Intended for
Holcim (Australia) Pty Ltd

Document type
Report

Date
May 2025

Teven Quarry Quarterly Noise Monitoring Assessment

Quarter 1 2025

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Teven Quarry Quarterly Noise Monitoring Assessment

Quarter 1 2025

Project name	**NSW Environmental Monitoring 2024-2025**
Project no.	**318001800**
Recipient	**Matt Kelly**
Document type	**Report**
Version	**1**
Date	**05/05/2025**
Prepared by	**Jake Bourke, Brodie Wood**
Checked by	**Arnold Cho**
Approved by	**Gavan Butterfield**
Description	**Data collected on 10 February 2025 and 17 March 2025 for Teven Quarry during Quarter 1 2025 in Teven, NSW, as part of the noise monitoring program**

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Contents

Table of Tables

Table of figures

Appendices

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

	Description
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 Teven Quarry ("the quarry") at Teven, NSW.

This NMA was done in accordance with the following documents:

- Noise Policy for Industry (NPfI) (NSW EPA, 2017)
- Teven Quarry Noise Management Plan (NMP) (Holcim Australia, 2021)
- Environment Protection Licence (EPL) number 3293 (NSW EPA, 2021)
- Development Consent Application Number SSD_6422 (Minister for Planning and Environment, 2015)
- 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)
- IEC 60942:2017 Electroacoustics - Electroacoustics – Sound calibrators (International Standard, 2017).

This NMA has been undertaken in accordance with the NMP for the quarterly period January to March 2025 and forms part of the monitoring program to determine compliance with conditions of the Development Consent.

1.2 Site Location and Sensitive Receivers

The quarry is in Teven, NSW, approximately 7 km west of Ballina. Sensitive receivers surrounding the quarry are primarily rural and residential properties in coastal bushland with elevated and undulating topography. Five monitoring locations have been selected as part of the NMA and in accordance with the EPL and Development Consent and are shown in **Table 1-1**.

Table 1-1: Monitoring locations locality and sensitive receptors

Monitoring Locations	Nearest Receiver	Locality and Sensitive Receivers
NM1	R7	West of the quarry situated at a rural residential property at the end of Leadbeatters Lane
NM2	R3/R4	East of the quarry situated at a rural residential property on Teven Road
NM3	R2	South of the quarry situated at a rural residential property at the end of Wellers Road
NM4	R10	North of the quarry situated at a rural residential property adjacent the site off Stokers Lane
NM5	R14	Northeast of the quarry situated at a rural residential property of Teven Road

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

Imagery@ESRI World Imagery

Legend

- Noise monitoring location
- Residential receiver location

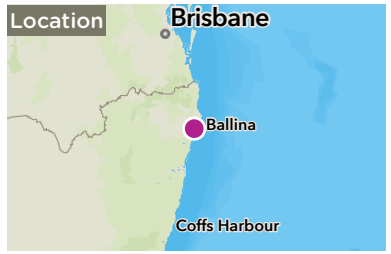

Figure 1 : Noise monitoring locations at Teven Quarry

2. Noise Criteria

Table 2-1 summaries the applicable onsite noise criteria outlined in the NMP and Development Consent for residential receivers (NM1, NM2, NM3, NM4, NM5) surrounding the quarry.

Table 2-1: Monitoring locations and noise criteria

Receivers	Monitoring Locations	Day[1]	Evening[2]
		LAeq (15min)	LAeq (15min)
		dB(A)	
R3, R4, R13, R15, R16, R17, R18, R20	NM2	38	35
All other receivers	NM1, NM3, NM4, NM5	37	35

[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. 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 1. The measurements were completed using a RION Sound Level Meter NL-52 on Monday 10 February and Monday 17 March 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 also 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-minute periods at each monitoring location over three days. As per the NMP, two sets of measurements were completed during the day, and two sets of measurements were completed during the evening, at each monitoring location. It is noted that the quarry was not operational during the evening periods, however, monitoring was conducted as per requirements of the EPL. 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:

- Wind speeds greater than 3m/s at 10m above ground level
- Temperature inversion conditions between 1.5°C and 3°C/100m and wind speed greater than 2m/s at 10m above ground level
- Temperature inversion conditions greater than 3°C/100m.

Appendix 5 of the Development Consent also specifies that except for wind speed at microphone height, the data to be used for determing meterological conditons shall be that recorded by a suitable meteorological station operating in the vicinity of the site.

4. Results and Discussion

4.1 Location NM1

Noise monitoring at location NM1 was conducted on Monday 10 February 2025 and Monday 17 March 2025 with results presented in **Table 4-1**. The quarry was inaudible at NM1 during the day. The quarry was not operational during the evening. Measured predominant ambient noise sources included flora and fauna, aircraft, dog barking, passing vehicles and an aircraft. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring (see Footnotes 2 and 3 below).

Table 4-1: Noise survey results and observations for Location NM1

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
17-03-25	3:28pm to 3:43pm (Day)	66.2	52.6	44.9	WD: 16° WS: 3.2 m/s Rain: Nil	WD: NW WS: 8 m/s Rain: Nil Stability Category: D[1]	Background wind/trees/insects 41-60 Car 60-62 Dogs barking 51-53 Aircraft 50-64 Quarry inaudible	<35	37
17-03-25	3:44pm to 3:59pm (Day)	65	54.7	47.6	WD: 16° WS: 3.2 m/s Rain: Nil	WD: NW WS: 8 m/s Rain: Nil Stability Category: D[1]	Wind/trees/insects/cicadas 41-60 Quarry inaudible	<38[2,3]	37
10-02-25	6:00pm to 6:15pm (Evening)	66.2	51.8	42.0	WD: n/a WS: 0 m/s Rain: Nil	WD: S WS: 9 m/s Rain: Nil Stability Category: E[1]	Insects/cicadas/trees/birds 38-66 Quarry not operational	n/a[4]	35
10-02-25	6:16pm to 6:31pm (Evening)	84.5	59.3	29.0	WD: n/a WS: 0 m/s Rain: Nil	WD: S WS: 9 m/s Rain: Nil Stability Category: E[1]	Insects/cicadas/trees/birds 37-61 Polaris passing 54-84 Quarry not operational	n/a[4]	35

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

[2] Measured LA90 value of 47.6 was dominated by flora and fauna so unable to separate extraneous noise from Holcim noise but estimated be less than 38 dBA at the assessment location.

[3] Negligible exceedance (NPfI 2017 – Table 4.1)

[4] Quarry not operational.

4.2 Location NM2

Noise monitoring at location NM1 was conducted on Monday 10 February 2025 and Monday 17 March 2025 with results presented in **Table 4-2**. The quarry was inaudible at NM2 during the day. The quarry was not operational during the evening. The ambient noise environment was dominated by flora, fauna and passing cars on Teven Road. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

Table 4-2: Noise survey results and observations for Location NM2

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
17-03-25	4:17pm to 4:32pm (Day)	81.4	61.6	45.3	WD: 26° WS: 3.2 m/s Rain: Nil	WD: NW WS: 8 m/s Rain: Nil Stability Category: D[1]	Background wind/trees/insects/birds 44-55 Passing cars 71-81 Quarry inaudible	<35	38
17-03-25	4:39pm to 4:54pm (Day)	85.3	61.5	46.5	WD: 26° WS: 3.2 m/s Rain: Nil	WD: NW WS: 8 m/s Rain: Nil Stability Category: D[1]	Background wind/trees/insects/birds 44-55 Passing cars 71-81 Quarry inaudible	<37	38
10-02-25	7:55pm to 8:10pm (Evening)	85.3	59.5	33.6	WD: n/a WS: 0 m/s Rain: Nil	WD: S WS: 1.5 m/s Rain: Nil Stability Category: E[1]	Background motorway hum/insects/cicadas 33-45 Cars passing 64-85 Aircraft 44-50 Quarry not operational	n/a[2]	35
10-02-25	8:12pm to 8:27pm (Evening)	82.6	56.2	34.7	WD: n/a WS: 0 m/s Rain: Nil	WD: SE WS: 1 m/s Rain: Nil Stability Category: E[1]	Background motorway hum/insects/cicadas 34-41 Cars passing 60-82 Quarry not operational	n/a[2]	35

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

[2] Quarry not operational.

4.3 Location NM3

Noise monitoring at location NM1 was conducted on Monday 10 February 2025 and Monday 17 March 2025 with results presented in **Table 4-3**. The quarry was inaudible at NM3 during the day. The quarry was not operational during the evening. The ambient noise environment was dominated by flora, fauna and background motorway. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

Table 4-3: Noise survey results and observations for Location NM3

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
17-03-25	4:59pm to 5:14pm (Day)	51.5	41.6	39.7	WD: 16° WS: 2.3 m/s Rain: Nil	WD: WNW WS: 8 m/s Rain: Nil Stability Category: D[1]	Background wind/trees/insects 40-50 Quarry inaudible	<30	37
17-03-25	5:15pm to 5:30pm (Day)	49.9	41.4	39	WD: 16° WS: 2.3 m/s Rain: Nil	WD: WNW WS: 8 m/s Rain: Nil Stability Category: D[1]	Background wind/trees/insects 40-50 Quarry inaudible	<29	37
10-02-25	8:32pm to 8:47pm (Evening)	56.5	53.7	44.8	WD: n/a WS: 0 m/s Rain: Nil	WD: ESE WS: <1 m/s Rain: Nil Stability Category: E[1]	Background motorway hum/insects/cicadas 42-57 Quarry not operational	n/a[2]	35
10-02-25	8:48pm to 9:03pm (Evening)	54.5	46.9	43.9	WD: n/a WS: 0 m/s Rain: Nil	WD: ESE WS: <1 m/s Rain: Nil Stability Category: E[1]	Background motorway hum/insects/cicadas 41-57 Quarry not operational	n/a[2]	35

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

[2] Quarry not operational.

4.4 Location NM4

Noise monitoring at location NM1 was conducted on Monday 10 February 2025 and Monday 17 March 2025 with results presented in **Table 4-4**. The quarry was inaudible at NM4 during the day. Holcim vehicles entering and exiting the site were observed and measured during both day periods. As these were offsite vehicle movements they did not constitute as a contributor to the quarry contribution. The quarry was not operational during the evening period. The ambient noise environment was dominated by background motorway hum, flora and fauna, aircraft and a passing car. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

Table 4-4: Noise survey results and observations for Location NM4

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq (15min) Contribution	LAeq (15min) Criteria (dBA)
		LAmax	LAeq	LA90					
17-03-25	2:04pm to 2:19am (Day)	75.2	55.9	46.9	WD: 16° WS: 3.2 m/s Rain: Nil	WD: WNW WS: 9 m/s Rain: Nil Stability Category: C[1]	Trees/wind/insects 48-56 Trucks passing 60-74 Quarry inaudible	<37	37
17-03-25	2:20pm to 2:35pm (Day)	82.8	53.2	48.1	WD: 16° WS: 3.2 m/s Rain: Nil	WD: WNW WS: 9 m/s Rain: nil Stability Category: C[1]	Trees/wind/insects 48-69 Trucks passing 54-60 Quarry inaudible	<29[2,3]	37
10-02-25	7:20pm to 7:35pm (Evening)	61.4	52.0	38.5	WD: n/a WS: 0 m/s Rain: Nil	WD: S WS: 3.5 m/s Rain: Nil Stability Category: E[1]	Background motorway hum/cicadas/insects/birds 36-61 Aircraft 40-43 Passing car 44-51 Quarry not operational	n/a[4]	35
10-02-25	7:36pm to 7:51pm (Evening)	72	55.5	39.8	WD: n/a WS: 0 m/s Rain: Nil	WD: S WS: 2 m/s Rain: Nil Stability Category: E[1]	Background motorway hum/cicadas/insects/birds 36-61 Quarry not operational	n/a[4]	35

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

[2] Measured LA90 value of 48.1 was dominated by trees, wind and insects and road traffic so unable to estimate contribution for quarry at assessment location.

[3] Monitoring was completed close to Stokers Lane at the entrance to the residence as to not disturb the resident, which places the attended noise monitoring location in direct line-of-sight of the quarry rather than near the sensitive receptor, i.e., the resident. Subsequently an estimated quarry contribution of 38 LAeq dBA was adopted for distance correction to receiver using noise emission level (NEL) calculations in Appendix 1.

[4] Quarry not operational.

Location NM5

Noise monitoring at location NM1 was conducted on Monday 10 February 2025 and Monday 17 March 2025 with results presented in **Table 4-5**. The quarry was inaudible at NM5 during the day. The quarry was not operational during the evening. The ambient noise environment was dominated flora, fauna and a passing tractor. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

Table 4-5: Noise survey results and observations for Location NM5

Date	Time (hrs)	Descriptor (dBA)			Meteorology (Handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria
		LAmax	LAeq	LA90					
17-03-25	2:39pm to 2:54pm (Day)	68	38	40.2	WD: 16° WS: 3.2 m/s Rain: Nil	WD: WNW WS: 9 m/s Rain: Nil Stability Category: C[1]	Background wind/trees/insects/birds 60-65 Passing tractor 60-65 Quarry inaudible	<30	37
17-03-25	2:56pm to 3:09pm (Day)	71.7	48.5	39	WD: 16° WS: 3.2 m/s Rain: Nil	WD: NW WS: 8.5 m/s Rain: Nil Stability Category: C[1]	Background wind/trees/insects/birds 60-65 Passing tractor 60-65 Quarry inaudible	<29	37
10-02-25	6:45pm to 7:00pm (Evening)	68.4	45.1	37.3	WD: 60° WS: 1.9 m/s Rain: Nil	WD: S WS: 8 m/s Rain: Nil Stability Category: E[1]	Insects/cicadas/trees/wind/birds 37-58 Quarry not operational	n/a[2]	35
10-02-25	7:00pm to 7:15pm (Evening)	59.4	45.0	38.9	WD: 60° WS: 1.9 m/s Rain: Nil	WD: S WS: 5 m/s Rain: Nil Stability Category: E[1]	Insects/cicadas/trees/wind/birds 37-59 Quarry not operational	n/a[2]	35

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

[2] Quarry not operational

5. Conclusion

This NMA completed by Ramboll at the Holcim Teven Quarry, Teven, NSW as a quarterly requirement of the NMP. Noise monitoring was completed on Monday 10 February and Monday 17 March 2025 at five locations selected as representative to the sensitive receptors at the surroundings to Teven Quarry.

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

It is noted that at NM1, the site noise contribution is estimated to be up to 38 dBA during one day period. This indicates that the noise criteria were exceeded by 1 dB which is however deemed negligible when considered against Table 4.1 of the NPfI. It should also be noted that the noise environment during the night-time noise monitoring was affected by extraneous noise sources whilst the site was inaudible. Therefore, it can be concluded that the exceedance was not caused by the site operation.

6. References

Holcim Australia (2021) *Teven Quarry, Noise Management Plan*.

International Electrotechnical Commission *IEC 60942:2017 Electroacoustics – Sound calibrators*

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Standards Australia (2018) *AS 1055:2018 Acoustics—Description and measurement of environmental noise*. Australian Standard.

Standards Australia and Standards New Zealand (2019) *AS/NZS IEC 61672.1:2019 Electroacoustics—Sound level meters, Part 1: Specifications*. Australian/New Zealand Standard.

Appendix 1

Noise Emission Level Calculation

Project No: 318001800
Client Name: Holcim Australia Pty Ltd
Project Name: NSW Environmental Monitoring
Project Site: Teven Quarry
5/05/2025

Noise Emission Level Calculation

RAMBOLL

NM4 day monitoring period (1:25PM to 1:40PM)

Site contribution corrected for distance from monitoring location to receiver

Noise source	Quarry contribution
Estimated site contribution (LAeq) at monitoring location (dBA)	38.0
Approx. distance from monitoring location to site (m)	310
Approx. distance from site to receiver (m)	500
Distance corrected site contribution at receiver (LAeq dBA)	**33.8**
Estimated additional attenuation (vegetation & ground absorption)	5
Estimated site contribution at receiver (dBA)	**28.8**

Intended for
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Date
August 2025

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Project name	**NSW Environmental Monitoring 2024-2025**
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Date	**12/08/2025**
Prepared by	**Jake Bourke, Brodie Wood**
Checked by	**Arnold Cho**
Approved by	**Gavan Butterfield**
Description	**Data collected on 13 May 2025 and 14 May 2025 for Teven Quarry during Quarter 2 2025 in Teven, NSW, as part of the noise monitoring program**

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Contents

Table of Tables

Table of figures

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

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- Teven Quarry Noise Management Plan (NMP) (Holcim Australia, 2021)
- Environment Protection Licence (EPL) number 3293 (NSW EPA, 2021)
- Development Consent Application Number SSD_6422 (Minister for Planning and Environment, 2015)
- 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)
- IEC 60942:2017 Electroacoustics - Electroacoustics – Sound calibrators (International Electrotechnical Commission, 2017).

This NMA has been undertaken in accordance with the NMP 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 Receivers

The quarry is in Teven, NSW, approximately 7 km west of Ballina. Sensitive receivers surrounding the quarry are primarily rural and residential properties in coastal bushland with elevated and undulating topography. Five monitoring locations have been selected as part of the NMA and in accordance with the EPL and Development Consent and are shown in **Table 1-1**.

Table 1-1: Monitoring locations locality and sensitive receptors

Monitoring Locations	Nearest Receiver	Locality and Sensitive Receivers
NM1	R7	West of the quarry situated at a rural residential property at the end of Leadbeatters Lane
NM2	R3/R4	East of the quarry situated at a rural residential property on Teven Road
NM3	R2	South of the quarry situated at a rural residential property at the end of Wellers Road
NM4	R10	North of the quarry situated at a rural residential property adjacent the site off Stokers Lane
NM5	R14	Northeast of the quarry situated at a rural residential property of Teven Road

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

Imagery@ESRI World Imagery

Legend

- Noise monitoring location
- Residential receiver location

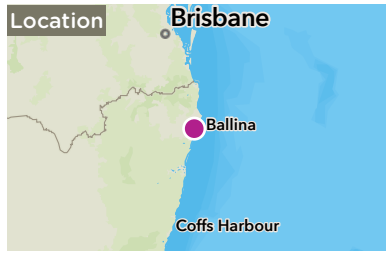

Figure 1 : Noise monitoring locations at Teven Quarry

2. Noise Criteria

Table 2-1 summaries the applicable onsite noise criteria outlined in the NMP and Development Consent for residential receivers (NM1, NM2, NM3, NM4, NM5) surrounding the quarry.

Table 2-1: Monitoring locations and noise criteria

Receivers	Monitoring Locations	Day[1]	Evening[2]
		LAeq (15min)	LAeq (15min)
		dB(A)	
R3, R4, R13, R15, R16, R17, R18, R20	NM2	38	35
All other receivers	NM1, NM3, NM4, NM5	37	35

[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. 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 1. The measurements were completed using a RION Sound Level Meter NL-52 on Tuesday 13 May and Wednesday 14 May 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 also 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-minute periods at each monitoring location over two days. As per the NMP, two sets of measurements were completed during the day, and two sets of measurements were completed during the evening, at each monitoring location. It is noted that the quarry was not operational during the evening periods, however, monitoring was conducted as per requirements of the EPL. 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:

- Wind speeds greater than 3m/s at 10m above ground level
- Temperature inversion conditions between 1.5°C and 3°C/100m and wind speed greater than 2m/s at 10m above ground level
- Temperature inversion conditions greater than 3°C/100m.

Appendix 5 of the Development Consent also specifies that except for wind speed at microphone height, the data to be used for determing meterological conditons shall be that recorded by a suitable meteorological station operating in the vicinity of the site.

4. Results and Discussion

4.1 Location NM1

Noise monitoring at location NM1 was conducted on Tuesday 13 May 2025 and Wednesday 14 May 2025 with results presented in **Table 4-1**. The quarry was inaudible at NM1 during the day. The quarry was not operational during the evening. Measured predominant ambient noise sources included background traffic, insects, cicadas, birds, llamas and passing cars. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

Table 4-1: Noise survey results and observations for Location NM1

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
13-05-25	4:13pm to 4:28pm (Day)	54.6	42.8	37.5	WD: n/a WS: 0 m/s Rain: Nil	WD: SSW WS: 2.5 m/s Rain: Nil Stability Category: E[1]	Background traffic/insects/cicadas/birds 37-46 Llama 47-48 Birds 50-54 Quarry inaudible	<28	37
13-05-25	4:31pm to 4:46pm (Day)	49	42	36.3	WD: n/a WS: 0 m/s Rain: Nil	WD: SSW WS: 2.5 m/s Rain: Nil Stability Category: E[1]	Background traffic/birds/insects/cicadas 35-46 Bird 40-45 Quarry inaudible	<26	37
14-05-25	6:03pm to 6:18pm (Evening)	52.4	49	45.2	WD: n/a WS: 0 m/s Rain: Nil	WD: WNW WS: 0 m/s Rain: Nil Stability Category: E[1]	Background traffic/insects/cicadas 48-52 Quarry not operational	n/a[2]	35
14-05-25	6:19pm to 6:34pm (Evening)	60.3	46	44.3	WD: n/a WS: 0 m/s Rain: Nil	WD: WNW WS: 0 m/s Rain: Nil Stability Category: E[1]	Background traffic/insects/cicadas 44-50 Passing car 56-60 Quarry not operational	n/a[2]	35

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

[2] Quarry not operational.

4.2 Location NM2

Noise monitoring at location NM2 was conducted on Tuesday 13 May 2025 and Wednesday 14 May 2025 with results presented in **Table 4-2**. The quarry was inaudible at NM2 during the day. The quarry was not operational during the evening. The ambient noise environment was dominated by flora, fauna, power tools, automotive noise from residence and passing cars on Teven Road. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

Table 4-2: Noise survey results and observations for Location NM2

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
13-05-25	1:53pm to 2:08pm (Day)	74.2	61	39.4	WD: 165° WS: 0.9 m/s Rain: Nil	WD: W WS: 2 m/s Rain: Nil Stability Category: E[1]	Wind/trees/insects/motor from residence backyard 50-52 Cars passing 80-84 Power tools 60-65 Birds 50-56 Quarry inaudible	<29	38
13-05-25	2:10pm to 2:25pm (Day)	68.3	58.3	37.1	WD: 165° WS: 0.9 m/s Rain: Nil	WD: W WS: 2 m/s Rain: Nil Stability Category: E[1]	Wind/trees/insects/motor from residence backyard 50-52 Power tools 59-62 Car passing 68-81 Quarry inaudible	<27	38
14-05-25	8:14pm to 8:29pm (Evening)	56.9	54.5	38.3	WD: n/a WS: 0 m/s Rain: Nil	WD: NNW WS: 0.5 m/s Rain: Nil Stability Category: E[1]	Background traffic/insects/cicadas 38-40 Car passing 57-82 Quarry not operational	n/a[2]	35
14-05-25	8:30pm to 8:45pm (Evening)	43.7	39.8	38.6	WD: n/a WS: 0 m/s Rain: Nil	WD: NNW WS: 1 m/s Rain: Nil Stability Category: E[1]	Background traffic/insects/cicadas/frogs 38-40 Aircraft 40-44 Quarry not operational	n/a[2]	35

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

[2] Quarry not operational.

4.3 Location NM3

Noise monitoring at location NM3 was conducted on Tuesday 13 May 2025 and Wednesday 14 May 2025 with results presented in **Table 4-3**. The quarry was inaudible at NM3 during the day. The quarry was not operational during the evening. The ambient noise environment was dominated by flora, fauna and background traffic. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

Table 4-3: Noise survey results and observations for Location NM3

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
13-05-25	1:14pm to 1:29pm (Day)	57	45	40	WD: 168° WS: 1.5 m/s Rain: Nil	WD: W WS: 2 m/s Rain: Nil Stability Category: E[1]	Wind/trees/insects 42-50 Birds 50-55 Quarry inaudible	<30	37
13-05-25	1:31pm to 1:46pm (Day)	53.3	43	39.5	WD: 168° WS: 1.5 m/s Rain: Nil	WD: WNW WS: 2 m/s Rain: Nil Stability Category: E[1]	Wind/trees/insects/birds 42-47 Quarry inaudible	<30	37
14-05-25	8:51pm to 9:06pm (Evening)	62.1	56.1	48.6	WD: n/a WS: 0 m/s Rain: Nil	WD: NNW WS: 1 m/s Rain: Nil Stability Category: E[1]	Background traffic/insects/frogs/cicadas 50-60 Quarry not operational	n/a[2]	35
14-05-25	9:07pm to 9:22pm (Evening)	63.2	55.5	45.6	WD: n/a WS: 0 m/s Rain: Nil	WD: N WS: 1.5 m/s Rain: Nil Stability Category: E[1]	Background traffic/insects/frogs/cicadas 50-60 Quarry not operational	n/a[2]	35

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

[2] Quarry not operational.

4.4 Location NM4

Noise monitoring at location NM4 was conducted on Tuesday 13 May 2025 and Wednesday 14 May 2025 with results presented in **Table 4-4**. The quarry was audible at NM4 during the day. The quarry was not operational during the evening period. The ambient noise environment was dominated by flora, fauna, aircraft and background traffic. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring (see Footnotes 2, 3 and 4 below).

Table 4-4: Noise survey results and observations for Location NM4

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq (15min) Contribution	LAeq (15min) Criteria (dBA)
		LAmax	LAeq	LA90					
13-05-25	2:33pm to 2:48pm (Day)	59.2	48.2	45.5	WD: 158° WS: 0.5 m/s Rain: Nil	WD: W WS: 2.5 m/s Rain: Nil Stability Category: E[1]	Machine rumblings/trees/wind/insects 45-50 Quarry audible	<37[2,3]	37
13-05-25	2:50pm to 3:05pm (Day)	56	46.6	42.3	WD: 158° WS: 0.5 m/s Rain: Nil	WD: W WS: 2.5 m/s Rain: Nil Stability Category: E[1]	Machine rumblings/trees/wind/insects 45-51 Quarry audible	<33[2,4]	37
14-05-25	7:01pm to 7:16pm (Evening)	55.1	50	44.7	WD: n/a WS: 0 m/s Rain: Nil	WD: n/a WS: <1 m/s Rain: Nil Stability Category: E[1]	Background traffic/insects/cicadas 44-54 Quarry not operational	n/a[5]	35
14-05-25	7:18pm to 7:33pm (Evening)	56.9	49.6	43.1	WD: n/a WS: 0 m/s Rain: Nil	WD: n/a WS: <1 m/s Rain: Nil Stability Category: E[1]	Background traffic/insects/cicadas 43-55 Aircraft 50-56 Quarry not operational	n/a[5]	35

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

[2] Monitoring was completed close to Stokers Lane at the entrance to the residence as to not disturb the resident, which places the attended noise monitoring location in direct line-of-sight of the quarry rather than near the sensitive receptor, i.e., the resident.

[3] An estimated quarry contribution of 46 LA90 dBA was adopted for distance correction to receiver using NEL calculations in **Appendix 1**.

[4] An estimated quarry contribution of 42 LA90 dBA was adopted for distance correction to receiver using NEL calculations in **Appendix 1**.

[5] Quarry not operational.

Location NM5

Noise monitoring at location NM1 was conducted on Tuesday 13 May 2025 and Wednesday 14 May 2025 with results presented in **Table 4-5**. The quarry was inaudible at NM5 during the day. The quarry was not operational during the evening. The ambient noise environment was dominated flora, fauna, background traffic, motorcycles and aircrafts. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

Table 4-5: Noise survey results and observations for Location NM5

Date	Time (hrs)	Descriptor (dBA)			Meteorology (Handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria
		LAmax	LAeq	LA90					
13-05-25	3:11pm to 3:26pm (Day)	62.1	43.9	40.7	WD: 130° WS: 2.9 m/s Rain: Nil	WD: W WS: 3.5 m/s Rain: Nil Stability Category: E[1]	Background traffic/wind/trees/insects/birds 40-47 Aircraft 48-56 Bird 60-62 Quarry inaudible	<31	37
13-05-25	3:41pm to 3:56pm (Day)	58.8	42.7	39.9	WD: 130° WS: 2.9 m/s Rain: Nil	WD: W WS: 3 m/s Rain: Nil Stability Category: E[1]	Background traffic/wind/trees/insects/birds 40-43 Birds 47-56 Quarry inaudible	<30	37
14-05-25	7:39pm to 7:54pm (Evening)	61.7	49.2	45.8	WD: n/a WS: 0 m/s Rain: Nil	WD: n/a WS: <1 m/s Rain: Nil Stability Category: E[1]	Background traffic/insects/cicadas 44-48 Motorbike 47-53 Passing car 48-54 Quarry not operational	n/a[2]	35
14-05-25	7:55pm to 8:10pm (Evening)	55.6	51.1	50.2	WD: n/a WS: 0 m/s Rain: Nil	WD: n/a WS: <1 m/s Rain: Nil Stability Category: E[1]	Background traffic/insects/cicadas 44-50 Bird 50-54 Passing car 51-54 Quarry not operational	n/a[2]	35

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

[2] Quarry not operational

5. Conclusion

This NMA completed by Ramboll at the Holcim Teven Quarry, Teven, NSW as a quarterly requirement of the NMP. Noise monitoring was completed on Tuesday 13 May 2025 and Wednesday 14 May 2025 at five locations selected as representative to the sensitive receptors at the surroundings to Teven Quarry.

No audible noise from quarry operations was observed at locations NM1, NM2, NM3 and NM5 during the day periods. Quarry noise was audible at location NM4 during the day monitoring periods where the quarry was audible with machinery. The quarry was not operational during the evening monitoring periods.

The results presented in this NMA show compliance with the relevant noise criteria at the Holcim Teven Quarry, Teven, NSW.

6. References

Holcim Australia (2021) *Teven Quarry, Noise Management Plan*.

International Electrotechnical Commission *IEC 60942:2017 Electroacoustics – Sound calibrators*

Minister for Planning and Environment (2015) 'Development Consent SSD_6422, Teven Quarry Project'.

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NSW EPA (2014) Discussion Paper. Validation of Inversion Strength Estimation Method.

NSW EPA (2017) *Noise Policy for Industry (NPfI)*. Sydney NSW: NSW Environment Protection Authority.

Standards Australia (2018) *AS 1055:2018 Acoustics—Description and measurement of environmental noise*. Australian Standard.

Standards Australia and Standards New Zealand (2019) *AS/NZS IEC 61672.1:2019 Electroacoustics—Sound level meters, Part 1: Specifications*. Australian/New Zealand Standard.

Appendix 1

Noise Emission Level Calculations

Project No: 318001800
Client Name: Holcim Australia Pty Ltd
Project Name: NSW Environmental Monitoring
Project Site: Teven Quarry
12/08/2025

Noise Emission Level Calculations

NM4 day monitoring period (2:33PM to 2:48PM)

Site contribution corrected for distance from monitoring location to receiver

Noise source	Quarry contribution
Estimated site contribution (LAeq) at monitoring location (dBA)	46.0
Approx. distance from monitoring location to site (m)	310
Approx. distance from site to receiver (m)	500
Distance corrected site contribution at receiver (LAeq dBA)	**41.8**
Estimated additional attenuation (vegetation & ground absorption)	5
Estimated site contribution at receiver (dBA)	**36.8**

NM4 day monitoring period (2:50PM to 3:05PM)

Site contribution corrected for distance from monitoring location to receiver

Noise source	Quarry contribution
Estimated site contribution (LAeq) at monitoring location (dBA)	42.0
Approx. distance from monitoring location to site (m)	310
Approx. distance from site to receiver (m)	500
Distance corrected site contribution at receiver (LAeq dBA)	**37.8**
Estimated additional attenuation (vegetation & ground absorption)	5
Estimated site contribution at receiver (dBA)	**32.8**