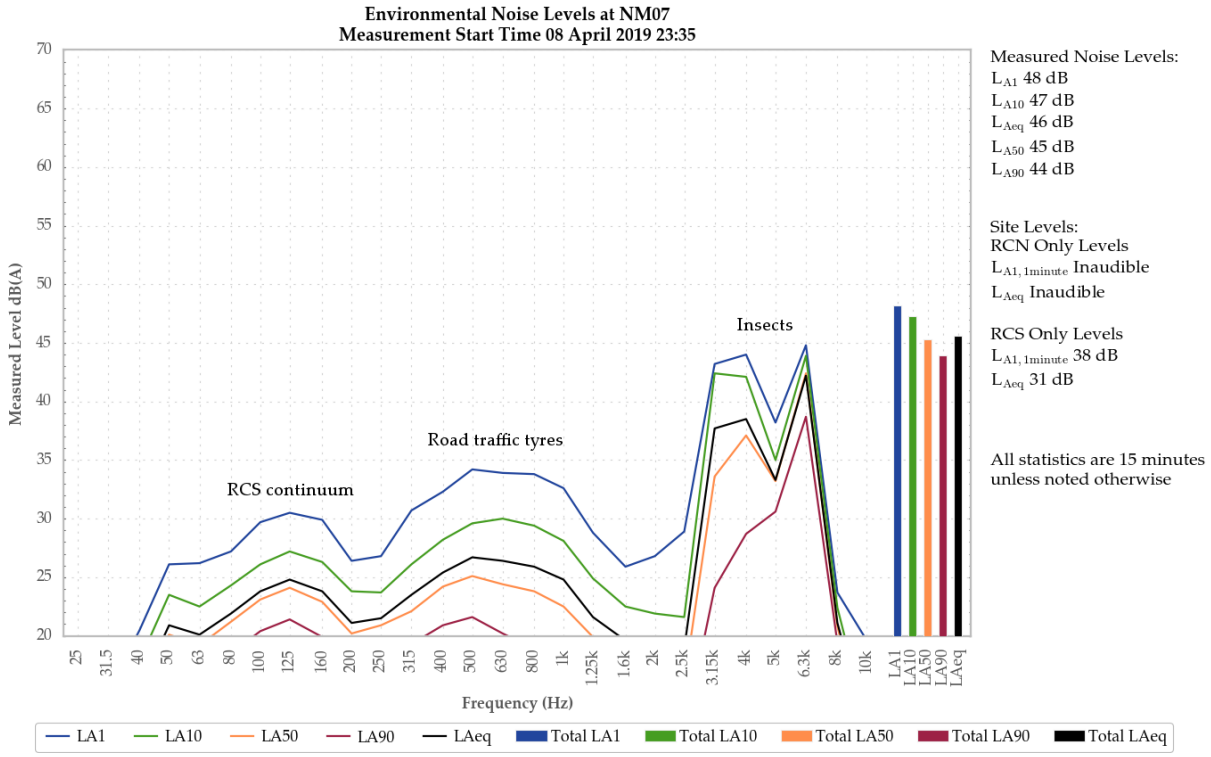


Figure 13: Environmental Noise Levels, NM07

RCN was inaudible.

A continuum from RCS was audible throughout the measurement, resulting in a site-only L_{Aeq} of 31 dB. Surges in the continuum generated the site-only $L_{A1,1minute}$ of 38 dB.

Insects were primarily responsible for all measured levels. Road traffic and the continuum from RCS were minor contributors to measured levels.

5.1.12 NM08

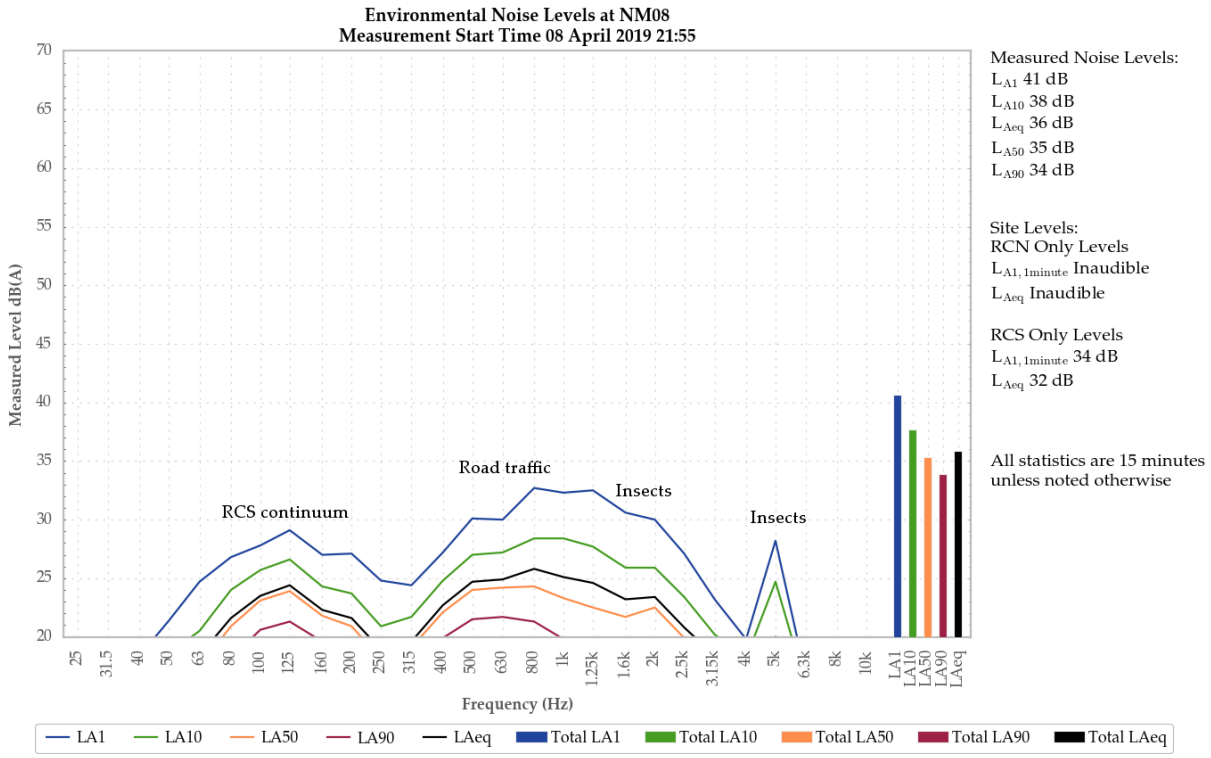


Figure 14: Environmental Noise Levels, NM08

RCN was inaudible.

A mining continuum from RCS was audible throughout the measurement, resulting in a site-only L_{Aeq} of 32 dB. Surges in the continuum were responsible for the site-only $L_{A1,1minute}$ of 34 dB.

Road traffic, RCS continuum and insects generated all measured levels.

Dogs were also noted.

5.1.13 NM08

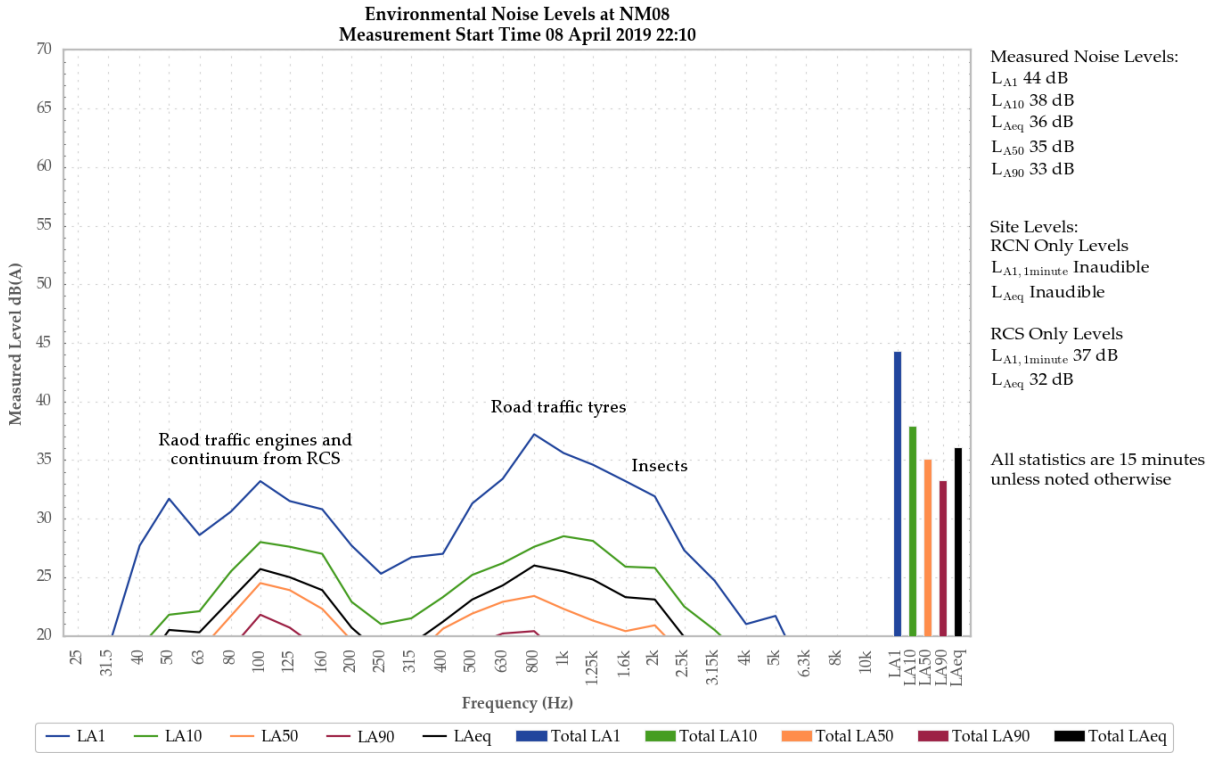


Figure 15: Environmental Noise Levels, NM08

RCN was inaudible.

A mining continuum from RCS was audible throughout the measurement, resulting in a site-only L_{Aeq} of 32 dB. Surges in the continuum were responsible for the site-only $L_{A1,1minute}$ of 37 dB.

Road traffic, RCS continuum and insects generated all measured levels.

Impacts from a nearby industrial estate, and bats were also noted.

5.1.14 NM11

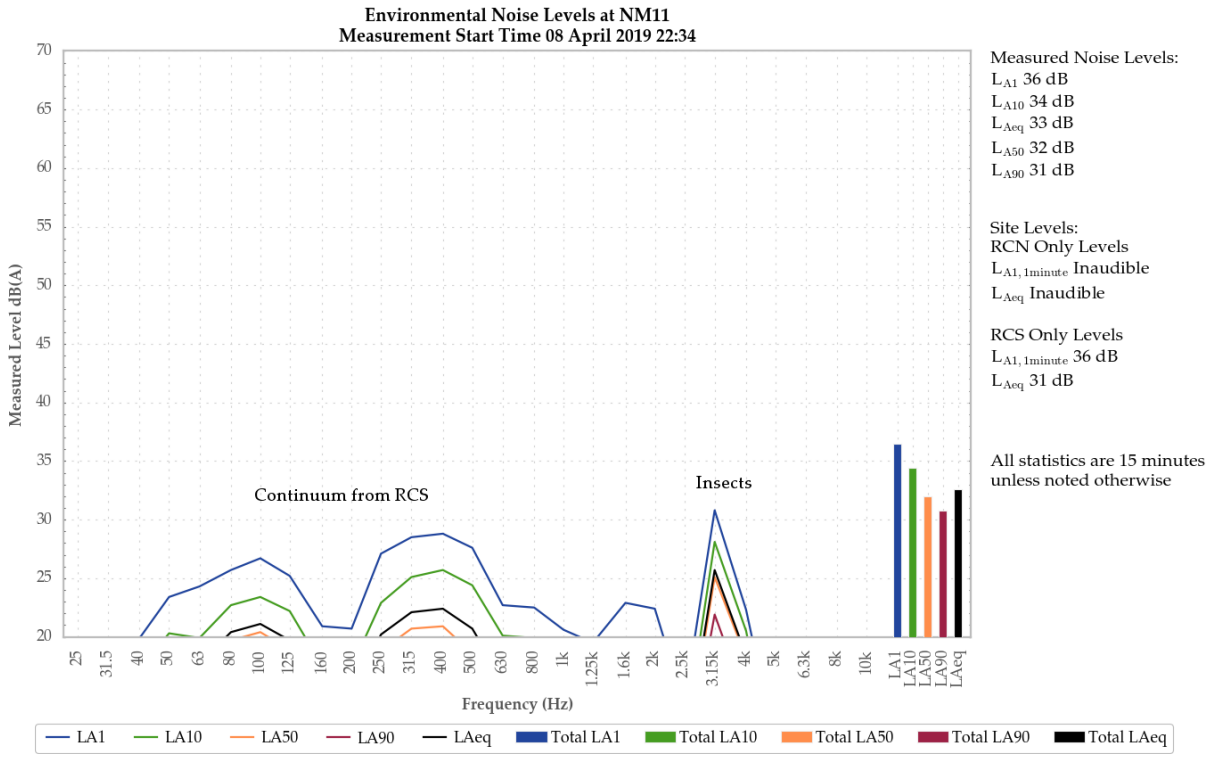


Figure 16: Environmental Noise Levels, NM11

RCN was inaudible.

A mining continuum from RCS was audible throughout the measurement, resulting in a site-only L_{Aeq} of 31 dB. Surges in the continuum were responsible for the site-only $L_{A1,1minute}$ of 36 dB.

RCS continuum was primarily responsible for measured levels. Insects contributed to all measured levels.

Frogs, bats, dogs and road traffic were also noted.

5.1.15 NM11

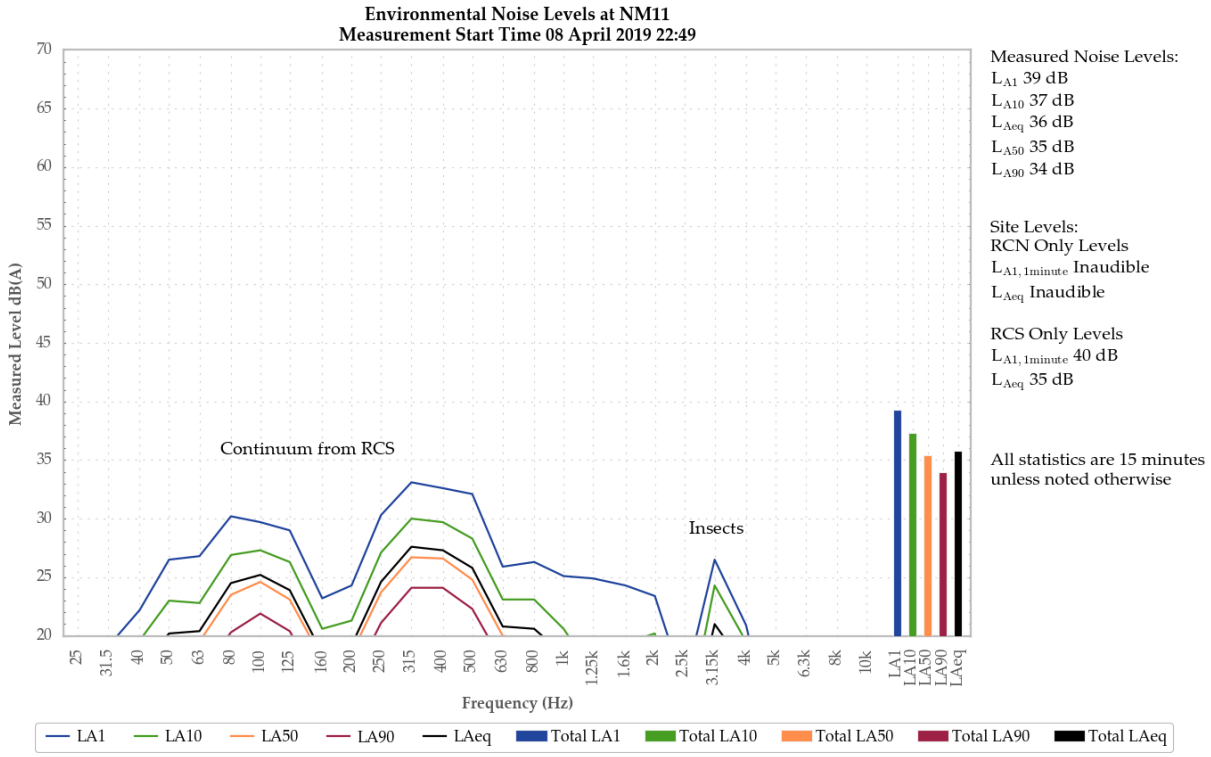


Figure 17: Environmental Noise Levels, NM11

RCN was inaudible.

A mining continuum from RCS was audible throughout the measurement, resulting in a site-only L_{Aeq} of 35 dB. Surges in the continuum were responsible for the site-only $L_{A1,1minute}$ of 40 dB.

RCS continuum was primarily responsible for measured levels.

Frogs, insects and trains were also noted.

6 SUMMARY

Global Acoustics were engaged by RCM to conduct a noise survey around their operations, situated north-west of the town of Singleton, NSW. The mine comprises RCN and RCS, which have separate noise criteria for each operation.

Environmental noise monitoring described in this report was undertaken during the night of 8 April 2019 with follow-up monitoring undertaken during the night of 15 April 2019. The purpose of the survey was to quantify and describe the acoustic environment around both operations and compare results with noise criteria outlined in the RCM EPL and NMP.

Noise levels from RCS complied with relevant criteria at all monitoring locations during the April 2019 monitoring survey.

Noise levels from RCN complied with relevant criteria at all monitoring locations during the April 2019 monitoring survey with the exception of NM05.

Initial monitoring at NM05

During the measurement at NM05 on 8 April 2019 which started at 22:01, a preparation plant continuum from RCN was audible throughout the measurement generating a site-only $L_{Aeq,15minute}$ of 39 dB. A 5 dB NPfI low frequency penalty was applicable, resulting in a site-only $L_{Aeq,15minute}$ of 44 dB, which was 3 dB over the relevant criterion. As a result, follow-up monitoring was scheduled within 7 days.

Follow-up monitoring at NM05

Follow-up monitoring was conducted at NM05 on 15 April 2019. RCN was inaudible during the measurement.

Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

APPENDIX

A NOISE MANAGEMENT PLAN & ENVIRONMENT PROTECTION LICENCE

RIX'S CREEK NOISE MANAGEMENT PLAN

5. Attended Noise Compliance Monitoring

5.1 INTRODUCTION

Attended monitoring is required to assess compliance with regulatory limits. Note: As described in this document it does not address the 25% of privately owned land aspect of Schedule 3, Condition 3 of the Rixs Creek North Cut Project Approval. As recommended in the 2011 Independent Environmental Audit, the requirement to assess affectation of 25% of privately owned land should be removed as a requirement (for all criteria); it is not practical to determine and has no relevance to resident amenity.

Attended monitoring at all receptor locations will be at night only commencing from 9pm, with results compared to all criteria (day, evening and night). Atmospheric conditions and noise propagation are usually the same on the evening/night and night/day time boundaries. Note also that receptors near to, or exposed to, the New England Highway have a completely different noise environment in the day due to traffic such that mining noise is unlikely to be a problem. This is consistent with the Independent Review of Cumulative Noise Impacts -Camberwell Village (WMPL, May 2010), which states:

> *The LAeq levels near the New England Highway are predominately due to road traffic and associated heavy vehicles, rather than mining or other industrial noise, and is unlikely to decrease in the future.*

Before the introduction of the NSW Industrial Noise Policy (EPA 2000) in 2000, the LA 10 descriptor was used for assessment of noise. LA10 measures the level exceeded for 10% of the specified period. Rixs Creek Mine Development Consent DA 49/50, approved in 1995, requires compliance with Schedule 2 Condition 10 which contains LA 10 criteria, as follows;

Noise Criteria 10. The Applicant must

(i) comply with LA 10 daytime noise level design goals set out below:

- *a. The Retreat 42dB(A)*
- *b. Singleton Heights 42dB(A)*
- *c. Maison Dieu Road 38dB(A)*

(ii) comply with LA I0 night time noise level design goals set out below:

- *a. The Retreat 40dB(A)*
- *b. Singleton Heights 40dB(A)*
- *c. Maison Dieu Road 38dB(A)*

In June 2012 Rix's Creek South Mine were required to develop Project Specific Noise Limits (PSNL) by NSW EPA. The PSNL contains prescriptive noise limits in accordance with the NSW Industrial Noise Policy (EPA 2000). The limits, as shown in Table 5-7, are prescribed in LAeq limits and have been

incorporated into this Noise Management Plan as part of the requirement of Condition 10A to implement best practice noise management across the Rix's Creek South site.

The following extract from *"The Noise Guide for Local Government 2013 (Part 2 Noise Assessment)"* provide a number of reasons why the LA10 descriptor has been superseded:

- *"LAeq is a measure of energy and can be mathematically manipulated, while LA10 is a statistical descriptor which cannot be accurately added to or subtracted from other LA10 measures or other descriptors.*
- *LAeq is supported as a better measure of the effect of noise – for example the World Health Organization uses it.*
- *There is a general worldwide move towards the use of LAeq as the preferred descriptor of source noise for most situations."*

Rix's Creek South Mine has incorporated the limits as set within the PSNL and Environmental Protection License 3391 into this Noise Management Plan. The limits within the PSNL are lower than the LA10 limits within DA 49/94 which are set as design goals only. As noted in the *The Noise Guide for Local Government 2013 (Part 2 Noise Assessment), "Typically the LA10 is about 3 dB(A) above the LAeq"*, so the levels set in the PSNL are much lower, being a reduction in the value of the limits as well as generally 3 dB lower The incorporation of the PSNL is considered best practice in accordance with Schedule 2 Condition 10 A.

Rix's Creek South Mine have incorporated the LAeq Criteria from the PSNL which is lower and more restrictive as the compliance requirement for DA 49/94.

5.1.1 Frequency

Attended compliance monitoring is to be undertaken one night per calendar month.

5.1.2 Locations

Compliance cannot be determined at each individual resident so on the monitoring night monitoring is targeted to locations where operational noise is likely to be the highest. These monitoring locations are selected by the following procedure.

Residences surrounding the Mine have been grouped generally according to the locality and local acoustic environment. These groupings are referenced in the relevant EAs as Noise Assessment Groups (NAG). Monitoring locations, including the receptor reference numbers from the relevant EAs and the NAG each represents, are listed in Table 5-6.

Compliance monitoring is to be conducted at locations indicated as being in the zone of meteorological enhancement by the predictive noise model. The procedure for determining which locations to monitor is as follows:

1. The acoustic consultant undertaking the monitoring will access the predictive model website for the site for the upcoming night shift. The model results will indicate graphically the predicted zone of meteorological enhancement;
2. A monitoring plan will be developed by the consultant for the upcoming night period. Locations are to include:
    a. If a clear zone of meteorological enhancement is indicated, one location in the opposite direction to the zone of predicted enhancement, and, all locations located within the predicted zone of enhancement; and
    b. If relatively neutral conditions are predicted with no clear zone of meteorological enhancement, the eight locations nearest the mine will be monitored. NM01, NM03 and NM10 would be excluded, as non-compliance at those locations in the absence of meteorological enhancement is unlikely due to distance from the Mine.
3. A minimum of six locations are to be monitored per night.

Once monitoring commences, the consultant will apply best judgment to either proceed with the original monitoring plan, or a modified plan if monitoring results justify a change.

The procedure for monitoring when a clear zone of meteorological enhancement is predicted is:

1. The first monitoring location will be the potentially most affected location in the opposite direction to the zone of predicted enhancement to confirm noise emission in that direction is well below compliance criteria;
2. If the Mine L_{Aeq} is more than 2 dB below the relevant criterion at the first location (L_{Aeq} < criterion minus 2 dB), the consultant will proceed with the original plan and move to the locations within the predicted zone of enhancement;
3. If the Mine L_{Aeq} is within 2 dB of the relevant criterion (L_{Aeq} >= criterion minus 2 dB), the consultant will monitor at the next most potentially affected location in the same general direction from the Mine. This procedure will be repeated until the Mine L_{Aeq} is more than 2 dB below the relevant criterion. Result acceptance procedures in Section 5.1.6 will be applied;
4. The consultant will then proceed with the original plan; and
5. If fatigue management rules result in insufficient time to monitor all locations, the consultant will apply best judgement to determine which locations will provide the best indication of compliance with the time available.

The procedure for monitoring when no clear zone of meteorological enhancement is predicted is:

1. The first monitoring location will be the potentially most affected location based on forecast and prevailing meteorological conditions;
2. If compliance is demonstrated, the consultant will proceed with the original plan;

3. If non-compliance is measured at any location, result acceptance procedures in Section 5.1.6 will be applied. Any locations in the same general direction from the Mine that were omitted in the original plan will be included; and

4. If fatigue management rules result in insufficient time to monitor all locations, the consultant will apply best judgement to determine which locations will provide the best indication of compliance with the time available.

The consultant shall maintain a fatigue management policy, which will be provided to the Mine and/or regulators on request.

Table 5-6 Attended Monitoring Locations

NMP ID	EA Ref. (ICO/RCM) [1]	Owner or Area	NAG [2]
NM01	132/171	Bowman	6 (RCN) / M (RCS)
NM03	63 / NA	Cherry	B, C, F, 1, 6 and 12 (RCN)
NM04	19 / 12	Andrews	11 and A (RCN) / A (RCS)
NM05	11 / 8	Ferraro	10 and 11 (RCN) / A (RCS)
NM06	150 / 23	Bridgman Road	9 (RCN) / B and C (RCS)
NM07	NA / 61	Gardiner Circuit	8 (RCN) / D and E (RCS)
NM08	NA / 152	Belmadar Way	NA / J, G and F (RCS)
NM10	NA / 126	Long Point	NA / K and I (RCS)
NM11	NA / 160	320 Maison Dieu Road	NA / K (RCS)
NM12	NA / 168	Corner of Maison Dieu Road and Shearers Lane	NA / L (RCS)

Notes: 1. NA indicates location was not included in the EA for that project; and

2. Indicates the NAG reference the location represents from the relevant EAs.

NM02 and NM09 are not required to be monitored in EPL 3391. This has been quantified by Global Acoustics in briefing note dated 30 June 2017 which is attached in Appendix E. (See also Appendix D for Copy of EPL 3391).

5.1.3 Methods

Attended monitoring is to be conducted in accordance with the *'Industrial Noise Policy' (INP)* guidelines and *Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'*. The duration of each measurement is to be 15 minutes.

As indicated in L3.3, L3.4 & L3.5 of EPL 3391:

L3.3 Noise from the premises is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of the dwelling where the dwelling is more than 30 metres from the boundary, to determine compliance with the noise level limits in this licence unless otherwise stated.

Where it can be demonstrated that direct measurement of noise from the premises is impractical, the EPA may accept alternative means of determining compliance. See Chapter 11 of the NSW Industrial Noise Policy.

The modification factors presented in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.

L3.4 Noise from the premises is to be measured at 1 m from the dwelling facade to determine compliance with the LA1(1minute) noise limits in this licence.

L3.5 The noise emission limits identified in this licence apply under all meteorological conditions of:
a) Wind speeds up to 3m/s at 10 metres above the ground level; or
b) Temperature inversion conditions of up to 3oC/100m and wind speed up to 2m/s at 10 metres above the ground.

In most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements are to be undertaken at a suitable and representative location.

Some measurement results may be inconclusive and reported as "Inaudible" (IA) or "Not Measurable" (NM). When site noise is noted as IA then there was no site noise at the monitoring location. However, if site noise is noted as NM, this means some noise was audible but could not be quantified. This means that noise from the site was either very low, or, being masked by other noise that was relatively loud. In the former case (very low site levels) it is not considered necessary to attempt to accurately quantify site NM noise as it would be significantly less than any criterion and most unlikely to cause annoyance (and in many cases, to be even noticed).

If site noise were NM due to masking then suitable methods must be employed as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for assessment of compliance.

As indicated in the notes below Table 2 of the Rixs Creek North Project Approval:

> *Noise generated by the projects is to be measured in accordance with the relevant requirements of the INP. Appendix 5 sets out the requirements for evaluating compliance with these criteria.*

The procedures and exemptions will include the assessment of modifying factors from Section 4 of the INP, where applicable. 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 or impulsive. However, tonality and low frequency are to be assessed by analysis of the measured L_{Aeq} and/or L_{Ceq} spectrum.

5.1.4 Meteorological Monitoring

In accordance with EPL 3391, one on-site Automatic Weather Station (AWS) is currently located at Rix's Creek Mine. This AWS complies with AS2923-1987 Ambient Air – Guide for measurement of horizontal wind for air quality applications and the INP. This AWS provides representative weather data for the Mine including wind speed and direction, sigma theta, solar radiation, lapse rate, humidity, rainfall and temperature. Weather data will be used to determine the validity of noise monitoring results in accordance with the INP. Wind speed and rain data will be used for this purpose. Extreme temperature inversions will be considered G-class inversions, as determined by use of sigma theta and wind speed to categorise inversion strength, in accordance with Appendix E of the INP.

For the purpose of determining valid meteorological conditions for which noise criteria apply the Rix's Creek Mine AWS as noted in the EPL will be used for assessment of Rix's Creek Mine.

5.1.5 Data to be collected

Data shall be collected in 15 minute periods and the Mine only L_{Aeq} result recorded. Low pass filtering will be used to remove extraneous noise such as insects when applicable. Other extraneous noise may be paused from the data set or excluded by other means. Statistical data must be one-third octave. Assessment of impact is to include consideration of mining activity and atmospheric conditions during each measurement. Wind speed and/or estimated temperature inversion conditions may result in regulatory criteria not being applicable in accordance with the INP.

The Mine only L_{Ceq} result should be collected simultaneously. Low pass filtering will be used to remove extraneous high spectrum noise when required

A low frequency noise penalty of 5 dB is to be added to the Mine only L_{Aeq} result when noise from the mine causes:

- The Mine only C weighted reading to exceed L_{Ceq} 65 dB during the day or evening periods; or
- The Mine only C weighted reading to exceed L_{Ceq} 60 dB during the night period.

The following information must be recorded during attended noise monitoring:

- Time and date;

- Location;
- Name of person carrying out the monitoring;
- Serial number of equipment used;
- Noted sources and noise levels, direction and frequency from source of interest;
- Duration of monitoring;
- Measured noise levels including L_{Aeq}, L_{Amax}, L_{Amin}, L_{A1}, L_{A10}, L_{A50} and L_{A90}, and
- Weather conditions including temperature, relative humidity, wind speed average, wind speed maximum, wind direction and estimated cloud cover.

5.1.6 Result Acceptance

A 15 minute measurement shall be taken and assessed against the applicable criterion. If the Mine only L_{Aeq} result is below the criterion, then the consultant will record it, note the site has passed and move on to the next monitoring location.

If the Mine only L_{Aeq} result exceeds the criterion, is attributable to the Mine, and taken in valid meteorological conditions, then the following steps are to be followed:

1. Consultant will record the reading, advise the Mine of the criterion exceedance and proceed to Step 2. The Mine will implement remedial action as required.
2. Within 75 minutes after the first measurement (and no earlier than 10pm) a second 15 minute measurement is to be made. If this second result exceeds the criterion then proceed to Step 3, otherwise proceed to Step 4.
3. If the result is attributable to the Mine and taken in valid meteorological conditions then proceed to Step 5.
4. The consultant will record the result, note the site has passed, schedule an additional monitoring test to be undertaken at the location within 1 week, and move on to the next monitoring location.
5. The consultant will record the result, note the site has failed and is deemed a '*noise affected night*' at that location. An additional monitoring test should be scheduled to be undertaken at the same location within 1 week, and move on to the next monitoring location.

If the Mine only L_{Aeq} result exceeds the criterion, is attributable to the Mine, and taken in invalid meteorological conditions, the consultant will record it, advise the Mine a measurement has exceeded the criterion, and move on to the next monitoring location.

As detailed in Section 6.2.3 of this NMP, the OCE is to be advised of any potential noise exceedance detected during attended monitoring. The flow chart in Figure 6-5 details the attended monitoring exceedance procedure.

5.1.7 Compliance Criteria

Table 5-7 sets out night period noise compliance criteria. Rixs Creek North criteria are sourced from the Project Approval. Rixs Creek South $L_{Aeq,15minute}$ intrusive noise criteria are based on proposed criteria nominated in the EIS. $L_{A1,1minute}$ criteria are based on sleep disturbance criteria for the relevant NAG derived in the EIS.

$L_{Aeq,15minute}$ criteria are applicable for the day (07:00 to 18:00), evening (18:00 to 22:00) and night (22:00 to 07:00) periods. $L_{A1,1minute}$ criteria are applicable for the night period only.

Table 5-7 Compliance Criteria

NMP ID	EA Ref. (RCN/RCS) [1]	Rix's Creek North		Rixs Creek South	
		$L_{Aeq,15minute}$ dB	$L_{A1,1minute}$ dB	$L_{Aeq,15minute}$ dB	$L_{A1,1minute}$ dB
NM01	132/171	38	48	40	48
NM03	63 / NA	40	45	40	45
NM04	19 / 12	37	49	37	49
NM05	11 / 8	41	47	41	47
NM06	150 / 23	36	48	42	47
NM07	NA / 61	NA	NA	40	45
NM08	NA / 152	NA	NA	40	47
NM10	NA / 126	NA	NA	40	47
NM11	NA / 160	NA	NA	40	47
NM12	NA / 168	NA	NA	40	47

Notes:

1. Criterion set as for Rixs Creek North in the absence of data in the EIS; and
2. "NA" indicates criteria not applicable at that location, as it was not included in the relevant EA, EIS or Project Approval.

NM02 and NM09 are not required to be monitored under EPL 3391. This has been quantified by Global Acoustics in briefing note dated 30 June 2017 which is attached in Appendix E. (See also Appendix D for Copy of EPL 3391).

5.1.8 Reporting

Attended monitoring reports should include a comparison to criteria detailed in the relevant project approval. All attended measurement result analysis should consider criteria applicability (for impact, mitigation, cumulative and acquisition criteria) with regard to wind speed and vertical temperature gradient.

All results that exceed criteria, including instances where the second measurement indicates compliance with criteria, shall be reported to DP&E the following day along with actions taken to reduce the noise.

All monitoring that results in a night being deemed a '*noise affected night*' in accordance with Section 5.1.6 shall be reported to DP&E and the affected community as per the notification requirements.

5.1.9 Exceedance Procedure

Procedures to be followed in the event of a measured noise exceedance are outlined in Section 6.2.3

6.2.3 Attended Compliance Monitoring Exceedance Measured

Any exceedance of a noise criterion is to be acted upon immediately it is measured. The acoustic consultant undertaking attended monitoring is to contact the Mine to advise operations of the problem and discuss possible changes to operations that should lead to compliance. A re-measure is required to evaluate the effectiveness of any change implemented as outlined in Section 5.1.6, if the measurement was made in valid meteorological conditions. The Senior Environmental Officer and/or the Environmental Officer should also be advised of the exceedance.

Responsibility: Noise Monitoring Consultant

Timing: Each event

The Department of Planning & Environment (Singleton Compliance Branch) and/or the Environment Protection Authority is to be informed of any noise criterion exceedance.

Responsibility: Environment Manager or Environmental Advisor/Officer

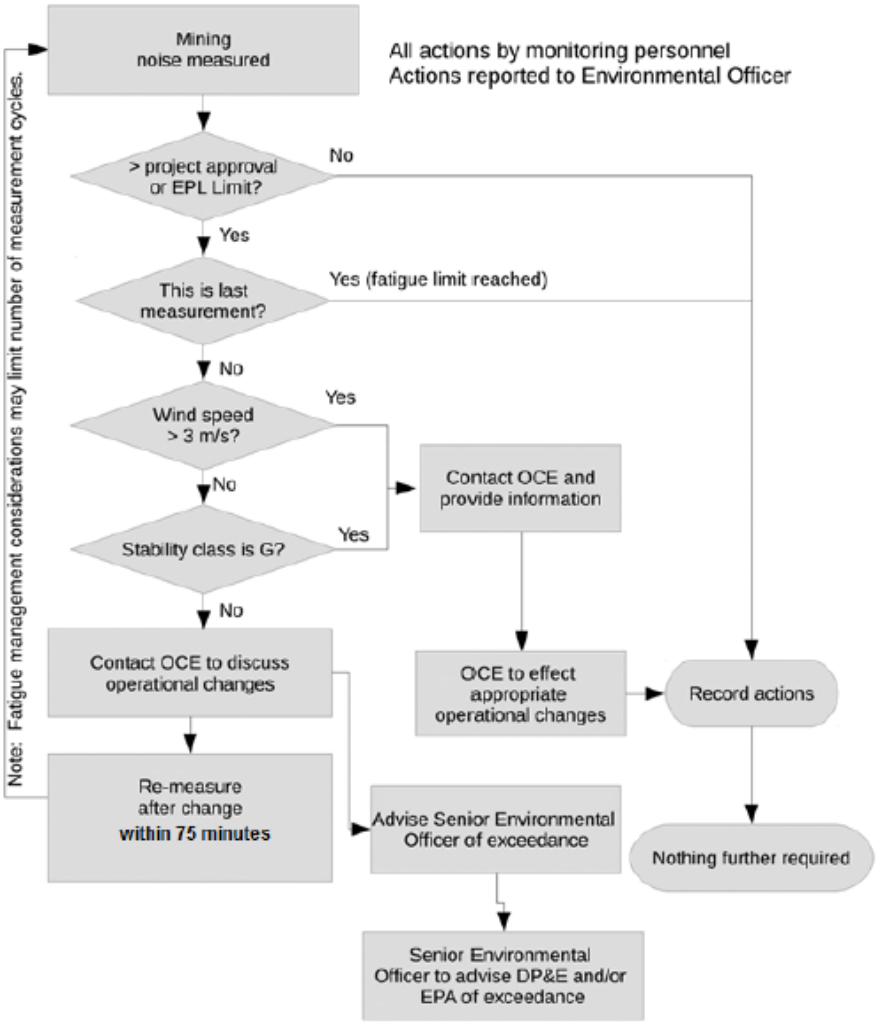
Timing: Each event

This Noise Management Plan is to be issued to any consultant conducting attended noise monitoring for the site so they understand all relevant procedures.

Responsibility: Environmental Advisor/Officer

Timing: On commencement of contract and every time this document is updated.

Figure 6-5 Attended Monitoring Exceedance Procedure



ENVIRONMENT PROTECTION LICENCE (EPL) 3391

L3 Noise limits

L3.1 Noise generated at the premises must not exceed the noise limits in the Table below.

Location	Day/Evening/Night LAeq (15 minute)	Night LA1 (1 minute)
EPA 29 and NMG1	40	48
EPA 30 and NMG3	40	45
EPA 31 and NMG4	37	49
EPA 32 and NMG5	41	47
EPA 33 and NMG6	42	47
EPA 34 and NMG7	40	45
EPA 35 and NMG8	40	47
EPA 36 and NMG10	40	47
EPA 37 and NMG11	40	47
EPA 38 and NMG12	40	47

L3.2 For the purpose of condition L3.1:

a) EPA (number) refers to EPA identification point numbers as referenced in condition P1.4; and
b) NMG (number) refers to all residential receivers on land within noise monitoring groups identified by plan of the premises titled "Rix's CreeK P/L EPL 3391 Noise Monitoring Locations" dated June 2017 EPA Ref DOC17/350379 and shape files EPA Ref DOC17/364557.

L3.3 For the purpose of condition L3.1:

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

L3.4 The noise limits set out in condition L3.1 apply under all meteorological conditions except for the following:

a) Wind speeds greater than 3 metres/second at 10 metres above the ground level;
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.

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 C19073

Client Details	Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thornton NSW 2322
Equipment Tested/ Model Number :	NA-28
Instrument Serial Number :	30131882
Microphone Serial Number :	04739
Pre-amplifier Serial Number :	11942

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	24.5°C	**Ambient Temperature :**	23.6°C
Relative Humidity :	54.5%	**Relative Humidity :**	51%
Barometric Pressure :	99.39kPa	**Barometric Pressure :**	99.36kPa

Calibration Technician : Charlie Neil
Calibration Date : 5 Feb 2019
Secondary Check: Lewis Boorman
Report Issue Date : 6 Feb 2019

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 61672-3:2013, 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	*±0.15dB*	*Temperature*	*±0.2°C*
12.5kHz	*±0.2dB*	*Relative Humidity*	*±2.4%*
16kHz	*±0.29dB*	*Barometric Pressure*	*±0.015kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.11dB*		

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.

PAGE 1 OF 1

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 C18618

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 : 23.6°C
Relative Humidity : 42.6%
Barometric Pressure : 98.42kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 22.4°C
Relative Humidity : 42.4%
Barometric Pressure : 98.45kPa

Calibration Technician : Lucky Jaiswal
Calibration Date : 26 Nov 2018
Secondary Check: Lewis Boorman
Report Issue Date : 29 Nov 2018
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 61672-3:2013, 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
31.5 Hz to 8kHz ±0.12dB
12.5kHz ±0.18dB
16kHz ±0.51dB
Electrical Tests
31.5 Hz to 20 kHz ±0.12dB

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 - 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.

Page 1 of 1

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
Calibration Date : 25 Jun 2018
Secondary Check: Lewis Boorman
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.

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.

PAGE 1 OF 1

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 Calibrator
IEC 60942-2017

Calibration Certificate

Calibration Number C19074

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

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

Atmospheric Conditions
Ambient Temperature : 23.8°C
Relative Humidity : 53.7%
Barometric Pressure : 100.09kPa

Calibration Technician : Charlie Neil
Calibration Date : 1 Feb 2019
Secondary Check: Lewis Boorman
Report Issue Date : 6 Feb 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
Pre Adjustment	94.0	1000.0	94.4	1000.38
Post Adjustment	94.0	1000.0	94.1	1000.39

The sound calibrator has been shown to conform to the class 1 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

Generated SPL	*±0.11dB*
Frequency	*±0.01%*
Distortion	*±0.45%*

Environmental Conditions

Temperature	*±0.2°C*
Relative Humidity	*±2.4%*
Barometric Pressure	*±0.015kPa*

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.

PAGE 1 OF 1

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 Calibrator
IEC 60942-2017

Calibration Certificate

Calibration Number C18619

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

Equipment Tested/ Model Number : Pulsar Model 106
Instrument Serial Number : 81334

Atmospheric Conditions
Ambient Temperature : 24.2°C
Relative Humidity : 42.9%
Barometric Pressure : 97.69kPa

Calibration Technician : Lucky Jaiswal
Calibration Date : 22 Nov 2018
Secondary Check: Lewis Boorman
Report Issue Date : 29 Nov 2018

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 Hz	94.2	1000.35

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	*±0.48%*	*Barometric Pressure*	*±0.015kPa*

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.

NATA
WORLD RECOGNISED ACCREDITATION

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.

PAGE 1 OF 1

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 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
Calibration Date : 22 Jan 2019
Secondary Check: Lewis Boorman
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.

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.

PAGE 1 OF 1