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Lynwood Quarry Quarterly Noise Monitoring Assessment

Quarter 3 2025

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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
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
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 Lynwood Quarry ("the quarry") at Marulan, NSW.

This NMA was done in accordance with the following documents:

- Noise Policy for Industry (NPfI) (NSW EPA, 2017)
- Lynwood Quarry Noise Management Plan (NMP) (Holcim, 2019)
- Environment Protection Licence (EPL) number 12939 (NSW EPA, 2021)
- Development Consent DA 128-5-2005 (Minister for Planning, 2017)
- Australian Standard AS 1055:2018 Acoustics — Description and measurement of environmental noise (Standards Australia, 2018)
- Australian Standard AS/NZS IEC 61672.1:2019 Electroacoustics – Sound level meters, Part 1: Specifications (Standards Australia and Standards New Zealand, 2019)
- International Electrotechnical Commission (IEC) 60942:2017 Electroacoustics - Electroacoustics – Sound calibrators (IEC, 2017).

This NMA has been undertaken for the quarterly period April to June 2025, and forms part of the monitoring program to determine compliance with conditions of the Development Consent.

1.2 Site Location and Sensitive Receptors

The quarry is located at 278 Stoney Creek Road, approximately 4 km to the west of the Marulan railway station and town centre. Sensitive receptors surrounding the quarry are primarily rural and residential (to the west of the site). The Hume Highway is located to the east and south of the quarry. Highway traffic (Hume Highway) is a dominant noise source.

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

RAMBOLL AUSTRALIA - GIS MAP file: 318000911_GIS_P006_NoiseMonitoring | F002_NoiseMonitoring_Lynwood_V04 | 29/01/2024

Legend

- Noise monitoring location
- Residence/noise assessment location

Figure 1 : Noise monitoring locations at Lynwood Quarry

2. Noise Criteria

Table 2-1 includes the applicable noise criteria outlined in the Development Consent and the EPL for the 16 residential receivers surrounding the quarry (L1–L16), and the four monitoring locations adopted from the NMP that are deemed representative and applicable for this NMA (N1–N4). It should be noted that the original location of N3 (on the northern boundary of 16038 Hume Highway, Marulan) continues to be inaccessible and as such N3 has been relocated to a nearby residential receiver approximately 900 m to the west on Munro Road, Marulan (**Figure 1**) where all future monitoring will take place. This revised location is deemed representative and applicable for this NMA.

Table 2-1: Monitoring locations and noise criteria

EPL ID	Receiver Description	Monitoring Locations		Day[1]	Evening[2]	Night[3]	Night[3]
		NMP ID	Address	LAeq (15min)	LAeq (15min)	LAeq (15min)	LA1 (1min)
				dBA			
L1	West of the Granite Pit.	N1	1114 Carrick Road, Marulan	35	35	35	45
L2	Northeast of the site	-	-	35	35	35	45
L3	Northeast of the site	-	-	35	35	35	45
L4	East of the site in Marulan	-	-	35	37	35	46
L5	East of the site in Marulan	-	-	35	35	35	46
L6	East of the site in Marulan	N2	End of Maclura Drive, Marulan	35	37	36	46
L7	East of the site in Marulan	-	-	38	38	35	55
L8	East of the site in Marulan	-	-	39	38	36	55
L9	East of the site in Marulan	-	-	39	39	37	56
L10	Southeast of the site in Old Marulan	-	-	42	42	40	53
L11	South of the site	N3	Off Marulan South Road, near DD8	35	35	36	47
L12	East of the site in Marulan	N4	Corner of Dorsett and Suffolk Road, Marulan	37	37	36	47
L13	East of the site in Marulan	-	-	40	38	37	47
L14	South of the site	-	-	35	35	35	47
L15	South of the site	-	-	35	35	35	47
L16	Northeast of the site	-	-	35	35	35	45

[1] 7 am–6 pm Monday to Saturday and 8 am–6 pm Sunday and public holidays

[2] 6 pm–10 pm Monday to Sunday

[3] 10 pm–7 am Monday to Saturday and 10 pm–8 am Sunday and public holidays

3. Methodology

The monitoring program was developed in accordance with the procedures described in AS 1055:2018 (Standards Australia, 2018) and the Approval Documents referenced in Section 1. The measurements were carried out using a RION Sound Level Meter NL-52 on Monday 1 September 2025. The acoustic instrumentation used carries current National Association of Testing Authorities (NATA) calibration and complies with AS/NZS IEC 61672-1:2019 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 60942:2017. Drift in calibration did not exceed ±0.3 dBA.

Attended noise monitoring was conducted for 15-minutes in duration during the day, evening, and night periods over two days at each monitoring location. 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 Meteorological Conditions

Meterology has an important influence on noise monitoring assessment. An onsite meterological station with data recorded at 10m height 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	$\Delta T > 4.0$

As stated in the Development Consent, the noise criteria in **Table 2-1** applies under all meteorological conditions except the following:

- Monitoring locations for the collection of representative noise data
- Wind speeds greater than 3 m/s at 10 metres above ground level
- Stability category F temperature inversion conditions and wind speeds greater than 2 m/s at 10 metres above ground level
- Stability category G temperature inversion conditions.

Appendix 10 of the Development Consent also specifies that except for wind speed at microphone height, the data to be used for determing meterological conditons must be that recorded by a suitable meteorological station operating in the vicinity of the site that complies with the requirements in the Approved Methods for Sampling of Air Pollutants in New South Wales guideline.

4. Results and Discussion

4.1 Location N1

Noise monitoring at location N1 was conducted on Monday 1 September 2025 with results presented in **Table 4-1**. Noise from the quarry was inaudible at N1 during the day, evening and night monitoring period. The ambient noise environment was dominated by wind, fauna, traffic, trains, and aircraft. The results are deemed to satisfy the established noise criteria and indicate that noise emissions from Lynwood Quarry did not contribute to noise nuisance at the time of the monitoring.

Table 4-1: Noise survey results and observations for location N1

Date	Time	Descriptor (dBA)			Meteorology (Handheld at microphone height)	Onsite Met Station (10m height)	Apparent Noise Source, Description and SPL (dBA)	Lynwood Quarry LAeq(15min) Contribution (dBA)	LAeq(15min) Criteria (dBA)	Lynwood Quarry LA1(1min) Contribution (dBA)	LA1(1min) Criteria (dBA)
		LA1	LAeq	LA90							
01-09-25	2:33pm to 2:48pm (Day)	60.1	48	32	WD: 270° WS: 1.2 m/s Rain: Nil	WD: 258° WS: 1.6 m/s Rain: Nil Stability Category: F[1]	Wind, insects, frogs, birds 30-50 Train 54-60 Aircraft 50-55 Bird 65-70 Quarry inaudible	<22	35	n/a	n/a
01-09-25	9:27pm to 9:42pm (Evening)	35.5	40.3	38	WD: n/a WS: 0 m/s Rain: Nil	WD: 42.6° WS: 0.6 m/s Rain: Nil Stability Category: F[1]	Background traffic, insects, cicadas 37-43 Train 40-44 Cow 40-42 Quarry inaudible	<28	35	n/a	n/a
01-09-25	10:00pm to 10:15pm (Night)	44.6	42.1	40.4	WD: n/a WS: 0 m/s Rain: Nil	WD: 282° WS: 0.2 m/s Rain: Nil Stability Category: F[1]	Background traffic, insects, cicadas 38-46 Cow 44-45 Quarry inaudible	<30	35	n/a[2]	45

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

[2] Measured LA1 value of 44.6 dBA was dominated by traffic and fauna, so unable to estimate contribution for quarry at the assessment location.

4.2 Location N2

Noise monitoring at location N2 was conducted on Monday 1 September 2025 with results presented in **Table 4-2**. Noise from the quarry was inaudible at N2 during the day, evening, and night monitoring periods. The ambient noise environment was dominated by background traffic, wind, trees, fauna and trains. The results satisfy the established noise criteria and indicate that noise emissions from Lynwood Quarry did not contribute to noise nuisance at the time of the monitoring.

Table 4-2: Noise survey results and observations for location N2

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (10m height)	Apparent Noise Source, Description and SPL (dBA)	Lynwood Quarry LAeq (15min) Contribution (dBA)	LAeq (15min) Criteria (dBA)	Lynwood Quarry LA1(1min) Contribution (dBA)	LA1 (1min) Criteria (dBA)
		LA1	LAeq	LA90							
01-09-25	1:29pm to 1:44pm (Day)	63.1	49.2	33.7	WD: 290° WS: 0.9 m/s Rain: Nil	WD: 253° WS: 1.0 m/s Rain: Nil Stability Category: F[1]	Background traffic, wind, trees, insects, birds 34-38 Dog 45 Train 60-67 Quarry inaudible	<24	35	n/a	n/a
01-09-25	8:14pm to 8:29pm (Evening)	52.5	47.5	44.3	WD: n/a WS: 0 m/s Rain: Nil	WD: 68° WS: 0.6 m/s Rain: Nil Stability Category: F[1]	Background traffic, insects, frogs, birds 44-57 Dog 45-47 Quarry inaudible	<34	37	n/a	n/a
01-09-25	11:06pm to 11:21pm (Night)	53.6	47.2	43.9	WD: n/a WS: 0 m/s Rain: Nil	WD: 249° WS: 0.2 m/s Rain: Nil Stability Category: F[1]	Background traffic, insects, frogs, birds 45-50 Train 50-56 Plover 50-56 Quarry inaudible	<34	36	n/a[2]	46

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

[2] Measured LA1 value of 53.6 dBA was dominated by traffic, fauna and a train, so unable to estimate contribution for quarry at the assessment location.

4.3 Location N3

Noise monitoring at location N3 was conducted on Monday 1 September 2025 with results presented in **Table 4-3**. Noise from the quarry was inaudible at N3 during the day, evening and night monitoring period. The ambient noise environment was dominated by background traffic and fauna. The results satisfy the established noise criteria and indicate that noise emissions from Lynwood Quarry did not contribute to noise nuisance at the time of the monitoring.

Table 4-3: Noise survey results and observations for location N3

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (10m height)	Apparent Noise Source, Description and SPL (dBA)	Lynwood Quarry LAeq (15min) Contribution (dBA)	LAeq (15min) Criteria (dBA)	Lynwood Quarry LA1(1min) Contribution (dBA)	LA1 (1min) Criteria (dBA)
		LA1	LAeq	LA90							
01-09-25	12:44pm to 12:59pm (Day)	40.3	35.2	33.1	WD: 258° WS: 0.8 m/s Rain: Nil	WD: 252° WS: 1.2 m/s Rain: Nil Stability Category: F[1]	Background traffic, insects, birds 32-46 Quarry inaudible	<23	35	n/a	n/a
01-09-25	7:30pm to 7:45pm (Evening)	44.1	44.1	41.3	WD: n/a WS: 0 m/s Rain: Nil	WD: 315° WS: 0.4 m/s Rain: Nil Stability Category: F[1]	Background traffic, insects, frogs 43-49 Quarry inaudible	<31	35	n/a	n/a
01-09-25	11:45pm to 12:00am (Night)	43	45.7	41.8	WD: 229° WS: 1.3 m/s Rain: Nil	WD: 249° WS: 0.2 m/s Rain: Nil Stability Category: F[1]	Background traffic, cicadas, insects, frogs, birds 40-47 Quarry inaudible	<32	36	n/a[2]	47

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

[2] Measured LA1 value of 43 dBA was dominated by traffic and fauna, so unable to estimate contribution for quarry at the assessment location.

4.4 Location N4

Noise monitoring at location N4 was conducted on Monday 1 September 2025 with results presented in **Table 4-4**. Noise from the quarry was inaudible at N4 during the day, evening and night monitoring period. The ambient noise environment was dominated by residential rumblings, fauna, wind, trees, background traffic, cars, trucks, a train and aircraft. The results satisfy the established noise criteria and indicate that noise emissions from Lynwood Quarry did not contribute to noise nuisance at the time of the monitoring.

Table 4-4: Noise survey results and observations for location N4

Date	Time	Descriptor (dBA)			Meteorology (Handheld at microphone height)	Onsite Met Station (10m height)	Apparent Noise Source, Description and SPL (dBA)	Lynwood Quarry LAeq (15min) Contribution (dBA)	LAeq (15min) Criteria (dBA)	Lynwood Quarry LA1(1min) Contribution (dBA)	LA1 (1min) Criteria (dBA)
		LA1	LAeq	LA90							
01-09-25	1:57pm to 2:22pm (Day)	55.8	44.6	32	WD: 257° WS: 1.2 m/s Rain: Nil	WD: 258° WS: 1.6 m/s Rain: Nil Stability Category: E[1]	Residential rumblings, birds, insects, wind, trees 34-50 Train 45-50 Car passing 50-56 Aircraft 52-65 Quarry inaudible	<22	37	n/a	n/a
01-09-25	8:42pm to 8:57pm (Evening)	46.5	42.6	40.3	WD: n/a WS: 0 m/s Rain: Nil	WD: 68° WS: 0.6 m/s Rain: Nil Stability Category: F[1]	Background traffic, insects 40-47 Dog barking 43 Quarry inaudible	<30	37	n/a	n/a
01-09-25	10:40pm to 10:55pm (Night)	44.1	40.1	38.4	WD: n/a WS: 0 m/s Rain: Nil	WD: 43° WS: 0.6 m/s Rain: Nil Stability Category: F[1]	Background traffic, insects, cicadas, frogs 38-41 Dog barking 43 Truck 44-47 Quarry inaudible	<28	36	n/a[2]	47

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

[2] Measured LA1 value of 44.1 dBA was dominated by traffic and fauna, so unable to estimate contribution for quarry at the assessment location.

5. Conclusion

This NMA was completed by Ramboll at the Holcim Lynwood Quarry, Marulan, NSW as a quarterly requirement of the NMP. Monitoring was carried out on Monday 1 September 2025 at four locations selected as representative to the sensitive receptors at the surroundings to Lynwood Quarry.

No audible noise from quarry operations was observed at any of the locations during the day, evening and night periods. The results presented in this NMA show compliance with the relevant noise criteria at the Holcim Lynwood Quarry, Marulan, NSW.

6. References

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