

Rix's Creek Coal Mine

Environmental Noise Monitoring

April 2018

Prepared for

Rix's Creek Pty Limited



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

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Environmental Noise Monitoring April 2018

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Prepared for

Rix's Creek Pty Limited
PO Box 4
East Maitland NSW 2323

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322



Prepared: Tambalyn Durney
Consultant



QA Review: Amanda Borserio
Consultant

Global Acoustics Pty Ltd ~ Environmental noise modelling and impact assessment ~ Sound power testing ~ Noise control advice ~ Noise and vibration monitoring ~ OHS noise monitoring and advice ~ Expert evidence in Land and Environment and Compensation Courts ~ Architectural acoustics ~ Blasting assessments and monitoring ~ Noise management plans (NMP) ~ Sound level meter and noise logger sales and hire

EXECUTIVE SUMMARY

Global Acoustics was engaged by 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).

Attended environmental noise monitoring described in this report was undertaken during the night period of 4 April 2018. The duration of each measurement was 15 minutes.

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 Rix's Creek Noise Management Plan (NMP).

Operational Noise Assessment

Noise levels from RCM complied with relevant criteria at all monitoring locations during the April 2018 monitoring survey.

Wind speed and/or calculated temperature inversion conditions may result in development consent criteria not always being applicable.

Low Frequency Noise Assessment

A low frequency noise assessment was carried out in accordance with the EPA's Noise Policy for Industry. Low frequency modifying factors, where applicable, did not result in any exceedances of RCM noise limits during the April survey.

Global Acoustics Pty Ltd

Table of Contents

| | |
|---|-----------|
| 1 INTRODUCTION..... | 1 |
| 1.1 Background..... | 1 |
| 1.2 Attended Noise Monitoring Locations..... | 1 |
| 1.3 Terminology and Abbreviations..... | 3 |
| 2 PROJECT CONSENT AND CRITERIA..... | 4 |
| 2.1 Project Specific Criteria..... | 4 |
| 2.2 Meteorological Conditions..... | 4 |
| 2.3 Modifying Factors..... | 5 |
| 2.3.1 <i>Tonality and Intermittent Noise</i> | 5 |
| 2.3.2 <i>Low Frequency Noise</i> | 5 |
| 3 METHODOLOGY..... | 7 |
| 3.1 Overview..... | 7 |
| 3.2 Attended Noise Monitoring..... | 8 |
| 3.3 Meteorological Data..... | 8 |
| 3.4 Modifying Factors..... | 9 |
| 3.5 Attended Noise Monitoring Equipment..... | 9 |
| 4 RESULTS..... | 10 |
| 4.1 Weather Forecast and Monitoring Location Selection..... | 10 |
| 4.2 Modifying Factors..... | 10 |
| 4.3 Overall Noise Levels..... | 10 |
| 4.4 Rix's Creek North..... | 11 |
| 4.5 Rix's Creek South..... | 13 |
| 4.6 Measured Atmospheric Conditions..... | 15 |
| 5 DISCUSSION..... | 16 |
| 5.1 Noted Noise Sources..... | 16 |
| 5.1.1 <i>NM01 – 4 April 2018</i> | 18 |
| 5.1.2 <i>NM02 – 4 April 2018</i> | 19 |
| 5.1.3 <i>NM03 – 4 April 2018</i> | 20 |

| | |
|-------------------------------------|-----------|
| 5.1.4 NM05 – 4 April 2018..... | 21 |
| 5.1.5 NM08 – 4 April 2018..... | 22 |
| 5.1.6 NM09 – 4 April 2018..... | 23 |
| 5.1.7 NM10 – 4 April 2018..... | 24 |
| 6 SUMMARY OF COMPLIANCE..... | 25 |

Appendices

| | |
|--|-----------|
| A NOISE MANAGEMENT PLAN..... | 26 |
| B CALIBRATION CERTIFICATES..... | 35 |

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 Rix's Creek Noise Management Plan (NMP).

Environmental noise monitoring described in this report was undertaken during the night of 4 April 2018.

1.2 Attended Noise Monitoring Locations

In accordance with the 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 |
|------------------------|-------------------------------------|------------------|--|
| NM1 | 132/171 | Bowman | End of Glennie Street, Camberwell |
| NM2 | 91/NA | Olofsson | Glennies Creek Road, Camberwell |
| NM3 | 47/NA | Cherry | 893 Middle Falbrook Road, Middle Falbrook |
| NM4 | 19/12 | Andrews | 997 Bridgman Road, Bridgman |
| NM5 | 11/8 | Ferraro | 788 Bridgman Road, Obanvale |
| NM6 | 145/19 | Murray | 427 Bridgman Road, Obanvale |
| NM7 | NA/61 | Gardiner Circuit | McMahon Way, Singleton Heights |
| NM8 | NA/152 | Belmadar Way | Cnr Belmadar Way and Maison Dieu Road, Maison Dieu |
| NM9 | NA/121 | Llanrian Drive | Llanrian Drive, Gowrie |
| NM10 ² | NA/135 | Long Point | End of Dights Crossing Road, Maison Dieu |

Notes:

1. NA indicates location was not included in the EA for that project; and
2. An offset correction has been applied to this measurement as the actual monitoring location is closer to RCM than the area it represents.

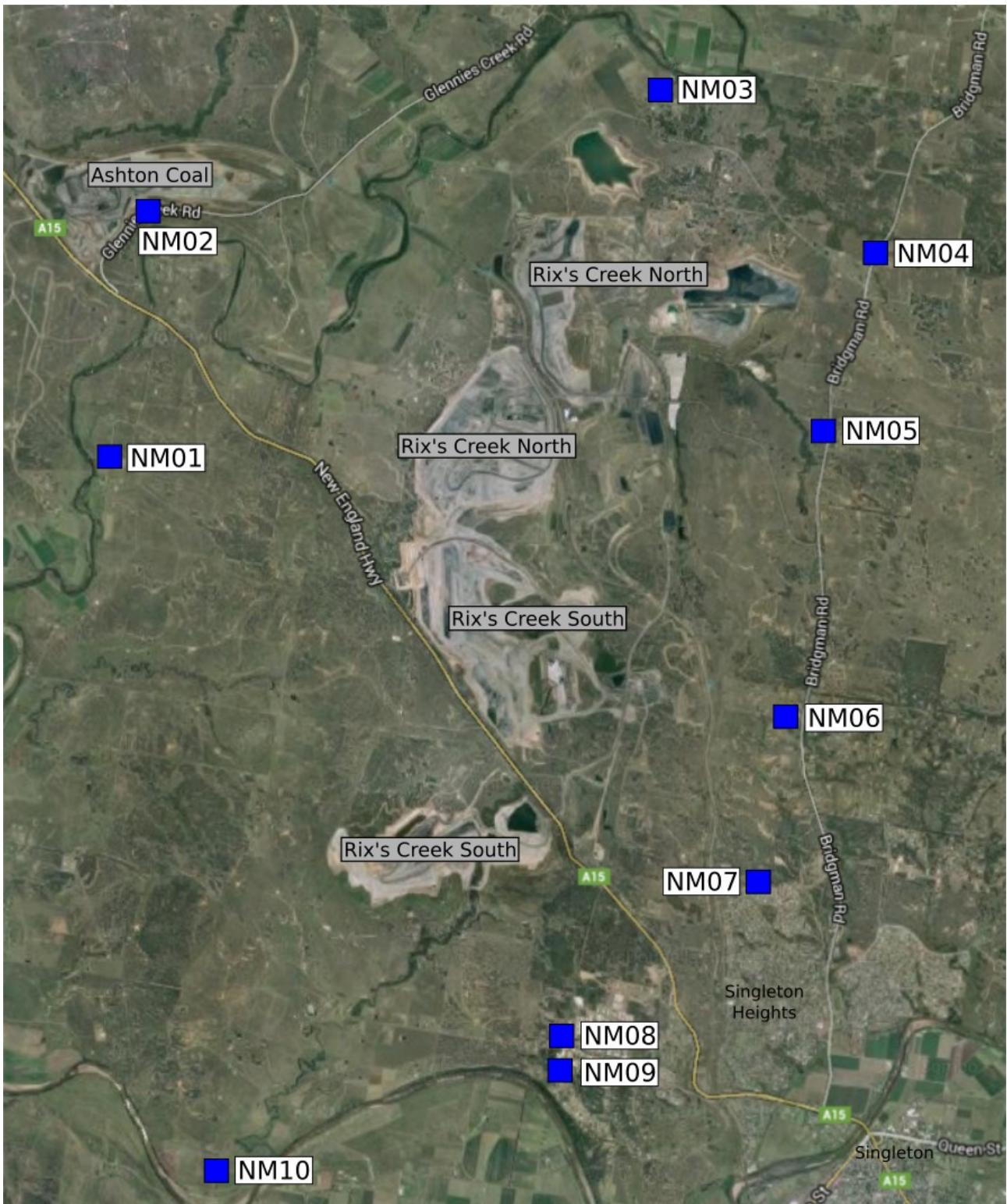


Figure 1: RCM Attended Noise Monitoring Locations

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 _{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 |
| 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

Compliance criteria are detailed in Table 2.1 and sourced from Rix's Creek NMP, approved on 19 December 2017. $L_{Aeq,15\text{minute}}$ criteria are applicable for the day (0700 to 1800), evening (1800 to 2200) and night (2200 to 0700) periods. $L_{A1,1\text{minute}}$ criteria are applicable for the night period only.

As stated in the Rix's Creek NMP, attended monitoring is to be undertaken during the night period only, with monitoring to commence at 9pm and results compared to all criteria.

Table 2.1: RIX'S CREEK IMPACT ASSESSMENT CRITERIA, dB

| Location Descriptor ID | Rix's Creek North (RCN) ^{1,3} | | Rix's Creek South (RCS) ^{1,3} | |
|------------------------|--|-------------------------|--|-------------------------|
| | $L_{Aeq,15\text{minute}}$ | $L_{A1,1\text{minute}}$ | $L_{Aeq,15\text{minute}}$ | $L_{A1,1\text{minute}}$ |
| NM1 | 38 | 48 | 40 | 48 |
| NM2 | 40 | 47 | 40 | 47 ² |
| NM3 | 39 | 45 | NA | NA |
| NM4 | 37 | 49 | 42 | 48 |
| NM5 | 41 | 47 | 42 | 48 |
| NM6 | 36 | 48 | 42 | 47 |
| NM7 | NA | NA | 40 | 45 |
| NM8 | NA | NA | 40 | 47 |
| NM9 | NA | NA | 40 | 47 |
| NM10 | 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;
2. Criterion set as for Rix's Creek North in absence of data in EIS; and
3. 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

The RCM NMP and Environment Protection License (EPL 3391) outlines required meteorological conditions for criteria to be applicable during attended noise monitoring:

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.

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. In addition, there is no equipment on site that is likely to generate tonal noise 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

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

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 $L_{A1,1\text{minute}}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or $L_{A\text{max}}$, received from the site during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

3.2 Attended Noise Monitoring

Due to the number and distance between monitoring locations in the 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

One on-site Automatic Weather Station (AWS) is currently located within each of the RCS and RCN 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.

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

For the purpose of determining valid meteorological conditions for which noise criteria apply:

- The Rix's Creek South AWS will be used for assessment of Rix's Creek South; and
- The Rix's Creek North AWS will be used for assessment of Rix's Creek North.

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 dominant low-frequency noise source.

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

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 | 701424 | 05/06/2019 |
| Rion NA-28 sound level analyser | 30131882 | 14/03/2019 |
| Pulsar 106 acoustic calibrator | P74813 | 05/06/2019 |
| Rion NC-73 acoustic calibrator | 11248300 | 10/10/2019 |

4 RESULTS

4.1 Weather Forecast and Monitoring Location Selection

On the night environmental monitoring was conducted, enhancement was predicted to the West and South-West. As a result, check monitoring was conducted at NM05 to the East, followed by monitoring at NM01, NM02, NM03, NM08, NM09 and NM10.

4.2 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 noise sources from site during the survey. In addition, there is no equipment on site that is likely to generate tonal noise as defined in the NPfI. 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 Overall 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 2018¹

| 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 | 04/04/2018 21:39 | 52 | 43 | 40 | 37 | 38 | 35 | 33 | 57 |
| NM02 | 04/04/2018 21:09 | 55 | 52 | 46 | 41 | 43 | 36 | 29 | 56 |
| NM03 | 04/04/2018 21:26 | 48 | 39 | 33 | 30 | 31 | 27 | 25 | 50 |
| NM05 | 04/04/2018 21:04 | 48 | 43 | 35 | 28 | 33 | 26 | 23 | 45 |
| NM08 | 04/04/2018 22:22 | 49 | 46 | 41 | 37 | 38 | 33 | 31 | 58 |
| NM09 | 04/04/2018 21:59 | 49 | 41 | 38 | 36 | 36 | 34 | 31 | 57 |
| NM10 | 04/04/2018 22:44 | 62 | 36 | 33 | 31 | 33 | 28 | 26 | 54 |

Notes:

1. Levels in this table are not necessarily the result of activity at RCM; and
2. All measurements are 15 minutes duration.

4.4 Rix's Creek North

Noise levels generated by activity at RCN are shown in Table 4.2 and Table 4.3. Table 4.2 compares measured levels with $L_{Aeq,15\text{minute}}$ impact assessment 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 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY RCN AGAINST IMPACT ASSESSMENT CRITERIA – APRIL 2018

| Location | Start Date and Time | Wind Speed m/s | Wind Direction | VTG °C/100m ¹ | $L_{Aeq,15\text{min}}$ Criterion dB ⁶ | Criterion Applies? ^{2,6} | RCN $L_{Aeq,15\text{min}}$ dB ^{3,4,5} | Exceedance ⁶ |
|----------|---------------------|----------------|----------------|--------------------------|--|-----------------------------------|--|-------------------------|
| NM01 | 04/04/2018 21:39 | 3.3 | 158 | -1.0 | 38 | No | IA | NA |
| NM02 | 04/04/2018 21:09 | 3.2 | 136 | -1.0 | 40 | No | NM | NA |
| NM03 | 04/04/2018 21:26 | 3.0 | 138 | -1.0 | 39 | No | 28 | NA |
| NM05 | 04/04/2018 21:04 | 3.7 | 135 | -1.0 | 41 | No | IA | NA |
| NM08 | 04/04/2018 22:22 | 2.6 | 160 | -1.0 | NA | Yes | IA | Nil |
| NM09 | 04/04/2018 21:59 | 2.6 | 136 | -1.0 | NA | Yes | IA | Nil |
| NM10 | 04/04/2018 22:44 | 2.4 | 148 | -1.0 | NA | Yes | IA | Nil |

Notes:

1. Sigma theta data used to calculate Vertical Temperature Gradient (VTG) in accordance with procedures outlined in the NPfI;
2. Noise emission criteria apply for winds up to 3 metres per second (at a height of 10 metres); or temperature inversion conditions up to 3°C/100m and wind speeds up to 2 metres per second;
3. These are results for RCN in the absence of all other noise sources;
4. NM denotes audible but not measurable, IA denotes inaudible;
5. Bold results in red are those greater than the relevant criterion (if applicable);
6. 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, NA in $L_{Aeq,15\text{minute}}$ criterion column means criterion not specified for this location; and
7. An offset correction of -1.3dB has been applied to the measurement at NM09 where audible and measurable.

Table 4.3 compares measured levels with RCN $L_{A1,1\text{minute}}$ impact assessment criteria. Criteria are then applied if weather conditions are in accordance with relevant limits.

Table 4.3: $L_{A1,1\text{minute}}$ GENERATED BY RCN AGAINST IMPACT ASSESSMENT CRITERIA – APRIL 2018

| Location | Start Date and Time | Wind Speed m/s | Wind Direction | VTG °C/100m ¹ | $L_{A1,1\text{min}}$ Criterion dB ⁶ | Criterion Applies? ^{2,6} | RCN $L_{A1,1\text{min}}$ dB ^{3,4,5} | Exceedance ⁶ |
|----------|---------------------|----------------|----------------|--------------------------|--|-----------------------------------|--|-------------------------|
| NM01 | 04/04/2018 21:39 | 3.3 | 158 | -1.0 | 48 | No | IA | NA |
| NM02 | 04/04/2018 21:09 | 3.2 | 136 | -1.0 | 47 | No | NM | NA |
| NM03 | 04/04/2018 21:26 | 3.0 | 138 | -1.0 | 45 | No | 30 | NA |
| NM05 | 04/04/2018 21:04 | 3.7 | 135 | -1.0 | 47 | No | IA | NA |
| NM08 | 04/04/2018 22:22 | 2.6 | 160 | -1.0 | NA | Yes | IA | Nil |
| NM09 | 04/04/2018 21:59 | 2.6 | 136 | -1.0 | NA | Yes | IA | Nil |
| NM10 | 04/04/2018 22:44 | 2.4 | 148 | -1.0 | NA | Yes | IA | Nil |

Notes:

1. Sigma theta data used to calculate Vertical Temperature Gradient (VTG) in accordance with procedures detailed in the NPfI;
2. Noise emission criteria apply for winds up to 3 metres per second (at a height of 10 metres); or temperature inversion conditions up to 3°C/100m and wind speeds up to 2 metres per second;
3. These are results for RCN in the absence of all other noise sources;
4. NM denotes audible but not measurable, IA denotes inaudible;
5. Bold results in red are those greater than the relevant criterion (if applicable);
6. 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, NA in $L_{Aeq,15\text{minute}}$ criterion column means criterion not specified for this location; and
7. An offset correction of -1.3dB has been applied to the measurement at NM09 where audible and measurable.

4.5 Rix's Creek South

Noise levels generated by activity at RCS are shown in Table 4.4 and Table 4.5. Table 4.4 compares measured levels with $L_{Aeq,15\text{minute}}$ impact assessment 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 4.4: $L_{Aeq,15\text{minute}}$ GENERATED BY RCS AGAINST IMPACT ASSESSMENT CRITERIA – APRIL 2018

| Location | Start Date and Time | Wind Speed m/s | Wind Direction | VTG °C/100m ¹ | $L_{Aeq,15\text{min}}$ Criterion dB | Criterion Applies? ^{2,6} | RCS $L_{Aeq,15\text{min}}$ dB _{3,4,5} | Exceedance ⁶ |
|----------|---------------------|----------------|----------------|--------------------------|-------------------------------------|-----------------------------------|--|-------------------------|
| NM01 | 04/04/2018 21:39 | 1.4 | 138 | 3.0 | 40 | No | IA | NA |
| NM02 | 04/04/2018 21:09 | 1.2 | 138 | 0.5 | 40 | Yes | IA | Nil |
| NM03 | 04/04/2018 21:26 | 1.4 | 137 | 3.0 | NA | No | IA | NA |
| NM05 | 04/04/2018 21:04 | 1.2 | 138 | 0.5 | 42 | Yes | IA | Nil |
| NM08 | 04/04/2018 22:22 | 1.2 | 143 | 0.5 | 40 | Yes | <30 | Nil |
| NM09 | 04/04/2018 21:59 | 1.2 | 144 | 3.0 | 40 | No | 31 | NA |
| NM10 | 04/04/2018 22:44 | 1.1 | 140 | 3.0 | 40 | No | 30 | NA |

Notes:

1. Sigma theta data used to calculate Vertical Temperature Gradient (VTG) in accordance with procedures detailed in the NPfI;
2. Noise emission criteria apply for winds up to 3 metres per second (at a height of 10 metres); or temperature inversion conditions up to 3°C/100m and wind speeds up to 2 metres per second;
3. These are results for RCS in the absence of all other noise sources;
4. NM denotes audible but not measurable, IA denotes inaudible;
5. Bold results in red are those greater than the relevant criterion (if applicable);
6. 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, NA in $L_{Aeq,15\text{minute}}$ criterion column means criterion not specified for this location; and
7. An offset correction of -1.3dB has been applied to the measurement at NM09 where audible and measurable.

Table 4.5 compares measured levels with RCS $L_{A1,1\text{minute}}$ impact assessment criteria. Criteria are then applied if weather conditions are in accordance with relevant limits.

Table 4.5: $L_{A1,1\text{minute}}$ GENERATED BY RCS AGAINST IMPACT ASSESSMENT CRITERIA – APRIL 2018

| Location | Start Date and Time | Wind Speed m/s | Wind Direction | VTG °C/100m ¹ | $L_{A1,1\text{min}}$ Criterion dB | Criterion Applies? ^{2,6} | RCS $L_{A1,1\text{min}}$ dB ^{3,4,5} | Exceedance ⁶ |
|----------|---------------------|----------------|----------------|--------------------------|-----------------------------------|-----------------------------------|--|-------------------------|
| NM01 | 04/04/2018 21:39 | 1.4 | 138 | 3.0 | 48 | No | IA | NA |
| NM02 | 04/04/2018 21:09 | 1.2 | 138 | 0.5 | 47 | Yes | IA | Nil |
| NM03 | 04/04/2018 21:26 | 1.4 | 137 | 3.0 | NA | No | IA | NA |
| NM05 | 04/04/2018 21:04 | 1.2 | 138 | 0.5 | 48 | Yes | IA | Nil |
| NM08 | 04/04/2018 22:22 | 1.2 | 143 | 0.5 | 47 | Yes | 35 | Nil |
| NM09 | 04/04/2018 21:59 | 1.2 | 144 | 3.0 | 47 | No | 33 | NA |
| NM10 | 04/04/2018 22:44 | 1.1 | 140 | 3.0 | 47 | No | 36 | NA |

Notes:

1. Sigma theta data used to calculate Vertical Temperature Gradient (VTG) in accordance with procedures detailed in the NPfI;
2. Noise emission criteria apply for winds up to 3 metres per second (at a height of 10 metres); or temperature inversion conditions up to 3°C/100m and wind speeds up to 2 metres per second;
3. These are results for RCS in the absence of all other noise sources;
4. NM denotes audible but not measurable, IA denotes inaudible;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in criterion applies and exceedance columns mean atmospheric conditions outside conditions specified or limits not available for that location and so criterion is not applicable, NA in $L_{Aeq,15\text{minute}}$ criterion column means criterion not specified for this location; and
7. An offset correction of -1.3dB has been applied to the measurement at NM09 where audible and measurable.

4.6 Measured Atmospheric Conditions

Atmospheric condition data measured by the operator at each location using a Kestrel hand-held weather meter is shown in Table 4.6. Atmospheric condition data is routinely recorded during each measurement to show conditions during the monitoring period. The wind speed, direction and temperature were measured at 1.8 metres.

Table 4.6: MEASURED ATMOSPHERIC CONDITIONS – APRIL 2018^{1,2}

| Location | Start Date and Time | Temperature degrees C | Wind Speed m/s | Wind Direction Degrees | Cloud Cover 1/8s |
|----------|---------------------|-----------------------|----------------|------------------------|------------------|
| NM01 | 04/04/2018 21:39 | 19 | 1.2 | 190 | 0 |
| NM02 | 04/04/2018 21:09 | 20 | 0 | 0 | 0 |
| NM03 | 04/04/2018 21:26 | 21 | 0 | 0 | 0 |
| NM05 | 04/04/2018 21:04 | 19 | 1.2 | 190 | 0 |
| NM08 | 04/04/2018 22:22 | 22 | 0.4 | 110 | 0 |
| NM09 | 04/04/2018 21:59 | 22 | 0.3 | 160 | 0 |
| NM10 | 04/04/2018 22:44 | 20 | 0.4 | 120 | 0 |

Notes:

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

Weather station data from RCN and RCS is used to determine compliance with specified noise criteria.

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 to Table 4.5 present data gathered during attended monitoring. These noise levels are the result of many sounds reaching the sound level meter microphone during monitoring. Received levels from various noise sources were noted during attended monitoring and particular attention was paid to the extent of RCM's contribution, if any, to measured levels. At each receptor location, RCM's $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

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} .

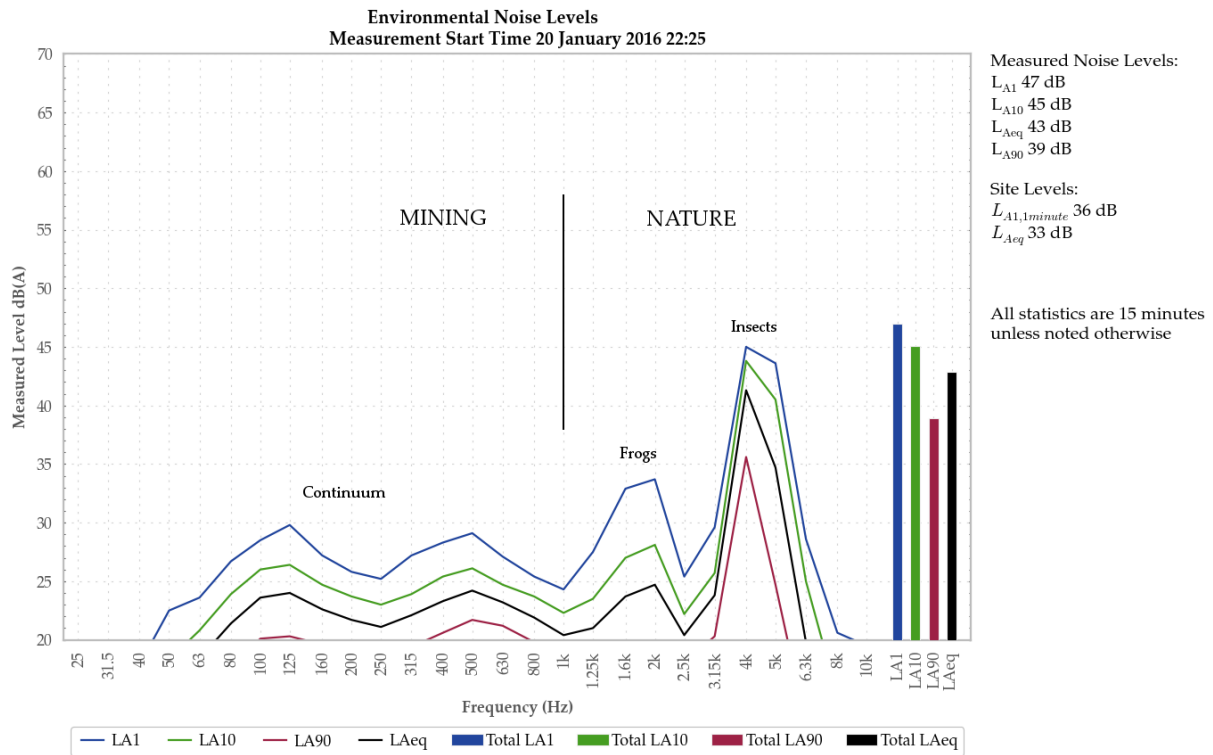


Figure 2: Sample graph (see Section 5.1 for explanation)

5.1.1 NM01 – 4 April 2018

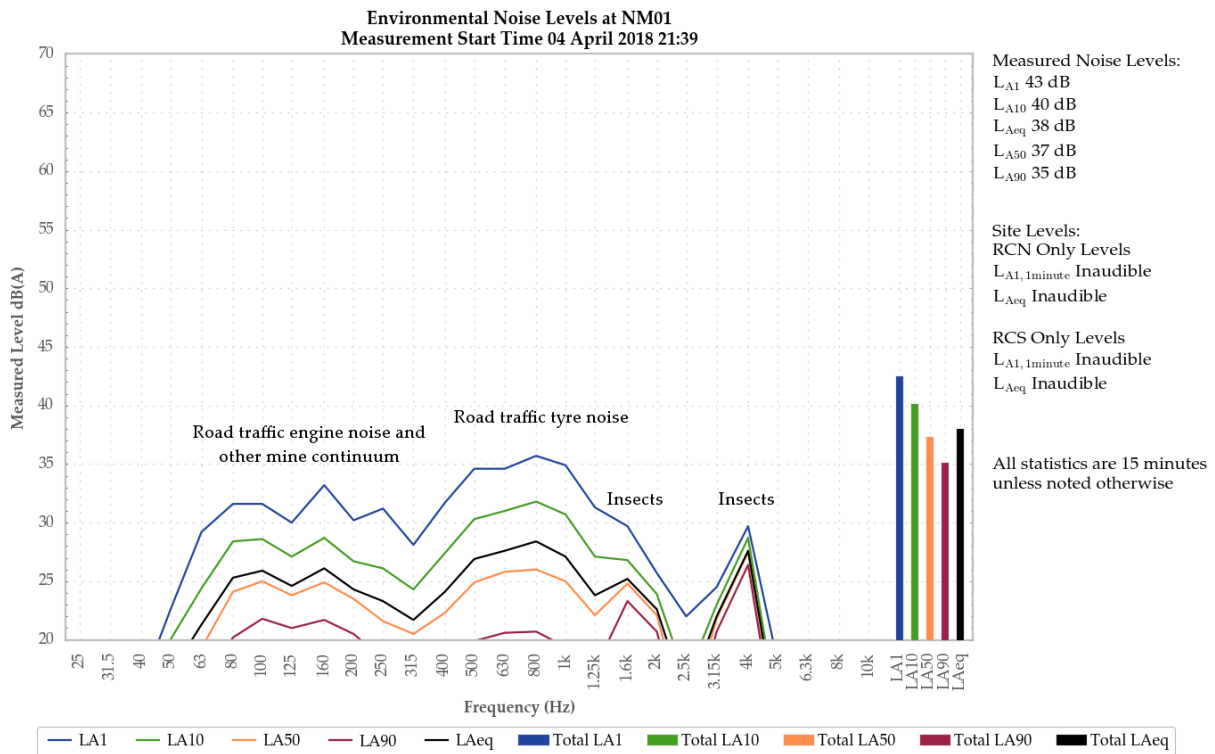


Figure 3: Environmental Noise Levels, NM01 – End of Glennie Street, Camberwell

RCM was inaudible.

Road traffic noise primarily generated the measured LA1 and LA10. Road traffic noise and insects generated the LAeq and LA50. Insects generated the measured LA90.

Cows were also noted.

5.1.2 NM02 – 4 April 2018

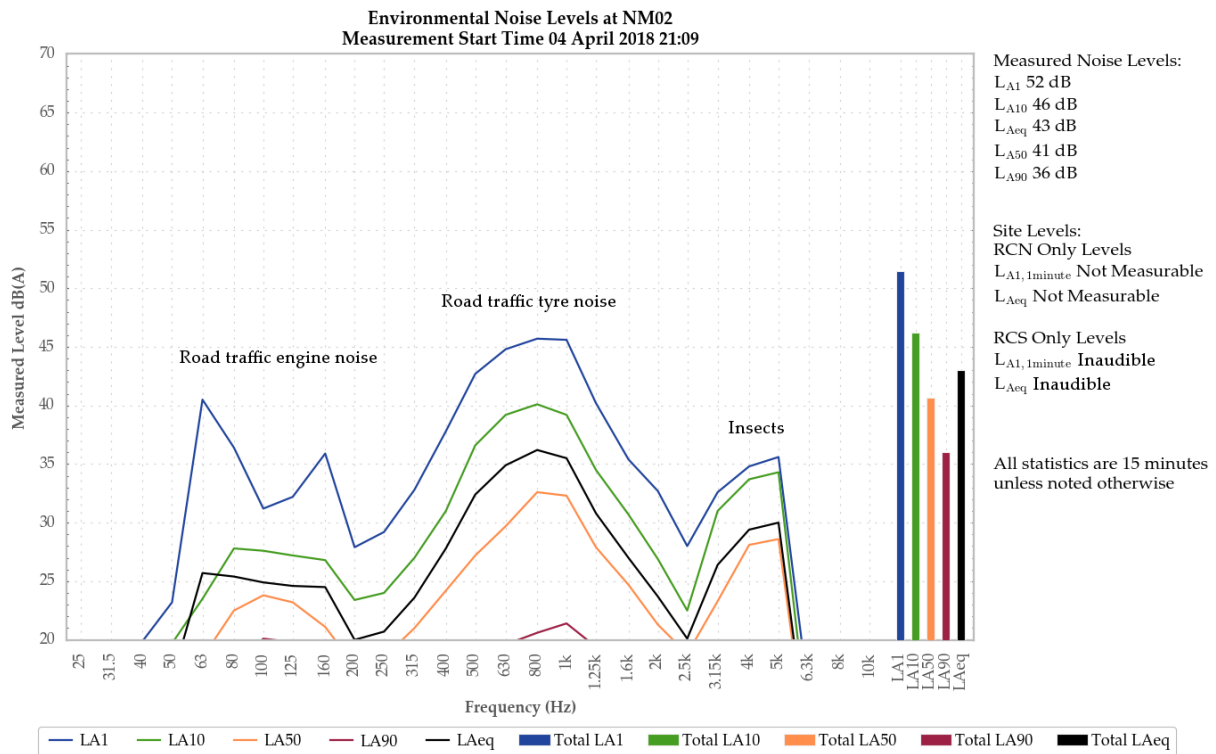


Figure 4: Environmental Noise Levels, NM02 – Glennies Creek Road, Camberwell

RCN was audible briefly as a continuum, but this contribution was not measurable.

RCS was inaudible.

Road traffic tyre noise and insects primarily generated measured levels.

Other mine continuum and bats were also noted.

5.1.3 NM03 – 4 April 2018

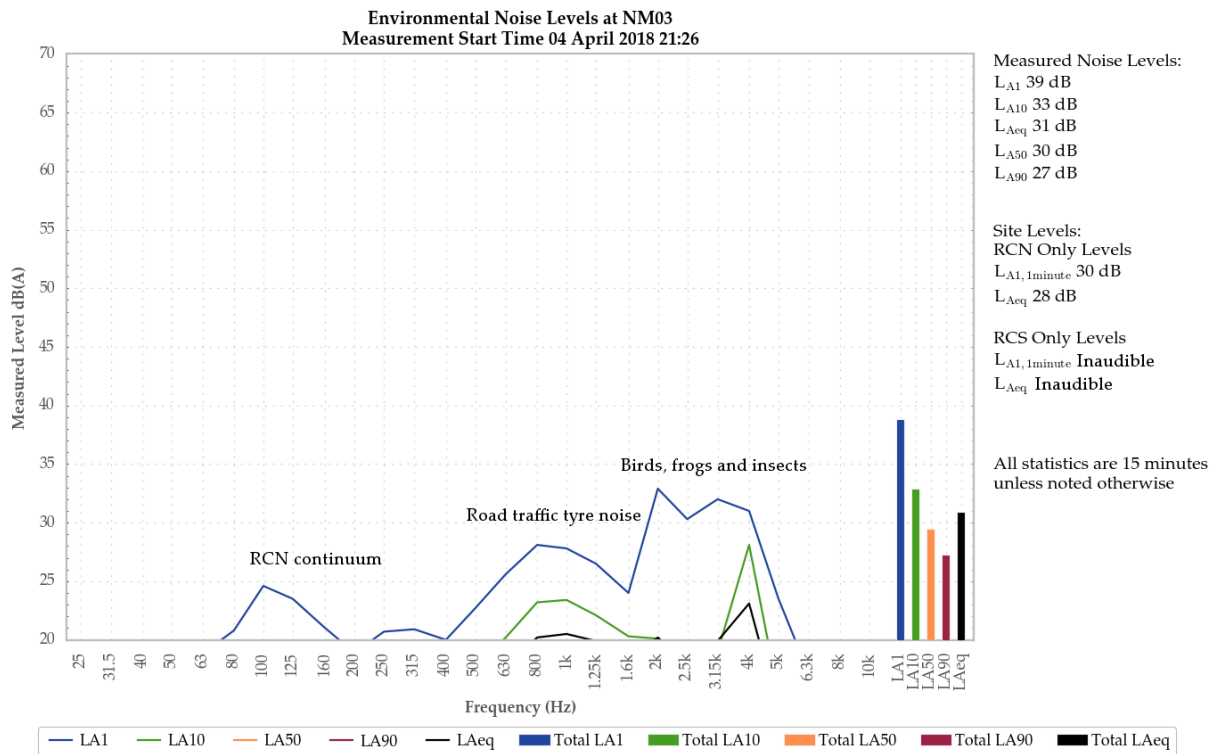


Figure 5: Environmental Noise Levels, NM03 – 893 Middle Falbrook Road, Middle Falbrook

RCN was audible as an engine continuum with regular surges, generating the site only LAeq of 28 dB and LA1,1minute of 30 dB.

RCS was inaudible.

Frogs and insects were primarily responsible for all measured levels.

Road traffic noise, aircraft, and nearby generator were also noted.

5.1.4 NM05 – 4 April 2018

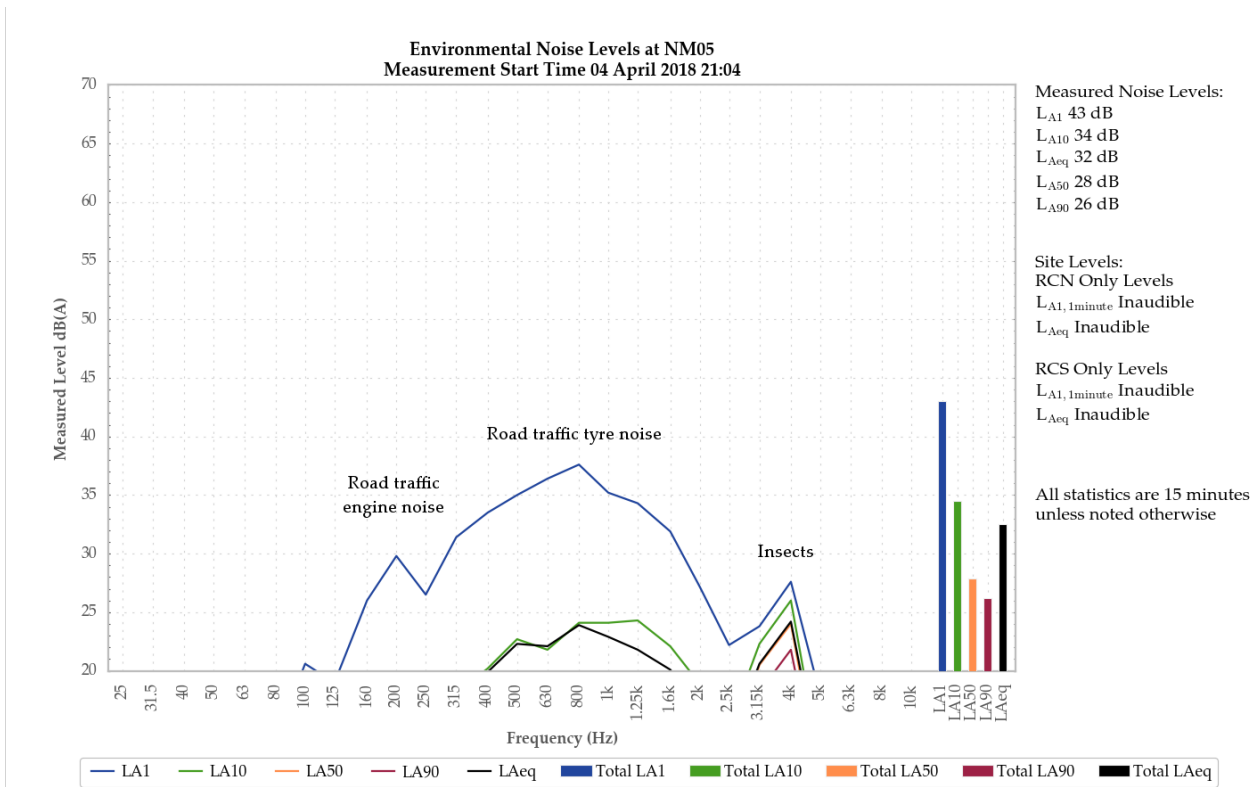


Figure 6: Environmental Noise Levels, NM05 – 788 Bridgman Road, Bridgman

RCM was inaudible during the measurement.

Road traffic and tyre noise generated the measured LA1. Insects primarily generated the measured LA10, LA50, LA90, and LAeq with minor contribution from road traffic.

Breeze and cows were also noted.

5.1.5 NM08 – 4 April 2018

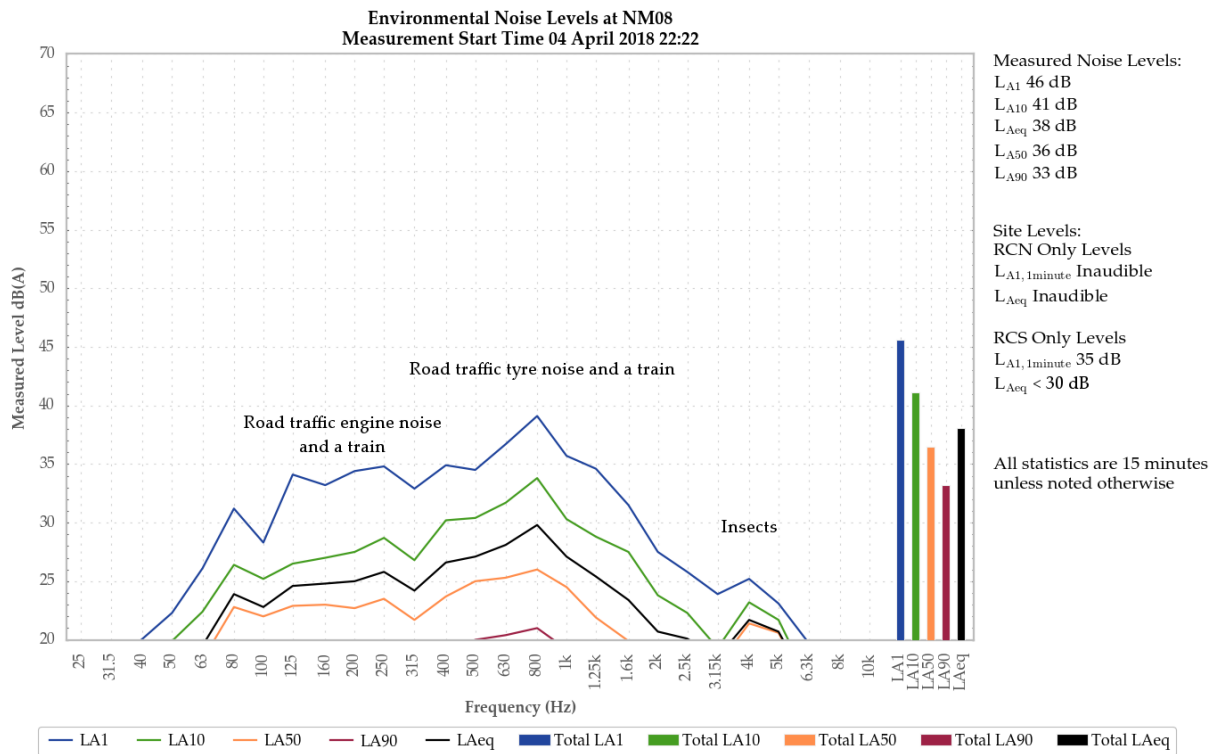


Figure 7: Environmental Noise Levels, NM08 – Crn Belmadar Way and Maison Dieu Road, Maison Dieu

RCN was inaudible.

Exhaust and engine surges were audible at times from RCS and generated the site only LAeq of less than 30 dB and an LA1,minute of 35 dB.

Road traffic and a train were primarily responsible for the measured levels.

Frogs, insects and birds were also noted.

5.1.6 NM09 – 4 April 2018

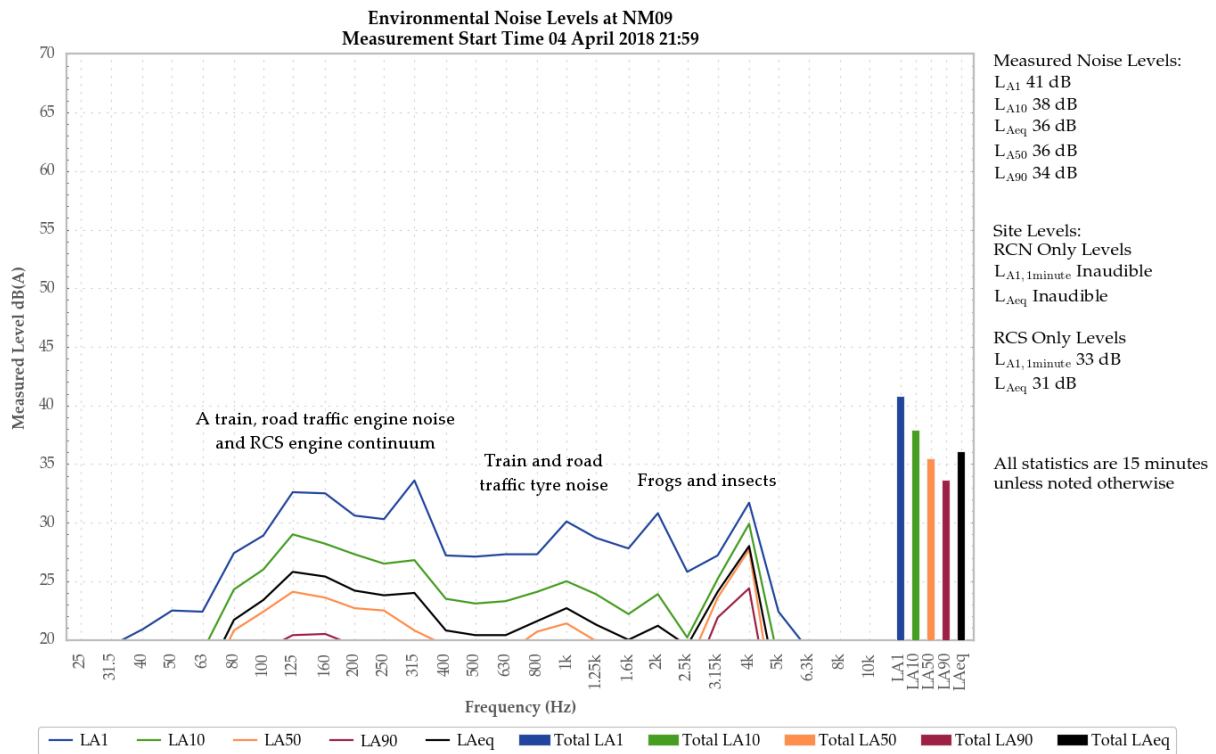


Figure 8: Environmental Noise Levels, NM09 – Llanrian Drive, Gowrie

RCN was inaudible.

Exhaust and engine noise/continuum from RCS generated a site only LAeq of 31 dB and an LA1,minute of 33 dB. A horn was also noted.

A train, road traffic, frogs and insects all combined to generate the measured LA1, LA10 and LAeq. Insects and RCS were primarily responsible for the measured LA90.

Birds were also noted.

5.1.7 NM10 – 4 April 2018

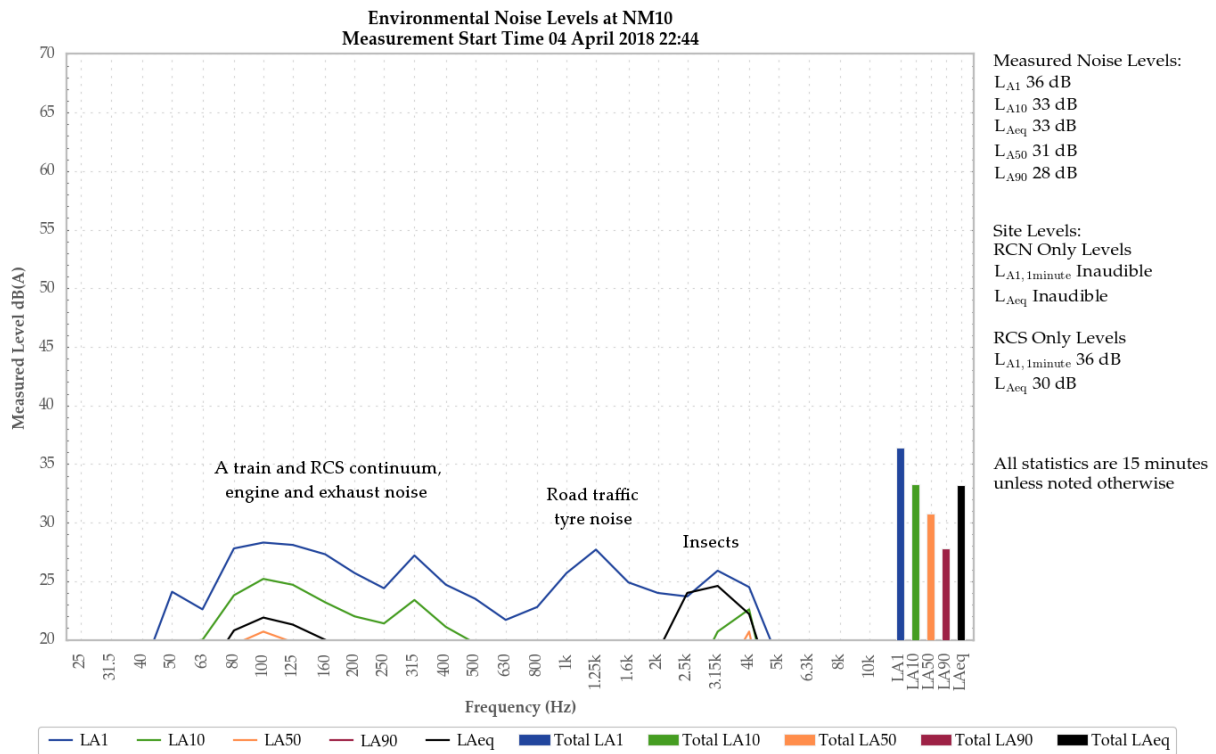


Figure 9: Environmental Noise Levels, NM10 – End of Dights Crossing Road, Maison Dieu

RCN was inaudible.

A continuum, engine and exhaust noise from RCS generated a site only LAeq of 30 dB. An exhaust surge generated the site only LA1,minute of 36 dB.

A train and road traffic tyre noise were primarily responsible for the measured LA1. A train combined with insects to generate the measured LA10 and LAeq. RCS and insects generated the LA50 and LA90.

Dogs were also noted.

6 SUMMARY OF COMPLIANCE

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

Environmental noise monitoring described in this report was undertaken during the night of 4 April 2018. 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 Rix's Creek Noise Management Plan (NMP).

Noise levels from RCM complied with relevant criteria at all monitoring locations during the April 2018 monitoring survey. Wind speed and/or calculated temperature inversion conditions may result in criteria not always being applicable.

Global Acoustics Pty Ltd

APPENDIX

A *NOISE MANAGEMENT PLAN*

5. Attended Noise Compliance Monitoring

5.1.1 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 2 of the Rix's 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.

5.1.2 FREQUENCY

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

5.1.3 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 ($L_{Aeq} < \text{criterion} - 2 \text{ dB}$), 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 ($L_{Aeq} \geq \text{criterion} - 2 \text{ dB}$), 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 5.1.7 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 5.1.7 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 (ICO) / M (RCM) |
| NM02 | 91/NA | Olofsson | 4 (ICO) |
| NM03 | 47/NA | Cherry | B, C, F, 1, 6 and 12 (ICO) |
| NM04 | 19/12 | Andrews | 11 and A (ICO) / A (RCM) |
| NM05 | 11/8 | Ferraro | 10 and 11 (ICO) / A (RCM) |
| NM06 | 145/19 | Murray | 9 (ICO) / B and C (RCM) |
| NM07 | NA/61 | Gardiner Circuit | 8 (ICO) / D and E (RCM) |
| NM08 | NA/152 | Belmadar Way | NA / J, G and F (RCM) |
| NM09 | NA/121 | Llanrian Drive | NA / H (RCM) |
| NM10 | NA/135 | Long Point | NA / K and I (RCM) |

- 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.

Figure 5-1 illustrates attended monitoring locations.

5.1.4 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 30C/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 procedures and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy.

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 LAeq and/or LCeq spectrum.

5.1.5 METEOROLOGICAL MONITORING

One on-site Automatic Weather Station (AWS) is currently located within each of the Rixs Creek South and Rixs Creek North mining lease areas. Each complies with AS2923-1987 Ambient Air – Guide for measurement of horizontal wind for air quality applications and the INP. These AWS provide representative weather data for the Mine including wind speed and direction, sigma theta, solar radiation, 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 Rixs Creek South AWS will be used for assessment of Rixs Creek South; and
- The Rixs Creek North AWS will be used for assessment of Rix's Creek North.

5.1.6 DATA TO BE COLLECTED

Data shall be collected in 15 minute periods and the Mine only LAeq 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.

5.1.7 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.

5.1.8 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 $L_{Aeq,15\text{minute}}$ intrusive noise criteria are based on proposed criteria nominated in the EIS. $L_{A1,1\text{minute}}$ criteria are based on sleep disturbance criteria for the relevant NAG derived in the EIS.

$L_{Aeq,15\text{minute}}$ 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. $L_{A1,1\text{minute}}$ criteria are applicable for the night period only.

Table 5-7 Compliance Criteria

| NMP ID | EA Ref. (ICO/RCM) ¹ | Rix's Creek North | | Rixs Creek South | |
|--------|--------------------------------|------------------------------|----------------------------|------------------------------|----------------------------|
| | | $L_{Aeq,15\text{minute}}$ dB | $L_{A1,1\text{minute}}$ dB | $L_{Aeq,15\text{minute}}$ dB | $L_{A1,1\text{minute}}$ dB |
| NM01 | 132/171 | 38 | 48 | 40 | 48 |
| NM02 | 91/NA | 40 | 47 | 40 | 47 ¹ |
| NM03 | 47/NA | 39 | 45 | NA | NA |
| NM04 | 19/12 | 37 | 49 | 42 | 48 |
| NM05 | 11/8 | 41 | 47 | 42 | 48 |
| NM06 | 145/19 | 36 | 48 | 42 | 47 |
| NM07 | NA/61 | NA | NA | 40 | 45 |
| NM08 | NA/152 | NA | NA | 40 | 47 |
| NM09 | NA/121 | NA | NA | 40 | 47 |
| NM10 | NA/135 | 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.

5.1.9 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 5.1.7 shall be reported to DP&E and the affected community as per the notification requirements.

5.1.10 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 advice of the problem and discuss possible changes to operations that should lead to compliance. A remeasure is required to evaluate the effectiveness of any change implemented as outlined in Section 5.1.7, 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: Senior Environmental Officer or Environmental Officer

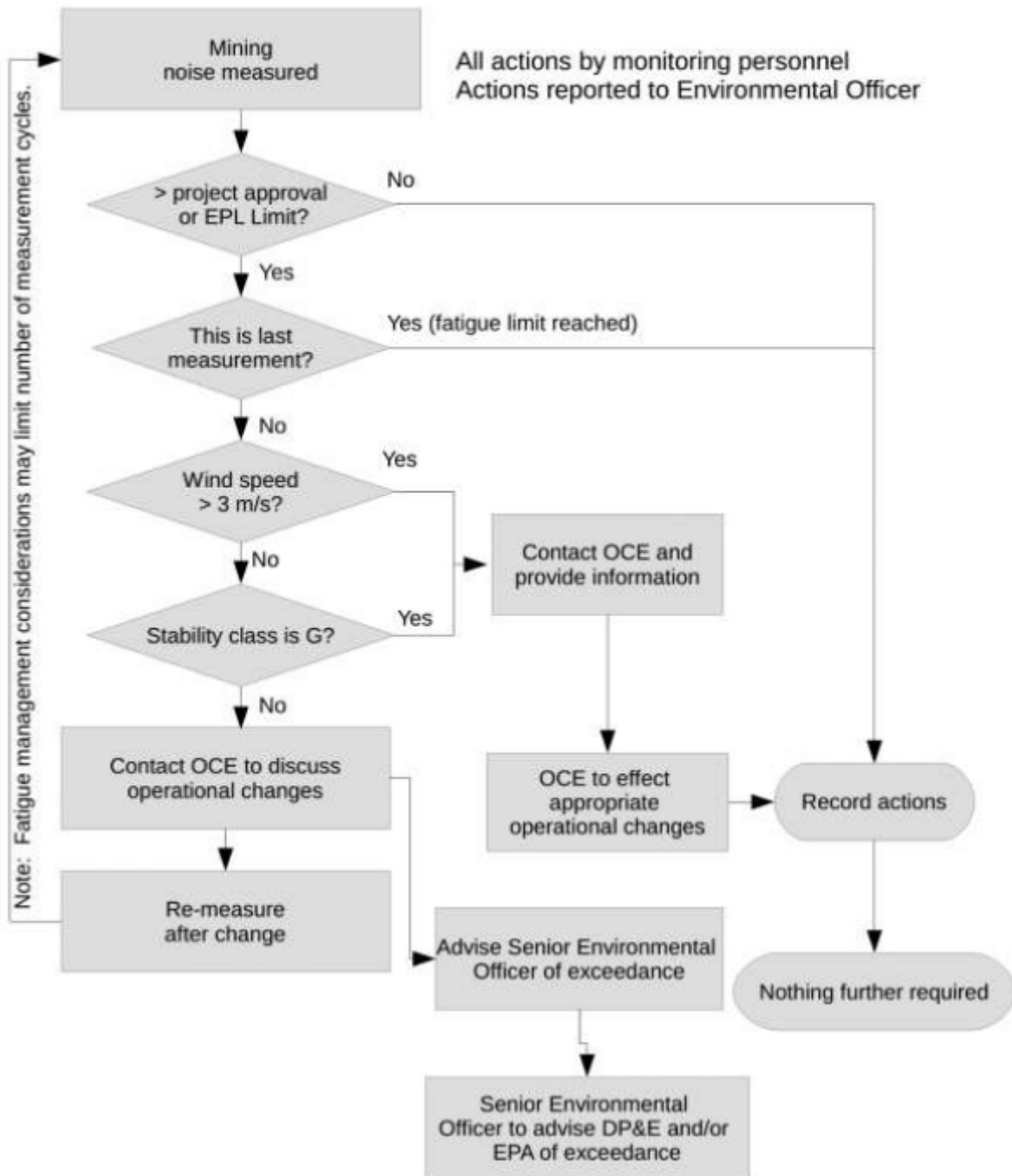
Timing: Each event

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 Officer


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

Figure 6-5 Attended Monitoring Exceedance Procedure



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

Octave Band Filter AS 4476:1997 Calibration Certificate

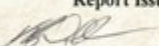
Calibration Number C17248A

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

Filter Model Number : Rion NA-28
Filter Serial Number : N/A
Instrument Serial Number : 00701424
Microphone Serial Number : 01916
Pre-amplifier Serial Number : 01463

Atmospheric Conditions
Ambient Temperature : 24.4°C
Relative Humidity : 39%
Barometric Pressure : 99.78kPa

Calibration Technician : Vicky Jaiswal **Secondary Check:** Nick Williams
Calibration Date : 05/06/2017 **Report Issue Date :** 06/06/2017


Approved Signatory :  Ken Williams

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

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

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

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



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PAGE 1 OF 1



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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 C17126

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

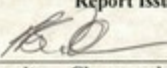
Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 30131882
Microphone Serial Number : 04739
Pre-amplifier Serial Number : 11942

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

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

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

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

Approved Signatory : 

Ken Williams

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

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

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

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

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



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PAGE 1 OF 1



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Sound Calibrator

IEC 60942-2004

Calibration Certificate

Calibration Number C17249

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

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

Atmospheric Conditions

Ambient Temperature : 24.3°C
Relative Humidity : 38.9%
Barometric Pressure : 99.96kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017
Secondary Check: Nick Williams
Report Issue Date : 06/06/2017

Approved Signatory :  Ken Williams

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

| | Nominal Level | Nominal Frequency | Measured Level | Measured Frequency |
|-----------------|---------------|-------------------|----------------|--------------------|
| Measured Output | 94.0 | 1000.0 | 93.8 | 1000.33 |

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

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

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

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PAGE 1 OF 1



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Sound Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C17511

Client Details Acoustic Research Labs Pty Ltd
Level 7, Bld 2, 423 Pennant Hills Road
Pennant Hills NSW 2120

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

Atmospheric Conditions

Ambient Temperature : 22.8°C
Relative Humidity : 49.8%
Barometric Pressure : 99.46kPa

Calibration Technician : Jason Gomes
Calibration Date : 10/10/2017
Secondary Check: Riley Cooper
Report Issue Date : 11/10/2017

Approved Signatory :

Ken Williams

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

| | Nominal Level | Nominal Frequency | Measured Level | Measured Frequency |
|-----------------|---------------|-------------------|----------------|--------------------|
| Measured Output | 94.0 | 1000.0 | 94.2 | 1004.10 |

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

Least Uncertainties of Measurement -

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

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

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



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PAGE 1 OF 1