Ashton Coal

Monthly attended noise monitoring - June 2026

Prepared for Ashton Coal Operations Pty Ltd

June 2026

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E251266 RP6

June 2026

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Approved by

Robert Kirwan
Senior Associate – Team Leader
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Level 3 175 Scott Street
Newcastle NSW 2300
ABN: 28 141 736 558

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Tables

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1 Introduction

1.1 Background

EMM Consulting Pty Limited (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal Operations (Ashton Coal, the site) located at Glennies Creek Road, Camberwell NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

Attended environmental noise monitoring described in this report was done during the night period of Thursday 18 June 2026 at three monitoring locations.

1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor/ID	Description/address	Coordinates (GDA94 MGA Zone 56)	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north-east)	320554	6405839
N4	South of New England Highway	319776	6404101

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Source: EMM (2019); DFSI (2017); GA (2011)

0 1 2 km
GDA 1994 MGA Zone 56 N

KEY

- Site boundary
- Noise monitoring location
- Meteorological station
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Cadastral boundary

Noise monitoring locations and Ashton colliery boundary

Ashton Coal
Monthly attended noise monitoring
Figure 1.1

EMM creating opportunities

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

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for 1% of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for 1% of the specified time period of one minute.
L_{A10}	The A-weighted noise level which is exceeded for 10% of the time.
L_{Aeq}	The energy average A-weighted noise level.
L_{A50}	The A-weighted noise level which is exceeded for 50% of the time, and is also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90% of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure are measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres (m).
VTG	The vertical temperature gradient in degrees Celsius per 100 m altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday–Saturday: 7:00 am to 6:00 pm, on Sundays and public holidays: 8:00 am to 6:00 pm.
Evening	Monday–Saturday: 6:00 pm to 10:00 pm, on Sundays and public holidays: 6:00 pm to 10:00 pm.
Night	Monday–Saturday: 10:00 pm to 7:00 am, on Sundays and public holidays: 10:00 pm to 8:00 am.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.

Appendix A provides further information that gives an indication as to how an average person perceives changes in noise level, and examples of common noise levels.

2 Noise limits

2.1 Development consent

Ashton Coal noise limits are provided in Table 1, Condition 2 of Appendix 6 of the current development consent 309-11-2001-i (DC) dated 6 July 2022. Relevant sections of the DC are reproduced in Appendix B.1.

2.2 Environment protection licence

Ashton Coal noise limits are provided in Condition L4.1 of the current EPL 11879 (EPL) dated 20 August 2025. Relevant sections of the EPL are reproduced in Appendix B.2.

2.3 Noise management plan

The approved current NMP (dated April 2023) adopts three attended noise monitoring locations that are representative of residences outlined in the DC and EPL. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limits

Noise limits based on the NMP and consistent with the DC and EPL are as shown in Table 2.1.

Table 2.1 Noise impact limits, dB

Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
N2	38	38	36	46
N3	38	38	36	46
N4	38	38	36	46

2.5 Meteorological conditions

The DC and EPL specify the following meteorological conditions under which noise limits do not apply during:

- periods of rain or hail
- average wind speed at microphone height exceeds 5 metres per second (m/s)
- wind speeds are greater than 3 m/s at 10 m above ground level
- temperature inversion conditions are greater than 3 °C/100 m.

2.6 Additional considerations

Monitoring and reporting have been done in accordance with the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017 and the 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055:2018 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the Ashton Coal on-site weather station (AWS) which allowed the correlation of atmospheric parameters with measured noise levels.

3.2 Attended noise monitoring

Attended noise monitoring was done during the night period at each location. The duration of each measurement was 15 minutes. Atmospheric conditions (at microphone height) were measured at each monitoring location.

Measured sound levels from various sources were noted during each measurement, and particular attention was paid to the extent of site contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, it was inaudible at the monitoring location. When site noise is noted as NM, this means it was audible but could not be quantified. All results noted as IA or NM in this report were due to one or more of the following:

- Site noise levels were very low, typically more than 10 dB below the measured background (L_{A90}), and unlikely to be noticed.
- Site noise levels were masked by more dominant sources that are characteristic of the environment (such as breeze in foliage or continuous road traffic noise) that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods, such as to move closer and back calculate. Cases may include 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.

If exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range but were determined to be at least 5 dB lower than relevant limits, then a maximum estimate may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

As per EPL Condition L4.4, this assessment determined stability categories for the attended monitoring period using the direct measurement method as per Fact Sheet D of the Noise Policy for Industry (2017).

The temperature lapse rate was calculated using data from two weather stations; Sentinex Unit 41 weather station (M1) located in Camberwell Village and Ashton Coal 'repeater' weather station (M2 – the site AWS) located in the north-eastern open cut area as shown in Figure 1.1. This was calculated for each 15-minute measurement using the following formula:

$$\text{Temperature lapse rate} = (\Delta T) \times (100/(\Delta H))$$

Where:

- ΔT = temperature measured at M2 (at 10 m above local ground level) minus temperature measured at M1 (at 10 m above local ground level).
- ΔH = the vertical height difference between M2 and M1 (equal to 73 m).

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. If applicable, modifying factor penalties have been reported and added to the measured site only L_{Aeq} noise levels.

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Instrumentation and personnel

Attended noise monitoring was conducted by Isaac Hepworth. Qualifications, experience, and/or demonstration of competence is in accordance with the EPA's Approved methods and supportive documentation is available upon request.

Equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Rion NA-28 sound level meter	00701424	21/05/2027	IEC 61672-1:2002
Pulsar 105 acoustic calibrator	78226	19/03/2028	IEC 60942:2003

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall (all sources) noise levels measured at each location during attended measurements are provided in Table 4.1. Discussion as to the sources responsible for measured levels is provided in Chapter 5 of this report.

Table 4.1 Total measured noise levels, dB – June 2026[1]

Location	Start date	Time	L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	L_{Amin}
N4	18/06/2026	22:00	56	46	43	40	40	35	32
N3	18/06/2026	22:25	53	51	45	43	41	39	36
N2	18/06/2026	22:46	59	56	49	46	43	39	37

Notes: 1. Levels in this table are not necessarily the result of activity at the site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 m above ground. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.2 Atmospheric conditions measured at microphone height – June 2026

Location	Date	Time	Temperature °C	Wind speed m/s	Wind direction ° Magnetic north[1]	Cloud cover 1/8s
N4	18/06/2026	22:00	16.9	<0.5	-	8
N3	18/06/2026	22:25	15.4	<0.5	-	8
N2	18/06/2026	22:46	16.9	<0.5	-	8

Note: 1. Degrees magnetic north, "-" indicates calm conditions.

4.1.1 Modifying factors

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.1.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Limits are applicable if weather conditions were within specified parameters during each measurement.

Table 4.3 Site noise levels and limits – June 2026

Location	Start date	Time	Wind		Stability class	VTG °C/100 m	Limits apply? [1]	Limit, dB		Site level, dB [2]		Exceedance, dB	
			Speed m/s	Direction° [3]				$L_{Aeq,15minute}$	$L_{A1,1minute}$	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N4	18/06/2026	22:00	0.6	215	G	5.2	No	36	46	<25	<25	N/A	N/A
N3	18/06/2026	22:25	0.5	21	G	5.1	No	36	46	<30	37	N/A	N/A
N2	18/06/2026	22:46	0.4	42	G	4.2	No	36	46	31	40	N/A	N/A

Notes: 1. Noise emission limits are applicable if weather conditions were within parameters specified in Section 2.5. 'N/A' in exceedance column indicates that limits were not applicable due to weather conditions.

2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.

3. Degrees magnetic north, "-" indicates calm conditions.

4. IA in the site level column means that the site was deemed inaudible at that location.

5. NM (not measurable) in the site level column means that the site noise was audible and satisfied the relevant limits but could not be quantified.

5 Discussion

5.1 Noted noise sources

During attended monitoring, the time variations (temporal characteristics) of noise sources are considered in each measurement via statistical descriptors. From these observations, summaries have been derived for the location and provided in this chapter. Statistical 1/3 octave-band analysis of environmental noise was undertaken, and the following figures display frequency ranges of various noise sources at each location for L_{A1}, L_{A10}, L_{Aeq}, L_{A50}, and L_{A90} descriptors. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 5.1, where frogs and insects are seen to be generating noise at frequencies above 1,000 Hz, while industrial noise is observed at frequencies less than 1,000 Hz.

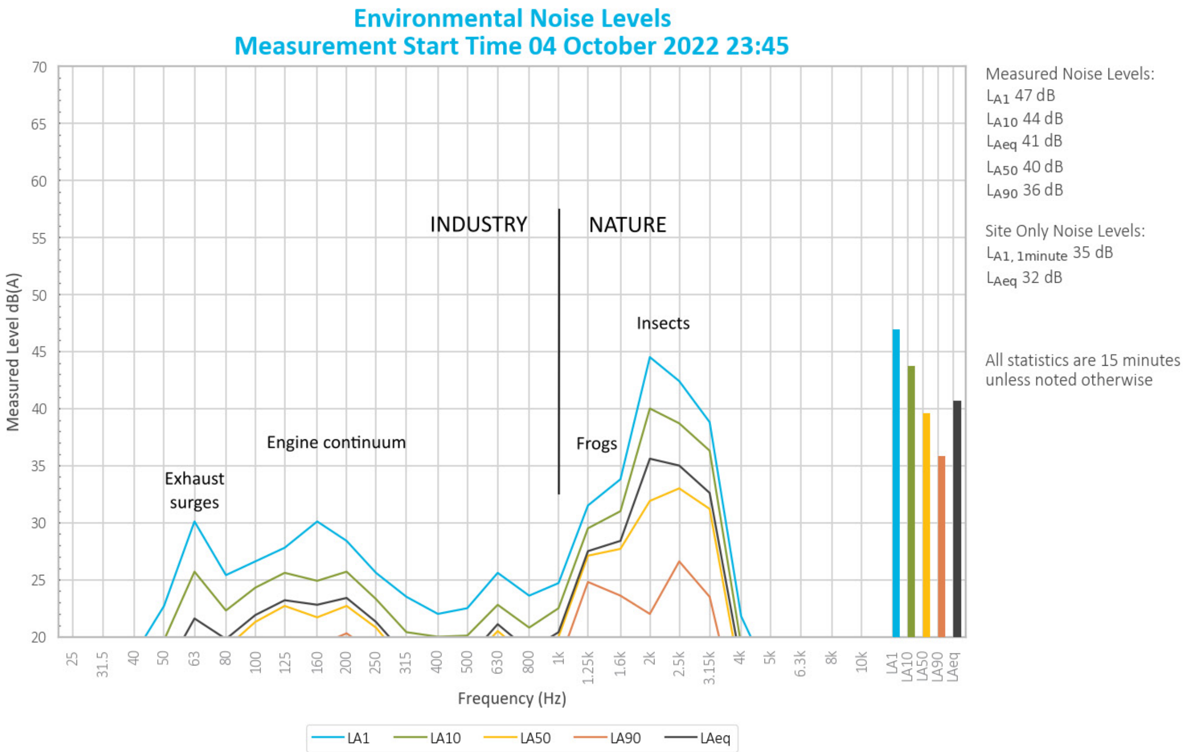

Figure 5.1 Example graph

5.2 N2 – Camberwell Village (west)

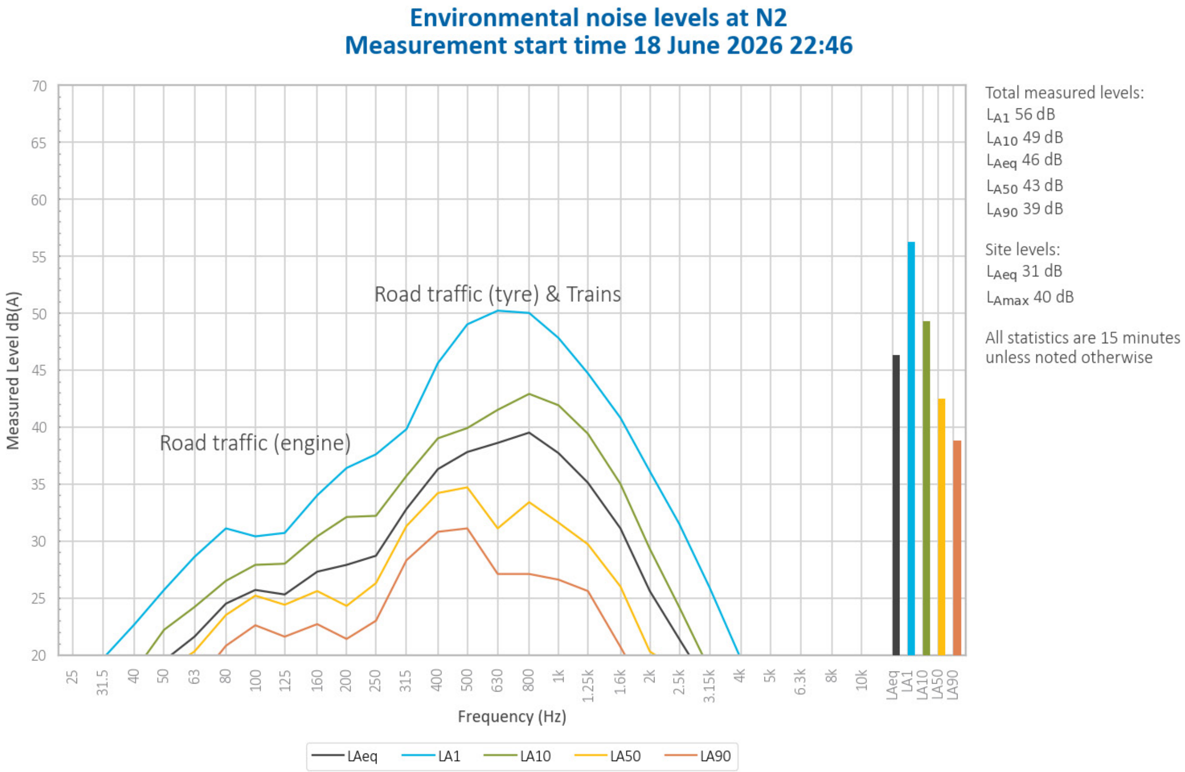

Figure 5.2 Environmental noise levels - N2, Camberwell Village (West)

Ashton Coal mining continuum was audible throughout the entire measurement, with reversing alarms audible on occasion. This generated a site $L_{Aeq,15minute}$ of 31 dB and an L_{Amax} of 40 dB.

Road traffic, trains, frogs and insects were responsible for total measured levels.

Noise from dogs was also noted.

Therefore, the Ashton Coal $L_{Aeq,15minute}$ and L_{Amax} noise contributions were below the relevant noise limits. It is noted, however, that the noise limits were not applicable due to the presence of a G Class atmospheric stability category during the measurement.

5.2.1 Cumulative mining noise at N2

Other mining noise was inaudible during the measurement and, therefore, did not contribute to any mining noise at this location. A graph of the total noise levels measured in the one-third octave frequency bands is shown in Figure 5.2.

5.3 N3 – Camberwell Village (north-east)

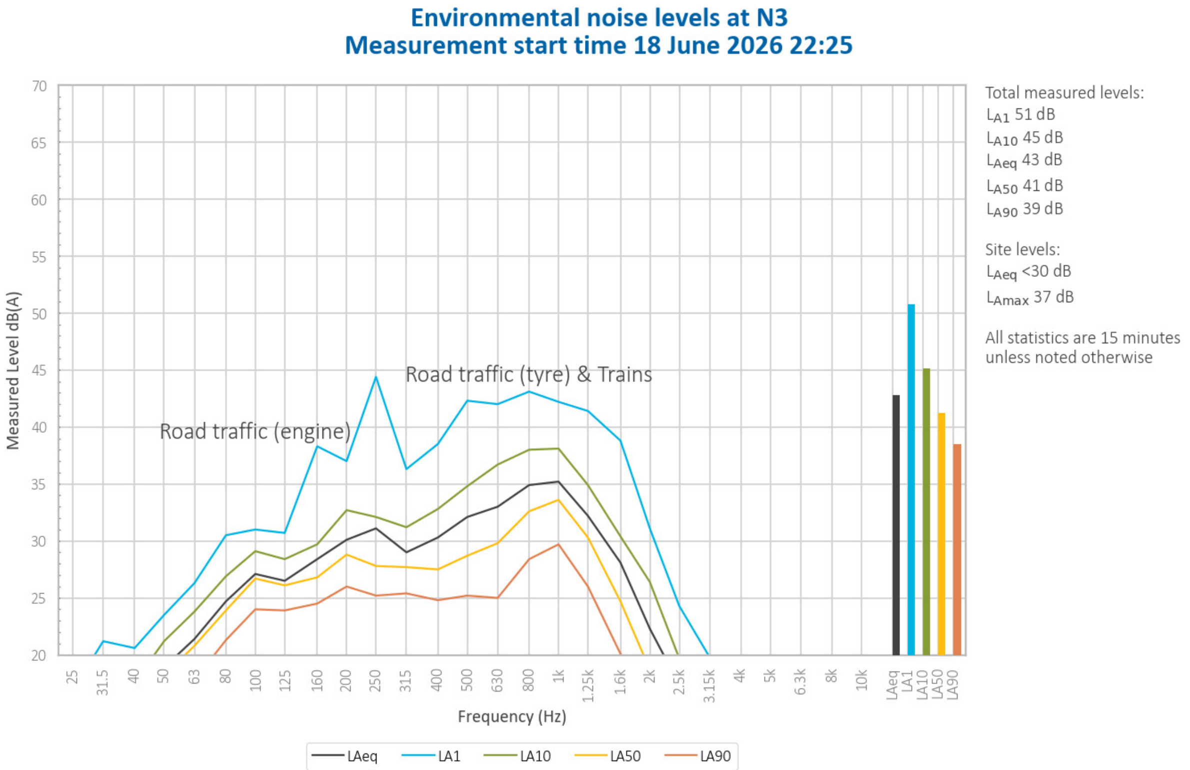

Figure 5.3 Environmental noise levels – N3, Camberwell Village (North-East)

Ashton Coal mining continuum was audible throughout the entire measurement. This generated a site $L_{Aeq,15minute}$ of <30 dB and an L_{Amax} of 37 dB.

Road traffic and trains were responsible for total measured levels.

Noise from dogs was also noted.

Therefore, the Ashton Coal $L_{Aeq,15minute}$ and L_{Amax} noise contributions were below the relevant noise limits. It is noted, however, that the noise limits were not applicable due to the presence of a G Class atmospheric stability category during the measurement.

5.3.1 Cumulative mining noise at N3

Other mining noise was inaudible during the measurement and, therefore, did not contribute to any mining noise at this location. A graph of the total noise levels measured in the one-third octave frequency bands is shown in Figure 5.3.

5.4 N4 – South of New England Highway

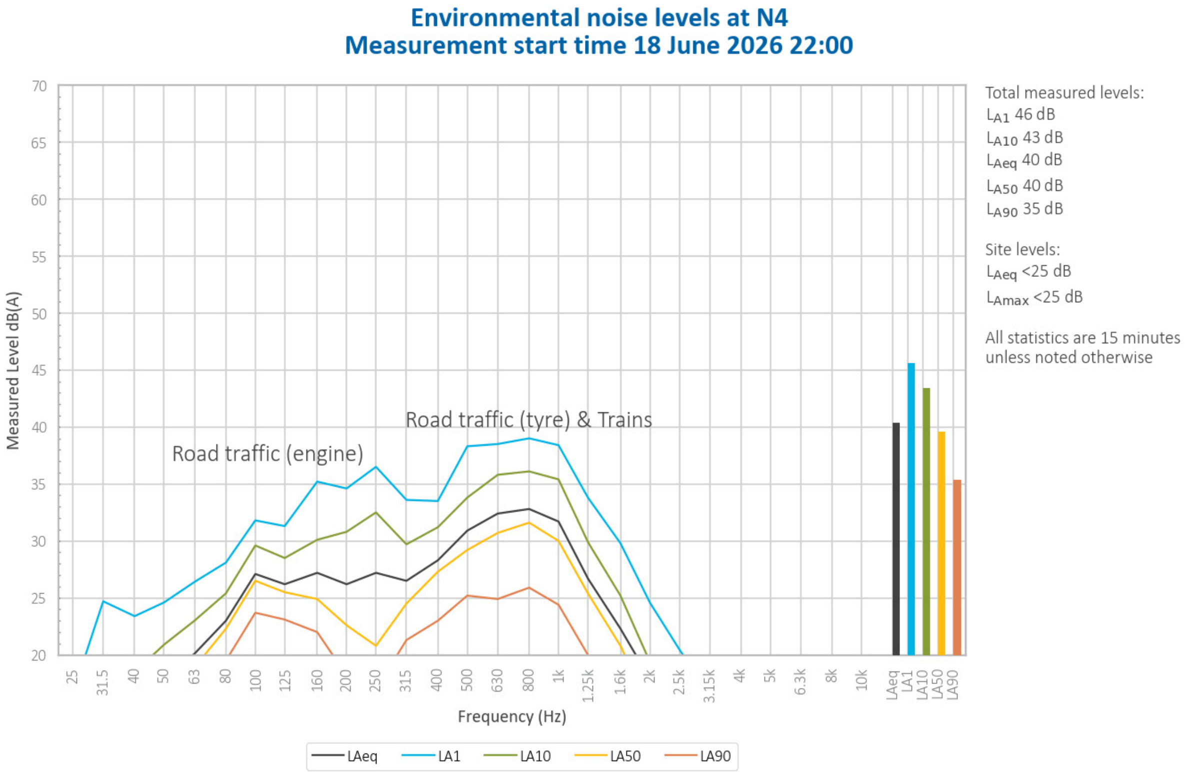

Figure 5.4 Environmental noise levels – N4, South of New England Highway

Ashton Coal mining continuum was audible throughout the entire measurement. This generated a site $L_{Aeq,15minute}$ of <25 dB and an L_{Amax} of <25 dB.

Road traffic, trains, frogs and insects were responsible for total measured levels.

Noise from livestock was also noted.

Therefore, the Ashton Coal $L_{Aeq,15minute}$ and L_{Amax} noise contributions were below the relevant noise limits. It is noted, however, that the noise limits were not applicable due to the presence of a G Class atmospheric stability category during the measurement.

5.4.1 Cumulative mining noise at N4

Other mining operations in the vicinity were audible at $L_{Aeq,15minute}$ <30 dB during the operator-attended noise survey at monitoring location N4. The cumulative mining noise level was estimated to be $L_{Aeq,night}$ <28 dB, which is below the relevant $L_{Aeq,night}$ 40 dB limit. A graph of the total noise levels measured in the one-third octave frequency bands is shown in Figure 5.4.

6 Summary

EMM Consulting Pty Limited (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified noise limits.

Attended environmental noise monitoring described in this report was done during the night period of Thursday 18 June 2026 at three monitoring locations as per the approved NMP.

Noise from the site complied with relevant limits at all monitoring locations during the June 2026 survey.

Appendix A
Noise perception and examples

EMM
creating opportunities

A.1 Noise levels

Table A.1 gives an indication as to how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
Up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or a quarter) as loud

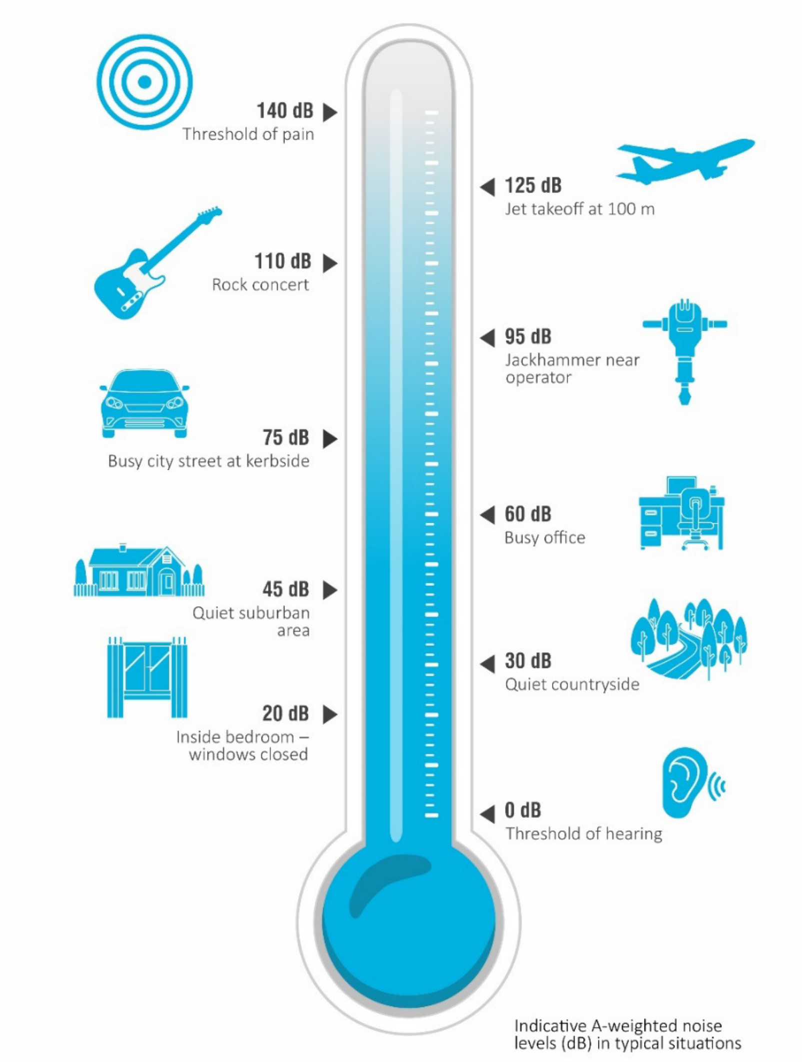

Figure A.1 Common noise levels

Appendix B
Regulator documents

creating opportunities

B.1 Development consent

APPENDIX 6

ALTERNATE NOISE CONDITIONS

NOISE

Application

1. Conditions 2 to 3 below have effect during times when open cut mining operations are not being undertaken at the Ashton Mine Complex, in the opinion of the Planning Secretary.

Noise Criteria

2. Except for the noise-affected land in Table 1 of Schedule 3, the Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 1 at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 1: Noise Criteria dB(A)

Receiver No.	Receiver	Day ($L_{Aeq\ (15min)}$)	Evening ($L_{Aeq\ (15min)}$)	Night ($L_{Aeq\ (15min)}$)	Night ($L_{A1\ (1\ min)}$)
-	All privately-owned land	38	38	36	46

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy*. Appendix 8 sets out the requirements for evaluating compliance with these criteria.

However, these noise criteria do not apply if the Applicant has an agreement with the relevant owner/s of the residence/land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Additional Noise Mitigation Measures

3. Upon receiving a written request from the owner of any residence on any privately-owned land where subsequent operational noise monitoring shows the noise generated by the development exceeds the noise limits in Table 2, the Applicant must implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the owner.

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

Table 2: Additional Noise Mitigation Criteria dB(A) $L_{Aeq\ (15min)}$

Receiver No.	Receiver	Day ($L_{Aeq\ (15min)}$)	Evening ($L_{Aeq\ (15min)}$)	Night ($L_{Aeq\ (15min)}$)
-	All privately-owned land	38	38	38

Notes:

- *Noise generated by the development is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 8 sets out the requirements for evaluating compliance with these criteria.*
- *For this condition to apply, the exceedance of the criteria must be systemic.*

APPENDIX 8

NOISE COMPLIANCE ASSESSMENT

Compliance Monitoring

1. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this approval.

2. Data collected for the purposes of determining compliance with the relevant conditions of this approval is to be excluded under the following meteorological conditions:
   a) during periods of rain or hail;
   b) average wind speed at microphone height exceeds 5 m/s;
   c) wind speeds greater than 3 m/s measures at 10 m above ground level; and
   d) temperature inversion conditions greater than 3°C/100m.

3. Unless otherwise agreed with the Planning Secretary, this monitoring is to be carried out in accordance with the relevant requirements relating for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to:
   a) monitoring locations for the collection of representative noise data;
   b) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   c) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

4. To the extent that there is any inconsistency between the Industrial Noise Policy and the requirements set out in this Appendix, the Appendix prevails to the extent of the inconsistency.

Determination of Meteorological Conditions

5. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located in the vicinity of the site (as required by condition 18 of Schedule 3).

B.2 Environmental protection licence

31	Groundwater monitoring	Monitoring mid-gradient of Upper Liddell coal seam, marked and shown as "WML183" on the Plan.

P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

Noise/Weather

EPA identi-fication no.	Type of monitoring point	Location description
12	Meteorological Station – to determine meteorological conditions for noise monitoring	Meteorological monitoring, marked and shown "Repeater - Meteorological Station" on the Plan.
13	Noise monitoring	Noise monitor, marked and shown "N3" on the Plan.
14	Noise monitoring	Noise monitor, marked and shown "N2" on the Plan.
15	Noise monitoring	Noise monitor, marked and shown "N4" on the Plan.
32	Meteorological Station – to determine meteorological conditions for noise monitoring	Meteorological Station, marked and shown as "M1" on the Plan.

P1.5 For the purposes of conditions P1.1 to P1.4 and L4.1; the "Plan" refers to the Plan titled "Ashton Underground Mine Environment Protection Licence 11879 Premises Boundary", Drawing No. A-1005_Mon, Revision No. 2025, dated 29 May 2025 (EPA ref. DOC25/503163).

The datum for grid references in the Plan is the Geodetic Datum of Australia 1994 (GDA94), MGA Zone 56.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 Flares must be operated by the licensee such that there is no visible emission other than for a total period of no more than 5 minutes in any 2 hours, except for heat haze.

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises unless specified in this licence.

L3.2 The licensee must not dispose of waste on the premises unless authorised by a condition of this Licence.

L4 Noise limits

L4.1 Noise from the premises must not exceed the noise limits specified in the table below.

Residences referenced in this table are from the consent DA 309-11-2001-i and the Plan.

Location	Day LAeq(15 minute)	Evening LAeq(15 minute)	Night LAeq(15 minute)	Night LAeq(1 minute)
EPA Point 13	38	38	36	46
EPA Point 14	38	38	36	46
EPA Point 15	38	38	36	46
All other privately owned residences	38	38	36	46

L4.2 For the purpose of condition L4.1:
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

L4.3 The noise emission limits identified in condition L4.1 apply under the following meteorological conditions:

a) wind speeds up to 3m/s at 10m above ground level; and
b) temperature inversion conditions up to 3 degrees C/100m.

L4.4 For the purposes of condition L4.1:

a) Data recorded by the closest and most representative meteorological station installed on the premises at Point 12 must be used to determine meteorological conditions; and
b) Temperature inversion conditions (stability category) are to be determined by the methods referred to in Fact Sheet D of the Noise Policy for Industry (2017) using Points 12 and 32.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

B.3 Noise management plan

Relevant parts of the DA have been reproduced in Appendix A along with reference to where they have been addressed in this document.

4.2 Applicable Criteria

Noise criteria for the ACP are divided into three categories:

- Impact assessment criteria;
- Additional noise mitigation criteria; and
- Cumulative noise acquisition criteria.

The RUM must adhere to a single set of noise criteria relating to noise generated by the RUM development.

4.2.1 Impact Assessment Criteria

In accordance with Condition 2, Appendix 6 of the Ashton DA and Condition L4.1 of EPL 11879, noise generated by the development within the ACP must not exceed the limits specified in **Table 3** at any privately-owned land or on more than 25 per cent of any privately-owned land. The noise limits are provided in decibels (dB).

Table 3: Ashton Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	36	46

In accordance with Condition 12, Schedule 3 of the RUM DA, noise generated by development in the ACOL-operated RUM must not exceed the limits specified in **Table 4** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 4 RUM Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	35	35	35	45

4.2.2 Additional Noise Mitigation Criteria

If noise emissions generated by the ACP exceed the criteria displayed in **Table 5** at any residence on privately-owned land, then, upon receiving a written request from the landowner, ACOL will implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation and/or air conditioning) at the residence in consultation with the owner.

Table 5 Additional Noise Mitigation Criteria dB(A)#

Location	Day	Evening	Night
	LAeq (15 minute)	LAeq (15 minute)	LAeq (15 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	38

* Exceedance of the criteria must be systemic.

4.2.3 Cumulative Noise Acquisition Criteria

If noise emissions generated by the ACP, and other mines exceed the criteria in **Table 6** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land (except for noise affected residential receivers in Condition 1, Schedule 3 of the Ashton DA) then, upon receiving a written request for acquisition from the landowner, ACOL together with the relevant mines, will acquire the land in accordance with the Acquisition Process (as defined in Conditions 7 and 8, Schedule 4 of the Ashton DA).

Table 6 Cumulative Noise Acquisition Criteria dB(A)

Location	Day	Evening	Night
	LAeq (period)	LAeq (period)	LAeq (period)
Camberwell Village	60	50	45
All other privately-owned land	55	50	45

4.3 Existing Environment

The ACP is located in the Hunter Valley region of New South Wales and is bound by the Main Northern Railway to the north, Hunter River to the south and Glennies Creek to the east with the New England Highway dividing the open cut from the underground mining areas.

Other mining operations in the area include the Ravensworth Complex, the Mount Owen Complex, Rix's Creek Open Cut, Integra Underground and Hunter Valley Operations.

The closest sensitive receivers are located in Camberwell. There are currently 13 private landholdings in the local area, 11 of these have an occupied residence.

Ambient noise levels within the village of Camberwell are influenced by the New England Highway to the south, the railway line to the northeast and surrounding mining operations. Attended noise monitoring has confirmed that the major contributing noise source is usually the New England Highway. Noise from ACP has been noted at times in Camberwell Village, historical reports show this has been infrequent and at relatively low levels.

Based on the historical meteorological data collected by ACOL's M2 (repeater) weather station the most common winds in winter are from the west-northwest and the east-southeast in summer. Prevailing winds act to enhance noise from surrounding noise sources (road, rail and mining).

Appendix C
Calibration certificates

EMM
creating opportunities

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C57618

EQUIPMENT TESTED : Acoustic Calibrator

Make & Model: Pulsar 105 **Serial No:** 78226
Class: 1
Owner: EMM Consulting
Level 1, 175 Scott Street
Newcastle, NSW 2300
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details and Class Tolerance overleaf.

CONDITION OF TEST:

Ambient Pressure	1005	hPa ±1 hPa	**Date of Receipt :**	12/03/2026
Temperature	23	°C ±1° C	**Date of Calibration :**	19/03/2026
Relative Humidity	51	% ±5%	**Date of Issue :**	20/03/2026

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: A. Nowosadzka **AUTHORISED SIGNATURE:** H. Soe
Lab Manager

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

Acu-Vib Electronics
ACOUSTICS AND VIBRATIONS
Head Office & Calibration Laboratory
Unit 14, 22 Hudson Avenue, Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

NATA
WORLD RECOGNISED ACCREDITATION
Accredited Laboratory No. 9262
Acoustic and Vibration Measurements

CERTIFICATE NO: C57618

The Calibrator described in this report has been tested to the requirements of the standard IEC 60942-[Ed 4]:2017-11.
The tests described in Annex B of the standard (Periodic tests) were carried out under the environmental conditions listed above to the following clauses:

Clause	**Test description**
B4.6	Sound Pressure Level (By comparison with a reference calibrator).
B4.7	Frequency (By measurement with a calibrated frequency meter).
B4.8	Total distortion and noise. (By measurement with a calibrated Noise and Distortion meter).

Notes:

1. The calibrator was calibrated with the main axis vertical and facing down.
2. No corrections have been made for atmospheric pressure, temperature, or humidity.
3. Unless otherwise indicated, a WS2 transfer microphone is used with the supplied adaptors or with suitable adaptors from the laboratory.

Parameter	Pre-Adj	Adj Y/N	Output: **(dB re 20 µPa)**	Frequency **(Hz)**	THD&N **(%)**
Level:	93.6	Y	93.88 dB	1000.31 Hz	0.40 %
Uncertainty			±0.11 dB	±0.05%	±0.40 %
Uncertainty (at 95% c.l.) k=2					

Parameter	Class 1		Class 2	
Nominal Frequency	250 Hz	1 kHz	250 Hz	1 kHz
Output dB SPL	0.25 dB	0.25 dB	0.40 dB	0.40 dB
Frequency Hz	0.7 % (1.75 Hz)	0.7 % (7 Hz)	1.7 % (4.25 Hz)	1.7 % (17 Hz)
THD&N	2.5 %	2.5 %	3.0 %	3.0 %

Tolerance limits from AS/IEC60942 (edition 4)

Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
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 C25320-V1

Client Details EMM Consulting
Level 3, 175 Scott Street
Newcastle NSW, 2300

Equipment Tested :	*Manufacturer*	*Model*	*Serial*
Instrument :	Rion	NA-28	00701424
Microphone :	Rion	UC-59	01916
Pre-amplifier :	Rion	NH-23	01463
Firmware Version :	2.0		

Pre-Test Atmospheric Conditions		**Post-Test Atmospheric Conditions**	
Ambient Temperature :	20 °C	**Ambient Temperature :**	21 °C
Relative Humidity :	62.1 %	**Relative Humidity :**	60.2 %
Barometric Pressure :	101.61 kPa	**Barometric Pressure :**	101.62 kPa

Calibration Technician : Emanuel Eid **Secondary Check:** Cooper Sallway
Calibration Date : 21-May-2025 **Report Issue Date :** 22-May-2025

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.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.13 dB*	*Temperature*	*±0.1 °C*
1kHz	*±0.13 dB*	*Relative Humidity*	*±1.9 %*
8kHz	*±0.14 dB*	*Barometric Pressure*	*±0.11 kPa*
Electrical Tests	*±0.13 dB*		

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

NATA WORLD RECOGNISED ACCREDITATION

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 SI units.

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

Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3:2013
Calibration Test Report

Calibration Number C25320-V1

Client Details	EMM Consulting Level 3, 175 Scott Street Newcastle NSW, 2300

Equipment Tested :	*Manufacturer*	*Model*	*Serial*
Instrument Serial Number :	Rion	NA-28	00701424
Microphone Serial Number :	Rion	UC-59	01916
Pre-amplifier Serial Number :	Rion	NH-23	01463
Firmware Version :	2.0		

Pre-Test Atmospheric Conditions		**Post-Test Atmospheric Conditions**	
Ambient Temperature :	20 °C	**Ambient Temperature :**	21 °C
Relative Humidity :	62.1 %	**Relative Humidity :**	60.2 %
Barometric Pressure :	101.61 kPa	**Barometric Pressure :**	101.62 kPa

Calibration Technician :	Emanuel Eid	**Secondary Check:**	Cooper Sallway
Calibration Date :	21-May-2025	**Report Issue Date :**	22-May-2025

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.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.13 dB*	*Temperature*	*±0.1 °C*
1kHz	*±0.13 dB*	*Relative Humidity*	*±1.9 %*
8kHz	*±0.14 dB*	*Barometric Pressure*	*±0.11 kPa*
Electrical Tests	*±0.13 dB*		

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

1. REVISION HISTORY

Revision	Date	Description
1	22-May-2025	Original Issue

2. OVERVIEW

This report presents the calibration test results of a NA-28 Sound Level Meter, and associated equipment. Calibration is carried out in accordance with *IEC 61672-3.2013, Electroacoustics - Sound Level Meters - Part 3: Periodic Tests*.

Relevant clauses from this standard have been used for periodic testing in conjunction with Acoustic Research Labs internal test methods described in Section 1 of the calibration work instruction manual.

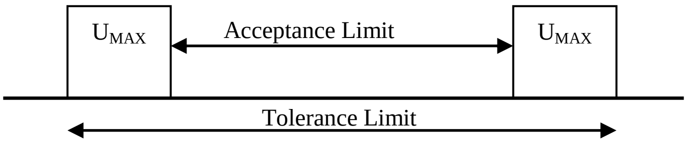
This report was generated using template version identifier of 64f64c78.

Where required, reference is made to manual version 50860 as provided by the manufacturer.

2.1 UNCERTAINTIES

For each test performed, the associated measurement uncertainties are derived at the 95% confidence level and are given with a coverage factor of 2.

The uncertainty applies at the time of measurement only, and takes no account of any drift or other effects that may apply afterwards. When estimating uncertainty at any later time, other relevant information should also be considered, including, where possible, the history of the performance of the instrument and the manufacturer's specifications.



Where deviations from the design goals are provided to determine conformance to performance specifications, each measurement is reported with:

The measured deviation from the design goal

Associated acceptance limits for the test

Maximum allowable uncertainty of measurement for the test

Actual expanded uncertainty for each measurement

2.2 DOCUMENT CONVENTIONS

Test results which highlight non-conformances relative to the standard, and the sound level meter type specified by the manufacturer have been marked with an **F** in the respective tests.

Any tests that are not required, due to sound level meter configuration, are marked N/A.

3. GENERAL

3.1 DEVICE UNDER TEST

Equipment Tested :	*Manufacturer*	*Model*	*Serial*
Instrument :	Rion	NA-28	00701424
Microphone :	Rion	UC-59	01916
Pre-amplifier :	Rion	NH-23	01463

All results within this report correspond to Channel 1 of the device tested.

Instrument received in fair condition..

3.2 ENVIRONMENTAL CONDITIONS DURING TEST

No corrections have been applied to any results obtained to compensate for the environmental conditions.

3.3 CALIBRATION TESTS

Where applicable the following tests were performed in accordance with the requirements of *IEC 61672-3.2013*. These clauses are used to define the periodic testing of Sound Level Meters.

Clause 10 Indication at the Calibration Check Frequency

Clause 11 Self Generated Noise

Clause 12 Acoustical Signal Tests of Frequency Weighting

Clause 13 Electrical Signal Tests of Frequency Weightings

Clause 14 Frequency and Time Weightings at 1kHz

Clause 15 Long Term Stability

Clause 16 Level Linearity on the Reference Level Range

Clause 17 Level Linearity including the level range control

Clause 18 Toneburst Response

Clause 19 Peak C Sound Level

Clause 20 Overload Indication

Clause 21 High Level Stability

3.4 TEST EQUIPMENT USED

All test equipment used during periodic testing are calibrated every 12months by an accredited laboratory, traceable to SI units.

The performance of all equipment during these calibrations and the effects of instrument stability are used to determine the measurement uncertainty of each reported result.

3.4.1 Multi-function Acoustic Calibrator

A Bruel & Kjaer 4226 Multi-function calibrator (S/N – 2985012) was used for frequency response testing of the entire instrument (including microphone). This instrument was used as a reference calibrator and for frequency response verification.

The acoustic signal was applied by the 4226 Multi-function calibrator using a 1/2 inch microphone input.

3.4.2 Microphone Electrical Equivalent Circuit

Calibration of most instrument parameters is carried out using electrical signals fed to the unit via a two-port electrical equivalent circuit of the microphone.

These signals were applied via the instrument’s microphone input.

Where possible, a 13 pF capacitance dummy microphone was used during testing.

3.4.3 Adjustable Attenuator

A means for varying the attenuation of electrical signals via the dummy microphone was provided by a JFW Industries dual rotary attenuator (S/N – 792819 2132). The attenuator is switchable in 1dB steps between 0dB and 60dB.

3.4.4 Arbitrary Function Generator

A Keysight 33511B (S/N – MY62000827) was used to generate the required electrical signals.

3.4.5 Environmental Monitoring

A MHB-382SD (S/N – AG44204) was used for measuring environmental conditions during device calibration. It is capable of providing temperature, relative humidity and pressure measurements.

4. CALIBRATION TEST RESULTS

4.1 INDICATION AT THE CALIBRATION CHECK FREQUENCY

The indication of the sound level meter at the calibration check frequency was checked by application of an acoustic signal at the reference sound pressure level and frequency.

Stated reference conditions as found in manual are

Reference Level : 94.0 dB

Reference Frequency : 1000.0 Hz

Indications before and after adjustments were recorded and are shown in Table 1 (all measurements in dB) -

Table 1 - Check Frequency Calibration Results

Frequency Weighting	Initial Response	B&K 4226 Corrected	FreeField Corrected	Final Corrected Response
A	94.30	94.10	94.10	94.02
C	94.20	94.10	94.10	94.02
Z	94.20	94.10	94.10	94.02

Free field adjustment data as provided by the manufacturer. Windscreen correction factors applied.

4.2 SELF GENERATED NOISE

4.2.1 Microphone Installed

Self generated noise was measured with the microphone installed on the sound level meter, in the configuration submitted for periodic testing. The sound level meter was set to the most-sensitive level range and with frequency weighting A selected.

Ten (10) time weighted observations were made over a period of 60 seconds.

Random Readings dB(A)

15.10	15.10	15.10	15.10	15.10
15.10	15.10	15.10	15.10	15.10

Acoustic Noise Floor : 15.1 dB(A)

4.2.2 Electrical Input Signal Device

With the microphone replaced by the electrical input signal device and terminated as specified, the sound level meter was set to the most-sensitive level range and with frequency weightings Z, C and A selected as provided.

Ten (10) time weighted observations were made over a period of 60 seconds.

Random Readings dB(A)

12.00	11.10	11.10	11.10	11.10
11.10	11.10	9.80	9.80	9.80

Random Readings dB(C)

14.10	14.60	15.50	13.50	14.10
14.60	14.10	14.10	14.10	14.60

Random Readings dB(Z)

20.2	22.2	20.0	20.0	19.8
21.7	21.4	22.0	23.2	23.3

	dB(A)	dB(C)	dB(Z)
Electric Noise Floor :	10.8	14.3	21.4

4.3 ACOUSTICAL SIGNAL TESTS OF A FREQUENCY WEIGHTING

The sound level meter was set to measure frequency weighting C with a FAST response. The test was carried out using a multi-function acoustic calibrator set to pressure mode.

Three (3) readings were made at each test frequency. The average of the readings was then corrected to the multi-function acoustic calibrator.

Table 2 - Frequency Weighting C Response

Freq Hz	Reading 1	Reading 2	Reading 3	Uncertainty (dB)
125	94.0	94.0	94.0	0.13
1 000	94.1	94.1	94.1	0.13
8 000	88.6	88.6	88.6	0.14

Actual Freq Hz	B&K 4226 Corrections	Corrected Response dB(C)		Uncertainty (dB)
		Actual	re 1kHz	
125.90	-0.06	93.94	-0.08	0.13
1005.10	-0.08	94.02	0.00	0.13
7915.10	0.07	88.67	-5.35	0.14

Adjustments were then applied to correct for free field and sound level meter body effects with data supplied by the manufacturer as per Table 3. Windscreen correction factors applied.

Table 3 - Correction Data

Actual Freq (Hz)	Pressure to Freefield (dB)	Uncertainty (dB)	Body Effects (dB)	Uncertainty (dB)	WS Effects (dB)	Uncertainty (dB)
125.90	0.00	0.25	0.00	0.25	0.00	0.20
1005.10	0.00	0.25	0.00	0.25	-0.10	0.20
7915.10	3.00	0.35	-0.10	0.35	-0.40	0.30

Finally, the corrected responses are normalised to the response at 1kHz and compared to the tolerance limits stated in Table 2 of IEC 61672.1-2013.

Table 4 - Acoustic C Response

Actual Freq (Hz)	Corrected Response dB(C)		Expected Response dB(C)		Deviation (dB)	P/F	Uncertainty (dB)	Maximum Permitted Uncertainty (dB)
	Actual	re 1kHz	re 1kHz	Tolerance Limit				
125.90	93.94	0.02	-0.2	±1.0	0.22	P	0.43	0.60
1005.10	93.92	0.00	0.0	±0.7	0.00	P	0.43	0.60
7915.10	91.17	-2.75	-3.0	+1.5 / -2.5	0.25	P	0.60	0.70

4.4 ELECTRICAL SIGNAL TESTS OF FREQUENCY WEIGHTINGS

Frequency weighting responses for Z, C and A were determined relative to the response at 1kHz using steady sinusoidal electrical input signals.

On the reference level range, and for each frequency weighting under test, the level of a 1kHz input signal was adjusted to yield 75dB. At test frequencies other than 1kHz, the input signal level was adjusted to compensate for the design goal attenuations as specified in Table 2 of IEC 61672.1-2013.

Table 5 - Measured Electrical Frequency Response

Freq (Hz)	A Weighting (dB)	C Weighting (dB)	Z Weighting (dB)	Uncertainty (dB)
63	75.0	75.0	75.0	0.13
125	75.0	75.0	75.0	0.11
250	75.0	75.0	75.0	0.10
500	75.0	75.0	75.0	0.10
1 000	75.0	75.0	75.0	0.10
2 000	75.1	75.1	75.0	0.10
4 000	75.1	75.0	75.0	0.10
8 000	75.1	75.1	75.0	0.10
15 850	74.6	74.6	75.0	0.13

Adjustments were then applied to correct for a uniform free field response and sound level meter body effects with data supplied by the manufacturer as per Table 6. Windscreen correction factors applied.

Table 6 - Correction Data

Freq (Hz)	Ufreq (dB)	Uncertainty (dB)	Body Effects (dB)	Uncertainty (dB)	WS Effects (dB)	Uncertainty (dB)
63	0.10	0.25	0.00	0.25	0.00	0.20
125	0.10	0.25	0.00	0.25	0.00	0.20
250	0.10	0.25	0.00	0.25	0.00	0.20
500	0.00	0.25	-0.20	0.25	0.00	0.20
1 000	0.00	0.25	0.00	0.25	-0.10	0.20
2 000	0.00	0.25	-0.10	0.25	-0.30	0.20
4 000	0.10	0.25	-0.30	0.25	-0.40	0.20
8 000	0.00	0.35	-0.10	0.35	-0.40	0.30
15 850	-0.10	0.45	-0.40	0.35	1.00	0.30

Finally, the corrected responses were referenced to the response at 1kHz and compared to the tolerance limits stated in Table 2 of IEC 61672.1-2013.

Table 7 - A Weighted Electrical Response

Freq (Hz)	Response (dB)		Tolerance Limit (dB)	P/F	Uncertainty (dB)	Maximum Permitted Uncertainty (dB)
	Corrected	re 1kHz				
63	75.10	0.20	±1.0	P	0.43	0.60
125	75.10	0.20	±1.0	P	0.42	0.60
250	75.10	0.20	±1.0	P	0.42	0.60
500	74.80	-0.10	±1.0	P	0.42	0.60
1 000	74.90	0.00	±0.7	P	0.42	0.60
2 000	74.70	-0.20	±1.0	P	0.42	0.60
4 000	74.50	-0.40	±1.0	P	0.42	0.60
8 000	74.60	-0.30	+1.5 / -2.5	P	0.59	0.70
15 850	75.10	0.20	+2.5 / –16	P	0.66	1.00

Table 8 - C Weighted Electrical Response

Freq (Hz)	Response (dB)		Tolerance Limit (dB)	P/F	Uncertainty (dB)	Maximum Permitted Uncertainty (dB)
	Corrected	re 1kHz				
63	75.10	0.20	±1.0	P	0.43	0.60
125	75.10	0.20	±1.0	P	0.42	0.60
250	75.10	0.20	±1.0	P	0.42	0.60
500	74.80	-0.10	±1.0	P	0.42	0.60
1 000	74.90	0.00	±0.7	P	0.42	0.60
2 000	74.70	-0.20	±1.0	P	0.42	0.60
4 000	74.40	-0.50	±1.0	P	0.42	0.60
8 000	74.60	-0.30	+1.5 / -2.5	P	0.59	0.70
15 850	75.10	0.20	+2.5 / –16	P	0.66	1.00

Table 9 - Z Weighted Electrical Response

Freq (Hz)	Response (dB)		Tolerance Limit (dB)	P/F	Uncertainty (dB)	Maximum Permitted Uncertainty (dB)
	Corrected	re 1kHz				
63	75.10	0.20	±1.0	P	0.43	0.60
125	75.10	0.20	±1.0	P	0.42	0.60
250	75.10	0.20	±1.0	P	0.42	0.60
500	74.80	-0.10	±1.0	P	0.42	0.60
1 000	74.90	0.00	±0.7	P	0.42	0.60
2 000	74.60	-0.30	±1.0	P	0.42	0.60
4 000	74.40	-0.50	±1.0	P	0.42	0.60
8 000	74.50	-0.40	+1.5 / -2.5	P	0.59	0.70
15 850	75.50	0.60	+2.5 / –16	P	0.66	1.00

4.5 FREQUENCY AND TIME WEIGHTINGS AT 1KHZ

A steady sinusoidal electrical input signal of 1kHz at the reference sound pressure level was applied to the reference level range.

The deviations of the indicated level of C and Z frequency weightings were recorded, along with the deviations of the indication of A weighted time averaged, and SLOW weighted response.

Table 10 - Frequency and Time Weighting Results

Frequency Weighting	Time Weighting	Response (dB)	Deviation (dB)	P/F	Tolerance Limit (dB)	Uncertainty (dB)	Maximum Permitted Uncertainty (dB)
A	Fast	94.0	0.0	P	±0.2	0.10	0.20
	Leq	94.0	0.0	P	±0.2	0.10	0.20
	Slow	94.0	0.0	P	±0.2	0.10	0.20
C	Fast	94.0	0.0	P	±0.2	0.10	0.20
Z	Fast	94.0	0.0	P	±0.2	0.10	0.20

4.6 LONG-TERM STABILITY

Long-term stability was tested by comparing a steady sinusoidal electrical signal applied at the start, and at the end of testing. The applied signal level was set to the reference level and frequency and was maintained constant. The difference between the indicated levels was recorded.

Table 11 - Frequency and Time Weighting Results

Signal Level (mV)	Initial Response (dB)	Final Response (dB)	Deviation (dB)	P/F	Tolerance Limit (dB)	Uncertainty (dB)	Maximum Permitted Uncertainty (dB)
63.1	94	94.0	0.0	P	±0.1	0.10	0.10

4.7 LEVEL LINEARITY ON THE REFERENCE LEVEL RANGE

Level linearity was tested with a steady sinusoidal electrical signal at a frequency of 8kHz, with the meter set to display frequency weighted A, FAST response.

The starting point for level linearity testing was set to 94.0dB as stated in the instruction manual.

Level linearity was measured in 5dB steps of increasing input signal level from the starting point up to within 5dB of the stated upper limit, then at 1dB steps up to (but not including) the first indication of overload.

Table 12 - Level Linearity - Increasing

Ideal (dB)	Response (dB)	Deviation (dB)	Tolerance Limit (dB)	P/F	Uncertainty (dB)	Maximum Permitted Uncertainty (dB)
94.0	94.0	0.0	±0.8	P	0.1	0.3
99.0	99.0	0.0	±0.8	P	0.1	0.3
104.0	104.0	0.0	±0.8	P	0.1	0.3
109.0	109.0	0.0	±0.8	P	0.1	0.3
114.0	114.0	0.0	±0.8	P	0.1	0.3
119.0	119.0	0.0	±0.8	P	0.1	0.3
123.0	123.0	0.0	±0.8	P	0.1	0.3
124.0	124.0	0.0	±0.8	P	0.1	0.3
125.0	125.0	0.0	±0.8	P	0.1	0.3
126.0	126.0	0.0	±0.8	P	0.1	0.3
127.0	127.0	0.0	±0.8	P	0.1	0.3
128.0	128.0	0.0	±0.8	P	0.1	0.3
129.0	129.0	0.0	±0.8	P	0.1	0.3

Overload indication at 130.0dB.

Level linearity test was the continued in 5dB steps of decreasing input signal level from the starting point up to within 5dB of the stated lower limit, then at 1dB steps up to (but not including) the first indication of under range.

Table 13 - Level Linearity - Decreasing

Ideal (dB)	Response (dB)	Deviation (dB)	Tolerance Limit (dB)	P/F	Uncertainty (dB)	Maximum Permitted Uncertainty (dB)
94.0	94.0	0.0	±0.8	P	0.1	0.3
89.0	89.0	0.0	±0.8	P	0.1	0.3
84.0	84.0	0.0	±0.8	P	0.1	0.3
79.0	79.0	0.0	±0.8	P	0.1	0.3
74.0	74.0	0.0	±0.8	P	0.1	0.3
69.0	69.0	0.0	±0.8	P	0.1	0.3
64.0	64.0	0.0	±0.8	P	0.1	0.3
59.0	59.0	0.0	±0.8	P	0.1	0.3
54.0	54.0	0.0	±0.8	P	0.1	0.3
49.0	49.0	0.0	±0.8	P	0.1	0.3
44.0	43.9	-0.1	±0.8	P	0.1	0.3
39.0	38.9	-0.1	±0.8	P	0.1	0.3
34.0	33.9	-0.1	±0.8	P	0.1	0.3
30.0	29.9	-0.1	±0.8	P	0.1	0.3
29.0	28.9	-0.1	±0.8	P	0.1	0.3
28.0	27.9	-0.1	±0.8	P	0.1	0.3
27.0	26.9	-0.1	±0.8	P	0.1	0.3
26.0	25.9	-0.1	±0.8	P	0.1	0.3

Under range indication at 25.0dB.

4.8 LEVEL LINEARITY INCLUDING LEVEL RANGE CONTROL

As the sound level meter had more than one level range, tests of level linearity errors including errors introduced by the level range control were performed with steady sinusoidal input signals at a frequency of 1kHz, with the sound level meter set to display A weighted, FAST response.

The level of the signal was adjusted to yield an indication of the reference sound pressure level on the reference level range, and with the signal kept constant, the indicated signal level was recorded for all level ranges.

For all level ranges, the signal level was decreased to a level that was 5dB above the stated lower limit of each range, the indicated levels were recorded and compared to the expected values.

Table 14 - Response to Reference Level

Range	Signal Level dB(A)	Response dB(A)	Deviation (dB)	Tolerance Limit (dB)	P/F	Uncertainty (dB)	Maximum Permitted Uncertainty (dB)
1	94.0	94.0	0.0	±0.8	P	0.1	0.3
2	94.0	94.0	0.0	±0.8	P	0.1	0.3
3	94.0	94.0	0.0	±0.8	P	0.1	0.3
4	94.0	93.9	-0.1	±0.8	P	0.1	0.3
5	94.0	Out of Range	N/A	±0.8	N/A	0.1	0.3
6	94.0	Out of Range	N/A	±0.8	N/A	0.1	0.3

Table 15 - Response to Low Level Signal

Range	Signal Level dB(A)	Response dB(A)	Deviation (dB)	Tolerance Limit (dB)	P/F	Uncertainty (dB)	Maximum Permitted Uncertainty (dB)
1	35.0	35.1	0.1	±0.8	P	0.1	0.3
2	25.0	25.0	0.0	±0.8	P	0.1	0.3

4.9 TONEBURST RESPONSE

The response of the sound level meter to short-duration signals was tested on the reference range with 4kHz tone bursts.

The tone bursts were generated from a steady sinusoidal signal at a level of 117.0dB.

Table 16 - FAST Weighted Response

Burst Length	Response dB(A)	Deviation (dB)	Tolerance Limit (dB)	P/F	Uncertainty (dB)	Maximum Permitted Uncertainty (dB)
200ms	116.0	0.0	±0.5	P	0.1	0.3
2ms	99.0	0.0	+1.0 / -1.5	P	0.1	0.3
0.25ms	89.9	-0.1	+1.0 / -3	P	0.1	0.3

Table 17 - SLOW Weighted Response

Burst Length	Response dB(A)	Deviation (dB)	Tolerance Limit (dB)	P/F	Uncertainty (dB)	Maximum Permitted Uncertainty (dB)
200ms	109.6	0.0	±0.5	P	0.1	0.3
2ms	90.0	0.0	+1.0 / -3	P	0.1	0.3

Table 18 - Sound Exposure Level Response

Burst Length	Response dB(A)	Deviation (dB)	Tolerance Limit (dB)	P/F	Uncertainty (dB)	Maximum Permitted Uncertainty (dB)
200ms	110.0	0.0	±0.5	P	0.1	0.3
2ms	90.0	0.0	+1.0 / -1.5	P	0.1	0.3
0.25ms	80.9	-0.1	+1.0 / -3	P	0.1	0.3

4.10 PEAK C RESPONSE

Indication of Peak C sound level was tested on the least sensitive level range. Test signals used were -

A single complete cycle of an 8kHz sinusoid, starting and stopping at zero crossings

Positive and negative half cycles of a 500Hz sinusoid, starting and stopping at zero crossings.

The level of the steady 8kHz sinusoid was adjusted to display 135.0dB(C).

Table 19 - Single Cycle Response

Response Peak C	Deviation (dB)	Tolerance Limit (dB)	P/F	Uncertainty (dB)	Overload Peak C	Maximum Permitted Uncertainty (dB)
138.3	-0.1	±2.0	P	0.22	N	0.35

Table 20 - Half Cycle Response

Signal Orientation	Response Peak C (dB)	Deviation (dB)	Tolerance Limit (dB)	P/F	Uncertainty (dB)	Maximum Permitted Uncertainty (dB)
Positive	136.9	-0.5	±1.0	P	0.1	0.35
Negative	136.9	-0.5	±1.0	P	0.1	0.35

No overload was noted during Peak C testing.

4.11 OVERLOAD INDICATION

The overload indication was tested on the least sensitive level range, with the sound level meter set to display frequency weighted A, time averaged values.

Positive and negative half cycle sinusoidal electrical signals at 4kHz were used. The test began at an indicated time averaged level of129.0dB(A).

Using the positive half cycle signal, the signal level was increased in steps of 0.5dB up to, but not including, the first indication of overload. The level of the input signal was then increased in steps of 0.1dB until the first indication of overload. These steps were repeated using the negative half cycle signal.

Table 21 - Overload Indication

Signal Orientation	Overload Response (dB)	Difference (dB)	Tolerance Limit (dB)	P/F	Uncertainty (dB)	Maximum Permitted Uncertainty (dB)
Positive		N/A	±1.5	N/A	0.10	0.25
Negative						

Overload indication could not be verified due to insufficient output of the waveform generator.

Overload latch indication could not be verified due to insufficient output of the waveform generator.

4.12 HIGH LEVEL STABILITY

High level stability was tested by measuring the response of the meter to high signal levels. The result was evaluated as the difference between the A-Weighted indicated levels in response to a steady 1kHz signal applied over 5 minutes.

Table 22 - FAST Weighted Response

Time Weighting	Initial Response (dB)	Final Response (dB)	Deviation (dB)	Tolerance Limit (dB)	P/F	Uncertainty (dB)	Maximum Permitted Uncertainty (dB)
Fast	129.0	129.0	0.0	±0.1	P	0.10	0.10
Slow	N/A	N/A	N/A	±0.1	N/A	0.10	0.10
Leq	129.0	129.0	0.0	±0.1	P	0.10	0.10

Australia

SYDNEY
Level 10 201 Pacific Highway
St Leonards NSW 2065
T 02 9493 9500

NEWCASTLE
Level 3 175 Scott Street
Newcastle NSW 2300
T 02 4907 4800

BRISBANE
Level 2 95 North Quay
Brisbane QLD 4000
T 07 3648 1200

CANBERRA
Suite 2.04 Level 2
15 London Circuit
Canberra City ACT 2601

ADELAIDE
Level 4 74 Pirie Street
Adelaide SA 5000
T 08 8232 2253

MELBOURNE
Suite 9.01 Level 9
454 Collins Street
Melbourne VIC 3000
T 03 9993 1900

PERTH
Suite 3.03
111 St Georges Terrace
Perth WA 6000
T 08 6430 4800

Canada

TORONTO
2345 Yonge Street Suite 300
Toronto ON M4P 2E5
T 647 467 1605

VANCOUVER
2015 Main Street
Vancouver BC V5T 3C2
T 604 999 8297

CALGARY
700 2nd Street SW Floor 19
Calgary AB T2P 2W2

linkedin.com/company/emm-consulting-pty-limited
emmconsulting.com.au