



MARSHALL DAY  
Acoustics 

THREE KINGS QUARRY  
BIANNUAL NOISE COMPLIANCE  
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Project: **THREE KINGS QUARRY**  
**Biannual Noise Compliance**

Prepared for: **Winstone Aggregates**  
**PO Box 17195**  
**Greenlane**  
**Auckland 1546**

Attention: **Angela Klein**

Report No.: **Rp 010 2011528A**

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#### Document Control

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## 1.0 INTRODUCTION

Marshall Day Acoustics (MDA) has carried out an environmental noise survey at monitoring positions adjacent to Three Kings Quarry, Mt Eden, on 14 November 2016. In response to a measured exceedance at one of the locations, Winstone Aggregates (Winstone) carried out a review of its operation and implemented changes to practicably reduce noise emission at the southern end of the site. On the 20 December 2016 a follow-up survey was carried out. This report presents and discusses the results of both compliance surveys.

Historically, Winstone was required to undertake two noise surveys per year, at two identified monitoring positions, as part of the Environmental Management Plan for the quarry, in order to determine compliance with the noise rules for the site. However, as quarrying activity at the site has now ceased, controlled fill operations is now considered to be the primary activity being undertaken and sound generated by this activity must comply with the noise limits contained in conditions in Environment Court Decision No. [2011] NZEnvC 214.

MDA understands that Winstone has chosen to continue biannual monitoring so as to ensure compliance is maintained as far as practicable.

A glossary of acoustic terminology used in this report is contained in Appendix A.

## 2.0 NOISE PERFORMANCE STANDARDS

Condition 54.51 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 <sub>10</sub> 60 dBA
Sunday & Public Holidays	9.00 am to 6.00 pm	
At all other times	L <sub>10</sub> 45 dBA L <sub>MAX</sub> 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 <sub>10</sub> 55 dBA
Sunday & Public Holidays	9.00 am to 6.00 pm	
At all other times	L <sub>10</sub> 45 dBA L <sub>MAX</sub> 75 dBA	

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

<sup>1</sup> It is noted that there is a discrepancy in the versions (year) of the acoustic standards quoted in the condition. It is also noted that NZS6802:2008 does not use the L<sub>10</sub> noise descriptor which has been used to specify the noise limits in condition 54.51. MDA understands that it is the intention of the Condition to reference NZS6801: 1991 and NZS6802:1991.

### **3.0 MEASUREMENTS**

#### **3.1 General**

Measurements were completed at each of the two measurement positions on 14 November 2016 and subsequently on 20 December 2016. The first was at the Grahame Breed Drive position and the second was at the Fyvie Avenue position. All measurements were in the mid-morning to early afternoon period. The measurement positions are the same as in all previous compliance measurements of this type and are shown on the figure in Appendix B.

Sound level measurements were carried out using a Brüel & Kjaer 2250 sound level meter, which satisfies the requirements for a Type 1 sound level meter according to IEC 651. Measurements were carried out and assessed generally in accordance with the relevant New Zealand Standards.

The weather was fine with variable cloud cover and a no more than gentle 3-5m/s breeze from the north (14 November 2016 survey) or south-west (20 December 2016 survey). These conditions are considered acceptable for environmental noise surveys.

#### **3.2 Operations and Equipment**

The following equipment was operating in the quarry during each survey. These operations were confirmed by the quarry supervisor following completion of each survey.

##### **14 November 2016 Survey**

###### Quarry Activity:

- No quarry extraction or supply activity

###### Fill Operations Activity:

- 2 x Caterpillar excavators loading Volvo articulated trucks at the trench
- 1 x Caterpillar D6 bulldozer compacting fill
- 4 x Volvo dump trucks carting fill within the site
- 1 x Caterpillar compactor
- 1 x Hyundai excavator working eastern face
- 1 x Komatsu bulldozer pulling a disc harrow
- 1 x WA 380 Komatsu wheel loader moving clean fill
- Arrival and departure of trucks delivering clean fill

##### **20 December 2016 Survey**

###### Quarry Activity:

- No quarry extraction or supply activity

###### Fill Operations Activity:

- 1 x Caterpillar D8 bulldozer pushing fill (SE corner)
- 1 x CAT825C compactor compacting fill (SE Corner)
- 2 x Volvo dump trucks carting fill within the site
- 1 x Volvo 290 Excavator loading dump trucks from stockpile (centre site)
- 1 x Komatsu D85 bulldozer pulling a disc harrow on stockpile (NE Corner)
- 1 x Volvo 240 Excavator sorting rock and soil in top stockpile (NW corner)
- 1x CAT 330 Excavator at trench in top stockpile (NE Corner)



- 1x watercart dampening haul roads within the site
- Arrival and departure of trucks delivering clean fill

### 3.3 Results

The measured sound levels are presented in Table 1 below.

**Table 1 – Measured Sound Levels**

Measurement Position	Duration	dB L <sub>A10</sub> <sup>(1)</sup>	Noise Sources <sup>(2)</sup>
<b>14 November 2016 Survey:</b>			
Fyvie Avenue	17 minutes	55	<u>Two bulldozers spreading fill, 2 Caterpillar excavators loading dump trucks, 4 Volvo articulated dump trucks carting fill, trucks arriving / dumping soft fill / departing, Caterpillar compactor, Caterpillar bulldozer pulling disc harrow</u> <i>Non-quarry sound:</i> Bird sounds, distant traffic on Mt Eden Road
Grahame Breed Drive	17 minutes	58	<u>Two bulldozers spreading fill, 2 Caterpillar excavators loading dump trucks, 4 Volvo articulated dump trucks carting fill, trucks arriving / dumping soft fill / departing, Caterpillar compactor, Caterpillar bulldozer pulling disc harrow</u> <i>Non-quarry sound:</i> Bird sounds, distant traffic on Mt Albert Road
<b>20 December 2016 Survey:</b>			
Fyvie Avenue	17 minutes	52	<u>Caterpillar bulldozer spreading fill, Komatsu bulldozer pulling disc harrow, 1 Caterpillar excavator loading dump trucks, 2 Volvo articulated dump trucks carting fill, 1 Volvo excavator sorting rock and soil, Caterpillar compactor, trucks arriving / dumping soft fill / departing,</u> <i>Non-quarry sound:</i> Bird sounds, distant traffic on Mt Eden Road
Grahame Breed Drive	17 Minutes	49	<u>Caterpillar bulldozer spreading fill, Komatsu bulldozer pulling disc harrow, 1 Caterpillar excavator loading dump trucks, 2 Volvo articulated dump trucks carting fill, 1 Volvo excavator sorting rock and soil, Caterpillar compactor, trucks arriving / dumping soft fill / departing,</u> <i>Non-quarry sound:</i> Bird sounds, distant traffic on Mt Eden Road

**Notes to Table 1:**

- (1) An explanation of technical terms is provided in Appendix A  
 (2) The controlling noise source(s) is underlined  
 (3) The measurement positions are shown in Appendix B

### 3.4 Discussion

It is understood that quarrying of Thee Kings Quarry has now ceased. Therefore, associated activities including extraction of rock from the quarry face, crushing and scoria load-out by dump truck will no longer occur. The following discusses each measurement, associated noise contributors and compliance assessment.

#### 3.4.1 Fyvie Avenue

During the 14 November 2016 survey, the overall noise level was controlled by fill operations occurring at the northern end and eastern side of the quarry (refer Photos 1 and 2 in Section 3.4.2). The primary noise generating plant was considered to be the two bulldozers, two excavators, and four articulated dump trucks. Trucks (both quarry and fill operations related) moving along the haul road, were also audible.

Ambient sound sources i.e. not associated with fill operations, included birds and distant traffic.

A level of 55 dB  $L_{A10}$  was measured at this location from fill operations, which complies with the consented noise limit.

During the 20 December 2016 survey, a similar noise contribution was observed coming from the site, except that only two Volvo articulated dump trucks were in operation instead of four.

A level of 52 dB  $L_{A10}$  was measured at this location from fill operations, which complies with the consented noise limit.

#### 3.4.2 Grahame Breed Drive

During the 14 November 2016 survey, the most audible sound sources at this measurement position were track noise from one of the bulldozers as well as engine noise from the dump trucks and bulldozers. Sound from truck tailgate closures was considered to control the maximum noise level ( $L_{AFmax}$ ) whereas the average maximum noise level ( $L_{A10}$ ) was controlled by bulldozer's tracking.

Ambient sound sources i.e. not associated with fill operations, included distant traffic sounds from the surrounding road network and bird sounds.

A level of 58 dB  $L_{A10}$  was measured for fill operations, which exceeded the consented noise limit of 55 dB  $L_{A10}$  at this location by 3 decibels.

During the 20 December 2016 survey, MDA noted that the subjective noise emission from the site was appreciably less than during the 14 November 2016 survey. This can be explained in part by the south-west wind direction (the measurement location was upwind of the site compared to the previous survey where it was considered to be downwind) and by the fact that most of the noisier plant was operating toward the centre and northern end of the site (a measure implemented by Winstones to reduce noise emission at the southern end of the site).

The primary noise generating plant during the survey was considered to be the Caterpillar bulldozer spreading fill, the Caterpillar compactor, and the two articulated dump trucks.

A level of 49dB  $L_{A10}$  was measured from fill operations, which complies with the consented noise limit.

Photos 1 & 2 show the plant which was in the quarry during the period of the 14 November 2016 noise survey.



**Photo 1: Southern End of Quarry (as viewed near Grahame Breed Drive position)**



**Photo 2: Northern end of Quarry (as viewed from south boundary fence)**



#### 4.0 CONCLUSIONS AND RECOMMENDATIONS

Marshall Day Acoustics has completed noise monitoring at the two nominated monitoring positions as required by the Environmental Management Plan for the Three Kings Quarry.

Fill operations is now widespread within the quarry and it is understood that quarrying activities have permanently ceased. Therefore, sound generating activity from the quarry during the survey period originated solely from fill operations and as such, has been assessed against the fill operations noise limits contained in [2011] NZEnvC 214.

For the 14 November 2016 survey, the cumulative acoustic emission from fill operations resulted in sound levels which complied with the relevant noise rules for quarry operations on the site at the Fyvie Avenue measurement position and exceeded by 3 decibels at the Grahame Breed Drive position.

In response to the measured exceedance at the Grahame Breed Drive location during the 14 November 2016 survey, Winstone implemented a review of its operation and moved all noisy plant away from the southern site boundary, only operating its newest/quietest plant in areas where the noise may impact surrounding neighbours.

On the 20 December 2016 a follow-up survey was carried out at the two measurement positions and the measured cumulative acoustic emission from fill operations resulted in sound levels which complied with the relevant noise rules for quarry operations on the site.

## APPENDIX A GLOSSARY OF TERMINOLOGY

<b>A-weighting</b>	The process by which sound levels are corrected to account for the non-linear frequency response of the human ear.
<b>dB</b>	<u>Decibel</u> 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. $\text{dB} = 20 \times \log(P/P_r)$
<b>dBA</b>	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.
<b><math>L_{A10}(t)</math></b>	The A-weighted noise level equalled or exceeded for 10% 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.
<b><math>L_{A95}(t)</math></b>	The A-weighted noise level equalled or exceeded for 95% of the measurement period. This is commonly referred to as the background noise level.
<b><math>L_{AFmax}</math></b>	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
<b>NZS 6801: 1991</b>	New Zealand Standard NZS 6801:1991 " <i>Measurement of Sound</i> ".
<b>NZS 6802: 1991</b>	New Zealand Standard NZS 6802:1991 " <i>Assessment of Environmental Sound</i> ".



## APPENDIX B NOISE MEASUREMENT POSITIONS



Source: Google Earth Pro