Boggabri Coal Mine

Mobile Plant Sound Power Survey

2019

Prepared for

Boggabri Coal Pty Limited

Global Acoustics

Noise and Vibration Analysis and Solutions

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Boggabri Coal Mine

Mobile Plant Sound Power Survey 2019

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Prepared for

Boggabri Coal Pty Limited
PO Box 12
Boggabri NSW 2382

Prepared by

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Thornton NSW 2322

Prepared:	Jonathan Erasmus Consultant	QA Review:	Jason Cameron 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

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1 INTRODUCTION

This report provides sound power (L_W) data for mobile equipment operating at Boggabri Coal Mine (BCM). An assessment of tonality for each plant item is also provided.

Sound power testing is undertaken over the course of the calendar year. Plant items identified with elevated sound power levels come under additional investigation. This type of monitoring and action is a form of noise control to ensure that equipment noise levels remain at or near modelled levels, assisting in compliance with off site receptor noise limits.

Noise level measurements in this report were taken on 9 January, 3 June, 4 June, 1 July, 15 July, and 16 July 2019.

1.1 Terminology

Some definitions of terminology, which may be used in this report, are provided in Table 1.1.

Table 1.1: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition
dB	Decibels. For sound pressure level this is 10 times the logarithm to the base 10 of the ratio of the mean-square sound pressure to the square of the reference sound pressure (20 micro-pascals)
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 micro-pascals.
L_W	Linear sound power level, expressed in decibels, is the logarithmic ratio of the sound power of a source in watts (W) relative to the sound power reference base of 10-12W
L_{WA}	A-weighted sound power level.
L_{Aeq}	The average A-weighted noise energy during a measurement period, in dB

2 METHODOLOGY

2.1 Test Standards

Test standards referenced in this document include:

- AS 2012.1-1990 'Acoustics – Measurement of airborne noise emitted by earth-moving machinery and agricultural tractors – Stationary test condition – Determination of Compliance With Limits for External Noise';
- AS 2012.2-1990 'Acoustics – Measurement of airborne noise emitted by earth-moving machinery and agricultural tractors – Stationary test condition – Operator's Position';
- AS 1269.1-2005 'Occupational Noise Measurement – Part 1 Measurement and assessment of noise immission and exposure';
- ISO 3744-2010 'Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for an essentially free field over a reflecting plane';
- ISO 6393:2008(E) 'Earth-moving machinery – Determination of sound power level – Stationary test conditions'; and
- ISO 6395:2008(E) 'Earth-moving machinery – Determination of sound power level – Dynamic test conditions'.

2.2 Test configuration

2.2.1 ISO/AS Sound Power Methodology

Sound power measurement and calculation of plant to ISO/AS level (as shown in Table 3.1) was carried out generally in accordance with Section 2.1 standards. More detail is provided below.

Komatsu 930E (720, 721, 722, 724, 725, 754, 291, 292)

- Stationary L_W and operator noise exposure test, engine at rated speed (1900 rpm), engine cooling fan operating at 100%, all engine compartment doors and hatches were closed;
- Dynamic uphill loaded L_W test, engine at operational speed (~1900 rpm), engine cooling fan operating at 100%, all engine compartment doors and hatches were closed; and
- Dynamic downhill unloaded L_W test, 20 km/h, all engine compartment doors and hatches were closed.

2.2.2 Screening Sound Power Methodology

Sound power measurement and calculation of plant to screening sound power level (as shown in Table 3.1) conducted using a reduced scope version of Section 2.1 standards.

The reduced scope uses fewer microphone positions than specified in the standards, with only ground positions used. The rationale being to increase mobility of the testing team, provide flexibility in choice of testing location, and to minimise disruption to mining production.

The test is mainly used as a screening tool. A more precise equipment sound power that would result from full adherence to the above standards was not required. A minimum of two test runs were recorded for each plant item with the aim to have less than 1.5 dB difference between results. It is considered that the results are of sufficient accuracy and repeatability for the purpose of this survey.

Typical test areas showing microphone positions are presented in Figure 1 and Figure 2. The majority of tests for mobile plant were undertaken using a dynamic test only, where the plant item passes through the test area shown in Figure 1 under full power on level ground. The measurement is commenced and completed when the plant item (centre of) passes between microphone positions 2 & 3 and 1&4 respectively. In some cases, stationary tests were conducted for dozers, wheel dozers, and loaders in order to determine engine noise in the absence of track noise and reverse alarms.

Haul trucks, water carts, service carts, front end loaders, graders and dozers were all tested on a flat test area at high idle using the test area shown in Figure 1. Drills were tested in-situ during normal operations using the test area shown in Figure 2. Excavator testing involved measurement at one or more locations at a known distance whilst normal truck loading operations were undertaken. This method provides the most convenient means to test diggers as it presents minimal disruption to production. Excavator testing was performed using some of the positions in Figure 2 (microphone positions being dependant on the excavator immediate working environment). A more accurate and repeatable test would cause significant disruption to production.

A more detailed test methodology document can be provided upon request.

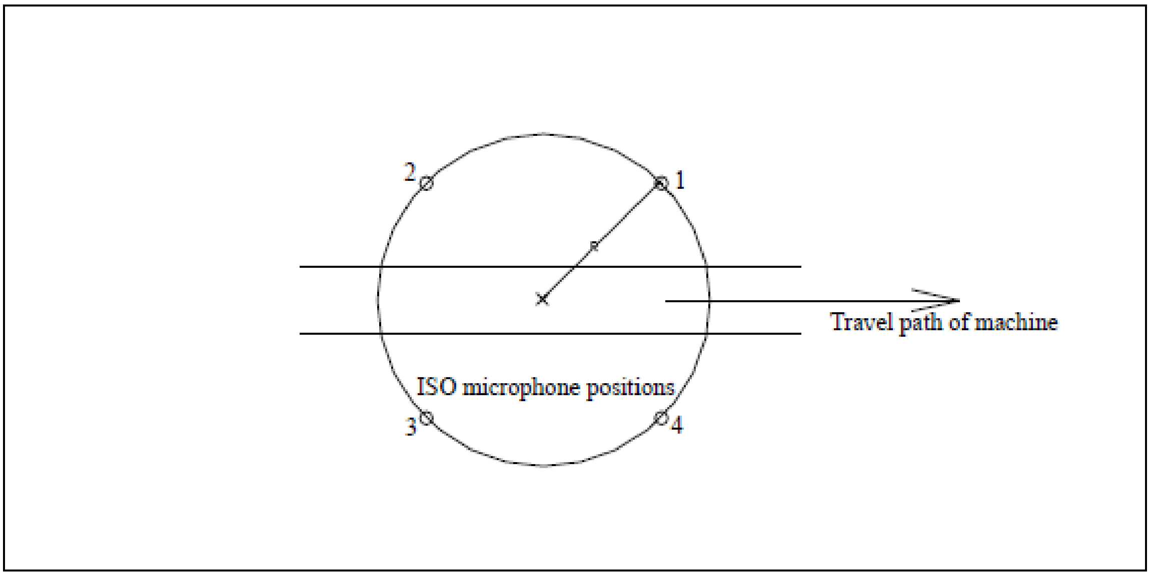

Figure 1 Sound Power Microphone Positions

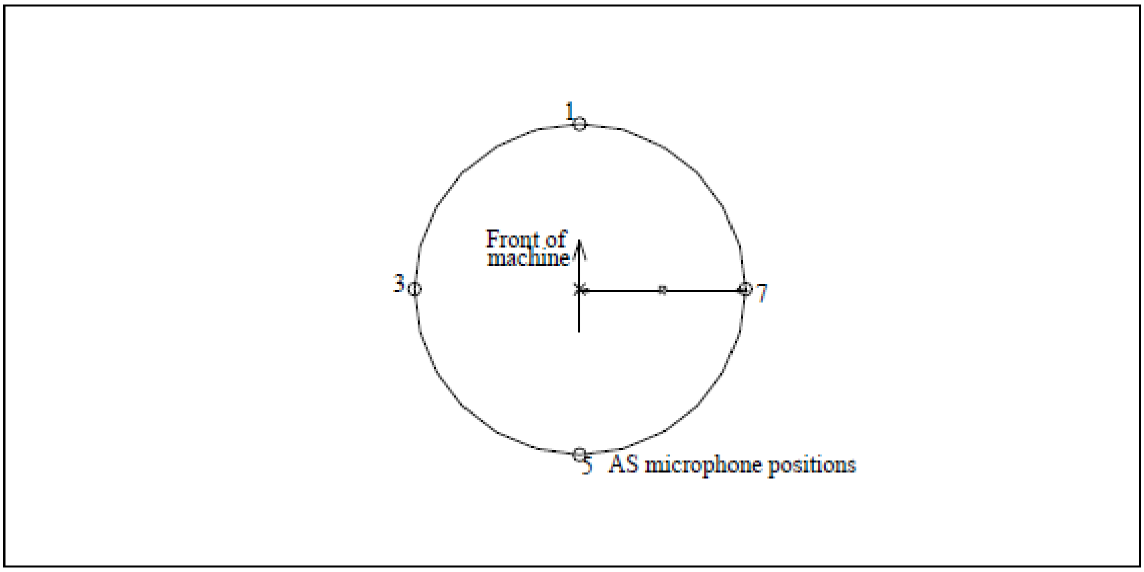

Figure 2 Alternate Stationary Sound Power Microphone Positions

2.3 Equipment Used

Equipment used to measure and record noise levels are listed in Table 2.1. Calibration certificates are provided in Appendix A.

Table 2.1: SOUND LEVEL MEASUREMENT EQUIPMENT

Model	Serial Number	Calibration Due Date
SVAN 948 noise and vibration analyser	6507	13/08/2020
Rion NC74 sound level calibrator	34172616	06/10/2019
SVAN 958 noise and vibration analyser	20880	10/03/2019
SVAN 958 noise and vibration analyser	14216	21/02/2021
Rion NC74 sound level calibrator	34483783	21/02/2021

2.4 Weather Conditions

Weather conditions at the time of testing are presented in Table 2.2.

Table 2.2: ATMOSPHERIC CONDITIONS

Date	Temperature (°C)	Wind Speed (m/s)	Barometric Pressure (hPa)	Relative Humidity (%)
09/01/2019	40	1 – 2	1015	40
03/06/2019	14	3 – 5	1019	62
04/06/2019	14	3 – 4	1014	61
01/07/2019	20	1 – 2	1025	47
15/07/2019	13	1 – 3	1022	47
16/07/2019	19	1 – 2	1023	53

2.5 Criteria

Sound power results in this report have been assessed against sound powers used in modelling for the Continuation of Boggabri Coal Mine Environmental Assessment (EA) (Hansen Bailey, 2010), as advised by Boggabri Coal Mine. Dozers have been assessed against the specified limits for 1st gear operation only.

2.6 Tonality

The NPfI states that a noise is determined to be tonal when the level of an individual one-third octave band exceeds the level of the adjacent bands on both sides by:

- 5 dB or more if the centre frequency of the band containing the tone is above 400Hz;
- 8 dB or more if the centre frequency of the band containing the tone is 160 Hz to 400 Hz inclusive;
- 15 dB or more if the centre frequency of the band containing the tone is below 160 Hz.

Tonal plant (Y/N) is listed in Table 3.1.

3 Overall Sound Power Results

Overall A-weighted sound power levels determined from measured SPL are shown in Table 3.1. Overall sound power screening results which exceeded the relevant criterion by 2 dB or less are considered minor and not significant enough to require additional investigation. Overall sound power screening results which exceeded the relevant criterion by 3 dB or more are considered significant and require additional investigation. Any difference in screening results for the same plant between consecutive years of +3 dB or more would also trigger a more detailed analysis of results (third octave band results analysis) and potentially follow-up machine inspection and/or additional testing.

This approach has been developed in consideration of a number of uncertainty factors and has been adopted and approved by the Department of Planning and Environment (DPE) in other annual noise testing regimes of mobile plant in NSW. These factors include, but are not limited to:

- As described in the Methodology section of this report, the acceptable repeatability for screening is up to 1.5 dB between measured results;
- Due to the mobile nature of screening testing, additional variables such as other mobile plant operating nearby, hard-packed and/or uneven testing surfaces, varying skill of operators, and certain modes of operations being undertaken during testing (in the case of excavators and drills) can result in measured noise levels that are slightly higher than they would be under full scope noise testing;

Single and one-third-octave graphs for equipment tested can be useful in identifying noise sources or differences between like machines. These graphs have not been included in this report but are available upon request.

Note that overall linear sound power levels are a better indicator of low frequency noise content of plant than overall A-weighted sound power levels. Low frequency noise can propagate further than high frequency noise, and so can indicate items with higher potential for off-site noise impacts.

Where plant has been tested to ISO/AS level, any exceedance of the relevant criterion is considered significant, and requires further investigation.

Table 3.1: 2019 SOUND POWER LEVELS

Plant No	Make/Model	Test Level	Test Type	Results dB	Results dB(A)	Limit dB	Limit dB(A)	Difference dB	Difference dB(A)	Comments	Tonal Hz
Excavators/Loaders											
EX123	Caterpillar 6060	Screening	Dynamic	131	122	130	120	1	2		No
EX125	Liebherr R9400	Screening	Dynamic	130	117	130	120	0	-3		No
EX257	Caterpillar 6030	Screening	Dynamic	129	123	130	120	-1	3		No
EX259	Hitachi EX2600-6	Screening	Dynamic	127	123	130	120	-3	3		No
EX261	Hitachi ZX870	Screening	Dynamic	120	108	130	120	-10	-12		No
WL188	Komatsu WA1200-3	Screening	Stationary	127	119	126	117	1	2		No
WL189	Komatsu WA320PZ-6	Screening	Stationary	108	97	126	117	-18	-20		No
Trucks											
DT291	Komatsu 930E	ISO	Dynamic, Downhill Unloaded	124	124	125	119	-1	5		1250
DT291	Komatsu 930E	ISO	Dynamic, Uphill Unloaded	128	114	125	119	3	-5		No
DT291	Komatsu 930E	ISO	Stationary	123	112	125	119	-2	-7		No
DT292	Komatsu 930E	ISO	Dynamic, Downhill Unloaded	125	123	125	119	0	4		1250
DT292	Komatsu 930E	ISO	Dynamic, Uphill Loaded	127	114	125	119	2	-5		No
DT292	Komatsu 930E	ISO	Stationary	122	111	125	119	-3	-8		No
DT720	Komatsu 930E	ISO	Dynamic, Downhill Unloaded	121	116	125	119	-4	-3		No
DT720	Komatsu 930E	ISO	Dynamic, Uphill Loaded	129	122	125	119	4	3		No

Plant No	Make/Model	Test Level	Test Type	Results dB	Results dB(A)	Limit dB	Limit dB(A)	Difference dB	Difference dB(A)	Comments	Tonal Hz
DT720	Komatsu 930E	ISO	Stationary	126	120	125	119	1	1		No
DT721	Komatsu 930E	ISO	Dynamic, Downhill Unloaded	126	123	125	119	1	4		No
DT721	Komatsu 930E	ISO	Dynamic, Uphill Loaded	132	123	125	119	7	4		No
DT721	Komatsu 930E	ISO	Stationary	127	121	125	119	2	2		No
DT722	Komatsu 930E	ISO	Dynamic, Downhill Unloaded	125	119	125	119	0	0		No
DT722	Komatsu 930E	ISO	Dynamic, Uphill Loaded	132	123	125	119	7	4		No
DT722	Komatsu 930E	ISO	Stationary	128	122	125	119	3	3		No
DT724	Komatsu 930E	ISO	Dynamic, Downhill Unloaded	125	124	125	119	0	5		1250
DT724	Komatsu 930E	ISO	Dynamic, Uphill Loaded	128	122	125	119	3	3		No
DT724	Komatsu 930E	ISO	Stationary	126	120	125	119	1	1		No
DT725	Komatsu 930E	ISO	Dynamic, Downhill Unloaded	125	123	125	119	0	4		No
DT725	Komatsu 930E	ISO	Dynamic, Uphill Loaded	128	123	125	119	3	4		No
DT725	Komatsu 930E	ISO	Stationary	127	122	125	119	2	3		No
DT754	Komatsu 930E	ISO	Dynamic, Downhill Unloaded	122	116	125	119	-3	-3		No
DT754	Komatsu 930E	ISO	Dynamic, Uphill Loaded	128	123	125	119	3	4		No
DT754	Komatsu 930E	ISO	Stationary	127	122	125	119	2	3		No
DT263	Komatsu 930E	Screening	Dynamic, Forward	130	117	126	117	4	0		No
DT264	Komatsu 930E	Screening	Dynamic, Forward	128	116	126	117	2	-1		No

Plant No	Make/Model	Test Level	Test Type	Results dB	Results dB(A)	Limit dB	Limit dB(A)	Differenc e dB	Difference dB(A)	Comments	Tonal Hz
DT265	Komatsu 930E	Screening	Dynamic, Forward	129	116	126	117	3	-1		No
DT306	Hitachi EH3500ACII	Screening	Dynamic, Forward	135	120	126	117	9	3		No
DT307	Hitachi EH3500ACII	Screening	Dynamic, Forward	130	118	126	117	4	1		No
DT308	Hitachi EH3500ACII	Screening	Dynamic, Forward	128	117	126	117	2	0		10000
DT748	Komatsu 930E	Screening	Dynamic, Forward	134	125	126	117	8	8		No
DT749	Komatsu 930E	Screening	Dynamic, Forward	132	122	126	117	6	5		No
DT750	Komatsu 930E	Screening	Dynamic, Forward	133	124	126	117	7	7		No
DT751	Komatsu 930E	Screening	Dynamic, Forward	134	125	126	117	8	8		No
DT752	Komatsu 930E	Screening	Dynamic, Forward	133	124	126	117	7	7		No
Dozers											
TD06	Caterpillar D11T	Screening	Dynamic, 1st Gear Forward	123	118	126	116	-3	2		No
TD06	Caterpillar D11T	Screening	Dynamic, 1st Gear Reverse	125	121	126	116	-1	5		No
TD06	Caterpillar D11T	Screening	Stationary	121	110	126	116	-5	-6		No
TD07	Caterpillar D11T	Screening	Dynamic, 1st Gear Forward	123	115	126	116	-3	-1		No
TD07	Caterpillar D11T	Screening	Dynamic, 1st Gear Reverse	123	118	126	116	-3	2		10000
TD07	Caterpillar D11T	Screening	Stationary	121	110	126	116	-5	-6		1600
TD078	Komatsu D375A-5EO	Screening	Dynamic, 1st Gear Forward	118	113	126	116	-8	-3		No
TD078	Komatsu D375A-	Screening	Dynamic, 1st Gear Reverse	119	114	126	116	-7	-2		No

Plant No	Make/Model	Test Level	Test Type	Results dB	Results dB(A)	Limit dB	Limit dB(A)	Difference dB	Difference dB(A)	Comments	Tonal Hz
	5EO										
TD078	Komatsu D375A-5EO	Screening	Stationary	113	106	126	116	-13	-10		No
TD079	Komatsu D475A-5EO	Screening	Dynamic, 1st Gear Forward	118	109	126	116	-8	-7		No
TD079	Komatsu D475A-5EO	Screening	Dynamic, 1st Gear Reverse	119	111	126	116	-7	-5		No
TD079	Komatsu D475A-5EO	Screening	Stationary	115	102	126	116	-11	-14		No
TD082	Komatsu D475A-5EO	Screening	Dynamic, 1st Gear Forward	121	117	126	116	-5	1		3150
TD082	Komatsu D475A-5EO	Screening	Dynamic, 1st Gear Reverse	122	118	126	116	-4	2		5000
TD082	Komatsu D475A-5EO	Screening	Stationary	118	104	126	116	-8	-12		No
TD80	Komatsu D475A-5EO	Screening	Dynamic, 1st Gear Forward	117	109	126	116	-9	-7		No
TD80	Komatsu D475A-5EO	Screening	Dynamic, 1st Gear Reverse	119	113	126	116	-7	-3		No
TD80	Komatsu D475A-5EO	Screening	Stationary	115	105	126	116	-11	-11		3150
					Graders						
GR060	Caterpillar 16M	screening	Dynamic, 1st Gear Forward	113	106	126	115	-13	-9		No
GR061	Caterpillar 16M	screening	Dynamic, 1st Gear Forward	115	107	126	115	-11	-8		No

Plant No	Make/Model	Test Level	Test Type	Results dB	Results dB(A)	Limit dB	Limit dB(A)	Difference dB	Difference dB(A)	Comments	Tonal Hz
Water Trucks											
WC029	Komatsu HD785-7	Screening	Dynamic, Forward	126	120	128	117	-2	3		No
WC031	Komatsu HD785-7	Screening	Dynamic, Forward	127	118	128	117	-1	1		No
Drills											
653	ReichDrill C700D	Screening	Stationary	130	120	129	117	1	3		No
658	ReichDrill C700D	Screening	Stationary	124	119	129	117	-5	2		No

4 SUMMARY

This report provides sound power (L_W) data for mobile equipment operating at Boggabri Coal Mine (BCM).

Results in Table 3.1 show that:

- Komatsu 930-E trucks 263, 265, 291, 292, 306, 307, 720, 721, 722, 724, 725, 748, 749, 750, 751, 752, and 754 exceeded A-weighted and/or linear target by 3 or more dB;
- EX257 and 259 exceeded the A-weighted target by 3 dB;
- TD06 exceeded the A-weighted target by 5 dB;
- WC029 exceeded the A-weighted target by 3 dB; and
- Drill 653 exceeded the A-weighted target by 3 dB.

Global Acoustics recommend that any plant with a sound power level change between test periods of greater than 2 dB and/or an exceedance of a sound power limit by more than 2 dB, be initially inspected for damaged or missing sound attenuation, further action to be determined from the outcomes of said inspection.

We trust this information is per your requirements. Please contact us if you require further details or advice.

Global Acoustics Pty Ltd

APPENDIX

A 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 C18436A

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

Filter Model Number : SVANTEK SVAN948
Filter Serial Number : N/A
Instrument Serial Number : 6507
Microphone Serial Number : 4010442
Pre-amplifier Serial Number : 5759

Atmospheric Conditions
Ambient Temperature : 22°C
Relative Humidity : 32.6%
Barometric Pressure : 99.89kPa

Calibration Technician : Lucky Jaiswal
Calibration Date : 13 Aug 2018
Secondary Check: Lewis Boorman
Report Issue Date : 14 Aug 2018
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.

Least Uncertainties of Measurement -

Electrical Tests		Environmental Conditions	
< 16Hz	*±0.19dB*	*Temperature*	*±0.3°C*
16Hz-100Hz	*±0.11dB*	*Relative Humidity*	*±2.5%*
100Hz-1000Hz	*±0.1dB*	*Barometric Pressure*	*±0.017kPa*
1000Hz-10kHz	*±0.1dB*		
>10kHz	*±0.16dB*		

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

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

NATA
WORLD RECOGNISED ACCREDITATION

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

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

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

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Sound Calibrator

IEC 60942-2004

Calibration Certificate

Calibration Number C17526

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

Equipment Tested/ Model Number : Rion NC-74
Instrument Serial Number : 34172616

Atmospheric Conditions
Ambient Temperature : 21.6°C
Relative Humidity : 42.4%
Barometric Pressure : 99.43kPa

Calibration Technician : Jason Gomes **Secondary Check:** Riley Cooper
Calibration Date : 06/10/2017 **Report Issue Date :** 10/10/2017

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
94.0	1000.0	94.1	1002.31

The sound calibrator has been shown to conform to the class 1 requirements for periodic testing, described in Annex B of IEC 60942:2004 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -

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

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

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

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Octave Band Filter
AS 4476:1997
Calibration Certificate

Calibration Number C17109A

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

Filter Model Number : SvanTek 958
Filter Serial Number : N/A
Instrument Serial Number : 20880
Microphone Serial Number : 2662995
Pre-amplifier Serial Number : 17124

Atmospheric Conditions
Ambient Temperature : 22.2°C
Relative Humidity : 50.1%
Barometric Pressure : 99.47kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 10/03/2017
Secondary Check: Riley Cooper
Report Issue Date : 13/03/2017

Approved Signatory : Juan Aguero

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.

Least Uncertainties of Measurement -

Electrical Tests		Environmental Conditions	
< 16Hz	*±0.19dB*	*Temperature*	*±0.05°C*
16Hz-100Hz	*±0.11dB*	*Relative Humidity*	*±0.46%*
100Hz-1000Hz	*±0.09dB*	*Barometric Pressure*	*±0.017kPa*
1000Hz-10kHz	*±0.09dB*		
>10kHz	*±0.16dB*		

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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NATA WORLD RECOGNISED ACCREDITATION

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Sound Level Meter

IEC 61672-3.2013

Calibration Certificate

Calibration Number C19126

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

Equipment Tested/ Model Number : SVANTEK SVAN 958
Instrument Serial Number : 14216
Microphone Serial Number : 480224
Pre-amplifier Serial Number : 5592

Pre-Test Atmospheric Conditions
Ambient Temperature : 23.3°C
Relative Humidity : 55.6%
Barometric Pressure : 99.58kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 23.9°C
Relative Humidity : 56.3%
Barometric Pressure : 99.5kPa

Calibration Technician : Lucky Jaiswal
Calibration Date : 21 Feb 2019
Secondary Check: Lewis Boorman
Report Issue Date : 22 Feb 2019

Approved Signatory : Ken Williams

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

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.15dB*	*Temperature*	*±0.2°C*
12.5kHz	*±0.2dB*	*Relative Humidity*	*±2.4%*
16kHz	*±0.29dB*	*Barometric Pressure*	*±0.015kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.11dB*		

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

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

NATA WORLD RECOGNISED ACCREDITATION

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

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

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

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Sound Calibrator

IEC 60942-2017

Calibration Certificate

Calibration Number C19125

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

Equipment Tested/ Model Number : Rion NC-74
Instrument Serial Number : 34483783

Atmospheric Conditions
Ambient Temperature : 24.2°C
Relative Humidity : 53.9%
Barometric Pressure : 99.54kPa

Calibration Technician : Lucky Jaiswal
Calibration Date : 21 Feb 2019
Secondary Check: Lewis Boorman
Report Issue Date : 22 Feb 2019
Approved Signatory : Ken Williams

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

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	94.2	1002.21

The sound calibrator has been shown to conform to the class 1 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	±0.11dB	*Temperature*	±0.2°C
Frequency	±0.01%	*Relative Humidity*	±2.4%
Distortion	±0.48%	*Barometric Pressure*	±0.015kPa

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

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