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Dubbo Quarry Annual Noise Monitoring Assessment
2024

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Dubbo Quarry Annual Noise Monitoring Assessment
2024

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Approved by	**Gavan Butterfield**
Description	**Data collected on 22 and 23 October 2024 for the annual noise monitoring program at Dubbo Quarry, Dubbo, NSW**

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Abbreviations and Definitions

	Description
ΔT	Vertical Temperature Difference, i.e. the measured difference in ambient temperature between two elevations on the same tower. It is defined as the upper-level temperature measurement minus the lower-level temperature measurement.
°	Degree
AGL	Above ground level
Ambient Noise	The all-encompassing noise within a given environment. It is the composite of sounds from many sources, both near and far.
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 described using the LA90 descriptor (see below).
C	Celcius
CCAM	Conformal Cubic Atmospheric Model
CSIRO	Commonwealth Scientific and Industrial Research Organisation
dB	Abbreviation for decibel, a measure of sound equivalent to 20 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure, and 10 times the logarithm of a given sound power to a reference power.
dB(A)	A measure of A-weighted sound levels. A Weighting is an adjustment made to the sound level measurement to approximate the response of the human ear.
EPA	Environment Protection Authority
EPL	Environment Protection Licence
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods. Normal daily traffic is not extraneous noise.
m	Metre
LA1	The noise level, measured in dB(A), which is exceeded for 1 per cent of the measurement period.
LA1(1min)	The noise level, measured in dB(A), which is exceeded for 1 per cent of the time over a 1-minute measurement period, i.e., is exceeded for 0.6 seconds. This measure can approximate to the maximum noise level but may be less if there is more than 1 noise event during this 0.6 second period.
LA10	The noise level, measured in dB(A), which is exceeded for 10 per cent of the time.
LA90	The noise level, measured in dB(A), which is exceeded for 90 per cent of the time, referred to as the background noise level. This is considered to represent the background noise (see above).
LAeq	The level of noise equivalent to the energy average of noise levels occurring over a defined measurement period.
LAeq (period)	The average equivalent noise level, measured in dB(A), during a measurement period (e.g., 15-minute, day, evening, or night).
LAmax	The A-weighted sound pressure level that represents the maximum noise level measured over the time that a given sound is measured.
NATA	National Association of Testing Authorities
NMA	Noise Monitoring Assessment
NMP	Noise Management Plan

	Description
NPfI	Noise Policy for Industry 2017
NSW	New South Wales
s	Second
SPL	The Sound Pressure Level. Sound pressure is the fluctuation in air pressure, from the steady atmospheric pressure, created by sound. The sound pressure level is the sound pressure expressed on a decibel scale.
TAPM	The Air Pollution Model

Source: Noise Guide for Local Government (NSW EPA, 2023)

1. Overview

1.1 Project Driver

Ramboll Australia Pty Ltd (Ramboll) has been commissioned by Holcim (Australia) Pty Ltd (Holcim) to complete a Noise Monitoring Assessment (NMA) for Dubbo Quarry ("the quarry") at Dubbo, NSW.

This NMA was done in accordance with the following documents:

- Noise Policy for Industry (NPfI) (NSW EPA, 2017).
- Dubbo Quarry Noise Management Plan (NMP) (EMM Consulting Pty Ltd, 2023).
- Development Consent SSD 10417 'Dubbo Quarry Continuation Project' (Minister for Planning, 2023).
- Australian Standard AS 1055:2018 Acoustics — Description and measurement of environmental noise (Standards Australia, 2018).
- IEC 60942 Ed. 3.0 b:2003 Electroacoustics – Sound calibrators (Standards Australia, 2003).

This NMA has been undertaken for 2024, and forms part of the annual monitoring program to determine compliance with Operational Noise Criteria stipulated in the Development Consent.

1.2 Site Location and Sensitive Receptors

The quarry is located within the Dubbo Regional Local Government Area (LGA) and is located approximately 1.9 km to the east of the city of Dubbo, NSW. The quarry is accessed via Sheraton Road which connects to the Mitchell Highway approximately 2 km north-west of the quarry. Noise sensitive receivers surrounding the quarry are primarily rural and residential (to the north, east and west of the site). The MAAS Quarry is located directly adjacent to Holcim to the north and is a dominant noise source for some of those receiver locations.

The monitoring locations with respect to the quarry and assessed receivers are presented in the locality plan in **Figure 1**.

Imagery@ESRI World Imagery

RAMBOLL AUSTRALIA - GIS MAP file: 318000911 GIS_P006_NoiseMonitoring | F010_NoiseMonitoring_Dubbo_V03 | 14/02/2025

Legend

- Noise monitoring location

Figure 1 : Noise monitoring locations at Dubbo Quarry

2. Noise Criteria

Table 2-1 includes the applicable noise criteria outlined in the Development Consent for the 6 residential receivers surrounding the quarry (R1-R5 and R23). The four monitoring locations adopted from the NMP that are deemed representative and applicable for this NMA are R2, R3, R4 and R5. It should be noted that R1 is not monitored as Holcim currently has a negotiated agreement in place with the landowner of this residential property, and R23 is not monitored as no residence currently exists at this location (i.e. vacant land).

Table 2-1: Monitoring locations and noise criteria

Residential assessment location	Easting	Northing	Day[1]		Night[2]	
			Stripping activities	All other quarrying operations		
			LAeq (15min)	LAeq (15min)	LAeq (15min)	LAmax
			dBA			
R1[3]	655384	6427170	49	49	40	52
R2	655320	6426775	46	44	35	52
R3	654875	6427538	43	43	37	52
R4	655838	6428439	41	41	35	52
R5	657491	6427569	40	41	35	52
R23[4]	655196	6428133	42	42	37	52
All other non-project related privately owned residences	-	-	40	40	35	52

[1] 7 am–6 pm Monday to Saturday.

[2] 10 pm–7 am Monday to Saturday.

[3] Holcim currently has a negotiated agreement in place with the landowner of this residential property.

[4] No residence currently exists at this location (i.e., vacant land).

3. Methodology

The monitoring program was developed in accordance with the procedures described in Australian Standard AS 1055:2018 and the Approval Documents referenced in Section 0. The measurements were carried out using a RION Sound Level Meter NL-52 on Tuesday 22 October and Wednesday 23 October 2024. The acoustic instrumentation used carries current NATA calibration and complies with AS/NZS IEC 61672-1:2013/2002 class 1. Calibration of all instrumentation was checked prior to and following measurements using a Pulsar Acoustic Calibrator 105 which carried a current NATA calibration and complies with IEC 60942:2003. Drift in calibration did not exceed ±0.3 dBA.

Each attended noise measurement was conducted for 15-minutes in duration during the day and night periods over two days. Where possible, throughout each measurement the operator quantified the contribution of each significant noise source. Where the quarry was not distinctly audible during the attended monitoring, the quarry contribution is estimated to be at least 10 dBA below the ambient noise level, as determined by the LA90.

3.1 Meteorology

Meterology has an important influence on noise monitoring assessment. Where an onsite meterological station with data recorded at 10m height has not been available, the nearest Department of Planning, Housing and Infrastructure (DPHI) meterological station has been used to adopt wind direction, wind speed and rain data to inform this assessment. Temperature data has been adopted from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Conformal Cubic Atmospheric Model (CCAM) and modelled using The Air Pollution Model (TAPM) to determine the atmospheric category as outline in **Table 3-1**.

Table 3-1: Classification of Atmospheric Stability (NSW EPA, 2014)

Stability Classification	Pasquill Stability Category	Ambient temperature change with height (°C/100m)
Extremely unstable	A	$\Delta T \leq -1.9$
Moderately unstable	B	$-1.9 < \Delta T \leq -1.7$
Slightly unstable	C	$-1.7 < \Delta T \leq -1.5$
Neutral	D	$-1.5 < \Delta T \leq -0.5$
Slightly stable	E	$-0.5 < \Delta T \leq 1.5$
Moderately stable	F	$1.5 < \Delta T \leq 4.0$
Extremely stable	G	$\Delta T > 4.0$

Condition B2 of the consent states that noise generated by the development must be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NSW NPfI (EPA, 2017). Fact Sheet D of the NPfI describes 'standard' and 'noise-enhancing' meteorological conditions under which the noise limits apply. These conditions are defined in **Table 3-2**.

Table 3-2: NPfI Meteorological conditions (EPA, 2017)

Meteorological condition	Definition
Standard	Defined by stability categories A through to D, with wind speeds up to 0.5 m/s at 10 m above ground level (AGL) for day, evening and night periods.
Noise-enhancing	Defined by stability categories A through to D, with light winds (up to 3 m/s at 10 m AGL) for the day and evening periods; and stability categories A through to D, with light winds (up to 3 m/s at 10 m AGL) and/or stability category F with winds up to 2 m/s at 10 m AGL.

Further, Section 5.2 of the NPfI states that noise limits applicable under very noise-enhancing conditions should be the limits that apply under standard or noise-enhancing conditions plus 5 dB. This implies that there will be no periods when noise limits do not apply due to meteorological conditions.

As per the consent, and in accordance with the NPfI, a +5 dB adjustment to the operational limits shown in **Table 2-1** is adopted when attended noise monitoring is undertaken during 'very noise-enhancing' conditions.

The NPfI defines very noise-enhancing conditions as conditions outside of the range of either standard or noise-enhancing meteorological conditions as outlined in **Table 3-2**. When monitoring has been undertaken during very noise-enhancing conditions, a +5 dB adjustment to the operational limits in **Table 2-1** have been adopted.

4. Results and Discussion

4.1 Location R2

Noise monitoring at location R2 was conducted on Tuesday 22 October 2024 and Wednesday 23 October 2024 with results presented in **Table 4-1**. Noise from the quarry was audible during the day and night periods. The ambient noise environment was dominated by birds, insects, and motorway hum. The results meet the established noise criteria and indicate that noise emissions from Dubbo Quarry did not contribute to noise nuisance at the time of the monitoring.

Table 4-1: Noise survey results and observations for Location R2

Date	Time	Descriptor (dBA)			Meteorology (Handheld at microphone height)	DPHI Met Station (at 10m)[1]	Apparent Noise Source, Description and SPL (dBA)	Dubbo Quarry LAeq(15min) Contribution (dBA)	LAeq(15min) Criteria (dBA)	Dubbo Quarry LAmax Contribution (dBA)	LAmax Criteria (dBA)
		LAmax	LAeq	LA90							
22-10-24	1:34pm to 1:49pm (Day)	61.2	43.6	38.0	WD: n/a WS: 0 m/s Rain: Nil	WD: 166° WS: 2.5 m/s Rain: nil Stability Category: E[2]	Birds/insects 44 Holcim reverse squawkers 35 (twice for 10-15 secs) Quarry audible	<20[3]	44	n/a	n/a
23-10-24	6:05am to 6:20am (Night)	60.0	43.9	39.0	WD: n/a WS: 0 m/s Rain: Nil	WD: 155° WS: 0.5 m/s Rain: nil Stability Category: G[2]	Birds, insects, motorway hum 36-60 Quarry audible	<39	40[6]	n/a[6]	57[6]

[1] Data sourced from Orange DPHI Met Station.

[2] Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

[3] Value estimated based on sound exposure level calculation in **Appendix 1**.

[4] Value estimated based on LA90. Quarry contribution was not able to be isolated/quantified from the measurement due to other noise sources including birds, insects, and motorway hum.

[5] As per the consent, and in accordance with the NPfI, a +5 dB adjustment to the operational limits shown in **Table 2-1** has been adopted due to attended noise monitoring being undertaken during 'very noise-enhancing' conditions, as indicated by the Stability Category.

[6] Measured LAmax of 60.0 dBA was dominated by motorway hum so unable to estimate contribution for quarry at assessment location.

4.2 Location R3

Noise monitoring at location R3 was conducted on Tuesday 22 October 2024 and Wednesday 23 October 2024 with results presented in **Table 4-2**. Noise from the quarry was inaudible during the day and night period. The ambient noise environment was dominated by MARS quarry (located between the monitoring location and the Holcim quarry), birds, trucks, motorway traffic and a horse. The results meet the established noise criteria and indicate that noise emissions from Dubbo Quarry did not contribute to noise nuisance at the time of the monitoring.

Table 4-2 Noise survey results and observations for Location R3

Date	Time	Descriptor (dBA)			Meteorology (Handheld at microphone height)	DPHI Met Station (at 10m)[1]	Apparent Noise Source, Description and SPL (dBA)	Dubbo Quarry LAeq(15min) Contribution (dBA)	LAeq (15min) Criteria (dBA)	Dubbo Quarry LAmax Contribution (dBA)	LAmax Criteria (dBA)
		LAmax	LAeq	LA90							
22-10-24	12:49pm to 1:04pm (Day)	52.0	38.8	35.0	WD: n/a WS: 0 m/s Rain: Nil	WD: 174° WS: 2.4 m/s Rain: nil Stability Category: E[2]	MARS quarry 33-46 Birds 33-46 Trucks 45-70 Quarry inaudible	<25	43	n/a	n/a
23-10-24	6:25am to 6:40am (Night)	65.2	48.4	40.3	WD: n/a WS: 0 m/s Rain: Nil	WD: 155° WS: 0.5 m/s Rain: nil Stability Category: G[2]	Adjacent MARS quarry 33-46 Birds/motorway 37-47 Horse 65 Quarry inaudible	<30	42[3]	n/a[4]	57[3]

[1] Data sourced from Orange DPHI Met Station.

[2] Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

[3] As per the consent, and in accordance with the NPfI, a +5 dB adjustment to the operational limits shown in **Table 2-1** has been adopted due to attended noise monitoring being undertaken during 'very noise-enhancing' conditions, as indicated by the Stability Category.

[4] Measured LAmax of 65.2 dBA was dominated by a horse so unable to estimate contribution for quarry at assessment location.

4.3 Location R4

Noise monitoring at location R4 was conducted on Tuesday 22 October 2024 and Wednesday 23 October 2024 with results presented in **Table 4-3**. Noise from the quarry was audible during the day period. The quarry was not operational during the night period. The ambient noise environment was dominated by a tree removalist, birds, motorway traffic, frogs, insects, and a passing car. The results meet the established noise criteria and indicate that noise emissions from Dubbo Quarry did not contribute to noise nuisance at the time of the monitoring.

Table 4-3: Noise survey results and observations for Location R4

Date	Time	Descriptor (dBA)			Meteorology (Handheld at microphone height)	DPHI Met Station (at 10m)[1]	Apparent Noise Source, Description and SPL (dBA)	Dubbo Quarry LAeq(15min) Contribution (dBA)	LAeq(15 min) Criteria (dBA)	Dubbo Quarry LAmax Contribution (dBA)	LAmax Criteria (dBA)
		LAmax	LAeq	LA90							
22-10-24	2:15pm to 2:30pm (Day)	60.1	43.9	35.8	WD: n/a WS: 0 m/s Rain: Nil	WD: 174° WS: 2.5 m/s Rain: nil Stability Category: E[2]	Tree removalist 50 Bird 40-50 Quarry inaudible	<26	41	n/a	n/a
23-10-24	4:57am to 5:12am (Night)	60.1	46.4	35	WD: n/a WS: 0 m/s Rain: Nil	WD: 125° WS: 0.8 m/s Rain: nil Stability Category: G[2]	Motorway/frogs/ insects 32-56 Car passing 50-60 Quarry not operational	n/a[3]	40[4]	n/a[5]	57[4]

[1] Data sourced from Orange DPHI Met Station.

[2] Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

[3] Quarry not operational.

[4] As per the consent, and in accordance with the NPfI, a +5 dB adjustment to the operational limits shown in **Table 2-1** has been adopted due to attended noise monitoring being undertaken during 'very noise-enhancing' conditions, as indicated by the Stability Category.

[5] Measured LAmax of 60.1 dBA was dominated by passing vehicles, frogs and insects so unable to estimate contribution for quarry at assessment location.

4.4 Location R5

Noise monitoring at location R5 was conducted on Tuesday 22 October 2024 and Wednesday 23 October 2024 with results presented in **Table 4-4**. Noise from the quarry was inaudible during the day period. The quarry was not operational during the evening period. The ambient noise environment was dominated by motorway traffic, birds, insects, a barking dog, and a passing train. The results meet the established noise criteria and indicate that noise emissions from Dubbo Quarry did not contribute to noise nuisance at the time of the monitoring.

Table 4-4: Noise survey results and observations for Location R5

Date	Time	Descriptor (dBA)			Meteorology (Handheld at microphone height)	DPHI Met Station (at 10m)[1]	Apparent Noise Source, Description and SPL (dBA)	Dubbo Quarry LAeq(15min) Contribution (dBA)	LAeq(15 min) Criteria (dBA)	Dubbo Quarry LAmax Contribution (dBA)	LAmax Criteria (dBA)
		LAmax	LAeq	LA90							
22-10-24	2:40pm to 2:55pm (Day)	57.8	44.4	40.0	WD: n/a WS: 0 m/s Rain: Nil	WD: 174° WS: 2.5 m/s Rain: nil Stability Category: E[2]	Motorway/birds/ insects 47 Dog barking 41-50 Quarry inaudible	<30	41	n/a	n/a
23-10-24	5:21am to 5:36am (Night)	64.6	54.4	44.6	WD: n/a WS: 0 m/s Rain: Nil	WD: 124° WS: 1 m/s Rain: nil Stability Category: G[2]	Motorway/birds/ insects 35-64 Train 50-62 Quarry not operational	n/a[3]	40[4]	n/a[5]	57[4]

[1] Data sourced from Orange DPHI Met Station.

[2] Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

[3] Quarry not operational.

[4] As per the consent, and in accordance with the NPfI, a +5 dB adjustment to the operational limits shown in **Table 2-1** has been adopted due to attended noise monitoring being undertaken during 'very noise-enhancing' conditions, as indicated by the Stability Category.

[5] Measured LAmax of 64.6 dBA was dominated by birds, insects, motorway and a train so unable to estimate contribution for quarry at assessment location.

4.5 Location R23

Noise monitoring at location R23 was conducted on Tuesday 22 October 2024 and Wednesday 23 October 2024 with results presented in **Table 4-5**. Noise from the quarry was inaudible during the day period. The quarry was not operational during the evening period. The ambient noise environment was dominated by motorway hum, passing cars, trucks, birds, a barking dog, and MARs quarry trucks. It is noted that location R23 currently represents a vacant block, and the established noise criteria do not yet apply to this location. However, noise monitoring was conducted for the purpose of checking compliance for future residential use. The results meet the established noise criteria and indicate that noise emissions from Dubbo Quarry would not have contributed to noise nuisance at the time of the monitoring.

Table 4-5 Noise survey results and observations for Location R23

Date	Time	Descriptor (dBA)			Meteorology (Handheld at microphone height)	DPHI Met Station (at 10m)[1]	Apparent Noise Source, Description and SPL (dBA)	Dubbo Quarry LAeq(15min) Contribution (dBA)	LAeq (15min) Criteria (dBA)	Dubbo Quarry LAmax Contribution (dBA)	LAmax Criteria (dBA)
		LAmax	LAeq	LA90							
22-10-24	2:35pm to 2:50pm (Day)	83.0	62.2	35.2	WD: n/a WS: 0 m/s Rain: Nil	WD: 174° WS: 2.5 m/s Rain: nil Stability Category: E[2]	Motorway hum 31-40 Cars 45-77 MARS quarry trucks 50-80 Quarry inaudible	<25	42	n/a	n/a
23-10-24	5:45am to 6:00am (Night)	74.7	55.2	39.1	WD: n/a WS: 0 m/s Rain: Nil	WD: 124° WS: 1 m/s Rain: nil Stability Category: G[2]	Birds/motorway 36-47 Barking dog 43 MARS quarry trucks/cars 45 Quarry not operational	n/a[3]	42[4]	n/a[5]	57[4]

[1] Data sourced from Orange DPHI Met Station.

[2] Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

[3] Quarry not operational.

[4] As per the consent, and in accordance with the NPfI, a +5 dB adjustment to the operational limits shown in **Table 2-1** has been adopted due to attended noise monitoring being undertaken during 'very noise-enhancing' conditions, as indicated by the Stability Category.

[5] Measured LAmax of 74.7 dBA was dominated by birds and vehicle movements so unable to estimate contribution for quarry at assessment location.

5. Conclusion

This NMA was completed by Ramboll for the Holcim Dubbo Quarry, Dubbo, NSW as an annual requirement of the NMP. Monitoring was carried out on Tuesday 22 and Wednesday 23 October 2024 at five locations selected as representative to the sensitive receptors at the surroundings to Dubbo Quarry.

Audible noise identified as emitted from the plant was recorded during the day and night at location R2. The quarry was inaudible at all other monitoring locations. The results presented in this NMA show compliance with the relevant noise criteria applicable to operations of the Holcim Dubbo Quarry, Dubbo, NSW.

6. Limitations

Ramboll Australia Pty Ltd prepared this report in accordance with the scope of work as outlined in our proposal to Holcim (Australia) Pty Ltd and in accordance with our understanding and interpretation of current regulatory standards.

Site conditions may change over time. This report is based on conditions encountered at the Site at the time of the report and Ramboll disclaims responsibility for any changes that may have occurred after this time.

The conclusions presented in this report represent Ramboll's professional judgment based on information made available during the course of this assignment and are true and correct to the best of Ramboll's knowledge as at the date of the assessment.

Ramboll did not independently verify all of the written or oral information provided to Ramboll during the course of this investigation. While Ramboll has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to Ramboll was itself complete and accurate.

This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

6.1 User Reliance

This report has been prepared exclusively for Holcim (Australia) Pty Ltd and may not be relied upon by any other person or entity without Ramboll's express written permission.

7. References

EMM Consulting Pty Ltd. (2023). *Noise Management Plan, Dubbo Quarry, Holcim (Australia) Pty Ltd.*

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Appendix 1

Sound Exposure Level Calculation

Project No: 318001800
Client Name: Holcim Australia Pty Ltd
Project Name: NSW Environmental Monitoring
Project Site: Dubbo Quarry
14/02/2025

Sound Exposure Level Calculation

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R2 Day monitoring period (1:34PM to 1:49PM)

Noise source	Holcim reverse squawkers
Measured distance from source (m)	-
Measured time (s)	15
Measured SPL (dBA)	35
Calculated Sel (dB)	47
Number events in 15min	2
Total LAeq (15min)	**20.2**