Ambience Audio Services
Acoustic Measurement and Analysis

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Results of Noise Monitoring

Blakebrook Quarry
550 Nimbin Road
Blakebrook NSW 2480

Prepared for

Northern Rivers Quarry & Asphalt
550 Nimbin Road
Blakebrook NSW 2480

Prepared by
Garry Hall
December 17th 2019

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1 INTRODUCTION

Ambience Audio Services conducted noise monitoring of quarry operations for Northern Rivers Quarry & Asphalt at Blakebrook via Lismore, northern NSW. The noise monitoring was requested by Ms Leonie Lockhart, Compliance Officer for Commercial Services at Lismore City Council, to measure and report on quarry operational noise levels at the identified affected residential receiver locations.

Noise monitoring was conducted on the 6th of November and 10th of December 2019 with full quarry operating conditions and suitable weather conditions. The noise monitoring at Receiver 8 was conducted on the 10th of December as information in the new Noise and Blast Management Plan Version 3.1 (ERM Aug. 2018) was only received after the measurements on the 6th of November had been reported.

Quarry operations while noise monitoring was conducted included crushing, screening and stockpiling on the eastern side of the quarry floor, rock breaking on the quarry floor, asphalt production at the mobile plant at the top of the quarry and trucks and loaders on the quarry floor and internal haul roads. A diagram of equipment operating on the quarry floor during noise monitoring at residential receivers is provided in Appendix D.

To assist with the interpretation of some of the terminology used in this report, Appendix A provides definitions of acoustic terms. Appendix B is a chart of everyday sound pressure levels.

2 NOISE MONITORING REQUIREMENTS

The noise monitoring requirements for the Blakebrook Quarry are outlined in Section 2.2, Sections 7.1, 7.2, 7.4, 7.4, 7.5 and 7.7 of the Noise and Vibration Management Plan Version 3.1 (Aug 2018) prepared by Environmental Resources Management Australia Pty Ltd (ERM).

Extracts of the relevant parts are copied below.

Section 2.2

3. The Proponent must ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land.

Table 2: Noise criteria dB(A)

Receiver	*Day* L_{Aeq} *(15 minute)*
Location 2	*36*
All other locations	*35*

Noise generated by the project is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy. Appendix 5 sets out the meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.

However, the noise criteria in Table 2 do not apply if the Proponent has an agreement with the relevant landowner to exceed the noise criteria, and the Proponent has advised the Department in writing of the terms of this agreement.

L6.1 Noise from the premises must not exceed:

(a) 35dB(A) LAeq(15 minute) during the day (7am to 6pm) Monday to Saturday;

Where LAeq means the equivalent continuous noise level – the level of noise equivalent to the energy-average of noise levels occurring over a measurement period.

7.1 MONITORING OBJECTIVES

The noise measurement procedures employed throughout the monitoring program shall be guided by the requirements of AS 1055-1997 "Acoustics - Description and Measurement of Environmental Noise" and the NSW EPA Noise Policy for Industry (EPA, 2017).

7.2 MONITORING LOCATIONS

The Noise Assessment (ERM, 2009) included seven noise monitoring locations that were used throughout the assessment, based on proximity to nearby potentially sensitive receptors. Given the proximity between monitoring locations and the location of anticipated noise-generating plant and equipment, the monitoring locations have been revised and separated into **primary** and **supplementary** acoustic monitoring locations for the purposes of this NBMP.

Primary and supplementary acoustic monitoring locations are identified in ***Figure 1.3.*** Primary acoustic monitoring locations consist of **locations 2, 4** and **8**, with the remainder consisting of supplementary acoustic monitoring locations.

An agreement was reached with the landowner located along Nimbin Road (previously identified as location 8, ERM 2009) in April 2016, wherein the landowner has agreed to exceedances in noise levels from quarry operations. As such the location has been removed as a primary acoustic monitoring location, and a new monitoring location selected.

Primary monitoring locations will be utilised during noise compliance monitoring and are considered representative in determining compliance with the relevant Conditions of Approval.

7.4 METHODOLOGY

Noise

Operator attended noise measurements shall be conducted at all primary acoustic measurement locations (Locations 2, 4 and 9 - refer ***Figure 1.3***) to quantify and characterise the maximum (LAmax), the energy equivalent (LAeq), and background (LA90) noise levels from ambient noise sources and quarrying operations over a 15 minute measurement period.

The operator shall quantify noise emissions and estimate the LAeq (Period) noise contribution during day time activities from each of the quarrying operations, as well as the overall level of ambient noise.

During attended monitoring, digital recordings will be conducted to allow for additional post analysis of the quarry noise levels and source identification.

All acoustic instrumentation employed throughout the monitoring program shall meet with the requirements of AS 1259.2-1990, "Sound Level Meters".

Instrument calibration shall be checked before and after each measurement survey, with the variation in calibrated levels not exceeding ±0.5 dBA.

7.5 METEOROLOGICAL PARAMETERS

Adverse meteorological conditions have the potential to increase noise levels, for example wind speeds up to 3m/s or temperature inversions, however wind speeds above 5m/s (and rainfall) have the potential to generate extraneous and erroneous noise events, which reduce the accuracy and confidence in measured data.

As such, meteorological parameters will be evaluated prior to undertaking works on site, to gain an understanding of the weather conditions and the potential for variations in noise levels.

All noise measurements shall be accompanied by both qualitative description (including cloud cover, approximate wind direction and speed) and quantitative measurements of prevailing local weather conditions throughout the survey period. Rainfall data will be collected from the rain gauge located on-site. All other weather data for the monitoring period will be purchased from the Bureau of Meteorology (BoM) website for the Lismore Observation Station, which is programmed to continuously record the meteorological parameters as shown in *Table 7.1*.

Table 7.1 Meteorological Measurement Parameters

Measured Parameter	Unit	Sample Interval
Mean Wind Speed	m/s	15 minutes
Mean Wind Direction	degrees	15 minutes
Aggregate Rainfall	Mm	15 minutes
Mean Air Temperature	C°	15 minutes

Modifying Factor Corrections

Factor	Assessment and Measurement	When to Apply	Correction	Comment
Tonal Noise	One-third octave or narrow band analysis.	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: • 5 dB or more if the centre frequency of the band containing the tone is above 400 Hz. • 8 dB or more if the centre frequency of the band containing the tone is 160 to 400 Hz inclusive. • 15 dB or more if the centre frequency of the band containing the tone is below 160 Hz.	5 dB	Narrow-band frequency analysis may be required to precisely detect occurrence.
Low Frequency Noise	Measurement of C-weighted and A-weighted level.	Measure/assess C and A weighted levels over same time period. Correction to be applied if the difference between the two levels is 15 dB or more.	5 dB	C-weighting is designed to be more responsive to low-frequency noise.

Noise monitoring at locations 1, 2, 3, 4 and 8 were conducted within 30m of the residential dwelling in the direction of the quarry. Location 6 was conducted at the road frontage, approximately 35m from the residential dwelling, as the property had dogs and horses in the house paddock.

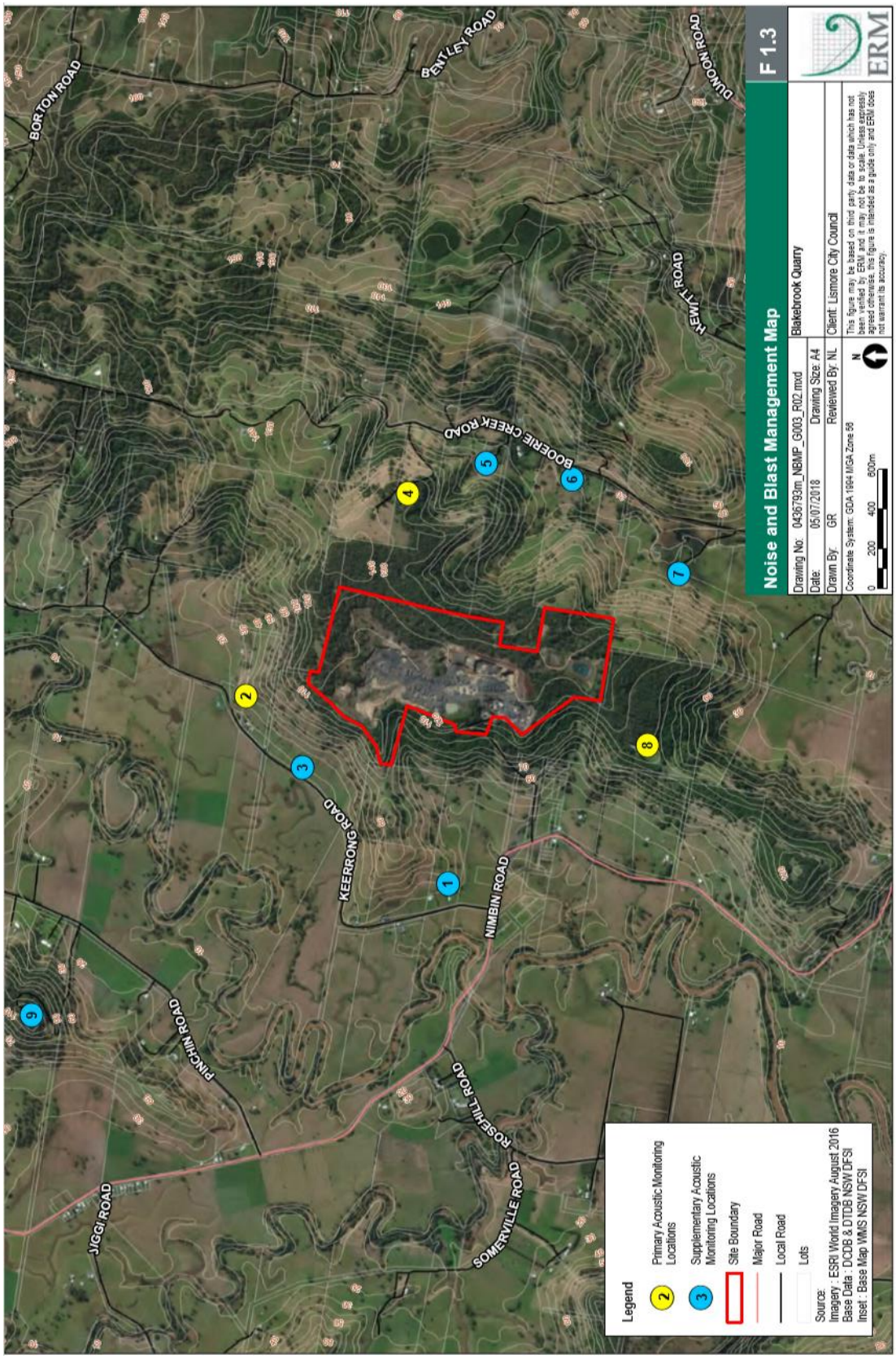
Table 2.1 Noise Monitoring Receiver Locations

Original Receiver Location	V3.1 Receiver Location	Street Address
1	1	28 Keerrong Rd Blakebrook
2	3	166 Keerrong Rd Blakebrook
3	2	190 Keerrong Rd Blakebrook
4	4	365 Booerie Creek Road Booerie Creek
6	6	289 Booerie Creek Rd Booerie Creek
8	8	484 Nimbin Rd Blakebrook

Primary Location

Note:
Some street addresses on Keerrong Road have been changed from previous assessments due to updated surveying.
Receiver 1 was 122 now 28
Receiver 3 was 126 now 166

Figure 2.1 Noise Monitoring Locations N&BNMP V3.1



3 MEASUREMENT PROCEDURE AND RESULTS

3.1 Instrumentation

Table 3.1 Instrumentation for Noise Monitoring

Instrument	Serial #	Calibration Date
Brüel and Kjær 2250L Sound Level Meter	3006868	July 2019
Brüel and Kjær 2250 Sound Level Meter	3008548	December 2019
Brüel and Kjær 2250L Sound Level Meter	2602785	October 2018
Svan SV30 Acoustic Calibrator	3849	July 2019
Brüel and Kjær Acoustic Calibrator	2292735	Dec 2019

The sound level meters (SLM) used during the noise survey conform to Australian Standard 1259 "Acoustics - Sound Level Meters", (1990) as type 1 precision sound level meters and have an accuracy suitable for both field and laboratory use.
The meters' calibrations were checked before and after the measurement periods with a Svan SV30 acoustic calibrator on the 6/11/2019 and a Bruel & Kjaer acoustic calibrator on the 10/12/2019. No significant system drift occurred over the measurement periods.

The SLMs and calibrators have been checked, adjusted and aligned to conform to the factory specifications and issued with conformance certificates by a certified NATA facility.

3.2 Measurement Procedures

Measurements were made in general accordance with procedures laid down in:

1. **Australian Standard AS 1055.1-1997: '**Acoustics - Description and measurement of environmental noise - General procedures';

2. **The NSW Government Noise Policy for Industry (EPA Oct 2017**

The microphone of a B&K 2250 SLM was mounted on a 1.5m high tripod and a Bruel and Kjær outdoor windscreen fitted to the microphone. The SLM was located on a flat area of land above the cliff face where the working equipment was operating, to monitor noise levels while measurements were being conducted at the receiver locations (*see Appendix D*). The SLM was set to record continuously for the duration of receiver monitoring with 1 second samples. A sound recording was conducted simultaneously.

The microphone of another B&K 2250 SLM was mounted on a 1.5m high tripod and a Bruel and Kjær outdoor windscreen fitted to the microphone. The SLM was used at the various receiver locations to monitor noise levels while the quarry was operating under full load conditions. The noise monitoring location was within 30m of the residential dwelling in the general direction of the quarry depending on vegetation and cattle in paddocks for receivers 1- 4 and receiver 8.

Noise monitoring at receiver 6 was conducted on the road frontage boundary approximately 35 from the residential dwelling as there were dogs and horses in the house paddock.

A 15 minute period was recorded at each location with 1 second samples with a simultaneous sound recording.

3.3 Weather Conditions

Weather conditions were generally good for acoustic measurements. Observations were taken at each receiver location with a Kestrel 3000 pocket weather meter.

Table 3.2 Observed Weather Conditions at Receiver Locations

Receivers Weather Summary 6th Nov & 10th Dec 2019								
Date	Time	Receiver	Temp	Relative Humidity	Wind	Wind Dir	Cloud Cover	
			℃	%	Speed (m/s)			
6/11/2019	9:55am	4	25	38	0.5 – 2.0	S	0/8	
	10:30am	6	25	34	0.1 – 1.5	S	0/8	
	11:10am	1	26	28	0.5 – 1.5	SE	0/8	
	11:40am	2	27	30	0.5 – 1.5	SE	0/8	
	12:05pm	3	28	25	0.5 – 2.0	SW	0/8	
10/12/2019	12:30pm	8	36	37	0.5 – 1.5	N	0/8	

Data from the local weather station near the weighbridge at NRQA is presented in Table 3.3.

Table 3.3 NRQA Local Weather Station

NRQA Local Weather Station 6th Nov & 10th Dec 2019						
		Temp °C	Relative Humidity %	Wind		
				Dir.	Speed	
Date	Time				(km/h)	(m/s)
6/11/2019	09:00am	15.2	70	E	0	0
	09:30am	17.6	62	NNE	0	0
	10:00am	20.4	52	NE	0	0
	10:30am	22.4	39	ENE	0.8	0.2
	11:00am	23.9	36	ENE	0.8	0.2
	11:30am	24.2	34	W	1.6	0.4
	12:00pm	25.7	32	ENE	1.6	0.4
	12:30pm	21.4	70	NE	1.6	0.4
10/12/2019	11:00am	30.2	62	ENE	1.6	0.4
	11:30am	31.2	57	NNE	1.6	0.4
	12:00pm	32.7	52	NE	3.2	0.9
	12:30pm	34.1	47	NE	3.2	0.9

The meteorological data for Lismore Airport (approximately 7kms to the south) for the monitoring period was downloaded from the Bureau of Meteorology website and provided in Table 3.4.

Table 3.4 Weather Observations at Lismore Airport

Lismore Airport Weather 6th Nov & 10th Dec 2019						
		Temp °C	Relative Humidity %	Wind		
				Dir.	Speed	
Date	Time				(km/h)	(m/s)
6/11/2019	09:00am	20.9	55	SW	17	4.7
	09:30am	21.7	35	SW	17	4.7
	10:00am	22.6	34	S	17	4.7
	10:30am	22.7	31	S	15	4.2
	11:00am	23.4	29	SSE	11	3
	11:30am	24.3	27	SE	6	1.7
	12:00pm	25.2	24	ESE	15	4.2
	12:30pm	25.6	24	WSW	11	3
10/12/2019	11:00am	32.0	48	NW	15	4.2
	11:30am	32.1	42	N	19	5.3
	12:00pm	33.7	37	NNW	20	5.5
	12:30pm	34.4	37	N	17	4.7

3.3 Measurement Results

Table 3.5 Measurement Results 6/11/2019

Measurement Summary 6th Nov 2019								
Measurement	Start Time	Elapsed Time (h:mm:ss)	L_{AFmax} [dB]	L_{Ceq} [dB]	L_{Aeq} [dB]	L_{Ceq}-L_{Aeq} [dB]	L_{AF10} [dB]	L_{AF90} [dB]
Receiver 1	10:59:43 AM	0:15:00	60.8	53.8	41.0	12.8	42.5	32.4
Receiver 3 (2)	11:33:00 AM	0:15:00	76.8	55.3	47.3	8.0	46.7	27.7
Receiver 2 (3)	11:59:59 AM	0:15:00	54.9	61.0	38.8	22.2	43.2	27.1
Receiver 4	9:49:50 AM	0:15:00	55.7	45.0	36.8	8.2	38.5	30.3
Receiver 6	10:26:07 AM	0:15:00	66.7	53.2	43.1	10.1	41.8	30.4
Top of Quarry	8:20:10 AM	4:17:56	91.4	75.6	79.1	3.5	79.1	64.9

(previous receiver number)

Table 3.6 Measurement Results 10/12/2019

Measurement Summary 10th Dec 2019								
Measurement	**Start Time**	**Elapsed Time** (h:mm:ss)	**L_{AFmax} [dB]**	**L_{Ceq} [dB]**	**L_{Aeq} [dB]**	**L_{Ceq}-L_{Aeq} [dB]**	**L_{AF10} [dB]**	**L_{AF90} [dB]**
Receiver 8 M1	11:53:10 AM	0:15:00	62.2	53.6	39.9	13.7	42.4	34.9
Receiver 8 M2	12:08:56 PM	0:15:00	55.1	55.8	42.3	13.5	45.7	35.4
Top of Quarry	11:17:43 AM	1:34:08	86.3	79.6	74.1	5.4	77.2	67.1

Note:
The above results are the ambient noise levels and includes noise from the rural surroundings and quarry noise if audible.

Table 3.7 Noise Observations at Receiver Locations

Noise Observations at Receiver Locations (All measurements 15 mins)			
Receiver	**Start Time**	**Observed Noise Sources**	**Quarry Noise**
1	10:59am	Birds, wind in trees, occasional local traffic on Keerrong Rd, distant cattle, distant traffic on Nimbin Rd, banging shed door	Quarry not audible
3 (2)	11:33am	Birds, wind in trees, occasional local traffic on Keerrong Rd, cattle, occasional water pump	Quarry barely audible
2 (3)	11:59am	Birds, wind in trees, occasional local traffic on Keerrong Rd, distant cattle, occasional insects	Quarry just audible at times.
4	9:49am	Birds, wind in trees, distant dogs, occasional distant vehicle	Quarry not audible
6	10:26am	Birds, wind in trees, distant dogs	Quarry not audible
8 M1	11:53am	Birds, insects, wind in trees, distant traffic Nimbin Rd, distant overhead aircraft	Occasional noise from rock hammer
8 M2	12:08pm	Birds, insects, wind in trees, distant traffic Nimbin Rd, distant overhead aircraft	Consistent intermittent noise from rock hammer

(previous receiver number)

4 DISCUSSION OF RESULTS

The measurements were undertaken while the quarry was operating under normal operating conditions (*see Appendix D for diagram for location of equipment*). A second noise logger was located above the quarry floor as a reference for quarry crushing operations noise levels whilst measurements were conducted at receivers.

Graph C.6 is the measured noise levels above the crushing operations on the 6th of November. The noise logger was located approximately 50m to the closest machine and approximately 100m to the farthest. The levels are very consistent throughout the receiver monitoring period 9:45am – 12:15pm. The levels are slightly higher during the 8:20am – 9am period as the rock breakers were working closer to the noise monitor for that period.

Graph C.9 is the measured noise levels above the crushing operations on the 10th of December. The noise logger was located approximately 50m to the closest machine and approximately 100m to the farthest. The levels indicate a reduction between 11:46am and 12:07pm and is due to the rock hammer not operating for that period.

Receiver 1 - quarry noise was not audible. The $L_{A90,15min}$ was 32.4 dB(A) and mainly attributed to wind in trees. It is estimated that the quarry $L_{Aeq,15\ min}$ is below 32 dB(A).

Receiver 2 (Previously R3) - quarry noise was just audible at times. The $L_{A90,15min}$ is quite low (27.1 dB(A). The 22 dB difference between L_{Aeq} and L_{Ceq} was attributed to wind. It is estimated that the quarry $L_{Aeq,15\ min}$ is below 30 dB(A).

Receiver 3 (Previously R2) - quarry noise was barely audible. The $L_{A90,15min}$ is quite low (27.7 dB(A) as on previous occasions. It is estimated that the quarry $L_{Aeq,15\ min}$ is below 30 dB(A).

Receiver 4 - quarry noise was not audible. The $L_{A90,15min}$ was 30.3 dB(A) and mainly attributed to wind in trees. It is estimated that the quarry $L_{Aeq,15\ min}$ is below 30 dB(A).

Receiver 6 - quarry noise was not audible. The $L_{A90,15min}$ was 30.4 dB(A). It is estimated that the quarry $L_{Aeq,15\ min}$ is below 30dB(A).

Receiver 8 M1 – 11:53am – 12:08pm – Occasional rock hammer at end of monitoring period. Graph C.9 indicates that the rock hammer was not operating for most of this period. Only operating approximately for the last minute.

Receiver 8 M1 – 12:08pm – 12:23pm – Rock hammer intermittent consistent level above background.

Receiver 8 – The background levels are very similar for the 2 measurements M1 – no rock hammer- M2 with rock hammer. The L_{AFmax} levels of the rock hammer were between 35 and 39 dBA. The crushing operations were not audible. Wind in trees was the main contributor to the background noise levels in both measurements which are similar in level.

There was consistent moving foliage noise during the first 2 -3 minutes of M2 which increased the total noise levels. It was noted that the wind was coming almost from the direction of the quarry.

Graph C.9 indicates that the rock hammer is approximately 10 -12 decibels higher than the crushing operations when measured at the top of the quarry. It is estimated that the crushing noise levels are approximately 25 – 30 decibels at Receiver 8. It is estimated that with the intermittent rock hammer operating the combined quarry noise levels are 31-33 decibels LAeq,15 min at Receiver 8.

No tonality was observed at any receiver location.

5 SUMMARY

A noise monitoring survey was conducted to assess compliance of quarry operational noise levels at the Northern Rivers Quarry and Asphalt facility at Blakebrook. Measurements were undertaken with calibrated noise monitoring equipment on the 6th of November and 10th of December 2019 and conducted in general accordance with procedures laid down in Australian Standard AS 1055.1-1997 and the NSW Noise Policy for Industry.

The Blakebrook Quarry operates under EPL No. 3384. Condition L6.1 stipulates that noise from the premises must not exceed 35dB(A) $L_{Aeq,15min}$ during the day (7am to 6pm) Monday to Saturday. The current Noise and Blast Management Plan V3.1 (Aug 2018) allows a limit of 36dB(A) $L_{Aeq,15min.}$ at Receiver 2 (previously Receiver 3).

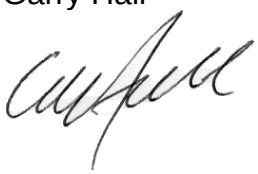
Measurements were conducted at 6 receiver locations while the quarry was operating under load conditions. The quarry was not audible at receiver locations 1, 4 and 6. The quarry was just audible at times at receiver locations 2 and 3. The rock hammer was audible at Receiver 8.

The quarry operational noise levels ($L_{Aeq,15min}$) were not able to be accurately assessed at residential receiver monitoring locations as the quarry noise was not audible or barely audible against other noise sources such as moving foliage.

It is estimated from the recorded $L_{A90,15\ min}$ levels and observations, that the quarry noise levels are below the Project Specific Noise Level of 35 dB(A) $L_{eq,15mins}$ at Receiver locations 1, 2, 3, 4, 6 and 8.

As Receiver 8 is close to the southern cell, it is recommended that noise monitoring be conducted at Receiver 8 when work in the southern cell is undertaken.

Garry Hall



Acoustic Consultant
Ambience Audio Services

APPENDIX A
Definitions of Terms

Sound pressure level (SPL): A measurable quantity of the size or amplitude of the pressure fluctuations (sound waves) above and below normal atmospheric pressure. Sound pressure levels are measured in decibels.

Decibels (dB): a ratio of energy flows. When used with sound measurement, it is the ratio between a measured quantity and an agreed reference level. The dB scale is logarithmic and uses the threshold of hearing of 20 μPa (micro pascals) as the reference level. This reference level is defined as 0 dB.

One useful aspect of the decibel scale is that it gives a much better approximation to the human perception of relative loudness than the Pascal scale. This is because the ear reacts to a logarithmic change in level, which corresponds to the decibel scale where 1 dB is the same relative change every on the scale. *Refer Appendix B*

Tonality: Noise containing a prominent frequency and characterized by a definite pitch.

Spectral characteristics: The frequency content of noise.

"A" frequency weighting: The method of frequency weighting the electrical signal within a noise-measuring instrument to simulate the way the human ear responds to a range of acoustic frequencies. The symbols for the noise parameters often include the letter "A" (e.g., L_{Aeq}, dBA) to indicate that frequency weighting has been included in the measurement.

Fast, Slow and Impulse time weightings: Standardised response times to help define fluctuating noise levels. Impulsive noises have high peak levels with a very short duration (e.g., gun shot), or a sequence of such peaks. Slow helps average out the fluctuations and is used to for better visual indication of the noise source. Environmental assessment standards usually specify the time weighting (**F**, **S**, or **I**) to use.

L_{Aeq}: The A-weighted continuous noise level. A widely used noise parameter that calculates a constant level of noise with the same energy content as the varying noise signal being measured. The time in minutes, which the measurement was sampled, is indicated with a following number. e.g. L_{Aeq15} is a 15 minute sample.

L_{AN}: The A-weighted sound pressure level that is exceeded for N per cent of the time over which a given sound is measured. e.g. **L_{A90}** is the A-weighted sound pressure level that is exceeded for 90% of the time over which a given sound is measured. L_{A90} is commonly used to describe the **background noise level** for community noise assessments.

Ambient noise: The all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far.

Extraneous noise: Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods and by events such as concerts or sporting events. Normal daily traffic is not to be considered extraneous.

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 $\mathbf{L_{A90}}$ descriptor.

Intrusive Noise: Refers to noise that intrudes above the background level by more than 5 decibels.

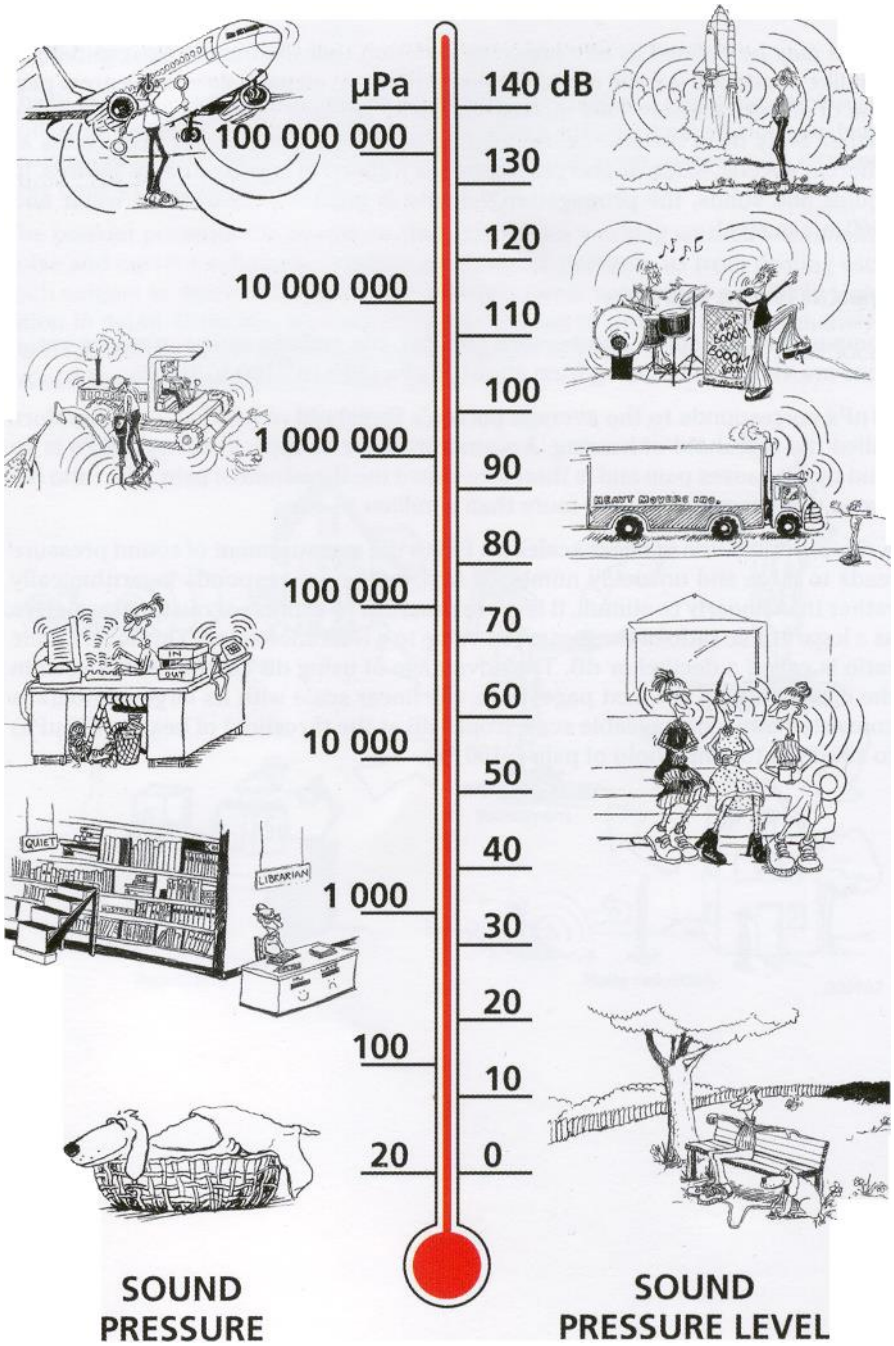
References:

Measuring Sound Brüel and Kjær Sound & Vibration Measurements A/S September 1984

Environmental Noise Brüel and Kjær Sound & Vibration Measurements A/S 2000, 2001

New South Wales Industrial Noise Policy NSW Environment Protection Authority January 2000

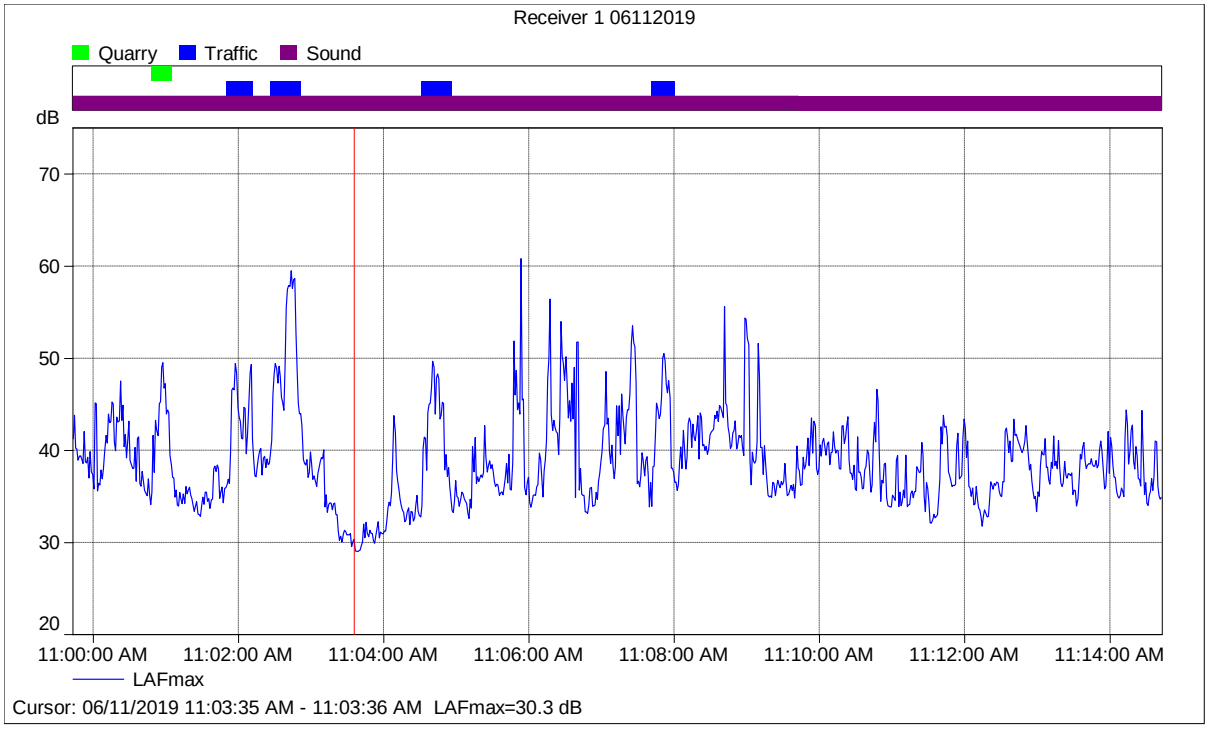
APPENDIX B
Comparison of Sound Pressure Levels



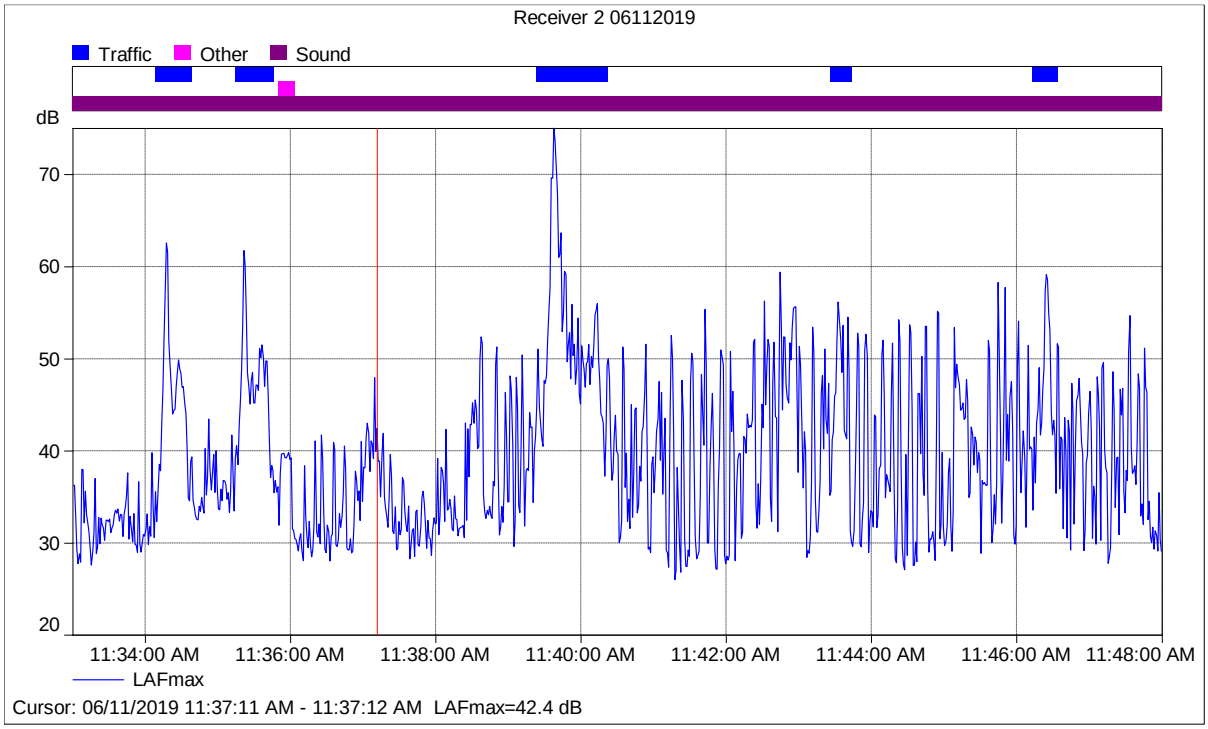
Our hearing covers a wide range of sound pressures – a ratio of over a million to one. The dB scale makes the numbers manageable.
Reproduced from
Environmental Noise Brüel and Kjær Sound & Vibration Measurements A/S 2000, 2001

APPENDIX C
Logged Levels at Receiver Locations – Graphs

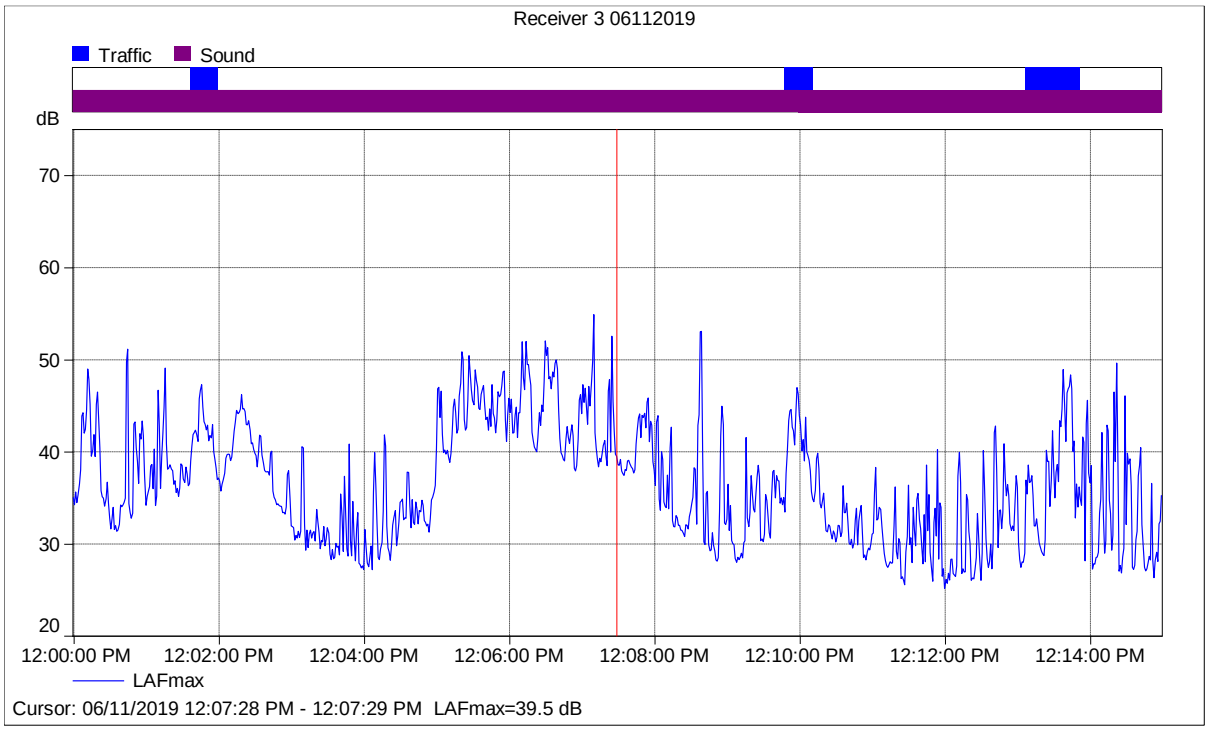
Graph C.1 Receiver 1



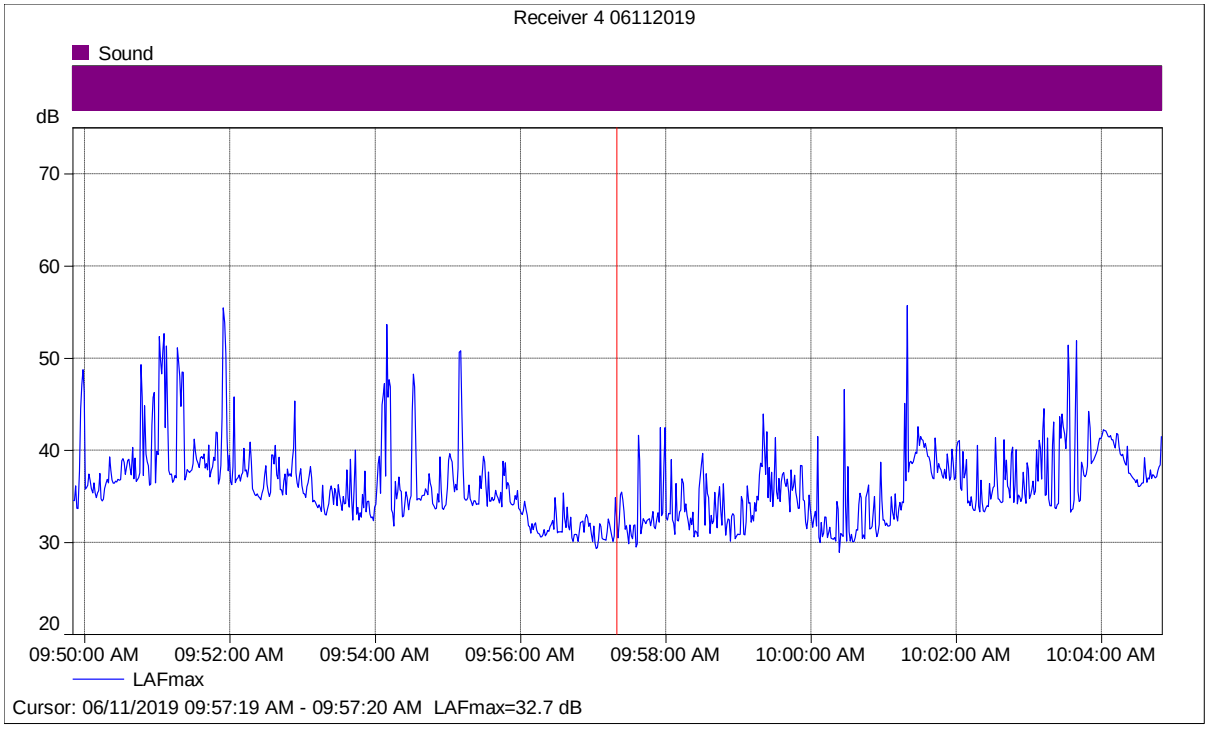
Graph C.2 Receiver 3 (Previously Receiver 2)



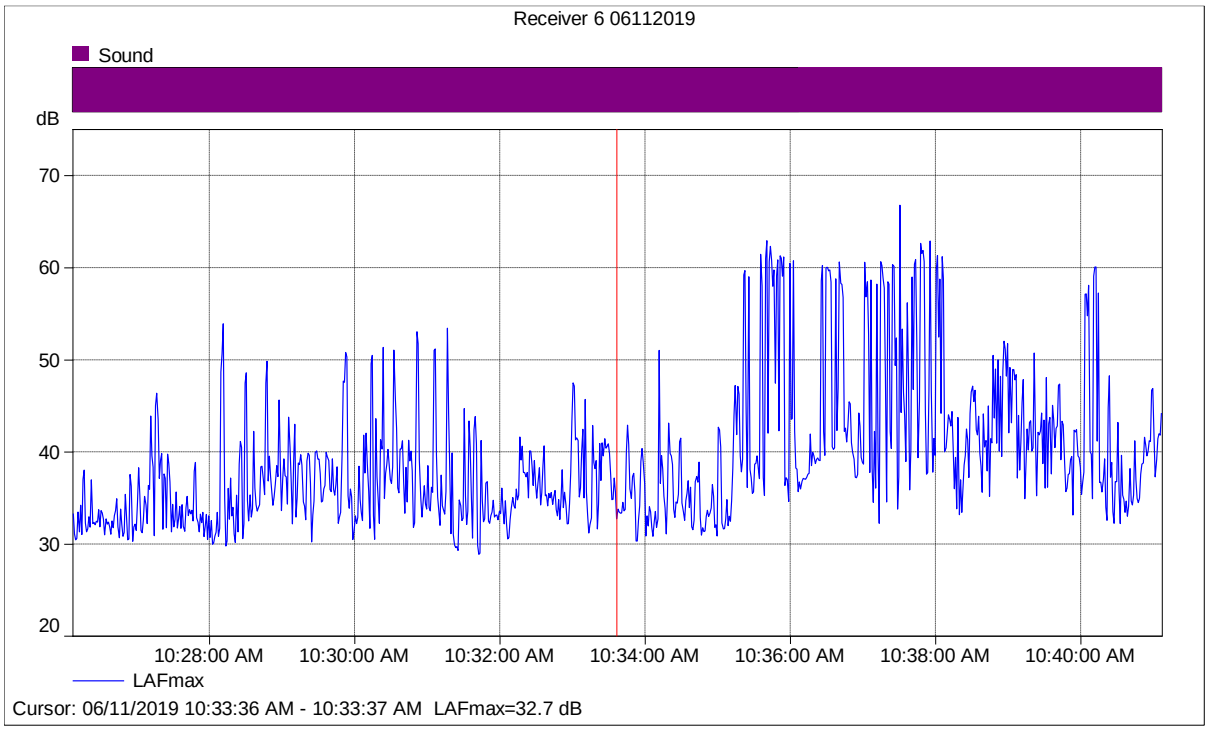
Graph C.3 Receiver 3 (Previously Receiver 2)



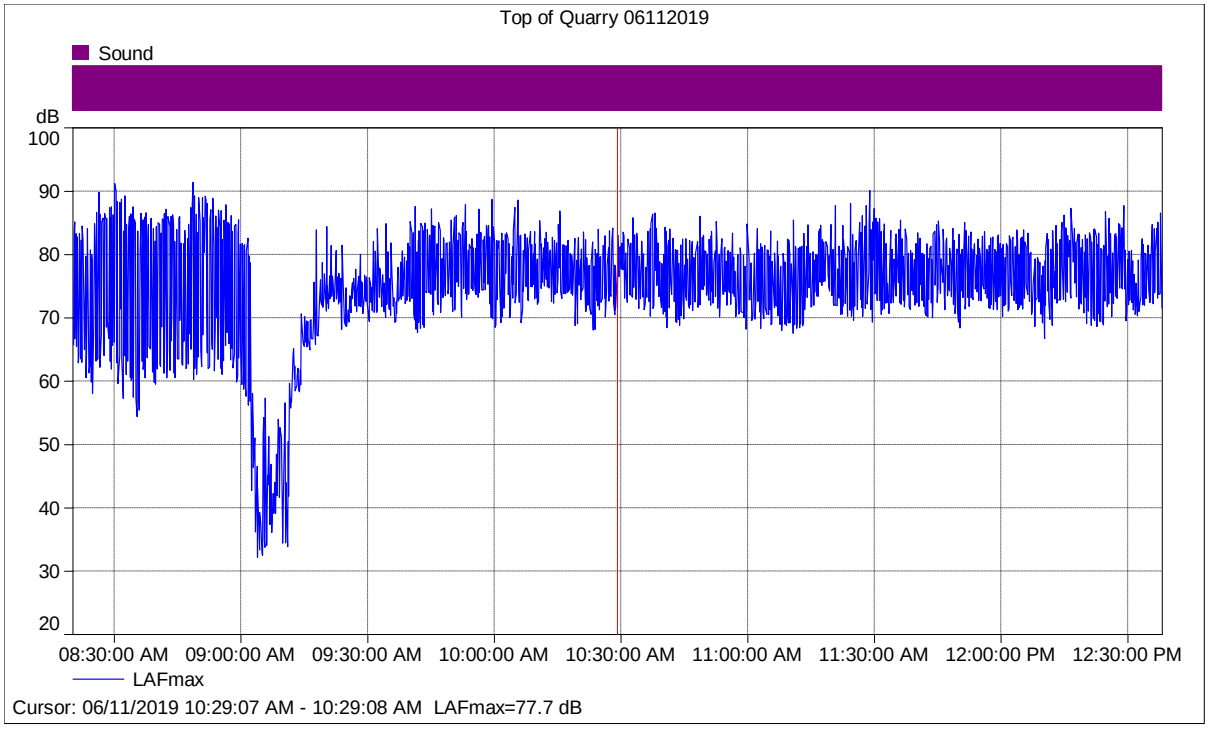
Graph C.4 Receiver 4



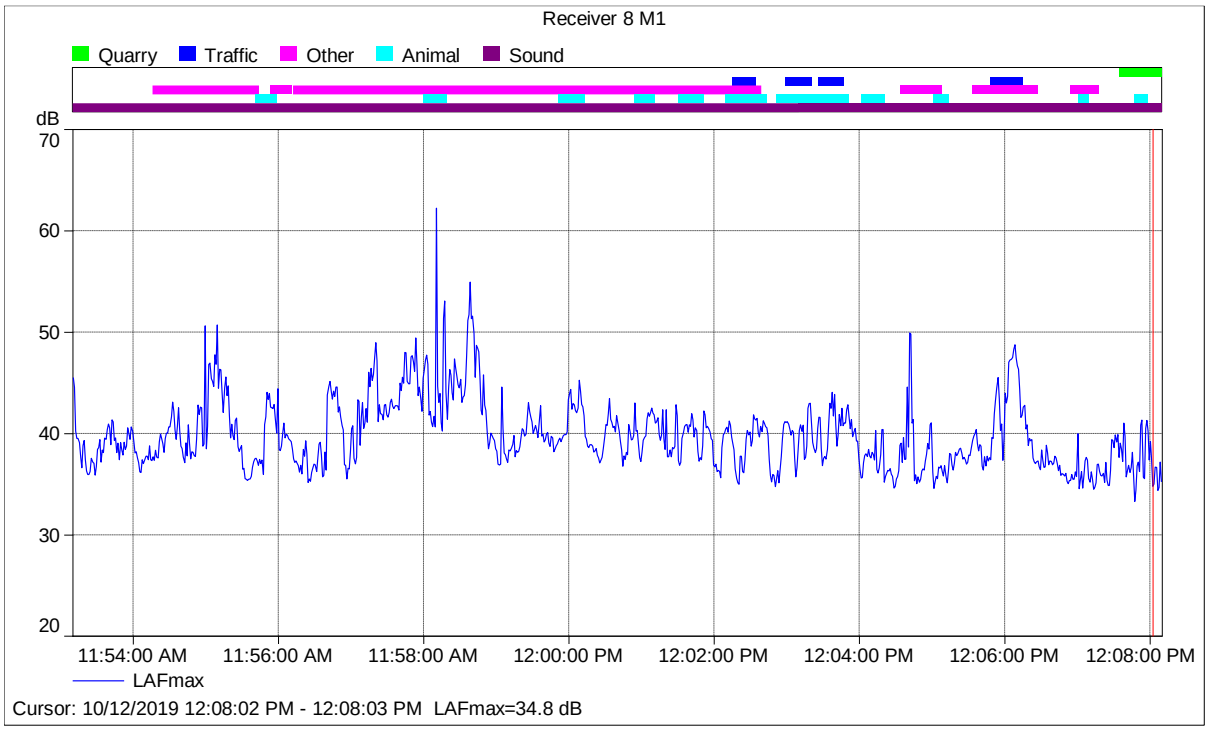
Graph C.5 Receiver 6



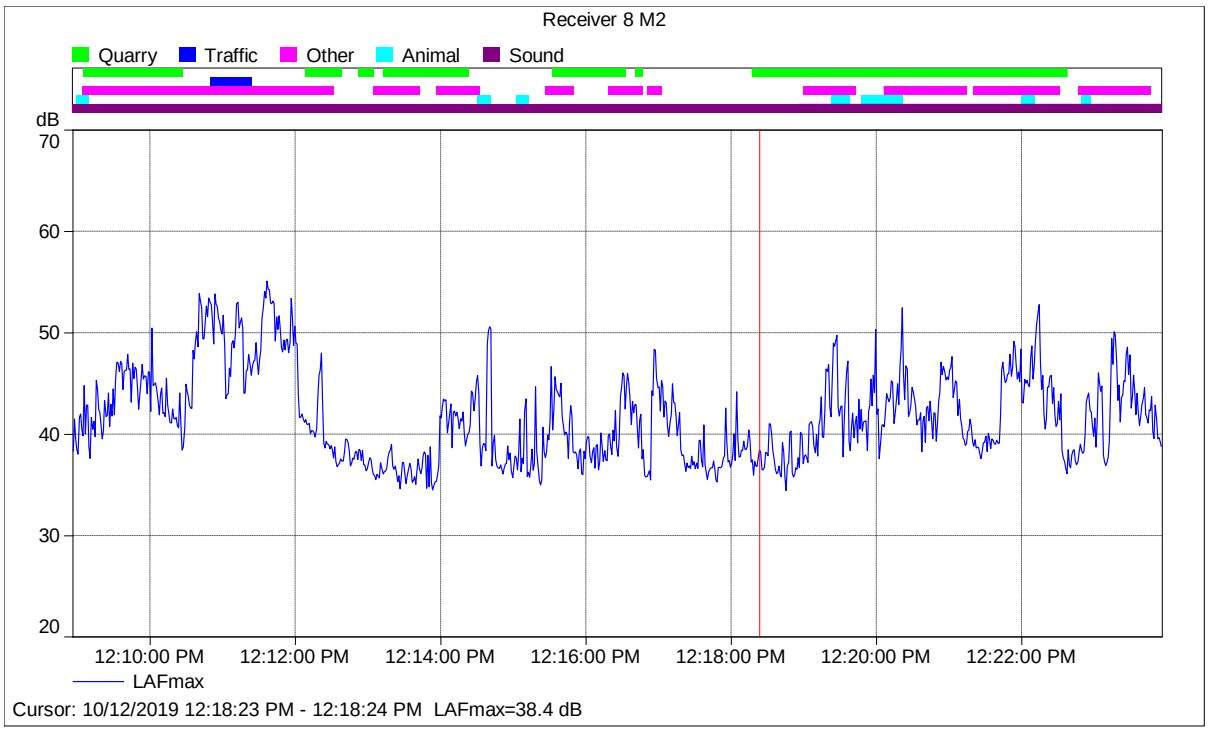
Graph C.6 Measured Noise Levels at Top of Quarry Above Crushing 6/11/2019



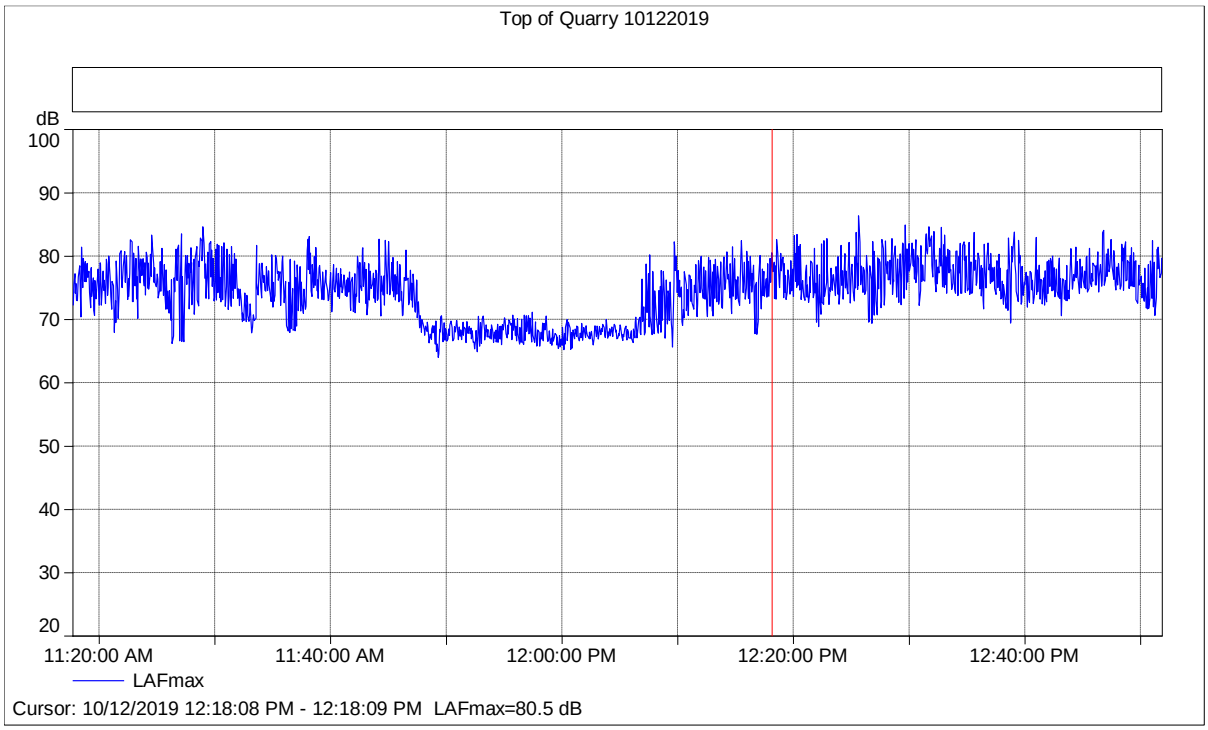
Graph C.7 Receiver 8 M1



Graph C.8 Receiver 8 M2



Graph C.9 Measured Noise Levels at Top of Quarry Above Crushing 10/12/2019



Appendix D
Quarry Operations 6th Nov & 10th Dec 2019

Source – Google Earth – Image Date 13/02/2019
Note : Aerial photo not of operations on 6th of Nov or 10th Dec 2019

Quarry Pit Floor Operations 6th November 2019

Equipment in use during noise monitoring

1 jaw crusher
1 screen deck
1 cone crusher
2 excavators
2 rock breakers
1 powered stockpiler
2 front end loaders
1 water truck
various haul trucks
various service vehicles

The mobile asphalt plant was also operating