Noise Monitoring Assessment

Wallerawang Quarry,
April 2018

Prepared for: Walker Quarries Pty Ltd
May 2018
MAC160392RP3

Muller Acoustic Consulting

Document Information

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Walker Quarries Pty Ltd to complete a bi-annual Noise Monitoring Assessment (NMA) for Wallerawang Quarry ('the quarry').

The NMA involved quantifying the noise contribution of the quarry by direct attended measurements to compare quarry emissions against relevant criteria. Monitoring has been conducted at three representative receiver locations in accordance with the Walker Quarry Noise Management Plan (NMP) and the quarry's Environmental Protection License (ref: 13172). An additional measurement at a nearfield reference location was also conducted to verify the operation of quarry plant and to quantify the noise contribution from site.

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

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- Environment Protection Licence EPL 13172 (EPL);
- Standards Australia AS 1055.1:1997 - Acoustics - Description and measurement of environmental noise - General Procedures;
- Atkins Acoustics and Associates Pty Ltd, Noise and Blast Impact Assessment, 2001; and
- R.W.Corkery & Co. Pty Limited, Wallerawang Quarry Noise Management Plan (NMP), 2016.

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 Environmental Protection License Noise Limits

Table 1 reproduces the noise criteria for the quarry as per Condition L4.1 of EPL 13172.

Table 1 Noise Limits, dBA

Location	Day	Evening	Night
	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$
All privately owned residences	43	43	39

Note: Day Period is 7am to 6pm, Evening Period is 6pm to 10pm, Night Period is 10pm to 7am.

It is noted that Condition L4.3 of EPL 13172 identifies conditions under which the noise criteria do not apply and include:

a) Wind speeds greater than 3m/s at 10m above ground level;

b) Temperature inversion conditions greater than 3 degrees Celsius / 100m; or

c) Under “non-significant weather conditions”.

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3 Methodology

3.1 Locality

Wallerawang is located approximately 10km to the north west of Lithgow, NSW. Receivers in the locality surrounding the quarry are primarily rural/residential and for consistency the naming conventions for each receiver has been retained from the NMP. The monitoring locations with respect to the quarry are presented in **Table 2** and graphically in the locality plan shown in **Figure 1.**

Table 2 Receiver Locations

ID	Address	Distance to Quarry Boundary
RL1	Reference Location (adjacent to site office)	N/A
N1	139 Gemalong, Marrangaroo, NSW	1000m
N2	987 Great Western Highway, Marrangaroo, NSW	160m
N3	2 Cypress Close, Wallerawang, NSW	480m

3.2 Environmental Noise Assessment Methodology

The attended noise surveys were conducted in general accordance with the procedures described in Standards Australia AS 1055-1997, "Acoustics - Description and Measurement of Environmental Noise", the EPL and NMP. The measurements were carried out using a Svantek Type 1, 971 noise analyser on Wednesday 4 April 2018. The acoustic instrumentation used carries current NATA calibration and complies with AS IEC 61672.1-2004-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5dBA.

Two daytime measurements of 15 minutes in duration were completed at each monitoring location during standard operations onsite. 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 $LA_{eq(15min)}$ quarry noise contribution for comparison against the relevant EPL limits.

FIGURE 1

LOCALITY PLAN

REF: MAC160392

0 200m

KEY	
N1	RECEIVER / MONITORING LOCATION
RL1	REFERENCE LOCATION
	PROJECT SITE

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4 Results

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

4.1 Assessment Results – Reference Location (RL1)

Operational attended noise monitoring was completed at RL1 on Wednesday 4 April 2018. Table 3 presents the monitored noise level contributions and observed meteorological conditions for each measurement.

Table 3 Operator-Attended Noise Survey Results – Reference Location 1 (RL1)

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology	Comments
		L_{Amax}	L_{Aeq}	L_{A90}			
4/4/2018	8:06	71	57	54	N/A	Wind Speed: 2.0m/s Wind Dir: SE Rain: Nil	Onsite Truck 59-61 Generator 56-58 HIAB 60-62 Highway Trucks 59-60
Quarry Site $L_{Aeq(15min)}$ Contribution							57
4/4/2018	10:16	79	57	52	N/A	Wind Speed: 0.5m/s Wind Dir: E Rain: Nil	Generator 53-54 Screening Plant 50-56 Water Cart 61-79 Highway Trucks 60-71
Quarry Site $L_{Aeq(15min)}$ Contribution							57

4.2 Assessment Results - Location N1

Operational attended noise monitoring was completed at N1 on Wednesday 4 April 2018. Table 4 presents the monitored noise level contributions and observed meteorological conditions for each measurement.

Table 4 Operator-Attended Noise Survey Results – Location N1

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology	Comments
		L_{Amax}	L_{Aeq}	L_{A90}			
4/4/2018	9:12	62	48	40	43	Wind Speed: 0.5m/s Wind Dir: E Rain: Nil	Traffic 46-62 Domestic Noise 36 – 38 Birds 42-54
		Quarry Site $L_{Aeq(15min)}$ Contribution					Quarry Inaudible
4/4/2018	11:22	66	50	42	43	Wind Speed: 1.2m/s Wind Dir: E Rain: Nil	Traffic 49-66 Birds 46-53 Aircraft 48-54
		Quarry Site $L_{Aeq(15min)}$ Contribution					Quarry Inaudible

4.3 Assessment Results - Location N2

Operational attended noise monitoring was completed at N2 on Wednesday 4 April 2018. Table 5 presents the monitored noise level contributions and observed meteorological conditions for each measurement.

Table 5 Operator-Attended Noise Survey Results – Location N2

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology	Comments
		L_{Amax}	L_{Aeq}	L_{A90}			
4/4/2018	8:26	65	47	42	43	Wind Speed: 0.9m/s Wind Dir: SE Rain: Nil	Traffic Noise 44-54 Birds 41-65 Wind in trees 43-45
		Quarry Site $L_{Aeq(15min)}$ Contribution					Quarry Inaudible
4/4/2018	10:38	66	43	37	43	Wind Speed: 0.6m/s Wind Dir: E Rain: Nil	Traffic 42-48 Birds 43-66 Aircraft 39-53
		Quarry Site $L_{Aeq(15min)}$ Contribution					Quarry Inaudible

4.4 Assessment Results - Location N3

Operational attended noise monitoring was completed at N3 on Wednesday 4 April 2018. Table 6 presents the monitored noise level contributions and observed meteorological conditions for each measurement.

Table 6 Operator-Attended Noise Survey Results – Location N3

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology	Comments
		L_{Amax}	L_{Aeq}	L_{A90}			
4/4/2018	8:51	55	46	39	43	Wind Speed: 1.0m/s Wind Dir: NE Rain: Nil	Insects 34-36 Traffic 46-55 Aircraft 44-50 Birds 36-45
		Quarry Site $L_{Aeq(15min)}$ Contribution					Quarry Inaudible
4/4/2018	11:01	62	46	35	43	Wind Speed: 1.4m/s Wind Dir: E Rain: Nil	Traffic 42-62 Birds 40-50 Insects 35-37
		Quarry Site $L_{Aeq(15min)}$ Contribution					Quarry Inaudible

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5 Discussion

5.1 Discussion of Results – Reference Location (RL1)

Monitoring on Wednesday 4 April 2018 was conducted when Wallerawang Quarry was operating at typical production levels, which included use of export trucks, water cart, maintenance work, sand plant and generator. The noise contribution from the quarry at the reference location was 57dBA $LA_{eq(15min)}$. Operations were typical of the works undertaken over the last six months at the quarry. The noise environment at the reference location was primarily dominated by the sand plant and generator with occasional engine noise from the water cart.

From the attended reference measurements, the sound power (Lw) for the three acoustically significant items of plant was calculated to be 96dBA $LA_{eq(15min)}$ for both measurements. It is noted that haul trucks were situated within the pit and were acoustically insignificant at this location.

To verify the received noise contribution from the quarry at each of the monitoring locations, calculations were undertaken to estimate the attenuation from the site to each monitoring location. The attenuation calculations incorporated loss due to distance and conservative topography and air absorption losses. The results of the attenuation calculations, identified received noise level and the results of the attended surveys are discussed for each monitoring location in Section 5.2 to 5.4.

5.2 Discussion of Results – Location N1

Monitoring on Wednesday 4 April 2018, identified that Wallerawang Quarry noise was inaudible for both attended measurements at this location. Therefore, the noise contribution from the quarry satisfied the relevant noise limits of 43dBA $LA_{eq(15min)}$. Extraneous non-quarry related sources included highway traffic, birds and wind that were significant contributors to the ambient noise environment.

The calculated attenuation between the quarry site and N1, taking into account the 1200m distance loss, the surrounding topography and air absorption, was 82dB. Based on the site Lw established from the near field measurements, the resulting received quarry contribution at N1 is <20dBA. This level is significantly lower than the ambient dominant sources which would mask site noise and confirms the quarry was inaudible at this location for both measurements.

5.3 Discussion of Results – Location N2

Monitoring results for N2 were dominated by highway traffic and bird noise that was constantly audible during all measurements on Wednesday 4 April 2018. Quarry emissions were inaudible during all measurements. Accordingly, quarry contributions remained below the relevant noise limit of 43dBA $LA_{eq(15min)}$.

The attenuation between the quarry site and N2 taking into account the 400m distance between the locations, the loss due to surrounding topography and air absorption is 72dB. Based on the current site Lw established from the near field measurements, the resulting received quarry contribution at N2 is <24dBA. Due to the low predicted received quarry noise level at N2, the masking effect of other dominant sources such as passing road traffic verifies that quarry operations were inaudible for both attended measurements.

5.4 Discussion of Results – Location N3

Monitoring conducted on Wednesday 4 April 2018 for N3 were dominated by local and highway traffic. Quarry contributions remained below the relevant criteria of 43dBA $LA_{eq(15min)}$ for both measurements conducted at the location.

The total attenuation due to distance, air absorption and surrounding topography for N3 was estimated to be 76dB. This resulted in an estimated site noise contribution of <20dBA and due to the presence of dominant extraneous noise sources such as passing traffic, the noise from the site was masked and verifies that the site was inaudible throughout both of the survey periods.

6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment on behalf of Walker Quarries Pty Ltd. The assessment was completed to assess Wallerawang Quarry noise emissions against relevant criteria presented in EPL 13172.

Attended monitoring for Wednesday 4 April 2018 identified that noise emissions generated by Wallerawang Quarry satisfy relevant noise limits specified in the Noise Management Plan and Environmental Protection Licence at all assessed locations. In summary, quarry noise was inaudible during all measurements with monitoring locations dominated by extraneous sources unrelated to quarry operations.

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Appendix A - Glossary of Terms

Several technical terms have been used in this report and are explained in **Table A1**.

Table A1 Glossary of Terms

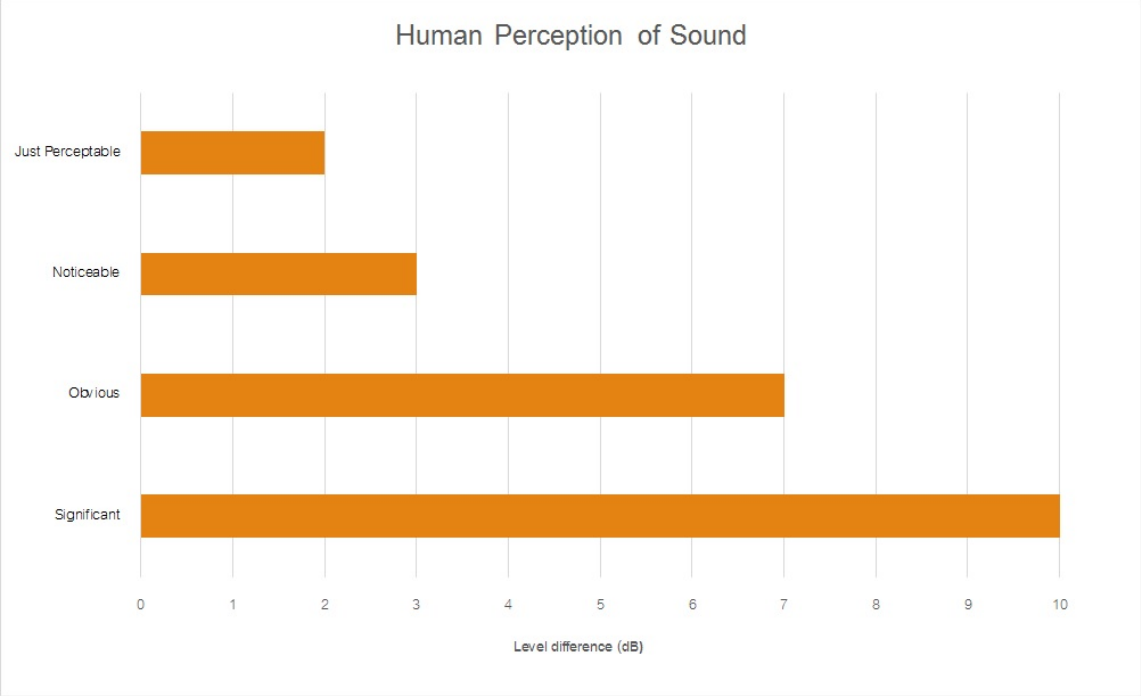
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L90 statistical noise levels.
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)	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 (SWL)	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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