

# Noise Monitoring Assessment

Dargues Gold Mine  
Majors Creek, NSW.  
December, 2021

Prepared for: Aurelia Metals Ltd  
December 2021  
MAC201092-01RP8



# Document Information

## Noise Monitoring Assessment

### Dargues Gold Mine, Majors Creek, NSW

December, 2021

**Prepared for:** Aurelia Metals Ltd

Dargues Gold Mine

920 Majors Creek Road

Majors Creek NSW 2622



**Prepared by:** Muller Acoustic Consulting Pty Ltd

PO Box 678, Kotara NSW 2289

ABN: 36 602 225 132

P: +61 2 4920 1833

[www.mulleracoustic.com](http://www.mulleracoustic.com)

Document ID	Status	Date	Prepared By	Signed	Reviewed By	Signed
MAC201092-01RP8	Final	9 December 2021	Nicholas Shipman		Oliver Muller	

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# 1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Aurelia Metals Ltd to complete a quarterly Noise Monitoring Assessment (NMA) for Dargues Gold Mine, Majors Creek, NSW (the 'mine').

The monitoring has been conducted in accordance with Condition L2 of the Environmental Protection Licence (EPL) #20095, and in accordance with the site's Noise Management Plan (NMP) 20170123, at five representative monitoring locations. This assessment has been undertaken during Quarter 4 on Wednesday 1 December 2021 and Thursday 2 December 2021 and forms part of the noise monitoring program to address relevant conditions.

The assessment has been conducted in accordance with the following documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- NSW Environment Protection Authority (EPA), Environment Protection Licence EPL #20095 (EPL);
- Dargues Gold Mine Noise Management Plan (NMP) 20170123;
- Dargues Gold Mine Project Approval, 10\_0054; and
- Australian Standard AS 1055:2018 - Acoustics - Description and measurement of environmental noise - General Procedures.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

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## 2 Noise Criteria

### 2.1 Operational Noise Criteria

Section L2 of the project's EPL (EPL #20095) outlines the applicable operational noise criteria for all privately owned residential receivers surrounding the mine. The criteria outlined in the EPL is reproduced below:

*L2.1 Noise from the premises must not exceed the sound pressure level (noise) limits presented in the Table below. Note that the limits apply to the operation of the project and represent the sound pressure level (noise) contribution, at the nominated receiver locations in the table.*

**Table 1** summaries the applicable noise criteria at the three monitoring locations in accordance with the sites EPL and NMP.

<b>Table 1 Noise Monitoring Program</b>				
Monitoring Location	Noise Criteria, dBA LAeq(15min)			Noise Criteria, dB LA1(1min)
	Day	Evening	Night	Night
	(7am to 6pm)	(6pm to 10pm)	(10pm to 7am)	(10pm to 7am)
At any residence	35	35	35	45
Majors Creek State Conservation Area (when in use by any person)	35	35	35	45

*L2.2 For the purpose of Noise Limit Conditions above:*

*'Day' is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays;*

*'Evening' is defined as the period from 6pm to 10pm on any day; and*

*'Night' is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.*

*L2.3 The noise emission limits identified in the table above apply under meteorological conditions of:*

- a) Wind speeds up to 3 m/s at 10m above ground level; or*
- b) temperature inversion conditions of up to 3 °C/100m and wind speeds up to 2 m/s at 10m above ground level*

*L2.4 For the purpose of the Condition L4.3:*

- a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station established at the premises for the purposes of this Environment Protection Licence ("Point 59" as outlined in Weather Monitoring conditions below)*

b) Stability category temperature inversion conditions are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the New South Wales Industrial Noise Policy (EPA 2000).

#### L2.5 Determining Compliance

To determine compliance:

a) with the  $Leq(15 \text{ minute})$  noise limits in the Noise Limits table, the noise measurement equipment must be located:

i) approximately on the property boundary, where any dwelling is situated 30 meters or less from the property boundary closest to the premises; or

ii) within 30 meters of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30 meters from the property boundary closest to the premises; or, where applicable

iii) within approximately 50 meters of the boundary of a National Park, Nature Reserve or State Conservation Area.

b) with the  $LA1(1 \text{ minute})$  noise limits in the Noise Limits table, the noise measurement equipment must be located within 1 meter of a dwelling façade.

c) with the noise limits in the Noise Limits table, the noise measurement equipment must be located:

i) at the most affected point at a location where there is no dwelling at the location; or

ii) at the most affected point within an area at a location prescribed by part (a) or part (b) of this condition.

L2.6 For the purposes of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

L2.7A breach of this license will still occur where noise generated from the premises in excess of the appropriate limit is measured: i) at a location other than an area prescribed in part (a) and part (b) of Condition L4.5; and/or ii) at a point other than the most affected point at a location.

**MAC Technical Note:** For sleep disturbance, the  $LA1(1 \text{ minute})$  descriptor is meant to represent a maximum noise level measured under 'fast' time response. DEC will accept analysis based on either  $LA1(1 \text{ minute})$  or  $LA(max)$ .



## 2.2 Road Noise Criteria

Environmental Performance Condition 2 of the Project Approval (AN10\_0054) specifies noise criteria for off-site traffic from the mine. The condition is reproduced below:

*Condition 2 The Proponent shall take all reasonable and feasible measures to ensure that the traffic noise generated by the project does not exceed the traffic noise impact assessment criteria in Table 2.*

Table 2 Traffic Noise Impact Assessment Criteria dB(A)		
Road	Assessment Criteria - dBA	
	Day (7am to 10pm)	Night (10pm to 7am)
Majors Creek Road, Araluen Road, Captains	55dBA	50dBA
Flat Road, Coghill Street and Wallace Street	LAeq(1hour)	LAeq(1hour)

*Note: The noise generated by the project is to be measured in accordance with the relevant procedures in the NSW Road Noise Policy.*

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### 3 Methodology

All attended noise surveys for this assessment were conducted in general accordance with the procedures described in Australian Standard AS 1055:2018, "Acoustics - Description and Measurement of Environmental Noise" and the EPL.

The acoustic instrumentation used carries current NATA calibration and complies with AS IEC 61672.1-2019-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed  $\pm 0.5$  dBA. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

#### 3.1 Operator Attended Noise Measurement Methodology

The locality surrounding the mine is primarily rural/residential. Operator attended noise monitoring was undertaken at five representative receivers outlined in the mine's NMP and are presented in **Table 3**.

Table 3 Receiver Location <sup>1</sup>			
Monitoring Location	Resident Identifier	Coordinates (GDA94-MGA55)	
		Easting	Northing
NM1	R29	748148	6061931
NM2	R108	747454	6062651
NM3	R20	748672	6061250
NM5	R27	748998	6061467
NM6	R34	751242	6064950

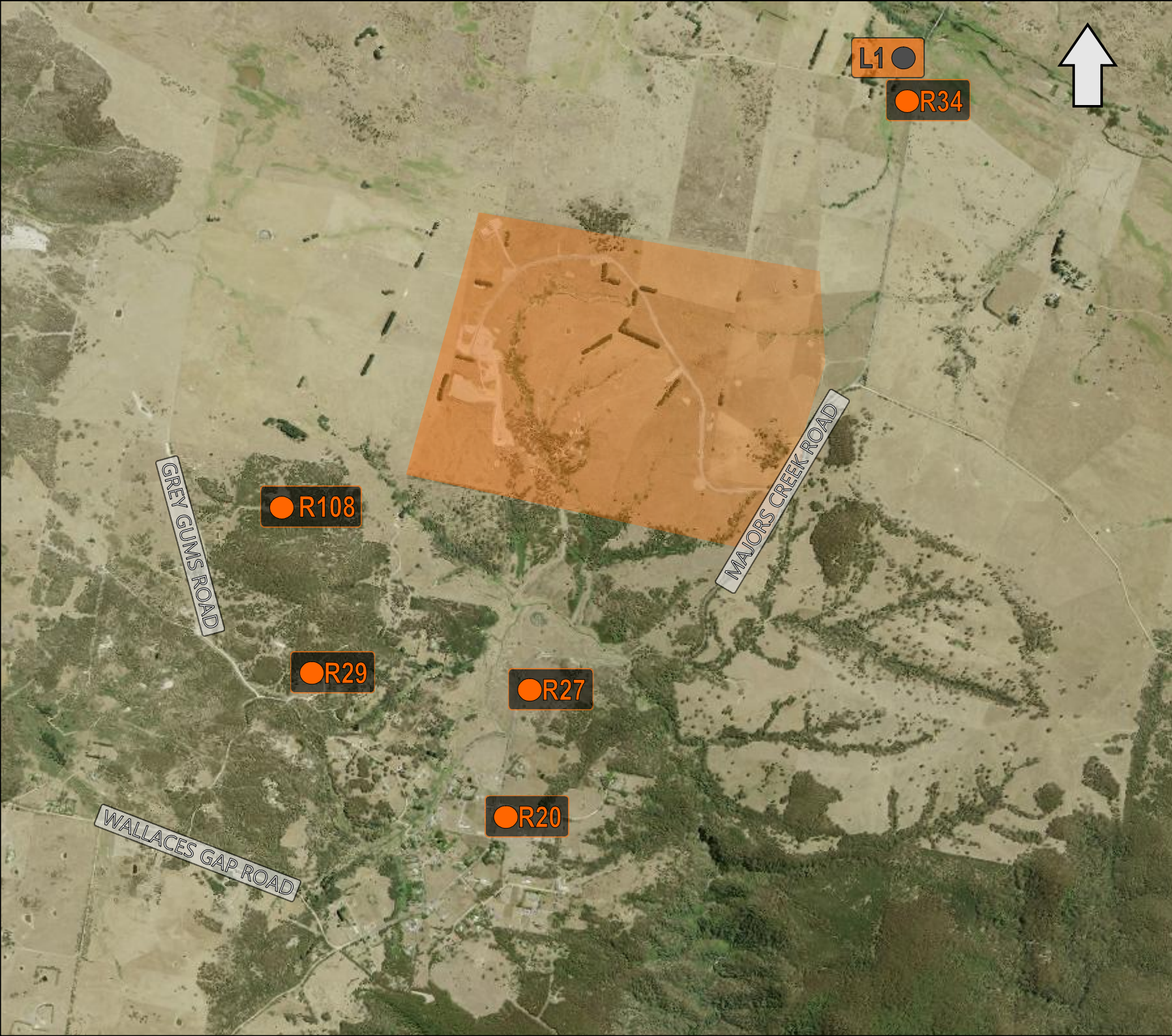
Note 1: As per the Mine's NMP.

The receiver locations and unattended noise measurement location are presented in **Figure 1**.

Attended measurements were carried out using a Svantek Type 1, 971 noise analyser on Wednesday 1 December 2021 and Thursday 2 December 2021. Where possible throughout each survey the operator quantified the contribution of any significant noise sources.

#### 3.2 Unattended Operational and Road Noise Assessment Methodology

Unattended road traffic noise monitoring was conducted on the boundary of 664 Majors Creek Road, Jembaicumbene, NSW (R34) using a Svantek Type 1, 977 noise analyser between Wednesday 1 December 2021 and Thursday 2 December 2021. Noise levels obtained at the monitoring location are considered representative of 664 Majors Creek Road, Jembaicumbene, NSW.



**FIGURE 1**  
**LOCALITY PLAN**  
REF: MAC201092



KEY	
	UNATTENDED LOCATION
	RECEIVER LOCATION
	SITE LOCATION



Imagery Source: Google Earth

## 4 Results

### 4.1 Assessment Results – Location R20

The results of the attended noise measurements at location R20 for the December 2021 survey are summarised in **Table 4** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 4 Operator-Attended Noise Survey Results – Location R20							
Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology <sup>1</sup>	Description and SPL, dBA
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>			
02/12/2021 (Day)	12:06	75	54	40	35	WD: W WS: 1.0m/s Rain: Nil	Birds 25-58
							Traffic 32-75
							Local residential noise 25-34
							DGM Inaudible
Dargues Site L <sub>Aeq</sub> (15min) Contribution							<30
Dargues Site L <sub>Amax</sub> Contribution							<35
01/12/2021 (Evening)	20:54	79	55	37	35	WD: W WS: 0.1m/s Rain: Nil	Traffic 36-79
							Insects 35-49
							Dog bark 37-51
							Birds 42-46
Local residential noise <44							
DGM Processing <35							
Dargues Site L <sub>Aeq</sub> (15min) Contribution							<35
Dargues Site L <sub>Amax</sub> Contribution							<35
01/12/2021 (Night)	22:44	55	46	38	35	WD: W WS: 0.1m/s Rain: Nil	Insects 35-46
							Birds 35-55
							DGM Inaudible
							Dargues Site L <sub>Aeq</sub> (15min) Contribution
Dargues Site L <sub>Amax</sub> Contribution							<35

Note 1: Meteorology data obtained from direct measurement by the operator.

## 4.2 Assessment Results – Location R27

The results of the attended noise measurements at location R27 for the December 2021 survey are summarised in **Table 5** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 5 Operator-Attended Noise Survey Results – Location R27								
Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology <sup>1</sup>	Description and SPL, dBA	
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>				
02/12/2021 (Day)	12:24	83	59	25	35	WD: W	Local residential noise 25-38	
						WS: 0.7m/s	Traffic 25-83	
						Rain: Nil	Birds 22-46	
							DGM Inaudible	
							Dargues Site L <sub>Aeq</sub> (15min) Contribution	<30
	Dargues Site L <sub>Amax</sub> Contribution	<35						
01/12/2021 (Evening)	20:34	81	53	34	35	WD: W	Insects 33-34	
						WS: 0.1m/s	Traffic 34-81	
						Rain: Nil	Birds <46	
							DGM Inaudible	
							Dargues Site L <sub>Aeq</sub> (15min) Contribution	<30
	Dargues Site L <sub>Amax</sub> Contribution	<35						
01/12/2021 (Night)	23:04	81	51	34	35	WD: W	Traffic 32-81	
						WS: 0.1m/s	Insects 32-46	
						Rain: Nil	DGM Inaudible	
							Dargues Site L <sub>Aeq</sub> (15min) Contribution	<30
							Dargues Site L <sub>Amax</sub> Contribution	<35

Note 1: Meteorology data obtained from direct measurement by the operator.

### 4.3 Assessment Results – Location R29

The results of the attended noise measurements at location R29 for the December 2021 survey are summarised in **Table 6** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 6 Operator-Attended Noise Survey Results – Location R29														
Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology <sup>1</sup>	Description and SPL, dBA							
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>										
02/12/2021 (Day)	11:45	70	44	30	35	WD: W WS: 1.4m/s Rain: Nil	Birds 32-54							
							Local residential noise 27-34							
							Insects <27							
							Traffic 27-70							
							Wind in trees 30-36							
							DGM Inaudible							
Dargues Site L <sub>Aeq</sub> (15min) Contribution							<30							
Dargues Site L <sub>Amax</sub> Contribution							<35							
01/12/2021 (Evening)	21:24	50	43	39	35	WD: W WS: 0.1m/s Rain: Nil	Insects 36-50							
							Traffic 39-46							
							Dog bark 42-47							
							DGM Inaudible							
							Dargues Site L <sub>Aeq</sub> (15min) Contribution							<30
							Dargues Site L <sub>Amax</sub> Contribution							<35
01/12/2021 (Night)	22:21	49	41	37	35	WD: W WS: 0.1m/s Rain: Nil	Insects 31-49							
							DGM Inaudible							
							Dargues Site L <sub>Aeq</sub> (15min) Contribution							<30
							Dargues Site L <sub>Amax</sub> Contribution							<35

Note 1: Meteorology data obtained from direct measurement by the operator.

#### 4.4 Assessment Results – Location R34

The results of the attended noise measurements at location R34 for the December 2021 survey are summarised in **Table 7** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 7 Operator-Attended Noise Survey Results – Location R34								
Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology <sup>1</sup>	Description and SPL, dBA	
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>				
02/12/2021 (Day)	12:46	80	59	28	35	WD: W	Birds 27-61	
						WS: 0.6m/s	Traffic 27-80	
						Rain: Nil	Livestock 29-44	
							DGM Inaudible	
							Dargues Site L <sub>Aeq</sub> (15min) Contribution	<30
	Dargues Site L <sub>Amax</sub> Contribution	<35						
01/12/2021 (Evening)	20:13	74	54	38	35	WD: W	Insects 36-62	
						WS: 0.1m/s	Birds 59-67	
						Rain: Nil	Traffic 36-74	
							Livestock 36-42	
							DGM Inaudible	
	Dargues Site L <sub>Aeq</sub> (15min) Contribution	<30						
	Dargues Site L <sub>Amax</sub> Contribution	<35						
01/12/2021 (Night)	23:26	76	51	40	35	WD: W	Insects 37-57	
						WS: 0.1m/s	Traffic 37-76	
						Rain: Nil	DGM Inaudible	
							Dargues Site L <sub>Aeq</sub> (15min) Contribution	<30
							Dargues Site L <sub>Amax</sub> Contribution	<35

Note 1: Meteorology data obtained from direct measurement by the operator.



#### 4.5 Assessment Results – Location R108

The results of the attended noise measurements at location R108 for the December 2021 survey are summarised in **Table 8** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 8 Operator-Attended Noise Survey Results – Location R108														
Date	Time (hrs)	Descriptor (dBA re 20 $\mu$ Pa)			EPL Limit	Meteorology <sup>1</sup>	Description and SPL, dBA							
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>										
02/12/2021 (Day)	11:26	72	36	24	35	WD: WNW WS: 0.6m/s Rain: Nil	Birds 22-56							
							Insects <22							
							Wind in trees 26-31							
							Operator 70-72							
							DGM Inaudible							
							Dargues Site L <sub>Aeq</sub> (15min) Contribution							
Dargues Site L <sub>Amax</sub> Contribution	<35													
01/12/2021 (Evening)	21:43	57	48	44	35	WD: W WS: 0.1m/s Rain: Nil	Insects 41-57							
							DGM Inaudible							
							Dargues Site L <sub>Aeq</sub> (15min) Contribution	<30						
							Dargues Site L <sub>Amax</sub> Contribution	<35						
							01/12/2021 (Night)	22:00	53	48	44	35	WD: W WS: 0.1m/s Rain: Nil	Insects 44-53
														DGM Inaudible
Dargues Site L <sub>Aeq</sub> (15min) Contribution	<30													
Dargues Site L <sub>Amax</sub> Contribution	<35													

Note 1: Meteorology data obtained from direct measurement by the operator.

#### 4.6 Unattended Road Traffic Noise Results – Location R34

To assess road traffic noise levels associated with mine vehicles, an unattended noise monitor was located on the boundary of 664 Majors Creek Road, Jembaicumbene (R34).

The results of the road traffic noise measurements on Wednesday 1 December 2021 and Thursday 2 December 2021 are summarised in **Table 9**.

As per Section 3(2) of Dargues Gold Mine's Noise Management Plan, results of the road traffic noise measurements identify that noise levels were influenced by extraneous noise sources such as birds and local road traffic not associated with the mine. The noise contribution of mine related traffic at this location remained below the relevant criteria.

<b>Table 9 Road Noise Survey Results</b>		
Operational Period	Overall Measured dB LAeq (dBA re 20 µPa)	Compliance Limit dB LAeq(1hr)
<b>Assessment Period – Day (7am to 10pm), dB LAeq(1hr)</b>		
7:00am to 6:00pm	60	55
<b>Assessment Period – Night (10pm to 7am), dB LAeq(1hr)</b>		
6:00am to 7:00am	57	50

## 5 Discussion

### 5.1 Operator Attended Noise Discussion

#### 5.1.1 Discussion of Results – Location R20

Operator attended measurement results at R20, on Wednesday 1 December 2021 and Thursday 2 December 2021 identified that DGM activities were barely perceptible during the evening period and inaudible during the day and night assessment periods, therefore satisfying criteria. Generally, birds, traffic, insects, dog bark, local residential noise and wind in trees were audible sources throughout all three monitoring periods.

Therefore, noise contribution from the mine satisfied the relevant noise criteria for the attended measurements on Wednesday 1 December 2021 and Thursday 2 December 2021.

#### 5.1.2 Discussion of Results – Location R27

Operator attended measurement results at R27, on Wednesday 1 December 2021 and Thursday 2 December 2021 identified that DGM remained inaudible during the assessment periods, therefore satisfied relevant criteria. Generally, local residential noise, traffic, birds and insects were audible sources throughout all three monitoring periods.

In summary the noise contribution from the mine satisfied the relevant noise criteria for the attended measurements on Wednesday 1 December 2021 and Thursday 2 December 2021.

#### 5.1.3 Discussion of Results – Location R29

Operator attended measurement results at R29, on Wednesday 1 December 2021 and Thursday 2 December 2021 identified that DGM activities remained inaudible during the assessment periods, and therefore satisfied criteria. Generally, birds, insects, wind in trees, local residential noise, traffic and dogs barking were audible sources throughout all three monitoring periods.

In summary the noise contribution from the mine satisfied the relevant noise criteria for the attended measurements on Wednesday 1 December 2021 and Thursday 2 December 2021.

#### 5.1.4 Discussion of Results – Location R34

Operator attended measurement results at R34, on Wednesday 1 December 2021 and Thursday 2 December 2021 identified that DGM activities remained inaudible during the assessment periods, and therefore satisfied criteria. Generally, birds, traffic, livestock and insects were audible sources throughout all three monitoring periods.

In summary the noise contribution from the mine satisfied the relevant noise criteria for the attended measurements on Wednesday 1 December 2021 and Thursday 2 December 2021.

#### 5.1.5 Discussion of Results – Location R108

Operator attended measurement results at R108 on Wednesday 1 December 2021 and Thursday 2 December 2021 identified that DGM activities remained inaudible during the assessment periods, and therefore satisfied criteria. Generally, insects, birds, wind in trees and operator noise were audible sources throughout all three monitoring periods.

In summary, the noise contribution from the mine satisfied the relevant noise criteria for the attended measurements Wednesday 1 December 2021 and Thursday 2 December 2021.

## 6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Aurelia Metals Ltd at Dargues Gold Mine, Majors Creek, NSW. The assessment was completed to quantify site noise emissions against relevant noise criteria pertaining to mine operations and offsite traffic noise emissions during Quarter 4, 2021.

Attended monitoring on Wednesday 1 December 2021 and Thursday 2 December 2021 has identified that operational noise emissions generated by the mine comply with relevant  $L_{Aeq(15min)}$  and  $L_{Amax}$  noise limits at all assessed receivers.

Road traffic noise levels were influenced by extraneous noise sources such as insects, birds and local road traffic not associated with the mine. Notwithstanding, mine road traffic noise levels remained below relevant road noise criteria.

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# Appendix A – Glossary of Terms

Table A1 provides a number of technical terms have been used in this report.

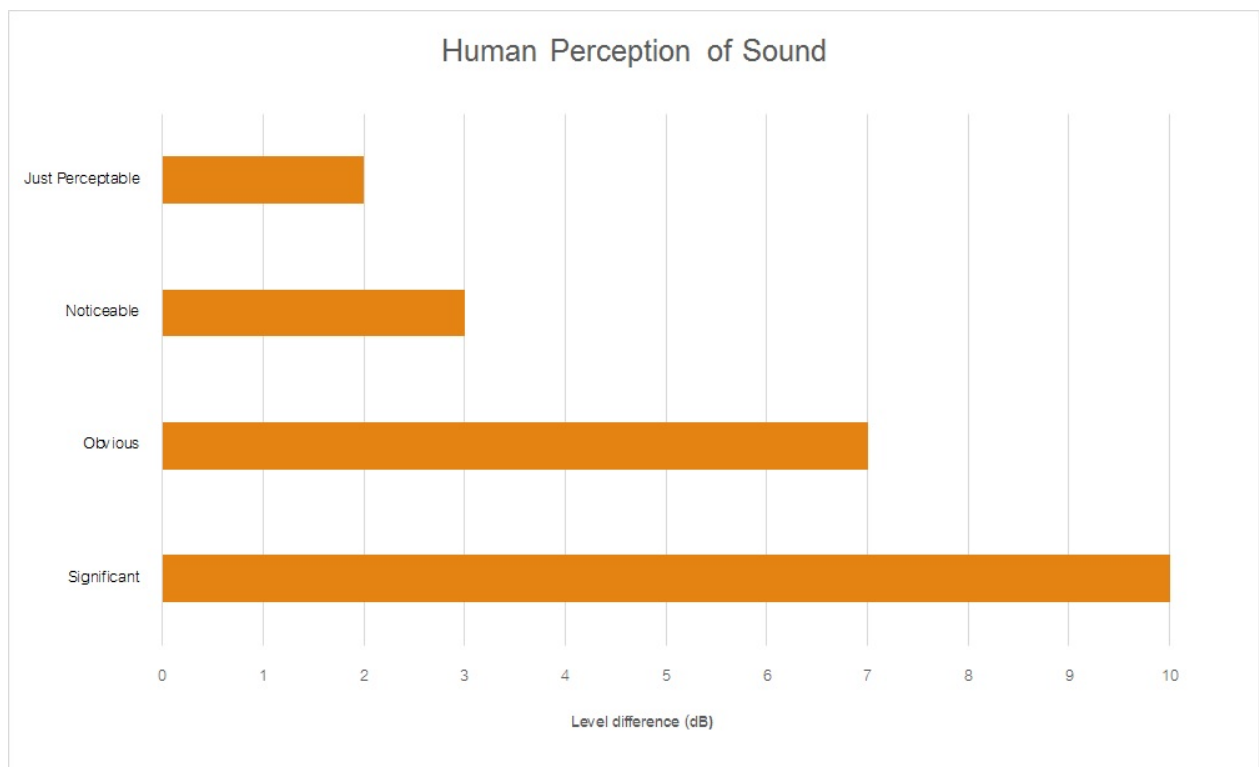
Table A1 Glossary of Terms	
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels.
Adverse Weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAm <sub>ax</sub>	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : $= 10 \cdot \log_{10} (W/W_0)$ Where : W is the sound power in watts and W <sub>0</sub> is the sound reference power at 10-12 watts.



Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA	
Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



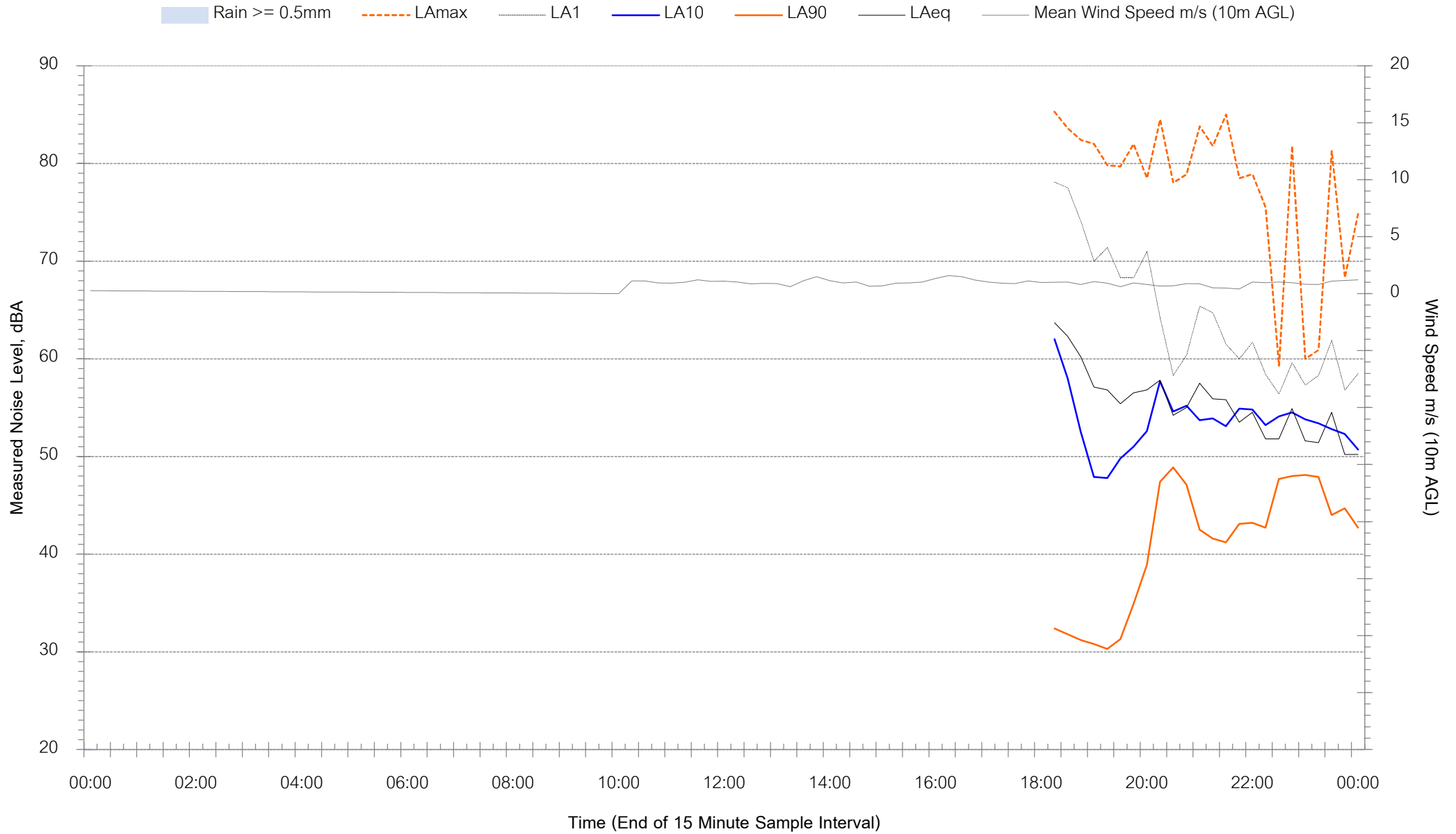
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# Appendix B – Unattended Noise Monitoring Charts



# Background Noise Levels

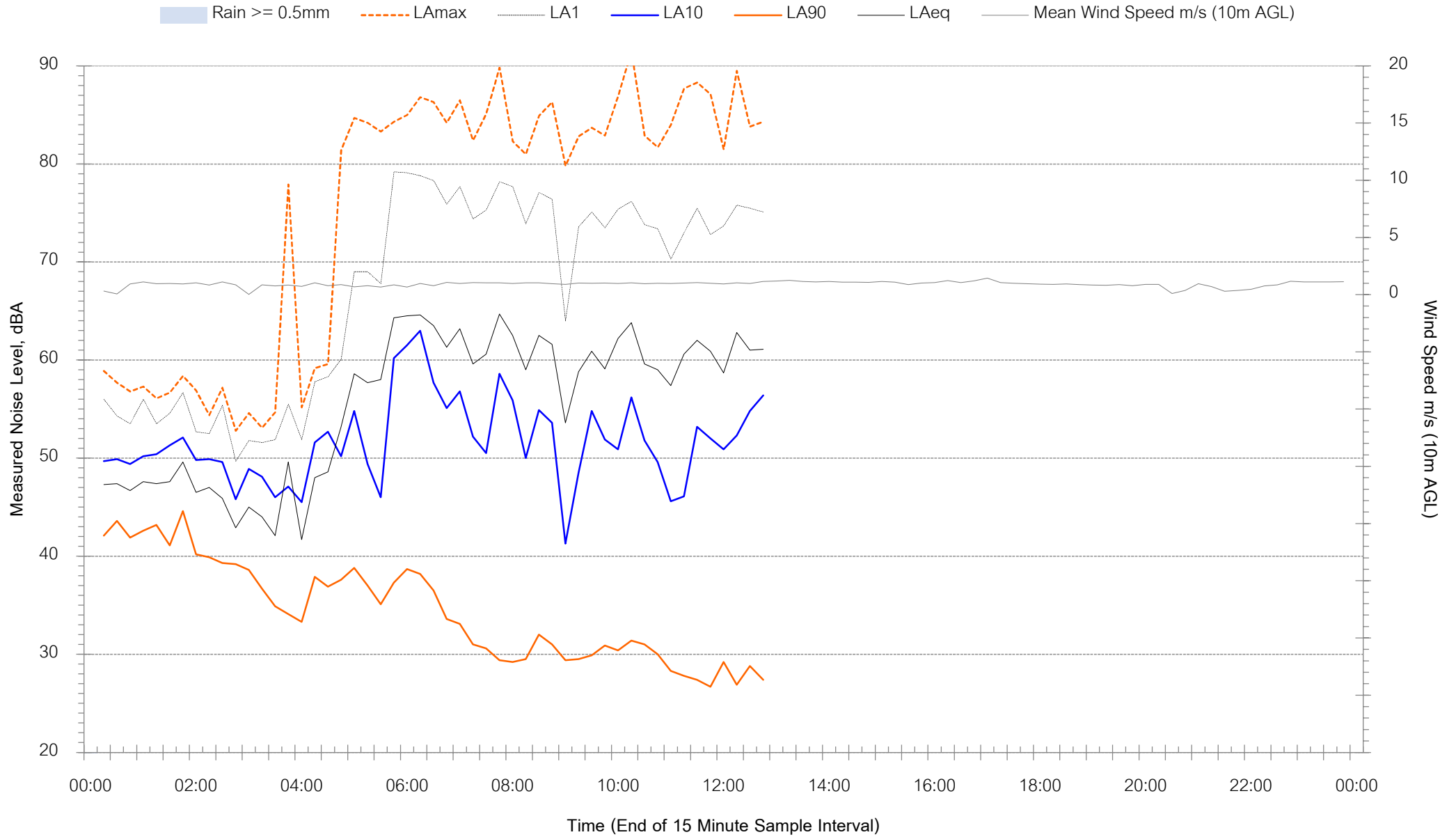
664 Majors Creek Road, Jembaicumbene (R34) - Wednesday 1 December 2021





# Background Noise Levels

664 Majors Creek Road, Jembaicumbene (R34) - Thursday 2 December 2021



Muller Acoustic Consulting Pty Ltd

PO Box 678, Kotara NSW 2289

ABN: 36 602 225 132

Ph: +61 2 4920 1833

[www.mulleracoustic.com](http://www.mulleracoustic.com)

