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QUARTERLY NOISE MONITORING ASSESSMENT – QUARTER 1 2023 TEVEN QUARRY, TEVEN, NSW

**QUARTERLY NOISE MONITORING ASSESSMENT –
QUARTER 1 2023
TEVEN QUARRY, TEVEN, NSW**

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Description **Data collected on 10 and 11 January 2023 for Teven Quarry during Quarter 1 2023 in Teven, NSW, as part of the noise monitoring program**

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ABBREVIATIONS AND DEFINITIONS

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).
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.
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.
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).
LAm_{ax}	The A-weighted sound pressure level that represents the maximum noise level measured over the time that a given sound is measured.
NMA	Noise Monitoring Assessment
NMP	Noise Management Plan

Source: Noise Guide for Local Government (NSW EPA, 2013)

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 (NPI) (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).
- IEC 60942 Ed. 3.0 b:2003 Electroacoustics - Sound calibrators (Standards Australia, 2003).

This NMA has been undertaken in accordance with the NMP for the quarterly period January to March 2023 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 in Teven, NSW, approximately 7 km west of Ballina, NSW. Sensitive receptors 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 Receptors
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**.



Legend

- Noise monitoring location

Figure 1 : Noise monitoring locations at Teven Quarry



2. NOISE CRITERIA

Table 2-1 summaries the applicable 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
		L _{Aeq} (15min)	L _{Aeq} (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 created 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 10 January 2023 and Wednesday 11 January 2023. 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 also carried a current NATA calibration and complies with IEC 60942:2003. Drift in calibration did not exceed ± 0.3 dBA.

Attended noise monitoring was conducted for 15-minute periods at each 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, or estimated to be less than criteria value.

4. RESULTS AND DISCUSSION

4.1 Location NM1

Noise monitoring at location NM1 was completed on Tuesday 10 January 2023 and Wednesday 11 January 2023. The quarry was not audible during any monitored period during the day and evening. These results indicate that noise emissions from Teven Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring event at Location NM1 are presented in Table 4-1. Noise sources included wind, cars, birds and insects.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and LAeq (dBA)	Teven Quarry Contribution (LA1sec) (dBA)	LAeq(15min) Criteria (dBA)
		LAmx	LAeq	LA90				
11-01-23	9:56 (Day)	70.2	51.3	42.2	WD: 315° WS: 1.2 m/s Rain: Nil	Wind 43-49 Insects 41-55 Birds 48-60 Car 54 Quarry inaudible	Inaudible	37
11-01-23	10:12 (Day)	71.5	54.0	49.5	WD: 315° WS: 2.1 m/s Rain: Nil	Wind 41-54 Insects 47-59 Birds 52-66 Quarry inaudible	Inaudible	37
10-01-23	19:00 (Evening)	61.7	51.4	43.5	WD: 270° WS: 1.4 m/s Rain: Nil	Wind 44-61 Birds 46-51 Insects 46-49 Quarry inaudible	Inaudible	35
10-01-23	19:16 (Evening)	70.1	48.2	42.1	WD: 270° WS: 1.7 m/s Rain: Nil	Wind 43-52 Insects 44-47 Car 45-51 Quarry inaudible	Inaudible	35

4.2 Location NM2

Noise monitoring at location NM2 was completed on Tuesday 10 January 2023 and Wednesday 11 January 2023. The quarry was not audible during any monitored period during the day and evening periods. These results indicate that noise emissions from Teven Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring events at Location NM2 are presented in Table 4-2. Noise sources measured included birds, machinery, insects, fish jumping and cars and trucks passing on Teven Road.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and LAeq (dBA)	Teven Quarry Contribution (LA1sec) (dBA)	LAeq(15min) Criteria (dBA)
		LAmx	LAeq	LA90				
11-01-23	12:07 (Day)	83.6	61.4	44.7	WD: 315° WS: 1.1 m/s Rain: Nil	Cars passing 57-78 Birds 53 Wind 48-54 Machinery 50-52 Holcim truck 82 Quarry inaudible	Inaudible	38
11-01-23	12:24 (Day)	83.4	60.8	41.1	WD: 315° WS: 1.1 m/s Rain: Nil	Cars/trucks 61-84 Wind 40-46 Birds 43-58 Quarry inaudible	Inaudible	38
10-01-23	20:53 (Evening)	81.4	51.8	42.1	WD: 270° WS: 1.8 m/s Rain: Nil	Vehicle 47-77 Wind 40-46 Fish in creek 42-44 Insects 42-46 Quarry inaudible	Inaudible	35
10-01-23	21:09 (Evening)	81.5	53	41.8	WD: 0° WS: 1.7 m/s Rain: Nil	Wind 43-48 Insects 42-44 Car 52-80 Quarry inaudible	Inaudible	35

4.3 Location NM3

Noise monitoring at location NM3 was completed on Tuesday 10 January 2023 and Wednesday 11 January 2023. The quarry was not audible during any monitored period during the day and evening periods. These results indicate that noise emissions from Teven Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring events at Location NM3 are presented in Table 4-3. Noise sources measured included aircrafts, distant road traffic and chirping insects (mostly cicada). Insects were the dominant noise source.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and LAeq (dBA)	Teven Quarry Contribution (LA1sec) (dBA)	LAeq(15min) Criteria (dBA)
		LAmx	LAeq	LA90				
11-01-23	12:46 (Day)	79.8	56.8	41.3	WD: 315° WS: 1.6 m/s Rain: Nil	Insects 46-62 Wind 47-54 Aircraft 80 Quarry inaudible	Inaudible	37
11-01-23	1:05 (Day)	63.9	50.6	44.7	WD: 315° WS: 3.7 m/s Rain: Nil	Insects 47-54 Wind 44-57 Quarry inaudible	Inaudible	37
10-01-23	21:28 (Evening)	64.4	43.3	41.6	WD: 0° WS: 0.8 m/s Rain: Nil	Insects 39-43 Wind 41-45 Motorway from afar 39-42 Quarry inaudible	Inaudible	35
10-01-23	21:44 (Evening)	87.6	52.7	41.6	WD: 0° WS: 1.7 m/s Rain: Nil	Insects 41-44 Wind 40-44 Motorway traffic from afar 38-43 Sneeze 88 Quarry inaudible	Inaudible	35

4.4 Location NM4

Noise monitoring at location NM4 was completed on Tuesday 10 January 2023 and Wednesday 11 January 2023. The quarry was inaudible during the evening period. During noise monitoring at location NM4 during the day period, the quarry was audible from the production area above the established noise criteria. It should be noted that the monitoring was completed close to Stokers Lane at the entrance to the residence as to not disturb the resident. The results and observations taken during the monitoring events at Location NM4 are presented in Table 4-4. Noise sources measured included birds, wind, aircraft, passing trucks, passing cars and insects.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and LAeq (dBA)	Seven Quarry Contribution (LA1sec) (dBA)	LAeq(15min) Criteria (dBA)
		LAmx	LAeq	LA90				
11-01-23	11:25 (Day)	86.6	58.8	47.6	WD: 315° WS: 1.4 m/s Rain: Nil	Insects (mostly cicadas) 56-67 Wind 46-58 Aircraft 48-50 Truck 59 Quarry audible (production area) 46	46	37
11-01-23	11:41 (Day)	65.9	55.1	47.8	WD: 315° WS: 3.1 m/s Rain: Nil	Insects 56-66 Wind 47-59 Birds 48 Quarry audible (production area) 46	46	37
10-01-23	20:01 (Evening)	73.3	54.3	45.1	WD: 270° WS: 2.4 m/s Rain: Nil	Insects (mostly cicadas) 46-58 Car 52-74 Wind 43-47 Quarry inaudible	Inaudible	35
10-01-23	20:36 (Evening)	64	46.5	44	WD: 270° WS: 3.5 m/s Rain: Nil	Insects (mostly cicadas) 44-57 Wind 46-48 Quarry inaudible	Inaudible	35

4.5 Location NM5

Noise monitoring at location NM5 was completed on Tuesday 10 January 2023 and Wednesday 11 January 2023. The quarry was inaudible during the evening period. These results indicate that noise emissions from Teven Quarry did not contribute to noise nuisance during this time. During noise monitoring at location NM5 during the day period audible quarry noise was observed from the production area. It should be noted that NM5 is a farm shed and not a living residence, so it is unlikely these noise emissions from Teven Quarry contributed to a noise nuisance at this time. The results and observations taken during the monitoring events at Location NM5 are presented in Table 4-5. Noise sources measured included birds, wind, insects, aircraft, passing trucks, and aircraft.

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

Date	Time (hrs)	Descriptor (dBA)			Meteorology	Description and SPL, dBA	Teven Quarry Contribution (LA1sec) (dBA)	LAeq(15min) Criteria
		LAmx	LAeq	LA90				
11-01-23	10:40 (Day)	68.4	47.5	42.5	WD: 315° WS: 3.6 m/s Rain: Nil	Wind 44-52 Insects 44-49 Birds 45 Aircraft 52-60 Quarry audible (production area) 46	46	37
11-01-23	10:56 (Day)	78.7	47.2	40.4	WD: 315° WS: 2.6 m/s Rain: Nil	Wind 43-49 Insects 39-41 Birds 40-42 Aircraft 45-52 Quarry audible (production area) 46	46	37
10-01-23	19:43 (Evening)	69.8	47.4	36.8	WD: 270° WS: 1.2 m/s Rain: Nil	Wind 44-51 Insects 39-60 Birds 35-38 Quarry inaudible	Inaudible	35
10-01-23	20:18 (Evening)	81.6	52	40.2	WD: 270° WS: 0.7 m/s Rain: Nil	Wind 39-51 Insects 40-56 Birds 40-43 Quarry inaudible	Inaudible	35

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 out on Tuesday 10 January 2023 and Wednesday 11 January 2023 at five locations selected as representative to the sensitive receptors at the surroundings to Teven Quarry.

Noise was audible during the day periods at NM4 and NM5. Monitoring at NM4 was completed at the gate of the residence, in direct line-of-site of the quarry. This location will be moved within closer proximity of the resident for subsequent monitoring periods. The quarry was audible at NM5 during the day monitoring period, but it is noted that this receptor is a farm shed rather than a residence. The quarry was not audible at any other location or period during the monitoring campaign.

6. REFERENCES

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

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

NSW EPA (2021) Environment Protection Licence number 3293.

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Standards Australia (2018) *AS 1055:2018 Acoustics—Description and measurement of environmental noise*. Australian Standard. Available at: https://infostore.saiglobal.com/preview/825367946534.pdf?sku=1131503_SAIG_AS_AS_2626154 (Accessed: 19 January 2023).

Standards Australia (2003) *AS 60942:2003 Electroacoustics - Sound calibrators*. Australian Standard.

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Date **09/08/2023**
Prepared by **Jake Bourke, Matilda Englert**
Checked by **Patrick Murray, Andrew Bell, Rachel Condon**
Approved by **Belinda Sinclair**
Description **Data collected on 10 May and 13 June 2023 for Teven Quarry during Quarter 2 2023 in Teven, NSW, as part of the noise monitoring program**

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APPENDICES

Appendix 1	
Sound Exposure Level Calculations	

ABBREVIATIONS AND DEFINITIONS

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).
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.
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.
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).
LAm_{ax}	The A-weighted sound pressure level that represents the maximum noise level measured over the time that a given sound is measured.
NMA	Noise Monitoring Assessment
NMP	Noise Management Plan

Source: Noise Guide for Local Government (NSW EPA, 2013)

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 (NPI) (NSW EPA, 2017).
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- 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 in accordance with the NMP for the quarterly period April to June 2023 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 in Teven, NSW, approximately 7 km west of Ballina. Sensitive receptors 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 Receptors
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

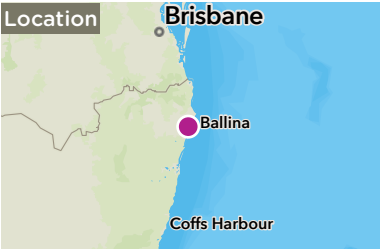
The monitoring locations with respect to the quarry and assessed receivers are presented in the locality plan shown in **Figure 1**.



Legend

- Noise monitoring 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
		L _{Aeq} (15min)	L _{Aeq} (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			

Table 2-2 summaries the applicable offsite noise criteria for vehicles traveling to and from site, as presented in the State Significant Development Assessment (SSD 6422) and as established by the NSW Road Noise Policy (RNP).

Table 2-2: Monitoring locations and noise criteria

Road Category	Type of Project/Land Use	Assessment Criteria dB(A)	
		Day (7.00am – 10.00pm)	Night (10.00pm – 7.00am)
Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	L _{Aeq} , 15 hour 60 (external)	L _{Aeq} , 9 hour 55 (external)
Local Roads	Existing residences affected by noise by additional traffic on existing local roads generated by land use development	L _{Aeq} , 15 hour 55 (external)	L _{Aeq} , 9 hour 50 (external)

Per the RNP, Teven Road is considered to be sub-arterial, and Stokers Lane is considered to be a local road. Accordingly, offsite noise from vehicles traveling to and from site should not exceed day/night noise levels of 60/55 dBA at NM2 and 55/50 dBA at NM4.

3. METHODOLOGY

The monitoring program was created 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 Wednesday 10 May and Tuesday 13 June 2023. 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 also carried a current NATA calibration and complies with IEC 60942:2003. Drift in calibration did not exceed ± 0.3 dBA.

Attended noise monitoring was conducted for 15-minute periods at each 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, or estimated to be less than criteria value.

4. RESULTS AND DISCUSSION

4.1 Location NM1

Noise monitoring at location NM1 was completed on Wednesday 10 May 2023. The quarry was not audible during any monitored period during the day and evening, with the ambient noise environment dominated by insects, aircraft, and distant traffic. These results indicate that noise emissions from Teven Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring event at Location NM1 are presented in **Table 4-1**.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and LAeq (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		LAm _{ax}	LA _{eq}	LA ₉₀				
10-05-23	5:32pm to 5:47pm (Day)	60.4	53.9	37.6	WD: n/a WS: 0 m/s Rain: Nil	Insects 55 Quarry inaudible	<28	37
10-05-23	5:44pm to 5:59pm (Day)	68.6	53.6	39.8	WD: n/a WS: 0 m/s Rain: Nil	Insects 55 Quarry inaudible	<30	37
10-05-23	6:10pm to 6:25pm (Evening)	59.2	41.4	40.1	WD: n/a WS: 0 m/s Rain: Nil	Aircraft 59 Cars in distance 40-45 Quarry inaudible	<30	35
10-05-23	6:33pm to 6:48pm (Evening)	71.8	42.2	40.1	WD: n/a WS: 0 m/s Rain: Nil	Quarry inaudible	<30	35

4.2 Location NM2

Noise monitoring at location NM2 was completed on Wednesday 10 May 2023 and Tuesday 13 June 2023. The quarry was not audible during the evening monitored period however offsite quarry vehicles entering and existing the site as well as onsite reverse squawkers were audible during the day. A single truck entering and existing the site was observed and measured during each day monitored period. We note that noise emission from trucks is considered to be below the $L_{Aeq, 15 \text{ hour}}$ day criteria of 60 dBA using sound level exposure calculations included in **Appendix 1**.

Additionally, a reverse squawker was observed and measured during both day monitoring periods for no more than 5 second durations. Noise emission from onsite squawkers has been determined to be well below the 15min L_{Aeq} criteria using sound level exposure calculations also included in **Appendix 1**. The ambient noise environment was dominated by passing cars on Teven Road, fish in adjacent river, and an aircraft. These results indicate that noise emissions from Teven Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring events at Location NM2 are presented in **Table 4-2**.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and LAeq (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)	Roadway Noise LAeq (15min) Contribution	LAeq (15hr) (external) Criteria (dBA)
		L _{Amax}	L _{Aeq}	L _{A90}						
10-05-23	2:33pm to 2:48pm (Day)	86.0	66.1	43.7	WD: 205° WS: 1.9 m/s Rain: Nil	Cars passing 61-81 Trucks entering/exiting site 56-83 Holcim reverse squawkers 50-51 Quarry vehicles audible	<34	38	<60	60
10-05-23	2:53pm to 3:08pm (Day)	90.2	67.5	44.8	WD: 205° WS: 1.9 m/s Rain: Nil	Cars passing 61-84 Trucks entering/exiting site 56-81 Holcim reverse squawkers 50-51 Quarry vehicles audible	<35	38	<58	60
13-06-23	6:41pm to 6:56pm (Evening)	50.0	37.1	34.5	WD: - WS: 1.4 m/s Rain: Nil	Aircraft 37-40 Distant traffic hum 34-37 Quarry inaudible	<25	35	n/a	n/a
13-06-23	7:00pm to 7:15pm (Evening)	56.7	37.8	34.8	WD: - WS: 1.4 m/s Rain: Nil	Fish 36-40 Quarry inaudible	<25	35	n/a	n/a

'-' indicates not recorded

4.3 Location NM3

Noise monitoring at location NM3 was completed on Wednesday 10 May 2023 and Tuesday 13 June 2023. The quarry was not audible during any monitored period during the day and evening periods, with the ambient noise environment dominated by wind, trees, birds, aircraft, and traffic noise. These results indicate that noise emissions from Teven Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring events at Location NM3 are presented in **Table 4-3**.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and LAeq (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		LAm _{ax}	LA _{eq}	LA ₉₀				
10-05-23	12:20pm to 12:35pm (Day)	61.0	44.3	38.3	WD: 202° WS: 3.5 m/s Rain: Nil	Work on nearby residence 40-49 Wind/trees 43-56 Birds 45-46 Quarry inaudible	<28	37
10-05-23	12:36pm to 12:51pm (Day)	65.0	44.6	38.4	WD: 202° WS: 3.5 m/s Rain: Nil	Work on nearby residence 40-49 Wind/trees 43-56 Birds 45-46 Aircraft 64 Quarry inaudible	<28	37
13-06-23	6:01pm to 6:16pm (Evening)	51.1	36.1	33.6	WD: - WS: 0.9 m/s Rain: Nil	Insects 33-34 Distant traffic hum 32-35 Quarry inaudible	<24	35
13-06-23	6:18pm to 6:33pm (Evening)	52.3	35.2	32.9	WD: - WS: 0.9 m/s Rain: Nil	Insects 33-34 Distant traffic hum 32-38 Aircraft 48-50 Loud car 37-38 Quarry inaudible	<23	35

⋯ indicates not recorded

4.4 Location NM4

Noise monitoring at location NM4 was completed on Wednesday 10 May 2023 and Tuesday 13 June 2023. The quarry was inaudible during the evening period. However offsite quarry vehicles entering and existing the site and onsite reverse squawkers were audible during the day. Up to two trucks entering and existing the site was observed and measured during each day monitoring period. Noise emission from trucks is considered to be well below the $L_{Aeq, 15 \text{ hour}}$ day criteria of 55 dBA as calculated using sound level exposure calculations included in **Appendix 1**. Additionally, a reverse squawker was observed and measured during both day monitoring periods for no more than 7 second durations. Noise emission from onsite squawkers is considered well below the 15min L_{Aeq} criteria using sound level exposure calculations also included in **Appendix 1**. It should be noted that the monitoring was completed close to Stokers Lane at the entrance to the residence as to not disturb the resident, however, this places the attended noise monitoring location in direct line-of-sight of the quarry rather than near the sensitive receptor, i.e., the resident. The results and observations taken during the monitoring events at Location NM4 are presented in **Table 4-4**.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and LAeq (dBA)	Teven Quarry LAeq (15min) Contribution	LAeq (15min) Criteria (dBA)	Roadway Noise LAeq (15min) Contribution	LAeq (15 hr) (external) Criteria (dBA)
		L _{Amax}	L _{Aeq}	L _{A90}						
10-05-23	1:53pm to 2:08pm (Day)	71.1	56.0	43.5	WD: 205° WS: 3.0 m/s Rain: Nil	Trucks entering/exiting site 55-56 Holcim reverse squawkers 47-50 Quarry vehicles audible	<34	37	<41	55
10-05-23	2:08pm to 2:23pm (Day)	74.2	54.0	44.0	WD: 205° WS: 3.0 m/s Rain: Nil	Trucks entering/exiting site 55-56 Holcim reverse squawkers 47-50 Quarry vehicles audible	<34	37	<38	55
13-06-23	7:22pm to 7:37pm (Evening)	55.6	39.2	35.6	WD: n/a WS: 0 m/s Rain: Nil	Aircraft 38-49 Quarry inaudible	<26	35	n/a	n/a
13-06-23	7:41pm to 7:56pm (Evening)	57.5	36.9	35.5	WD: n/a WS: 0 m/s Rain: Nil	Quarry inaudible	<26	35	n/a	n/a

4.5 Location NM5

Noise monitoring at location NM5 was completed on Wednesday 10 May 2023 and Tuesday 13 June 2023. The quarry was inaudible during any monitored period during the day and evening. These results indicate that noise emissions from Teven Quarry did not contribute to noise nuisance during this time. The results and observations taken during the monitoring events at Location NM5 are presented in **Table 4-5**.

Noise sources measured included insects, wind, and cars.

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

Date	Time (hrs)	Descriptor (dBA)			Meteorology	Description and SPL, dBA	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria
		L _{Amax}	L _{Aeq}	L _{A90}				
10-05-23	3:35pm to 3:50pm (Day)	61.3	47.7	42.2	WD: n/a WS: 0 m/s Rain: Nil	Insects 46-47 Wind 48-51 Quarry inaudible	<32	37
10-05-23	3.50pm to 4:05pm (Day)	61.8	46.5	41.2	WD: n/a WS: 0 m/s Rain: Nil	Insects 46-47 Wind 48-56 Quarry inaudible	<31	37
13-06-23	8:03pm to 8:18pm (Evening)	67.2	47.1	36.7	WD: - WS: 1.2 m/s Rain: Nil	Car 53-60 Quarry inaudible	,27	35
13-06-23	8:23pm to 8:38pm (Evening)	60.8	40.3	33.9	WD: - WS: 1.2 m/s Rain: Nil	Cars 51-56 Insects 34-36 Quarry inaudible	<24	35

- indicates not recorded

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 Wednesday 10 May 2023 and Tuesday 13 June 2023 at five locations selected as representative to the sensitive receptors at the surroundings to Teven Quarry. No audible quarry noise was recorded at any of the selected monitoring locations.

Noise was audible during the day periods at NM2 and NM4 but was in compliance with offsite noise requirements of the Road Noise Policy and onsite noise requirements of the NMP and Development Consent for residential receivers. Monitoring at NM4 was completed at the gate of the residence, in direct line-of-sight of the quarry. Moving this location within closer proximity of the residence for subsequent monitoring periods is recommended to better capture the noise impacts at the receptor, however it is acknowledged that resident approval will be required to gain access onto the property. The quarry was not audible at any other location or period during the monitoring campaign.

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

6. REFERENCES

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Standards Australia (2003) *AS 60942:2003 Electroacoustics - Sound calibrators*. Australian Standard.

APPENDIX 1

SOUND EXPOSURE LEVEL CALCULATIONS

NM2 Holcim reverse squawkers

Monitoring period	2:33PM to 2:48 PM and 2:53PM to 3:08PM
Meas. Dist from source (m)	1230
Meas. Time (s)	5
Meas. LAeq dB	51
Calc Sel dB	58
No. Events in 15min	1
Total LAeq (15min)	28

NM4 Holcim reverse squawkers

Monitoring period	1:53 to 2:08 PM, and 2:08 to 2:23 PM
Meas. Dist from source (m)	260
Meas. Time (s)	7
Meas. LAeq dB	50
Calc Sel dB	58
No. Events in 15min	1
Total LAeq (15min)	29

NM2 Holcim trucks entering/exiting site

Monitoring period	2:33 to 2:48 PM
Meas. Dist from source (m)	10
Meas. Time (s)	5
Meas. LAeq dB	83
Calc Sel dB	90
No. Events in 15 hrs	60
No. seconds in 15hrs	54000
Total LAeq (15hrs)	60

NM4 Holcim trucks entering/exiting site

Monitoring period	2:33 to 2:48 PM
Meas. Dist from source (m)	30
Meas. Time (s)	15
Meas. LAeq dB	56
Calc Sel dB	68
No. Events in 15 hrs	120
No. seconds in 15hrs	54000
Total LAeq (15hrs)	41

NM2 Holcim trucks entering/exiting site

Monitoring period	2:53PM to 3:08PM
Meas. Dist from source (m)	10
Meas. Time (s)	5
Meas. LAeq dB	81
Calc Sel dB	88
No. Events in 15 hrs	60
No. seconds in 15hrs	54000
Total LAeq (15hrs)	58

NM4 Holcim trucks entering/exiting site

Monitoring period	2:53PM to 3:08PM
Meas. Dist from source (m)	30
Meas. Time (s)	15
Meas. LAeq dB	56
Calc Sel dB	68
No. Events in 15 hrs	60
No. seconds in 15hrs	54000
Total LAeq (15hrs)	38

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QUARTERLY NOISE MONITORING ASSESSMENT – QUARTER 3 2023 TEVEN QUARRY, TEVEN, NSW

**QUARTERLY NOISE MONITORING ASSESSMENT –
QUARTER 3 2023
TEVEN QUARRY, TEVEN, NSW**

Project name **Quarterly Noise Monitoring Assessment for Teven Quarry – Quarter 3 2023**
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APPENDICES

Appendix 1

Noise Emission Level and Sound Level Exposure Calculations

ABBREVIATIONS AND DEFINITIONS

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).
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.
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.
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).
LAm_{ax}	The A-weighted sound pressure level that represents the maximum noise level measured over the time that a given sound is measured.
NMA	Noise Monitoring Assessment
NMP	Noise Management Plan
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.

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).
- IEC 60942 Ed. 3.0 b:2003 Electroacoustics - Sound calibrators (Standards Australia, 2003).

This NMA has been undertaken in accordance with the NMP for the quarterly period July to September 2023 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

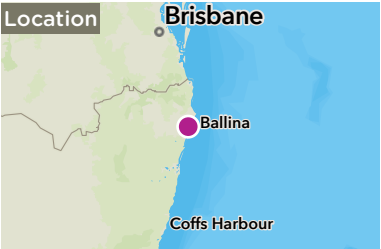
The monitoring locations with respect to the quarry and assessed receivers are presented in the locality plan shown in **Figure 1**.



Legend

- Noise monitoring 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
		L _{Aeq} (15min)	L _{Aeq} (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 8 August and Wednesday 9 August 2023. 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 also carried a current NATA calibration and complies with IEC 60942:2003. Drift in calibration did not exceed ± 0.3 dBA.

Attended noise monitoring was conducted for 15-minute periods at each 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.

4. RESULTS AND DISCUSSION

4.1 Location NM1

Noise monitoring at location NM1 was completed on Tuesday 8 August and Wednesday 9 August 2023. The quarry was not audible during any monitored period during the day and evening, with the ambient noise environment dominated by aircraft, barking dogs, passing cars, and distant traffic. The quarry was not operational during the evening period. These results indicate that noise emissions from Teven Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring event at Location NM1 are presented in **Table 4-1**.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		L _{Amax}	L _{Aeq}	L _{A90}				
09-08-2023	12:00pm to 12:15pm (Day)	71.2	45.9	38.1	WD: 180° WS: 2.5 m/s Rain: Nil	Background road traffic/wind 38-40 Quarry inaudible	<28	37
09-08-2023	12:16pm to 12:31pm (Day)	84.9	54.5	37.1	WD: 180° WS: 2.5 m/s Rain: Nil	Background road traffic/wind 38-40 Car passing 84 Quarry inaudible	<27	37
08-08-2023	6:00pm to 6:15pm (Evening)	79.9	52.4	37.1	WD: n/a WS: 0 m/s Rain: Nil	Dogs barking 39-40 Passing car 40-79 Quarry not operational	n/a ¹	35
08-08-2023	6:16pm to 6:31pm (Evening)	81.6	51.5	33.6	WD: n/a WS: 0 m/s Rain: Nil	Aircraft 40-52 Passing car 60-81 Quarry not operational	n/a ¹	35

¹ quarry not operational

4.2 Location NM2

Noise monitoring at location NM2 was completed on Tuesday 8 August and Wednesday 9 August 2023. The quarry was not operational during the evening period. Offsite quarry vehicles entering and exiting the site were audible during the day. A single Holcim truck exiting the site was observed and measured during one monitored day period, however as this was an offsite vehicle movement it doesn't constitute as a contributor to the quarry contribution. The ambient noise environment was dominated by passing cars on Teven Road, fish in adjacent river, and birds. These results indicate that noise emissions from Teven Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring events at Location NM2 are presented in **Table 4-2**.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		L _{Amax}	L _{Aeq}	L _{A90}				
09-08-2023	9:55am to 10:10am (Day)	79.4	58.1	42.5	WD: 205° WS: 3.1 m/s Rain: Nil	Background noise (wind, birds, highway traffic) 47-55 Holcim truck exiting quarry (occurred once) 41-77 Birds 42-55 Passing cars on Teven Rd 42-78 Quarry inaudible	<33	38
09-08-2023	10:10am to 10:25am (Day)	74.1	55.3	40.5	WD: 205° WS: 3.1 m/s Rain: Nil	Background noise (wind, birds, highway traffic) 48-62 Passing cars on Teven Rd 60-78 Quarry inaudible	<31	38
08-08-2023	8:00pm to 8:15pm (Evening)	82.3	57.9	38.1	WD: n/a WS: 0 m/s Rain: Nil	Background road traffic 38-40 Fish jumping in river 39-40 Passing cars on Teven Rd 82 Quarry inaudible	n/a ¹	35
08-08-2023	8:18pm to 8:33pm (Evening)	77.5	50.9	36.7	WD: n/a WS: 0 m/s Rain: Nil	Background road traffic 38-40 Fish jumping in river 39-40 Passing cars on Teven Rd 82 Quarry inaudible	n/a ¹	35

¹ quarry not operational

4.3 Location NM3

Noise monitoring at location NM3 was completed on Tuesday 8 August and Wednesday 9 August 2023. The quarry was audible during one monitored day period. However, it was difficult to determine the noise nuisance from the site vehicles reverse squawkers due to the constant background noise which was dominated by road traffic. These results indicate that noise emissions from Teven Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring events at Location NM3 are presented in **Table 4-3**. The ambient noise environment consisted of background road traffic, wind, birds, frogs, and insects.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		L _{Amax}	L _{Aeq}	L _{A90}				
09-08-2023	9:09am to 9:24am (Day)	57.3	43.4	39.6	WD: 250° WS: 3.7 m/s Rain: Nil	Background road traffic/wind 39-43 Aircraft 41-57 Frogs 40-41 Birds 41-43 Quarry inaudible	<30	37
09-08-2023	9:25am to 9:40am (Day)	56.1	44.4	39.7	WD: 250° WS: 3.7 m/s Rain: Nil	Background road traffic/wind 39-43 Reverse squawkers 41-42 (unable to quantify due to constant background noise) Aircraft 41-42 Frogs 40-50 Birds 39-54 Quarry onsite vehicles audible	<30 ²	37
08-08-2023	8:40pm to 8:55pm (Evening)	59.3	50.3	39.9	WD: n/a WS: 0 m/s Rain: Nil	Background road traffic 40-51 Insects 52-59 Quarry inaudible	n/a ¹	35
08-08-2023	8:55pm to 9:10pm (Evening)	62.2	51.3	41.9	WD: n/a WS: 0 m/s Rain: Nil	Background road traffic 39-44 Insects 52-59 Quarry inaudible	n/a ¹	35

¹ quarry not operational

² sound level exposure calculation in Appendix 1 estimated holcim reverse squawkers at 23 dBA but higher LA90 value adopted for conservatism.

4.4 Location NM4

Noise monitoring at location NM4 was completed on Tuesday 8 August and Wednesday 9 August 2023. The quarry was not operating during the evening period. The quarry was audible during both monitored day periods. One offsite quarry vehicle entering and exiting the site was observed and measured during each day monitoring period, however as this was an offsite vehicle movement it doesn't constitute as a contributor to the quarry contribution. Additionally, an onsite reverse squawker was observed and measured during both day monitoring periods for no more than 15 second durations. Noise emission from onsite squawkers is below the 15min L_{Aeq} criteria using sound level exposure calculations also included in **Appendix 1**. It should be noted that the monitoring was completed close to Stokers Lane at the entrance to the residence as to not disturb the resident, however, this 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 the LA90 results for both monitored day periods were adopted for distance correction to receiver using noise emission level calculations in **Appendix 1**. The results and observations taken during the monitoring events at Location NM4 are presented in **Table 4-4**. These results indicate that noise emissions from Teven Quarry may contribute to noise nuisance during the evening. Noise nuisance can be considered for both monitored day periods with estimated quarry contribution at 43 and 44 LAeq (15min) dBA which are both above the criteria of 37 LAeq (15min) dBA.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq (15min) Contribution	LAeq (15min) Criteria (dBA)
		L _{Amax}	L _{Aeq}	LA90				
09-08-2023	11:21am to 11:36am (Day)	73.0	54.9	48.6	WD: 180° WS: 2.1 m/s Rain: Nil	Crusher 52-54 Holcim truck exiting quarry 50-73 (occurred once) Quarry audible - reverse squawkers 53-60	43 ²	37
09-08-2023	11:37am to 11:52am (Day)	74.5	56.4	49.5	WD: 180° WS: 2.1 m/s Rain: Nil	Crusher 52-54 Holcim truck exiting quarry 56-74 (occurred once) Quarry audible - reverse squawkers 53-60	<44 ²	37
08-08-2023	7:23pm to 7:38pm (Evening)	46.4	41.7	40.5	WD: n/a WS: 0 m/s Rain: Nil	Background road traffic 40-46 Quarry inaudible	n/a ¹	35

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq (15min) Contribution	LAeq (15min) Criteria (dBA)
		LAmx	LAeq	LA90				
08-08-2023	7:39pm to 7:54pm (Evening)	56.2	41.8	39.8	WD: n/a WS: 0 m/s Rain: Nil	Background road traffic 40-46 Passing car on Teven Rd 46-56 Quarry inaudible	n/a ¹	35

¹ quarry not operational

² value estimated based on distance correction to receiver location in calculation in **Appendix 1**.

4.5 Location NM5

Noise monitoring at location NM5 was completed on Tuesday 8 August and Wednesday 9 August 2023. The quarry was inaudible during any monitored period during the day and evening. These results indicate that noise emissions from Teven Quarry did not contribute to noise nuisance during this time. The results and observations taken during the monitoring events at Location NM5 are presented in **Table 4-5**.

Noise sources measured included cars, birds, and aircraft.

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

Date	Time (hrs)	Descriptor (dBA)			Meteorology	Description and SPL, dBA	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria
		LAmax	LAeq	LA90				
09-08-2023	12:43pm to 12:58pm (Day)	88.3	66.5	37.5	WD: 180° WS: 2.2 m/s Rain: Nil	Passing cars 88 Birds 45-48 Aircraft 58-69 Quarry inaudible	<28	37
09-08-2023	12:58pm to 1:13pm (Day)	86.7	64.3	38.9	WD: 180° WS: 2.2 m/s Rain: Nil	Passing cars 86 Birds 40-57 Quarry inaudible	<29	37
08-08-2023	6:47pm to 7:02pm (Evening)	79.5	56.0	40.0	WD: n/a WS: 0 m/s Rain: Nil	Background road traffic 39-41 Passing cars on Teven Rd 40-79 Quarry not operational	n/a ¹	35
08-08-2023	7:02pm to 7:17pm (Evening)	79.9	55.6	39.3	WD: n/a WS: 0 m/s Rain: Nil	Background road traffic 39-41 Passing cars on Teven Rd 40-79 Quarry not operational	n/a ¹	35

¹ 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 8 August and Wednesday 9 August 2023 at five locations selected as representative to the sensitive receptors at the surroundings to Teven Quarry.

Noise was audible from the quarry and offsite site vehicles during both day periods at NM4 and one day period at NM3. Audible quarry noise at NM3 showed compliance with onsite noise requirements of the NMP and Development Consent for residential receivers. Audible quarry vehicles at NM4 were estimated to not show compliance with the NMP and Development Consent for residential receivers using noise emission level calculations. Noise nuisance can be considered for both monitored day periods at NM4 with estimated quarry contribution at 43 and 44 LAeq (15min) dBA which are both above the criteria of 37 LAeq (15min) dBA. Monitoring at NM4 was completed at the gate of the residence, in direct line-of-sight of the quarry and subsequently, noise emission level calculations were required to estimate quarry contribution and it is acknowledged that this methodology has limitations. Moving this location within closer proximity of the residence for subsequent monitoring periods is recommended to better capture the noise impacts at the receptor, however it is acknowledged that resident approval will be required to gain access onto the property. The quarry was not operational during the evening period. The quarry was not audible at any other location or period during the monitoring campaign.

The results presented in this NMA show compliance with the relevant noise criteria at the Holcim Teven Quarry, Teven, NSW, except for day monitored periods at NM4.

6. REFERENCES

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APPENDIX 1 NOISE EMISSION LEVEL AND SOUND LEVEL EXPOSURE CALCULATIONS

NM4 site contribution corrected for distance from monitoring location to receiver

Monitoring period	11:21am to 11:36am
Measured site contribution (LA90) at monitoring location (dBA)	49
Approx. distance from monitoring location to site (m)	315
Approx. distance from site to receiver (m)	500
Distance corrected site contribution at receiver (LAeq dBA)	45.0
Estimated additional attenuation (vegetation)	2.0
Estimated site contribution at receiver (dBA)	43

NM4 site contribution corrected for distance from monitoring location to receiver

Monitoring period	11:37am to 11:52am
Measured site contribution (LA90) at monitoring location (dBA)	50
Approx. distance from monitoring location to site (m)	315
Approx. distance from site to receiver (m)	500
Distance corrected site contribution at receiver (LAeq dBA)	46.0
Estimated additional attenuation (vegetation)	2.0
Estimated site contribution at receiver (dBA)	44

NM3 Holcim reverse squawkers

Monitoring period	9:25AM to 9:40AM
Meas. Dist from source (m)	925
Meas. Time (s)	4
Meas. LAeq dB	42
Calc Sel dB	48
No. Events in 15min	3
Total LAeq (15min)	23

NM4 Holcim reverse squawkers

Monitoring period	11:21AM to 11:36AM and 11:37AM to 11:52AM
Meas. Dist from source (m)	260
Meas. Time (s)	15
Meas. LAeq dB	60
Calc Sel dB	58
No. Events in 15min	1
Total LAeq (15min)	29

NM4 Holcim crusher

Monitoring period	11:21AM to 11:36 AM
Meas. Dist from source (m)	260
Meas. Time (s)	5
Meas. LAeq dB	54
Calc Sel dB	58
No. Events in 15min	5
Total LAeq (15min)	36

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QUARTERLY NOISE MONITORING ASSESSMENT – QUARTER 4 2023 TEVEN QUARRY, TEVEN, NSW

**QUARTERLY NOISE MONITORING ASSESSMENT –
QUARTER 4 2023
TEVEN QUARRY, TEVEN, NSW**

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APPENDICES

Appendix 1

Sound Exposure Level and Noise Emission Level Calculations

ABBREVIATIONS AND DEFINITIONS

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).
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.
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.
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).
LAm_{ax}	The A-weighted sound pressure level that represents the maximum noise level measured over the time that a given sound is measured.
NMA	Noise Monitoring Assessment
NMP	Noise Management Plan
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.

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).
- IEC 60942 Ed. 3.0 b:2003 Electroacoustics - Sound calibrators (Standards Australia, 2003).

This NMA has been undertaken in accordance with the NMP for the quarterly period October to December 2023 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**.



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
		L _{Aeq} (15min)	L _{Aeq} (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 Wednesday 11 October and Thursday 12 October 2023. 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 also carried a current NATA calibration and complies with IEC 60942:2003. Drift in calibration did not exceed ± 0.3 dBA.

Attended noise monitoring was conducted for 15-minute periods at each 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.

4. RESULTS AND DISCUSSION

4.1 Location NM1

Noise monitoring at location NM1 was completed on Wednesday 11 October and Thursday 12 October 2023. The quarry was not audible during any monitored period during the day and evening, with the ambient noise environment dominated by wind, trees, and birds. The quarry was not operational during the evening period. These results indicate that noise emissions from Teven Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring event at Location NM1 are presented in **Table 4-1**.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		L _{Amax}	L _{Aeq}	L _{A90}				
12-10-2023	10:27am to 10:42am (Day)	87.8	56.3	27.8	WD: n/a WS: 0 m/s Rain: Nil	Background wind/trees 25-35 Car passing 88 Birds 30-53 Quarry inaudible	<18	37
12-10-2023	10:44am to 12:59am (Day)	57.9	36.3	27.3	WD: n/a WS: 0 m/s Rain: Nil	Background wind/trees 25-33 Birds 40-57 Quarry inaudible	<17	37
11-10-2023	6:00pm to 6:15pm (Evening)	69.7	48.4	39.5	WD: 50° WS: 3.1 m/s Rain: Nil	Background wind/trees/birds 36-69 (only exceeded 50dBA for period of 23 secs) Quarry not operational	n/a ¹	35
11-10-2023	6:17pm to 6:32pm (Evening)	70.8	53.0	42.8	WD: 50° WS: 3.1 m/s Rain: Nil	Background wind/trees/birds only exceeded 50dBA for a period of 18 secs Quarry not operational	n/a ¹	35

¹ quarry not operational.

4.2 Location NM2

Noise monitoring at location NM2 was completed on Wednesday 11 October and Thursday 12 October 2023. The quarry was not audible during any monitored period during the day and evening, with the ambient noise environment dominated by wind, trees, birds, insects, an aircraft, a lawn mower and passing cars on Teven Road. The quarry was not operational during the evening period. These results indicate that noise emissions from Teven Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring events at Location NM2 are presented in **Table 4-2**.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		L _{Amax}	L _{Aeq}	L _{A90}				
12-10-2023	12:38pm to 12:53pm (Day)	81.0	58.8	42.2	WD: 10° WS: 3.6 m/s Rain: Nil	Background wind/trees/birds/lawn mower 39-50 Cars passing on Teven Road 50-81 Quarry inaudible	<32	38
12-10-2023	12:53pm to 1:08pm (Day)	84.5	60.3	45.1	WD: 10° WS: 3.6 m/s Rain: Nil	Background wind/trees/birds 40-50 Cars passing on Teven Road 50-85 Quarry inaudible	<35	38
11-10-2023	8:04pm to 8:19pm (Evening)	61.6	41.1	37.4	WD: n/a WS: 0 m/s Rain: Nil	Background motorway/ insects 37-39 Cars passing on Teven Road 43-58 Quarry inaudible	n/a ¹	35
11-10-2023	8:20pm to 8:35pm (Evening)	61.1	40.2	36.9	WD: n/a WS: 0 m/s Rain: Nil	Background motorway/insects 36-38 Cars passing on Teven Road 49 Aircraft 36-48 (30 seconds) Quarry inaudible	n/a ¹	35

¹ quarry not operational.

4.3 Location NM3

Noise monitoring at location NM3 was completed on Wednesday 11 October and Thursday 12 October 2023. The quarry was not audible during any monitored period during the day and evening, with the ambient noise environment dominated by background motorway traffic, insects, wind, and a car. The quarry was not operational during the evening period. These results indicate that noise emissions from Teven Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring events at Location NM3 are presented in **Table 4-3**.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		L _{Amax}	L _{Aeq}	L _{A90}				
12-10-2023	1:13pm to 1:28pm (Day)	59.8	42.9	39.1	WD: 10° WS: 3.7 m/s Rain: Nil	Background motorway/insects/wind 36-60 Birds 40-42 Quarry inaudible	<29	37
12-10-2023	1:28pm to 1:43pm (Day)	58.4	43.7	38.6	WD: 10° WS: 3.7 m/s Rain: Nil	Background motorway/insects/wind 35-58 Birds 40-46 Quarry inaudible	<29	37
11-10-2023	8:42pm to 8:57pm (Evening)	69.5	44.9	44.9	WD: n/a WS: 0 m/s Rain: Nil	Background motorway/insects 43-45 Aircraft 70 Quarry inaudible	n/a ¹	35
11-10-2023	8:57pm to 9:12pm (Evening)	59.1	46.1	46.1	WD: n/a WS: 0 m/s Rain: Nil	Background motorway/insects 43-45 Car 46-59 Quarry inaudible	n/a ¹	35

¹ quarry not operational.

4.4 Location NM4

Noise monitoring at location NM4 was completed on Wednesday 11 October and Thursday 12 October 2023. The quarry was audible during both monitored day periods. During the first day period two offsite Holcim quarry trucks were observed and measured entering the site, however as this was offsite vehicle movement it doesn't constitute as a contributor to the quarry contribution. Holcim alarms were also observed and measured for up to 10 seconds on two occasions, however, are below the 15min L_{Aeq} criteria using sound level exposure calculations included in **Appendix 1**. During the second day period a Holcim tipper and Holcim alarms were observed and measured for up to four seconds on two occasions, however both are below the 15min L_{Aeq} criteria using sound level exposure calculations included in **Appendix 1**. Holcim crushing and screening equipment was observed continuously through this same period and a sound level exposure calculation was used to determine a quarry contribution of 43 dBA 15min L_{Aeq} . It should be noted that the monitoring was completed close to Stokers Lane at the entrance to the residence as to not disturb the resident, however, this puts the attended noise monitoring location in direct line-of-sight of the quarry rather than near the sensitive receptor, i.e., the resident. A calculated cumulative noise level 15min L_{Aeq} result was adopted for distance correction to receiver using noise emission level calculations in **Appendix 1**. The quarry was not operational during the evening period. These results indicate that noise emissions from Teven Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring events at Location NM4 are presented in **Table 4-4**.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry L_{Aeq} (15min) Contribution	L_{Aeq} (15min) Criteria (dBA)
		L_{Amax}	L_{Aeq}	L_{A90}				
12-10-2023	9:32am to 9:47am (Day)	68.8	50.0	40.8	WD: n/a WS: 0 m/s Rain: Nil	Birds 40-60 Aircraft 47-54 Holcim trucks entering site 54-68 (twice for approx. 10 secs each) Holcim alarms 43-45 (twice briefly) Quarry audible	28	37
12-10-2023	9:49am to 10:04am (Day)	64.9	47.3	40.1	WD: n/a WS: 0 m/s Rain: Nil	Birds 41-60 Aircraft 40-50 (once for 30 secs) Insects 41-56 (continuous sporadic) Holcim tipper 47-51 (once for 3 secs) Holcim alarms 41-42 (twice for 4 secs each) Holcim crusher/screening equipment 41-43 (continuous) Quarry audible	37 ²	37

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq (15min) Contribution	LAeq (15min) Criteria (dBA)
		L _{Amax}	L _{Aeq}	L _{A90}				
11-10-2023	7:28pm to 7:43pm (Evening)	58.2	45.6	42.7	WD: n/a WS: 0 m/s Rain: Nil	Background motorway/insects/frogs 41-58 Quarry inaudible	n/a ¹	35
11-10-2023	7:44pm to 7:59pm (Evening)	62.5	43.1	42.0	WD: n/a WS: 0 m/s Rain: Nil	Background motorway/insects/frogs 41-43 Aircraft 47-62 (occurred once for 26 secs) Quarry inaudible	n/a ¹	35

¹ quarry not operational.

² value estimated based on distance correction to receiver location in calculation in **Appendix 1**.

4.5 Location NM5

Noise monitoring at location NM5 was completed on Wednesday 11 October and Thursday 12 October 2023. The quarry was not audible during any monitored period during the day and evening, with the ambient noise environment dominated by background motorway traffic, wind, trees, insects, birds, aircraft, passing cars on Teven Rd and a lawn mower on a nearby property. The quarry was not operational during the evening period. These results indicate that noise emissions from Teven Quarry did not contribute to noise nuisance during this time. The results and observations taken during the monitoring events at Location NM5 are presented in **Table 4-5**.

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

Date	Time (hrs)	Descriptor (dBA)			Meteorology	Description and SPL, dBA	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria
		L _{Amax}	L _{Aeq}	L _{A90}				
12-10-2023	11:07am to 11:22am (Day)	87.5	62.2	38.7	WD: 40° WS: 1.7 m/s Rain: Nil	Background wind/birds 38-40 Aircraft 40-45 occurred once for 28 secs, cars passing on Teven Rd occurred 8 times approx. 15 secs each 40-87, mower on nearby residence 40-47 Quarry inaudible	<29	37
12-10-2023	11:22am to 11:33am (Day)	89.1	65.6	41.4	WD: 40° WS: 1.4 m/s Rain: Nil	Background wind/birds/mower 44-49 Aircraft 39-46 occurred once, passing cars occurred 8 times for approx 15 seconds each 50-90 Quarry inaudible	<31	37
11-10-2023	6:49pm to 7:04pm (Evening)	62.1	43.5	37.4	WD: 52° WS: 1.3 m/s Rain: Nil	Background motorway/birds/trees/insects exceeded 40dBA for 16 seconds 34-62 Aircraft 40-48 occurred once for 50 seconds Quarry not operational	n/a ¹	35
11-10-2023	7:05pm to 7:20pm (Evening)	61.6	51.8	39.4	WD: 52° WS: 1.3 m/s Rain: Nil	Background motorway/birds/trees/insects exceeded 40dBA for 20 seconds in the first 10 minutes. At 10 minutes, 50-61 frogs (continuous) Quarry not operational	n/a ¹	35

¹ 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 Wednesday 11 October and Thursday 12 October 2023 at five locations selected as representative to the sensitive receptors at the surroundings to Teven Quarry.

Noise was audible from the quarry and offsite site vehicles during both day periods at NM4. Audible quarry noise at NM4 showed compliance with onsite noise requirements of the NMP and Development Consent for residential receivers. Monitoring at NM4 was completed at the gate of the residence, in direct line-of-sight of the quarry and subsequently, noise emission level calculations were required to estimate quarry contribution and it is acknowledged that this methodology has limitations. Moving this location within closer proximity of the residence for subsequent monitoring periods is recommended to better capture the noise impacts at the receptor, however it is acknowledged that resident approval will be required to gain access onto the property. The quarry was not operational during the evening period. The quarry was not audible at any other location or period during the monitoring campaign.

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

6. REFERENCES

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APPENDIX 1

SOUND EXPOSURE LEVEL AND NOISE EMISSION LEVEL CALCULATIONS

NM4 day monitoring period (9:32AM to 9:47AM)

Noise source	Holcim alarms
Meas. Dist from source (m)	260
Meas. Time (s)	10
Meas. LAeq dB	45
Calc Sel dB	55
No. Events in 15min	2
Total LAeq (15min)	28

NM4 day monitoring period (9:49AM to 10:04AM)

Noise source	Holcim tipper
Meas. Dist from source (m)	260
Meas. Time (s)	3
Meas. LAeq dB	51
Calc Sel dB	56
No. Events in 15min	1
Total LAeq (15min)	26

Noise source	Holcim alarms
Meas. Dist from source (m)	260
Meas. Time (s)	4
Meas. LAeq dB	42
Calc Sel dB	48
No. Events in 15min	2
Total LAeq (15min)	21

Noise source	Holcim crusher/ screening equipment
Meas. Dist from source (m)	260
Meas. Time (s)	900
Meas. LAeq dB	43
Calc Sel dB	73
No. Events in 15min	1
Total LAeq (15min)	43

Cumulative SEL of tipper, alarms and crusher/screening equipment	43
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NM4 day monitoring period (9:49AM to 10:04AM)

Site contribution corrected for distance from monitoring location to receiver

Noise source	Holcim crusher/ screening equipment
Estimated site contribution (LAeq) at monitoring location (dBA)	43.1
Approx. distance from monitoring location to site (m)	315
Approx. distance from site to receiver (m)	500
Distance corrected site contribution at receiver (LAeq dBA)	39.1
Estimated additional attenuation (vegetation)	2
Estimated site contribution at receiver (dBA)	37.1