Noise Monitoring Assessment

Dargues Gold Mine
Majors Creek, NSW
Quarter Ending, September 2024

Prepared for: Aurelia Metals Ltd
September 2024
MAC201092-01RP19

Muller Acoustic Consulting

Document Information

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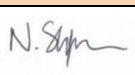
MAC201092-01RP19	19 September 2024	Nicholas Shipman		Oliver Muller	

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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 3, 2024 between Wednesday 4 September 2024 and Thursday 5 September 2024 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);
- NSW Environment Protection Authority (EPA's), Approved Methods for the measurement and analysis of environmental noise in NSW, 2022;
- Standards Australia AS 1055:2018 - Acoustics - Description and measurement of environmental noise - General Procedures;
- Dargues Gold Mine Noise Management Plan (NMP) (Aurelia Metals Ltd); and
- Dargues Gold Mine Project Approval, 10_0054.

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 five monitoring locations in accordance with the sites EPL and NMP.

Table 1 Noise Monitoring Program

Monitoring Location	Noise Criteria, dBA $LA_{eq(15min)}$			Noise Criteria, dB $LA_{1(1min)}$
	Day (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 7am)	Night (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 License ("Point 59" as outlined in Weather Monitoring conditions below); and

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 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 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 $L_{A1(1\ minute)}$ descriptor is meant to represent a maximum noise level measured under 'fast' time response. DEC will accept analysis based on either $L_{A1(1\ minute)}$ or $L_{A(max)}$.

2.2 Road Noise Criteria

Section 2.2.2 of the NSW Road Noise Policy specifies noise criteria for principal haulage routes applicable to off-site traffic from the mine and are reproduced 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 Flat Road, Coghill Street and Wallace Street	60dBA $L_{Aeq(15hour)}$	55dBA $L_{Aeq(9hour)}$

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

Section 8.7 of the Noise Management Plan regarding the traffic noise monitoring is reproduced below:

> *During the initial stages of the Project and annually thereafter, the Company would undertake a traffic noise monitoring program at 600 Majors Creek Road, the closest residence to Majors Creek Road, between the Project Site and the intersection with Araluen Road.*

The traffic noise monitoring assessment will be completed at a later date within the 2024 assessment period and is therefore not included in this assessment.

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3 Methodology

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

The acoustic instrumentation used carries appropriate and current NATA (or manufacturer) calibration certificates with records of all calibrations maintained by MAC as per Approved Methods for the measurement and analysis of environmental noise in NSW (EPA, 2022) and complies with AS/NZS 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 ±0.5dBA.

3.1 Operator Attended Noise Measurement Methodology

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

Table 3 Receiver Location[1]

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 real-time noise monitor location are presented in **Figure 1.**

Attended measurements were carried out using a Svantek Type 1, 971 noise analyser between Wednesday 4 September 2024 and Thursday 5 September 2024. Where possible throughout each survey the operator quantified the contribution of any significant noise sources.

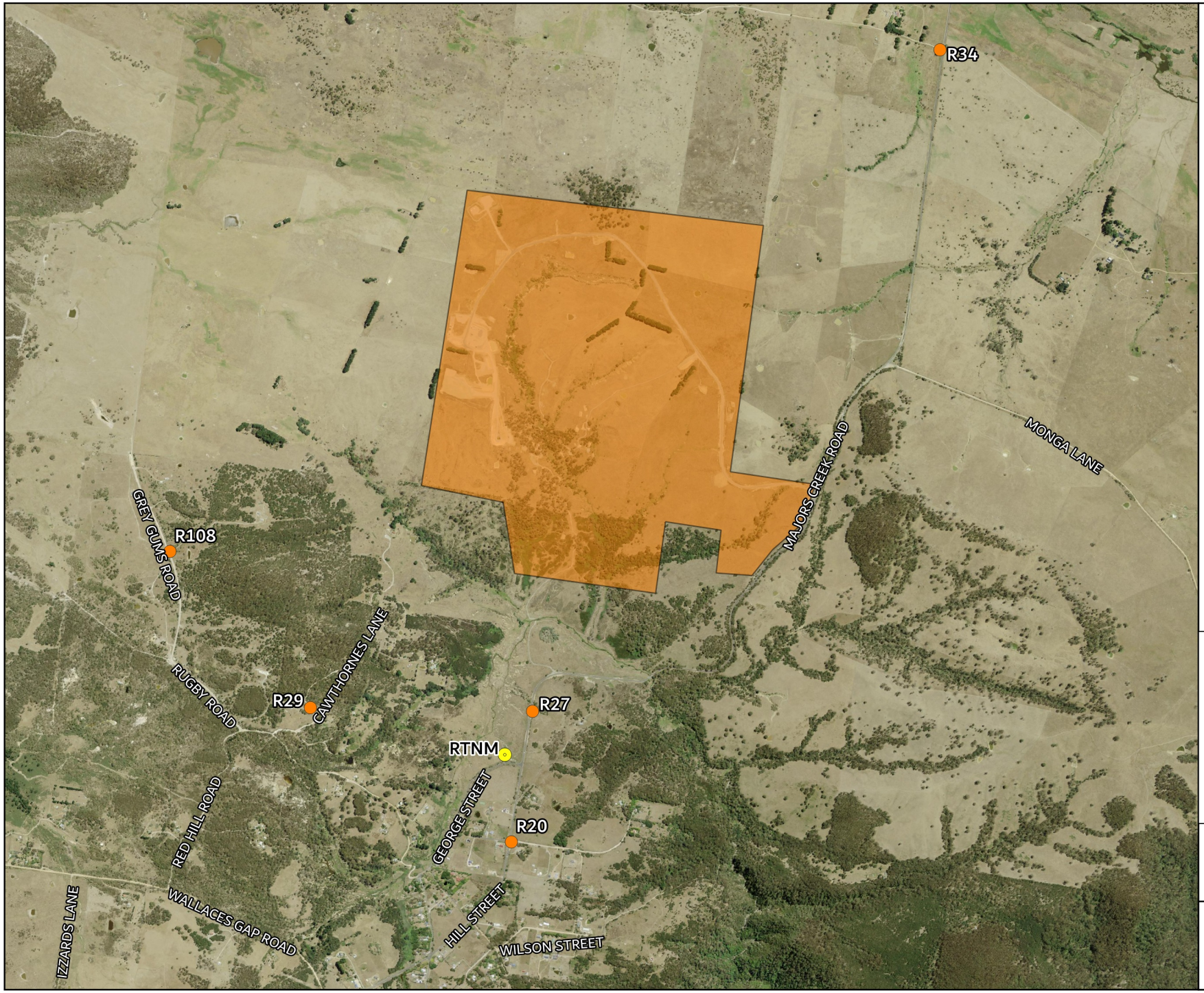

FIGURE 1

LOCALITY PLAN

MAC201092-01

Dargues Gold Mine

KEY

- Project Boundary
- Attended Monitoring Location
- Real-Time Noise Monitoring Terminal

0 200 400 600 800 1,000 m

N

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4 Results

4.1 Meteorological Conditions

Weather data for the noise assessment was sourced from DGMs on-site meteorological station as well as operator measured conditions on site of EPL nominated receiver locations. The data was used to determine prevailing meteorological conditions at the time of the attended measurements, which are presented in **Table 4**. It is noted that as per Condition L2.3 of the EPL, noise emission limits are applicable for the monitoring period.

Table 4 Prevailing Meteorological Conditions

Date & Time	DGM on-site Meteorological Station		Operator Measured Weather Monitoring Location (1.8m AGL)	
	Wind Direction	Wind (m/s)	Wind Direction	Wind (m/s)
04/09/2024 19:41	WNW	2.1	W	0.1
04/09/2024 20:16	WNW	2.2	W	1.5
04/09/2024 20:34	WNW	2.2	W	1.8
04/09/2024 20:56	WNW	2.1	W	1.5
04/09/2024 21:15	WNW	2.4	W	2.0
04/09/2024 22:00	NW	2.9	W	2.5
04/09/2024 22:19	WNW	3.1	W	1.2
04/09/2024 22:40	NW	3.4	W	1.5
04/09/2024 23:03	NW	3.2	W	1.5
04/09/2024 23:38	NNW	2.6	W	2.0
05/09/2024 08:30	NW	3.2	NW	2.8
05/09/2024 08:50	NW	3.1	NW	2.5
05/09/2024 09:13	NW	4.2	NW	2.5
05/09/2024 09:32	NW	4.3	NW	2.5
05/09/2024 10:07	NW	4.1	NW	2.8

4.2 Assessment Results – Location R20

The results of the attended noise measurements at location R20 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 R20

Date	Time (hrs)	Descriptor (dBA re 20µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
05/09/2024 (Day)	09:13	79	60	50	35	WD: NW WS: 2.5m/s Stab Class: D	Wind in vegetation 48-58 Birds 48-65 Traffic 48-79 DGM inaudible
Dargues Site $L_{Aeq(15min)}$ Contribution							<35
04/09/2024 (Evening)	20:34	54	50	42	35	WD: W WS: 1.8m/s Stab Class: E	Wind in vegetation 40-54 Insects 40-44 DGM inaudible
Dargues Site $L_{Aeq(15min)}$ Contribution							<32
04/09/2024 (Night)	22:40	80	57	38	35/45	WD: W WS: 1.5m/s Stab Class: E	Traffic 35-80 Insects <35 Wind in vegetation 35-55 DGM inaudible
Dargues Site $L_{Aeq(15min)}$ Contribution							<28
Dargues Site L_{Amax} Contribution							<28

Note 1: Meteorology data obtained from DGM onsite weather station.

4.3 Assessment Results – Location R27

The results of the attended noise measurements at location R27 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 R27

Date	Time (hrs)	Descriptor (dBA re 20µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
05/09/2024 (Day)	09:32	80	61	51	35	WD: NW WS: 2.5m/s Stab Class: E	Wind in vegetation 48-58 Birds <45 Traffic 45-80 DGM inaudible
Dargues Site $L_{Aeq(15min)}$ Contribution							<35
04/09/2024 (Evening)	20:16	68	43	35	35	WD: W WS: 1.5m/s Stab Class: E	Wind in vegetation 31-44 Traffic 31-68 DGM inaudible
Dargues Site $L_{Aeq(15min)}$ Contribution							<25
04/09/2024 (Night)	23:03	73	47	37	35/45	WD: W WS: 1.5m/s Stab Class: D	Wind in vegetation 34-46 Traffic 34-73 DGM inaudible
Dargues Site $L_{Aeq(15min)}$ Contribution							<27
Dargues Site L_{Amax} Contribution							<27

Note 1: Meteorology data obtained from DGM onsite weather station.

4.4 Assessment Results – Location R29

The results of the attended noise measurements at location R29 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 R29

Date	Time (hrs)	Descriptor (dBA re 20µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
05/09/2024 (Day)	08:50	67	52	44	35	WD: NW WS: 2.5m/s Stab Class: D	Wind in vegetation 41-67 Birds 41-56 DGM inaudible
Dargues Site $L_{Aeq(15min)}$ Contribution							<34
04/09/2024 (Evening)	20:56	50	31	27	35	WD: W WS: 1.5m/s Stab Class: E	Wind in vegetation 27-39 Insects <27 Dog bark 37-50 DGM inaudible
Dargues Site $L_{Aeq(15min)}$ Contribution							<20
04/09/2024 (Night)	22:19	47	28	25	35/45	WD: W WS: 1.5m/s Stab Class: E	Wind in vegetation 24-47 Insects <24 DGM inaudible
Dargues Site $L_{Aeq(15min)}$ Contribution							<20
Dargues Site L_{Amax} Contribution							<20

Note 1: Meteorology data obtained from DGM onsite weather station.

4.5 Assessment Results – Location R34

The results of the attended noise measurements at location R34 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 R34

Date	Time (hrs)	Descriptor (dBA re 20µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
05/09/2024 (Day)	10:07	78	59	50	35	WD: NW WS: 2.8m/s Stab Class: D	Wind in vegetation 48-65 Birds 48-78 Traffic <58 DGM inaudible
Dargues Site $L_{Aeq(15min)}$ Contribution							<35
04/09/2024 (Evening)	19:41	47	32	29	35	WD: W WS: 0.1m/s Stab Class: E	Insects 27-32 Dog bark 27-34 Livestock 36-47 DGM inaudible
Dargues Site $L_{Aeq(15min)}$ Contribution							<20
04/09/2024 (Night)	23:38	59	52	43	35/45	WD: W WS: 2.0m/s Stab Class: D	Wind in vegetation 48-59 DGM inaudible
Dargues Site $L_{Aeq(15min)}$ Contribution							<33
Dargues Site L_{Amax} Contribution							<33

Note 1: Meteorology data obtained from DGM onsite weather station.

4.6 Assessment Results – Location R108

The results of the attended noise measurements at location R108 are summarised in **Table 9** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 9 Operator-Attended Noise Survey Results – Location R108

Date	Time (hrs)	Descriptor (dBA re 20µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
05/09/2024 (Day)	08:30	75	58	46	35	WD: NW WS: 2.8m/s Stab Class: D	Wind in vegetation 40-68 Birds 40-75 Aircraft <40 DGM inaudible
Dargues Site $L_{Aeq(15min)}$ Contribution							<35
04/09/2024 (Evening)	21:15	54	38	31	35	WD: W WS: 2.0m/s Stab Class: E	Wind in vegetation 29-54 Insects <29 DGM inaudible
Dargues Site $L_{Aeq(15min)}$ Contribution							<21
04/09/2024 (Night)	22:00	59	41	31	35/45	WD: W WS: 2.5m/s Stab Class: E	Wind in vegetation 28-59 DGM inaudible
Dargues Site $L_{Aeq(15min)}$ Contribution							<21
Dargues Site L_{Amax} Contribution							<21

Note 1: Meteorology data obtained from DGM onsite weather station.

5 Discussion

5.1 Discussion of Results – Location R20

Operator attended measurement results at R20, between Wednesday 4 September 2024 and Thursday 5 September 2024 identified that DGM emissions remained inaudible during the measurement period. Therefore, DGM noise emissions remained below relevant criteria. Generally, wind in vegetation, birds, traffic and insects were audible throughout all three monitoring periods.

In summary, the noise contribution from the mine satisfied the relevant noise criteria for the attended measurements between Wednesday 4 September 2024 and Thursday 5 September 2024.

5.2 Discussion of Results – Location R27

Operator attended measurement results at R27, between Wednesday 4 September 2024 and Thursday 5 September 2024 identified that DGM emissions remained inaudible during the measurement period, therefore remained below relevant criteria. Generally, traffic, wind in vegetation and birds were audible throughout all three monitoring periods.

In summary, the noise contribution from the mine satisfied the relevant noise criteria for the attended measurements between Wednesday 4 September 2024 and Thursday 5 September 2024.

5.3 Discussion of Results – Location R29

Operator attended measurement results at R29, between Wednesday 4 September 2024 and Thursday 5 September 2024 identified that DGM emissions remained inaudible during the measurement period, therefore remained below relevant criteria. Generally, wind in vegetation, birds, insects and dogs barking were audible throughout all three monitoring periods.

In summary, the noise contribution from the mine satisfied the relevant noise criteria for the attended measurements between Wednesday 4 September 2024 and Thursday 5 September 2024.

5.4 Discussion of Results – Location R34

Operator attended measurement results at R34, between Wednesday 4 September 2024 and Thursday 5 September 2024 identified that DGM activities remained inaudible during the assessment periods and therefore remained below relevant criteria. Generally, traffic, insects, birds, livestock, dogs barking and wind in vegetation 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 between Wednesday 4 September 2024 and Thursday 5 September 2024.

5.5 Discussion of Results – Location R108

Operator attended measurement results at R108, between Wednesday 4 September 2024 and Thursday 5 September 2024 identified that DGM activities remained inaudible during the assessment periods and therefore remained below relevant criteria. Generally, wind in vegetation, birds, insects and aircraft 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 between Wednesday 4 September 2024 and Thursday 5 September 2024.

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 during Quarter 3, 2024.

Attended monitoring on Wednesday 4 September 2024 and Thursday 5 September 2024 has identified that operational noise emissions generated by the mine satisfy relevant $LA_{eq(15min)}$ and LA_{max} noise limits at all assessed receivers.

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Appendix A – Glossary of Terms

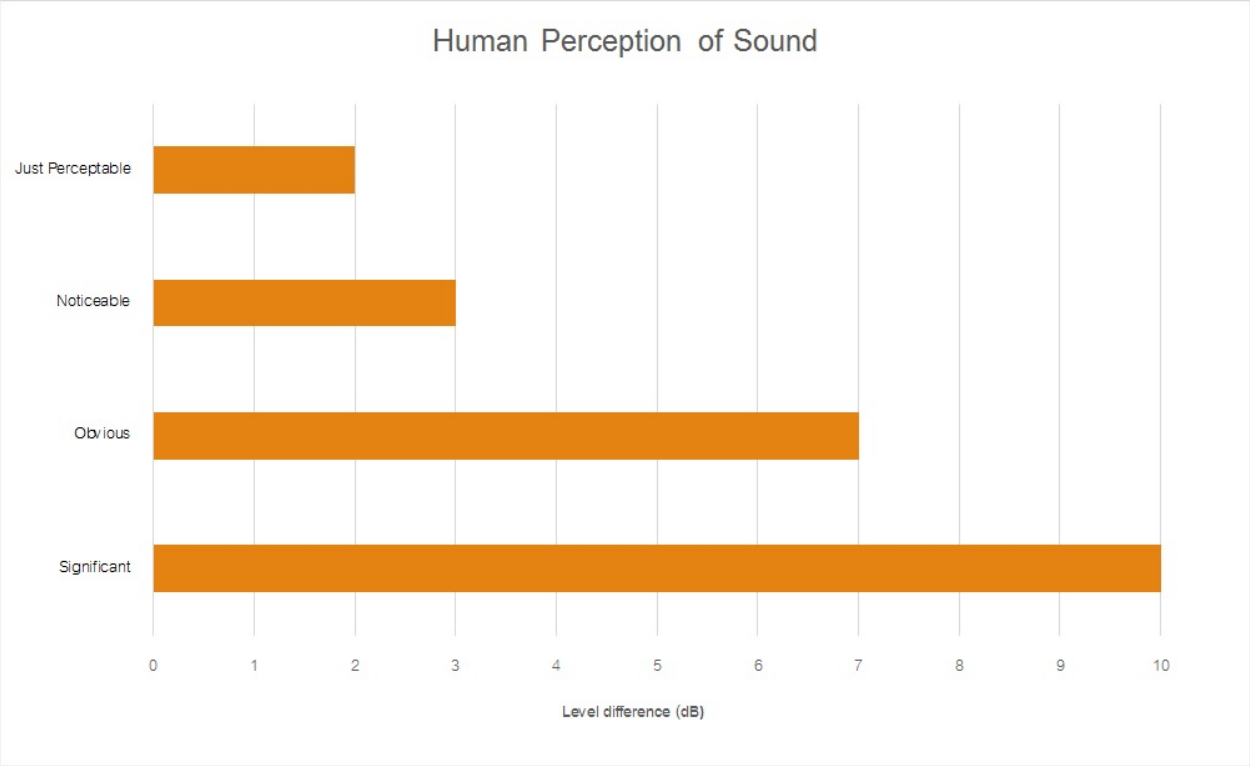
Table A1 provides a number of technical terms have been used in this report.

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.
LAmax	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.log10 (W/Wo) Where : W is the sound power in watts and Wo 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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