

THREE KINGS QUARRY
Noise Compliance Assessment – Fill Operations
Rp 001 R01 2012309A

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Project: **THREE KINGS QUARRY
Noise Compliance Assessment – Fill Operations**

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1.0 INTRODUCTION

Marshall Day Acoustics (MDA) has been engaged by Winstone Aggregates to carry out a noise assessment of activity associated with fill operations at the Three Kings Quarry in Auckland.

The purpose of this assessment is to determine compliance with noise emission performance standards described in Environment Court Conditions of Consent (Decision No. [2011] NZEnvC 214).

2.0 NOISE PERFORMANCE STANDARDS

Condition 51 of the consent sets out the following with respect to noise limits:

“Any activity on the site associated with fill operations at the Three Kings Quarry shall not exceed the following noise limits at residentially zoned land fronting Mount Eden Road between street numbers 904 and 944 (including 14-16 Kingsway):

Monday to Saturday	7:00 am to 10:00 pm	L_{10} 60 dBA
Sunday & Public Holidays	9.00 am to 6.00 pm	
At all other times	L_{10} 45 dBA L_{MAX} 75 dBA	

At all other residentially zoned land noise limits as per the table below shall not be exceeded.

Monday to Saturday	7:00 am to 10:00 pm	L_{10} 55 dBA
Sunday & Public Holidays	9.00 am to 6.00 pm	
At all other times	L_{10} 45 dBA L_{MAX} 75 dBA	

N.B - Noise shall be measured and assessed in accordance with NZS6801: 1991 and NZS6802:2008.”¹

¹ It is noted that there is a discrepancy in the versions (year) of the standards quoted in the condition. It is also noted that NZS6802:2008 does not use the L₁₀ noise descriptor which has been used to specify the noise limits in condition 51.

3.0 FILL OPERATIONS ACTIVITY

As advised by Winstone Aggregates, current activity at the quarry associated with 'fill operations' consists of the following:

- Delivery of fill materials to the quarry pit by truck (or other suitable vehicle). Vehicles use the existing haul roads within the quarry
- Spreading and compaction of the fill materials by the 'fill bulldozer' (Komatsu D65 – refer Photos 2 and 3 in Appendix B)

During the noise survey, fill material was being delivered to the northern end of the quarry, which is the first area being filled (Refer Photos 1 to 4 in Appendix B).

Winstone Aggregates advise that the current average number of fill truck deliveries is 30 to 40 per day.

4.0 MEASURED NOISE LEVELS

A site survey was carried out between 10:20 am and 3:30 pm on 11 July 2012, during which noise levels were measured, generally in accordance with the relevant standards stipulated in the consent order (i.e. New Zealand Standard NZS 6801:1991 "*Measurement of Sound*"), at the four positions marked MP1 to MP4 as indicated on the aerial view in Appendix C.

Measurement positions MP1 (4 Barrister Avenue – refer Photos 5 and 6 in Appendix B) and MP2 (51/53 Fyvie Avenue - refer Photos 7 and 8 in Appendix B) were selected to be representative of the nearest residentially zoned land not fronting Mt Eden Road.

Direct measurement of noise emission from fill operations at the quarry at residentially zoned land fronting Mt Eden Road (between street numbers 904 and 944) was impracticable due to the continuous nature of the traffic on Mt Eden Road and the dominant noise level generated by that traffic.

A 15 minute measurement was undertaken at the front boundary of 908 Mt Eden Road (MP4 – refer Photos 11 and 12 in Appendix B and Appendix C) to demonstrate the elevated noise levels from traffic. The measured level at MP4 was 69 dB L_{A10} . Noise from fill activity inside the quarry was inaudible at this location and would not have contributed to the overall noise level. The measured level of 69 dB L_{A10} at MP4 is 9 decibels higher than the relevant 60 dB L_{A10} noise limit (in condition 51) making direct measurement at residentially zoned land fronting Mt Eden Road impracticable.

In order to assess noise emission from fill operations at the quarry, a closer measurement position at the eastern rim of the quarry (MP3 – refer Photos 9 and 10 in Appendix B and Appendix C) away from Mt Eden Road was selected. This position had direct line of sight into the quarry in relation to activity from trucks delivering fill materials and from fill bulldozer operations. It was also screened from traffic noise from Mt Eden Road by the existing buildings at 985 Mt Eden Road.

Weather conditions during the period of measurement were suitable for noise level monitoring with 6-8 okta cloud cover. The wind direction at times of measurement varied and is noted in Table 1.

A Brüel & Kjaer Type 2260 Investigator was used for attended measurements. Equipment was calibrated both before and after measuring noise levels using a Brüel & Kjaer Sound

Level Calibrator Type 4231. All equipment carried current calibration certification provided by Electroacoustic Calibration Services Ltd, Auckland.

Table 1 summarises the measurement results.

Table 1 – Measured Noise Levels

Measure- ment Position ⁽²⁾	Start Time Finish Time Wind Direction/ Speed ⁽³⁾	Measure- ment Duration minutes	Measured Levels dB			Noise Sources ⁽¹⁾
			L _{A10}	L _{Aeq}	L _{A95}	
MP1 (4 Barrister Ave)	10:24 am 10:47 am ESE 1.3 m/s	15	50	48	44	<u>Fill bulldozer</u> , sprinklers, trucks (approx. 7 off) delivering fill materials <i>Occasional:</i> Excavator bucket sounds from Fyvie Ave, birds
MP2 (Fyvie Ave)	12:20 pm 12:24 pm SW 1.9 m/s	20	51	49	45	<u>Plant noise including crushing plant, wheel loaders, excavators, fill bulldozer and trucks.</u> <i>Occasional:</i> Bird sounds and voices from children/adults in Fyvie Ave.
MP3 (NE rim of quarry)	2:05 pm 2:41 pm ESE 1.6 m/s	15	57	56	53	<u>Fill bulldozer</u> , trucks delivering fill materials
MP4 (908 Mt Eden Road)	3:08 pm 3:27 pm WSW 1.2 m/s	15	69	66	52	<u>Traffic noise from vehicles using Mt Eden Road fill operations from inside quarry not audible</u>

Notes to Table 1:

- (1) Underlined noise sources are dominant
- (2) Measurement positions shown on the figure in Appendix C
- (3) Wind speed and direction data based on NIWA Cliflo data for Agent 1962 (Auckland Aero)

An explanation of technical terms in Table 1 is provided in Appendix A.

Inspection of the measured noise levels in Table 1 indicates that noise emission at the nearest residentially zoned sites not fronting Mt Eden Road (MP1 and MP2) complied with the relevant 55 dB L_{A10} noise limit.

It is noted that the measurement at MP2 contains sound from both quarry activity and fill operations. Accordingly, noise emission from just the fill operations would be expected to be less than the measured level of 51 dB L_{A10} .

A noise level of 57 dB L_{A10} was measured at the east rim of the quarry pit (MP3) during fill operations. This measurement position is approximately 110 metres west of the nearest residentially zoned land fronting Mt Eden Road. Taking into account this separation distance, and screening provided by buildings at 985 Mt Eden Road and the quarry topography, it is estimated that the noise level received at the nearest residentially zoned land fronting Mt Eden Road is 44 dB L_{A10} , which readily complies with the relevant 60 dB L_{A10} limit.

5.0 CONCLUSIONS

Marshall Day Acoustics has undertaken a noise assessment of activity associated with fill operations at the Three Kings Quarry in Auckland.

Fill activity includes the delivery of fill materials to the quarry and spreading and compaction of those materials by a bulldozer.

Direct measurement of noise emission at residentially zoned land fronting Mt Eden Road (between street numbers 904 and 944) was not possible due to dominant traffic noise generated from Mt Eden Road. However, compliant noise levels were measured at a position closer to the noise of interest at the eastern rim of the quarry.

Noise levels at other nearest residentially zoned land, not fronting Mt Eden Road, were found to comply with the relevant limits.

Based on the measured noise levels, the fill operations activity taking place at the Three Kings Quarry was found to comply with the noise performance standards outlined in condition 51 of the consent.

APPENDIX A GLOSSARY OF TERMINOLOGY

dB	Decibel. The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of $P_r=20 \mu\text{Pa}$ i.e. $\text{dB} = 20 \times \log(P/P_r)$
dBA	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.
L_{Aeq}	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{A95}	The A-weighted noise level equalled or exceeded for 95% of the measurement period. This is commonly referred to as the background noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{A10}	The A-weighted noise level equalled or exceeded for 10% of the measurement period. This is commonly referred to as the average maximum noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
Noise	A sound that is unwanted by, or distracting to, the receiver.
Ambient	The ambient noise level is the noise level measured in the absence of the intrusive noise or the noise requiring control. Ambient noise levels are frequently measured to determine the situation prior to the addition of a new noise source.
NZS 6801:1991	New Zealand Standard NZS 6801:1991 " <i>Measurement of Sound</i> "
NZS 6802:1991	New Zealand Standard NZS 6802:1991 " <i>Assessment of Environmental Sound</i> ".

APPENDIX B PHOTOS



*Photo 1 – View of ‘fill operations’ area at northern end of quarry
(taken from west rim)*



*Photo 2 – Closer view of ‘fill operations’ area at northern end of quarry
(taken from the west rim)*



***Photo 3 –View of ‘fill operations’ area at northern end of quarry
(taken from the north-east rim)***



Photo 4 –View of central quarry area (taken from the north-east rim)



Photo 5 –Measurement position MP1



Photo 6 –View north towards the quarry from measurement position MP1



Photo 7 –Measurement position MP2 (old photo taken 29/3/2006)



Photo 8 –Measurement position MP2 (old photo taken 29/3/2006)



Photo 9 – Measurement position MP3



Photo 10 – Measurement position MP3



Photo 11 – Measurement position MP4 (Mt Eden Road)



Photo 12 – Measurement position MP4

APPENDIX C AERIAL VIEW / MEASUREMENT POSITIONS

