

Annual Noise Monitoring Assessment

South Keswick Quarry
Dubbo, NSW
October 2023

Prepared for: Regional Quarries Australia Pty Limited
November 2023
MAC231914-06RP1



Document Information

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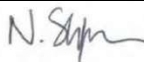

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APPENDIX A – GLOSSARY OF TERMS

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Regional Quarries Australia Pty Limited (Regional Quarries) to complete a Noise Monitoring Assessment (NMA) for the South Keswick Quarry (the quarry), Dubbo, NSW.

The NMA involved quantifying the noise contribution of the quarry by direct attended measurements to determine quarry noise emissions so that effective management and controls can be implemented where required. The monitoring has been conducted in general accordance with Conditions L4 and M7 of the EPL #21017 at four representative receiver locations. It is noted that this assessment has been completed to address conditions of the Environmental Protection License (EPL).

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's), Approved Methods for the measurement and analysis of environmental noise in NSW, 2022;
- Environment Protection Licence EPL 21017 (EPL, 2022);
- Standards Australia AS/NZS IEC 61672.1-2019-Electroacoustics - Sound level meters – Specifications; and
- Standards Australia 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 Environmental Protection License Noise Limits

Table 1 reproduces the operational noise limits for assessed receivers referenced from condition 4.1 of the EPL #21017 that have been adopted for this NMA and are consistent with historic EPL monitoring locations.

Table 1 Noise Limits, dBA¹				
Receiver Identification	Day ²	Evening ²	Night Shoulder ²	
	LAeq(15min)	LAeq(15min)	LAeq(15min)	LA _F (max)
R3	35	35	35	45
R7	39	35	35	45
R10	38	35	35	45
R31	36	35	35	45

Note 1: Noise criteria adopted from EPL 21017.

Note 2: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night Shoulder - the period from 5am to 7am Monday to Saturday as defined from EPL 21017.

The subsequent conditions stated in Section L4 and M7 of the projects EPL (EPL #21017) are reproduced below.

L4.3 Noise-enhancing meteorological conditions.

- a) *The noise limits set out in condition L4.1 apply under the following meteorological conditions, except for the following:*
- b) *For those meteorological conditions referred to in condition L4.3 a), the noise limits that apply are the noise limits in condition L4.1 plus 5dB.*

Assessment Period	Meteorological Conditions
<i>Day</i>	<i>Stability Categories A, B, C and D with wind speeds up to and including 3m/s at 10m above ground level.</i>
<i>Evening</i>	<i>Stability Categories A, B, C and D with wind speeds up to and including 3m/s at 10m above ground level.</i>
<i>Night</i>	<i>Stability Categories A, B, C and D with wind speeds up to and including 3m/s at 10m above ground level.</i>

L4.4 For the purpose of condition L4.3:

- a) The meteorological conditions are to be determined from the meteorological data obtained from the meteorological weather station identified as EPA monitoring point 2.*
- b) Stability category shall be determined using the following method from Fact Sheet D of the Noise Policy for Industry (NSW EPA 2017).*

Note: Noise Policy for Industry is the document titled "Noise Policy for Industry" published by the NSW Environment Protection Authority in October 2017.

L4.5 To assess compliance:

- a) With the LAeq (15 minute) or the LAFmax noise limits in condition L4.1 and L4.3, the noise measurement equipment must be located:*
 - approximately on the property boundary, where any residence is situated 30 metres or less from the property boundary closest to the premises; or where applicable;*
 - in an area within 30 meters of a residence façade, but not closer than 3 meters where any residence on the property is situated more than 30 meters from the property boundary closest to the premises; or where applicable;*
 - in an area within 50 meters of the boundary of a National Park or a Nature Reserve;*
or
 - at any other location identified in condition L4.1.*
- b) With the LAeq (15 minutes) or the LAFmax noise limits in condition L4.1 and L4.3, the noise measurement equipment must be located:*
 - at the reasonably most affected point at a location where there is no residence at the location; or*
 - at the reasonably most affected point within an area at a location prescribed by condition L4.5(a).*

L4.6 A non-compliance of conditions L4.1 and L4.3 will still occur where noise generated from the premises is measured in excess of the noise limit at a point other than the reasonably most affected point at the locations referred to in condition L4.5(a) or L4.5(b).

Note to L4.5 and L4.6: The reasonably most affected point is a point at a location or within an area at a location experiencing or expected to experience the highest sound pressure level from the premises.

4.7 For the purpose of determining the noise generated from the premises, the modifying corrections in Table C1 in Fact Sheet C of the Noise Policy for Industry (NSW EPA, 2017) must be applied, if appropriate, to the noise levels measured by the noise monitoring equipment.

4.8 Noise measurements must not be undertaken where rain or wind speed at microphone level will affect the acquisition of valid measurements.

M7 Noise Monitoring

M7.1 To assess compliance with Condition L4.1, attended commissioning noise monitoring must be undertaken in accordance with Condition L4.5 and:

- a) occur at EPA identification points 3, 4, 5, 11;*
- b) occur within 3 months of commencement of operations;*
- c) occur during one day, evening and night period (morning shoulder) as defined in the Noise Policy for Industry for a minimum of:*
 - 1 hour during the day;*
 - 30 minutes during the evening; and*
 - 1 hour during the night (morning shoulder)*
- d) Occur during a period when the premises is operating in a manner typical of its approved operations.*

It is noted that site emissions remained below relevant criteria at all assessed receivers during the October 2023 assessment, therefore mitigation measures were not implemented.

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3 Methodology

3.1 Locality

South Keswick Quarry is located at 20L Sheraton Road, Dubbo, NSW. Receivers in the locality surrounding the quarry are primarily rural/residential and for consistency the naming conventions for each receiver have been retained from Condition L4.1 of the EPL. The monitoring locations with respect to the quarry are presented in the locality plan shown in **Figure 1**.

3.2 Assessment Methodology

The attended noise survey was conducted by two MAC staff members in general accordance with the procedures described in Standards Australia AS 1055:2018, "Acoustics - Description and Measurement of Environmental Noise" and the EPL. Measurements were carried out using two Svantek Type 1, 971 noise analysers between Wednesday 11 October 2023 and Friday 13 October 2023. 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 ± 0.5 dBA.

Daytime measurements were of 1 hour (four 15-minutes) duration, evening measurements were of 30 minutes (two 15-minutes) duration and morning shoulder measurements were of 1 hour (four 15-minutes) duration. Where possible, throughout each survey the operator quantified the contribution of each significant noise source. Extraneous noise sources were excluded from the analysis to calculate the $L_{Aeq}(15min)$ quarry noise contribution for comparison against the relevant EPL limit.

Prevailing meteorological conditions for the monitoring period were sourced from the South Keswick quarry's on-site meteorological station. Results obtained during non-prevailing meteorological conditions (ie F Class Stability in conjunction with a 2m/s drainage or G Class Stability) are considered not applicable against the EPL criteria.

Where the quarry is inaudible, the contribution is estimated to be at least 10dBA below the ambient noise level.



FIGURE 1
 Locality Plan
 MAC231914-06
 South Keswick Quarry

KEY

- Quarry Boundary
- Attended Monitoring Locations



4 Results

The monitoring and assessment results are presented in individual tables for each assessment location.

4.1 Meteorological Conditions

Weather data for the noise assessment was sourced from South Keswick quarry's 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 2**.

Table 2 Prevailing Meteorological Conditions

Date & Time	South Keswick Quarry		Operator Measured Weather	
	Meteorological Station		Monitoring Location	
	Dubbo, NSW		(1.8m AGL)	
	Wind Direction	Wind (m/s)	Wind Direction	Wind (m/s)
11/10/2023 12:10	S	2.7	S	0.2
11/10/2023 12:30	WSW	3.1	S	0.5
11/10/2023 12:40	SSW	1.6	S	0.2
11/10/2023 13:00	SSW	1.9	S	0.4
11/10/2023 13:30	WSW	2.6	S	1.0
11/10/2023 13:50	SSW	2.9	S	1.0
11/10/2023 14:00	SSW	2.5	S	1.4
11/10/2023 14:10	SW	3.0	S	1.6
11/10/2023 15:50	SW	4.2	SW	2.8
11/10/2023 16:10	SSW	3.6	SW	2.8
11/10/2023 16:20	SSW	2.9	SW	2.9
11/10/2023 16:40	SW	3.2	SW	2.9
11/10/2023 17:00	SSW	2.6	SW	2.5
11/10/2023 17:20	SW	2.6	SW	2.5
11/10/2023 17:30	SSW	3.0	SW	2.0
11/10/2023 17:50	SW	2.2	SW	2.0
11/10/2023 18:00	SW	2.6	W	0.6
11/10/2023 18:20	SW	2.1	W	0.1
11/10/2023 18:30	SW	2.0	SW	0.5
11/10/2023 18:40	SW	1.9	SW	0.5
11/10/2023 19:00	SW	1.4	SW	0.5
11/10/2023 19:10	SW	0.6	SW	0.5
12/10/2023 06:00	SSW	0.6	E	0.1
12/10/2023 06:20	W	0.2	E	0.1
12/10/2023 06:30	W	0.2	E	0.1
12/10/2023 06:50	SSW	0.6	E	0.1
13/10/2023 06:00	W	0.1	N	0.1
13/10/2023 06:20	SSW	0.5	N	0.4
13/10/2023 06:30	WSW	0.3	N	0.2
13/10/2023 06:50	W	0.1	N	0.1

4.2 Assessment Results - Location R3 (EPA 3)

The results of the attended noise measurements at location R3 (EPA 3) for the October 2023 survey are summarised in **Table 3** with the relevant EPL limits, the calculated quarry noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 3 Operator-Attended Noise Survey Results – Location R3							
Date	Time (hrs) ¹	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology ²	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}			
13/10/2023	06:00					WD: SW	Birds 33-54
	(Morning	54	39	35	35/45	WS: 1.0m/s	Traffic 30-44
	Shoulder)					Stab: E	Livestock 31-42 Quarry inaudible
South Keswick Quarry L _{Aeq} (15min) Contribution							<25
South Keswick Quarry L _{Amax} Contribution							<25
13/10/2023	06:15					WD: SW	Birds 34-59
	(Morning	59	41	37	35/45	WS: 1.0m/s	Traffic 30-45
	Shoulder)					Stab: F	Livestock <35 Other industry 34-44 Quarry inaudible
South Keswick Quarry L _{Aeq} (15min) Contribution							<27
South Keswick Quarry L _{Amax} Contribution							<27
13/10/2023	06:30					WD: SW	Birds 34-49
	(Morning	61	44	39	35/45	WS: 1.0m/s	Traffic 37-45
	Shoulder)					Stab: D	Aircraft 41-61 Dog bark <38 Other industry 35-45 Quarry inaudible
South Keswick Quarry L _{Aeq} (15min) Contribution							<29
South Keswick Quarry L _{Amax} Contribution							<29
13/10/2023	06:45					WD: SW	Aircraft 37-55
	(Morning	65	42	38	35/45	WS: 1.0m/s	Livestock 41-50
	Shoulder)					Stab: E	Birds 34-65 Traffic 41-44 Other Industry 35-38 Quarry processing <35 (3 minutes)
South Keswick Quarry L _{Aeq} (15min) Contribution							<35
South Keswick Quarry L _{Amax} Contribution							<35

Table 3 Operator-Attended Noise Survey Results – Location R3

Date	Time (hrs) ¹	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology ²	Description and SPL, dBA							
		L _{Amax}	L _{Aeq}	L _{A90}										
11/10/2023	17:00 (Day)	71	43	29	35	WD: SW WS: 2.5m/s Stab: C	Livestock 30-47							
							Insects 29-48							
							Birds 33-71							
							Residential noise 34-38							
							Train 34-42							
							Traffic 34-52							
							Quarry processing 28-33							
							South Keswick Quarry L _{Aeq} (15min) Contribution	31						
							11/10/2023	17:15 (Day)	60	42	29	35	WD: SW WS: 2.5m/s Stab: D	Birds 27-55
														Traffic 35-60
Aircraft 30-49														
Quarry mobile plant 28-35 (3 minutes)														
South Keswick Quarry L _{Aeq} (15min) Contribution	24													
11/10/2023	17:30 (Day)	74	43	27	35	WD: SW WS: 2.5m/s Stab: C								Birds 28-74
														Traffic 28-38
														Residential noise 35-51
														Quarry mobile plant 28-32 (5 minutes)
														South Keswick Quarry L _{Aeq} (15min) Contribution
							11/10/2023	17:45 (Day)	74	42	27	35	WD: SW WS: 2.5m/s Stab: C	Aircraft 27-55
														Birds 30-74
														Livestock 30-50
														Traffic <27
														Quarry inaudible
South Keswick Quarry L _{Aeq} (15min) Contribution	<20													
11/10/2023	19:03 (Evening)	61	40	29	35	WD: SW WS: 0.5m/s Stab: E								Traffic 27-61
														Insects 26-40
														Livestock 32-44
														Aircraft 33-52
							Quarry inaudible							
							South Keswick Quarry L _{Aeq} (15min) Contribution	<20						
							11/10/2023	19:18 (Evening)	53	36	32	35	WD: SW WS: 0.5m/s Stab: D	Traffic 30-43
														Livestock 35-53
														Dog bark 34-36
														Quarry inaudible
South Keswick Quarry L _{Aeq} (15min) Contribution	<22													

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night Shoulder - the period from 5am to 7am Monday to Saturday as defined from EPL 21017.

Note 2: Meteorological data obtained from direct measurement by the operator and by South Keswick on-site MET station.

4.3 Assessment Results - Location R7 (EPA 4)

The results of the attended noise measurements at location R7 (EPA 4) for the October 2023 survey are summarised in **Table 4** with the relevant EPL limits, the calculated quarry noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 4 Operator-Attended Noise Survey Results – Location R7

Date	Time (hrs) ¹	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology ²	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}			
12/10/2023	06:00 (Morning Shoulder)	67	49	44	35/45	WD: NE WS: 0.5m/s Stab: F	Livestock 42-49
							Traffic 40-58
							Birds 44-60
							Train 44-67
							Quarry inaudible
South Keswick Quarry L _{Aeq} (15min) Contribution							<35
South Keswick Quarry L _{Amax} Contribution							<34
12/10/2023	06:15 (Morning Shoulder)	67	49	47	35/45	WD: NE WS: 0.5m/s Stab: E	Livestock 43-49
							Traffic 40-58
							Birds 45-67
							Quarry inaudible
							South Keswick Quarry L _{Aeq} (15min) Contribution
South Keswick Quarry L _{Amax} Contribution							<35
12/10/2023	06:30 (Morning Shoulder)	67	50	46	35/45	WD: NE WS: 0.5m/s Stab: E	Traffic 45-58
							Livestock 44-51
							Aircraft 46-55
							Birds 45-67
							Quarry inaudible
South Keswick Quarry L _{Aeq} (15min) Contribution							<35
South Keswick Quarry L _{Amax} Contribution							<35
12/10/2023	06:45 (Morning Shoulder)	69	52	47	35/45	WD: NE WS: 0.5m/s Stab: F	Traffic 45-69
							Livestock 44-47
							Birds 47-62
							Dog bark 48-50
							Quarry inaudible
South Keswick Quarry L _{Aeq} (15min) Contribution							<35
South Keswick Quarry L _{Amax} Contribution							<35
11/10/2023	15:54 (Day)	58	39	35	39	WD: SW WS: 2.9m/s Stab:	Birds 30-58
							Wind in vegetation 33-58
							Quarry mobile plant 33-39 (13 minutes)
South Keswick Quarry L _{Aeq} (15min) Contribution							35

Table 4 Operator-Attended Noise Survey Results – Location R7

Date	Time (hrs) ¹	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology ²	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}			
11/10/2023	16:09 (Day)	65	40	35	39	WD: SW WS: 2.8m/s Stab: C	Birds 30-65
							Traffic 31-39
							Wind in vegetation 33-40
							Quarry mobile plant 33-39
South Keswick Quarry L _{Aeq} (15min) Contribution							36
11/10/2023	16:24 (Day)	59	39	35	39	WD: SW WS: 2.8m/s Stab: C	Traffic 30-40
							Birds 34-59
							Aircraft 36-51
							Quarry mobile plant 33-40 (13 minutes)
South Keswick Quarry L _{Aeq} (15min) Contribution							35
11/10/2023	16:39 (Day)	68	45	34	39	WD: SW WS: 2.6m/s Stab: D	Operator 45-50
							Birds 34-53
							Residential noise 40-68
							Aircraft 35-43
							Quarry mobile plant 32-42 (12 minutes)
South Keswick Quarry L _{Aeq} (15min) Contribution							37
11/10/2023	18:26 (Evening)	65	44	37	35	WD: SW WS: 0.5m/s Stab: D	Residential noise 35-65
							Birds 40-61
							Quarry inaudible
South Keswick Quarry L _{Aeq} (15min) Contribution							<27
11/10/2023	18:41 (Evening)	71	46	38	35	WD: SW WS: 0.5m/s Stab: D	Residential noise 40-71
							Birds 40-55
							Quarry inaudible
South Keswick Quarry L _{Aeq} (15min) Contribution							<28

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night Shoulder - the period from 5am to 7am Monday to Saturday as defined from EPL 21017.

Note 2: Meteorological data obtained from direct measurement by the operator and by South Keswick on-site MET station.

4.4 Assessment Results - Location R10 (EPA 5)

The results of the attended noise measurements at location R10 (EPA 5) for the October 2023 survey are summarised in **Table 5** with the relevant EPL limits, the calculated quarry noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 5 Operator-Attended Noise Survey Results – Location R10

Date	Time (hrs) ¹	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology ²	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}			
12/10/2023	06:00 (Morning Shoulder)	69	48	42	35/45	WD: E WS: 0.1m/s Stab: F	Birds 40-69
							Traffic 40-56
							Dog bark 54-62
							Rooster 50-60
Quarry inaudible							
South Keswick Quarry L _{Aeq} (15min) Contribution							<32
South Keswick Quarry L _{Amax} Contribution							<32
12/10/2023	06:15 (Morning Shoulder)	68	49	43	35/45	WD: E WS: 0.1m/s Stab: E	Birds 41-56
							Traffic 41-52
							Aircraft 44-55
							Dog bark 42-66
Livestock 56-68							
Quarry inaudible							
South Keswick Quarry L _{Aeq} (15min) Contribution							<33
South Keswick Quarry L _{Amax} Contribution							<33
12/10/2023	06:30 (Morning Shoulder)	63	49	44	35/45	WD: E WS: 0.1m/s Stab: E	Aircraft 44-59
							Birds 42-52
							Dog bark 52-59
							Traffic 40-47
Rooster 50-56							
Livestock 56-63							
Quarry inaudible							
South Keswick Quarry L _{Aeq} (15min) Contribution							<34
South Keswick Quarry L _{Amax} Contribution							<34
12/10/2023	06:45 (Morning Shoulder)	78	52	46	35/45	WD: E WS: 0.1m/s Stab: F	Livestock 51-58
							Birds 44-78
							Traffic 44-54
							Rooster 48-52
Other industry 44-50							
Quarry inaudible							
South Keswick Quarry L _{Aeq} (15min) Contribution							<35
South Keswick Quarry L _{Amax} Contribution							<35

Table 5 Operator-Attended Noise Survey Results – Location R10

Date	Time (hrs) ¹	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology ²	Description and SPL, dBA							
		L _{Amax}	L _{Aeq}	L _{A90}										
11/10/2023	13:31 (Day)	76	46	31	38	WD: S WS: 1.0m/s Stab: B	Birds 38-61							
							Livestock 52-76							
							Rooster 49-56							
							Other industry 29-36							
							Traffic 32-38							
							Aircraft 34-48							
							Quarry inaudible							
South Keswick Quarry L _{Aeq} (15min) Contribution							<21							
11/10/2023	13:46 (Day)	61	39	31	38	WD: S WS: 1.0m/s Stab: B	Rooster 29-61							
							Livestock 38-52							
							Residential noise 30-34							
							Other industry 29-38							
							Quarry inaudible							
							South Keswick Quarry L _{Aeq} (15min) Contribution							<21
							11/10/2023	14:01 (Day)	60	40	31	38	WD: S WS: 1.4m/s Stab: A	Birds 29-53
Rooster 36-48														
Other industry 29-33														
Aircraft 32-60														
Quarry inaudible														
South Keswick Quarry L _{Aeq} (15min) Contribution														<21
11/10/2023	14:16 (Day)	61	38	31	38	WD: S WS: 1.6m/s Stab: B								Birds 34-61
							Wind in vegetation 28-36							
							Rooster 39-56							
							Other industry 28-34							
							Livestock 36-39							
							Quarry inaudible							
							South Keswick Quarry L _{Aeq} (15min) Contribution							<21
11/10/2023	18:42 (Evening)	93	66	30	35	WD: W WS: 0.1m/s Stab: D	Birds 36-52							
							Livestock 26-93							
							Traffic 26-34							
							Quarry inaudible							
							South Keswick Quarry L _{Aeq} (15min) Contribution							<20

Table 5 Operator-Attended Noise Survey Results – Location R10

Date	Time (hrs) ¹	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology ²	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}			
11/10/2023	18:57 (Evening)	84	56	31	35	WD: W WS: 0.1m/s Stab: E	Birds 31-59
							Dog bark 30-56
							Livestock 76-84
							Aircraft 30-48
South Keswick Quarry L _{Aeq} (15min) Contribution							<21

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night Shoulder - the period from 5am to 7am Monday to Saturday as defined from EPL 21017.

Note 2: Meteorological data obtained from direct measurement by the operator and by South Keswick on-site MET station.

4.5 Assessment Results - Location R31 (EPA 11)

The results of the attended noise measurements at location R31 (EPA 11) for the October 2023 survey are summarised in **Table 6** with the relevant EPL limits, the calculated quarry noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 6 Operator-Attended Noise Survey Results – Location R31							
Date	Time (hrs) ¹	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology ²	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}			
13/10/2023	06:00 (Morning Shoulder)	71	54	33	35/45	WD: N WS: 0.1m/s Stab: E	Birds 38-56
							Traffic 28-71
							Rooster <36
							Quarry inaudible
South Keswick Quarry L _{Aeq} (15min) Contribution							<23
South Keswick Quarry L _{Amax} Contribution							<23
13/10/2023	06:15 (Morning Shoulder)	82	65	42	35/45	WD: N WS: 0.4m/s Stab: F	Traffic 36-82
							Birds 40-52
							Quarry trucks 36-40 (1 minute)
							South Keswick Quarry L _{Aeq} (15min) Contribution
South Keswick Quarry L _{Amax} Contribution							40
13/10/2023	06:30 (Morning Shoulder)	80	64	42	35/45	WD: N WS: 0.2m/s Stab: D	Birds 44-56
							Traffic 36-80
							Aircraft 44-48
							Quarry trucks 36-41 (30 seconds)
South Keswick Quarry L _{Aeq} (15min) Contribution							23
South Keswick Quarry L _{Amax} Contribution							41
13/10/2023	06:45 (Morning Shoulder)	75	59	36	35/45	WD: N WS: 0.1m/s Stab: E	Birds 33-56
							Traffic 36-75
							Quarry trucks 33-42 (1 minute)
							South Keswick Quarry L _{Aeq} (15min) Contribution
South Keswick Quarry L _{Amax} Contribution							42
11/10/2023	12:12 (Day)	83	64	38	36	WD: S WS: 0.2m/s Stab: B	Birds 38-46
							Traffic 34-83
							Other industry 34-36
							Quarry trucks 34-39 (1 minute)
South Keswick Quarry L _{Aeq} (15min) Contribution							26

Table 6 Operator-Attended Noise Survey Results – Location R31

Date	Time (hrs) ¹	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology ²	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}			
11/10/2023	12:27 (Day)	79	60	33	36	WD: S WS: 0.5m/s Stab: A	Birds 35-48
							Traffic 34-79
							Aircraft 37-56
							Quarry trucks 32-36 (1 minute)
South Keswick Quarry L _{Aeq} (15min) Contribution							22
11/10/2023	12:42 (Day)	82	63	36	36	WD: S WS: 0.2m/s Stab: A	Traffic 31-82
							Birds 36-46
							Quarry mobile plant <34 (10 seconds)
							Quarry trucks 30-36 (1 minute)
South Keswick Quarry L _{Aeq} (15min) Contribution							22
11/10/2023	12:59 (Day)	77	62	36	36	WD: S WS: 0.4m/s Stab: A	Traffic 32-77
							Birds 34-50
							Insects 32-36
							Quarry trucks 32-40 (2 minutes)
South Keswick Quarry L _{Aeq} (15min) Contribution							29
11/10/2023	18:03 (Evening)	76	56	32	35	WD: W WS: 0.6m/s Stab: D	Birds 27-60
							Traffic 27-76
							Quarry trucks 28-44 (1 minute)
							South Keswick Quarry L _{Aeq} (15min) Contribution
11/10/2023	18:22 (Evening)	72	53	33	35	WD: W WS: 0.1m/s Stab: D	Birds 36-61
							Traffic 28-72
							Livestock <38
							Quarry inaudible
South Keswick Quarry L _{Aeq} (15min) Contribution							<23

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night Shoulder - the period from 5am to 7am Monday to Saturday as defined from EPL 21017.

Note 2: Meteorological data obtained from direct measurement by the operator and by South Keswick on-site MET station.

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5 Discussion

5.1 Discussion of Results - Location R3 (EPA 3)

Monitoring conducted between Wednesday 11 October 2023 and Friday 13 October 2023 identified that quarry mobile plant and site processing noise emissions were audible on four occasions during the assessment period at location R3. The estimated quarry contribution remained below relevant criteria during the measurement period. Extraneous sources such as birds, traffic, aircraft, dogs barking, insects, residential noise, train pass-by, livestock and other industrial noise were audible during the measurement period.

5.2 Discussion of Results - Location R7 (EPA 4)

Monitoring conducted between Wednesday 11 October 2023 and Thursday 12 October 2023 identified that quarry mobile plant noise emissions were audible on four occasions during the assessment period at location R7. The estimated quarry contribution remained below relevant criteria during the measurement period. Extraneous sources such as birds, traffic, livestock, train pass-by, dogs barking, aircraft, residential noise and wind in vegetation were audible during the measurement period.

5.3 Discussion of Results - Location R10 (EPA 5)

Monitoring conducted between Wednesday 11 October 2023 and Thursday 12 October 2023 identified that noise emissions remained inaudible during the assessment period at location R10. Therefore, quarry emissions remained below the relevant noise limits for each measurement period. Extraneous sources such as birds, traffic, dogs barking, rooster, aircraft, livestock, residential noise, and other industrial noise were audible during the measurement period.

5.4 Discussion of Results - Location R31 (EPA 11)

Monitoring conducted between Wednesday 11 October 2023 and Friday 13 October 2023 identified that quarry road trucks were audible on eight occasions during the assessment period at location R31. The estimated quarry contribution remained below relevant criteria during the measurement period. Extraneous sources such as birds, traffic, rooster, aircraft, livestock, and other industrial noise were audible during the measurement period.

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6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Regional Quarries Australia Pty Limited. Monitoring was conducted in accordance with Conditions L4 and M7 of the Environmental Protection Licence (EPL #21017, 2022). The assessment was completed to provide annual monitoring data so that South Keswick Quarry can actively quantify and manage site noise emissions.

Attended monitoring conducted between Wednesday 11 October 2023 and Friday 13 October 2023 identified that South Keswick Quarry noise emissions were audible on several occasions during the attended measurement period. A review of monitoring data and operator attended observations determined that South Keswick Quarry contributions remained below relevant limits during the monitoring period.

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Appendix A – Glossary of Terms

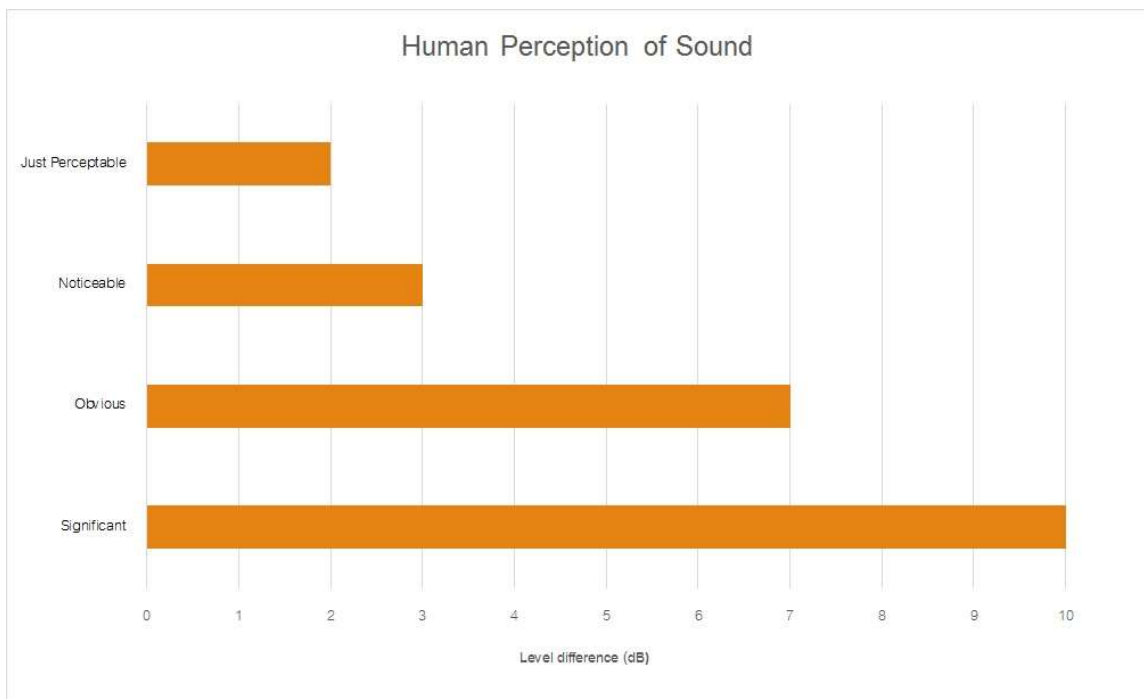
A number of technical terms have been used in this report and are explained in **Table A1**.

Table A1 Glossary of Acoustical 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 L90 statistical noise levels.
Ambient Noise	The total noise associated with a given environment. Typically, a composite of sounds from all 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 sound.
Background Noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is usually represented by the LA90 descriptor
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 Z-weighted or decibels Linear (unweighted).
Extraneous Noise	Sound resulting from activities that are not typical of the area.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A sound level which is exceeded 10% of the time.
LA90	Commonly referred to as the background noise, this is the level exceeded 90% of the time.
LAeq	Represents the average noise energy or equivalent sound pressure level over a given period.
LAm _{ax}	The maximum sound pressure level received at the microphone during a measuring interval.
Masking	The phenomenon of one sound interfering with the perception of another sound. For example, the interference of traffic noise with use of a public telephone on a busy street.
RBL	The Rating Background Level (RBL) as defined in the NPI, is an overall single figure representing the background level for each assessment period over the whole monitoring period. The RBL, as defined is the median of ABL values over the whole monitoring period.
Sound power level (L _w or SWL)	This is a measure of the total power radiated by a source in the form of sound and is given by $10 \cdot \log_{10} (W/W_0)$. Where W is the sound power in watts to the reference level of 10^{-12} watts.
Sound pressure level (L _p or SPL)	the level of sound pressure; as measured at a distance by a standard sound level meter. This differs from L _w in that it is the sound level at a receiver position as opposed to the sound 'intensity' of the source.

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 Pressure 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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