

Northsands Resources Quarry 86 (Lot 6) Wesco Rd, Nowergup

Noise Impact Assessment

11 March 2021

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Table of Contents

E	xecuti	ve Summary	i
		roduction	
	1,1	Site Locality & Surrounding Environs	
	1.2	Site Operations	
2		vironmental Criteria	_
3		ise Monitoring Methodology	
4		ise Level Measurements	
	4.1	Boundary Noise Measurements	
	4.2	Logging Results	
	4.3	Predicted Noise Levels at Closest Residences	
_		nclusion	_
A	nnend	lix A	14



Executive Summary

EcoAcoustics Pty Ltd was commissioned by the OHMS Environment to complete a Noise Impact Assessment at Northsands Resources Quarry located at 86 (Lot 6) Wesco Rd, Nowergup. The purpose of this report is to assess the noise associated with existing operations at the site in accordance with the prescribed standards contained in the Environmental Protection (Noise) Regulations 1997.

The results of the noise measurements and the predicted noise levels at nearby noise sensitive premises show that the site complies with the daytime assigned noise levels from the *Environmental Protection (Noise) Regulations 1997*.



1 Introduction

EcoAcoustics Pty Ltd was commissioned by the OHMS Environment to complete a Noise Impact Assessment at Northsands Resources Quarry located at 86 (Lot 6) Wesco Rd, Nowergup. The purpose of this report is to assess the noise associated with existing operations at the site in accordance with the prescribed standards contained in the *Environmental Protection (Noise)* Regulations 1997.

Appendix A provides a glossary of terminology used in this report.

1.1 Site Locality & Surrounding Environs

The site is located at Lot 6 Wesco Rd, Nowergup. The nearest residential premises are located to the west of the site and are identified in *Figure 1.1*. The addresses of the closest premises are as follows:

- > 140 Gibbs Road;
- > 172 Gibbs Road: and
- ➤ 79 Dayrell Road. It is important to note that this house is located within a chicken farm, therefore is classified as a caretakers premises under the Noise Regulations. However, in accordance with the request, this caretakers premises has been considered.

Their distances from the closest crushing or screening area are outlined in *Table 1.1*. It is important to note that the existing quarry is located within an area containing primary production, sand and limestone extraction, wastewater treatment and plantations.



Figure 1.1: Site and Surroundings (source: Intramaps)



Table 1.1 Receiver Distances

Receiver (Refer Figure 1.1)	Closest Pit Boundary/Haul Route (m)		
172 Gibbs Road, R1	394m Pit Boundary 96m Haul Route		
140 Gibbs Road, R2	33om		
79 Dayrell Road, R3	116m Haul Route		

1.2 Site Operations

The site operates Monday to Friday from 7am until 4pm. The method of extraction involves the use of 4 front end loaders and two dozers. The raw material is sorted by 4 screens and then crushed by two crushers and stockpiled on site within the working excavation area. The front-end loaders are then used to process sand and load the trucks. Owing to the limited staff, only two items of plant operate simultaneously.

The material stockpiles are located at different locations within the excavation area as extraction occurs for each stage. Excavated material is stockpiled within 20 metres of the screen. Trucks enter the site and loader and loaded from the stockpiles.

The material stockpiles vary but comprise the following as a maximum within the excavation site:

- ➤ Area of sand material/stockpile up to 30m long x 30m wide
- the height of the material topsoil to be up to 6m which achieve a height of approximately 1.5m to 3m above the highest item of plant equipment
- ➤ Volume of sand stockpile 4,000m³ to 6,000m³

The operations comprise the following machinery being used on site:

- > 12 and 25 Tonne trucks used to cart sand off site
- ➤ Komatsu WA 500 Loader
- Caterpillar 972H Loader
- 2 Kawasaki Loaders
- Komatsu 475 Dozer
- ➤ Caterpillar D11 Dozer
- > 2 Terex Finlay 883 Screens
- 2 McCluskey/Kleeman Sigo Screens
- 2 Terex Finlay J-1175 Jaw Crushers



The screening plant and crusher are located on-site and used on an as needs basis which usually comprise up to four times per year for 2 weekly intervals each time up to a maximum of 8 weeks per year. During screening and crushing, the loaders load the crusher, the material is crushed and moved through to the screening plant and a loader is used to create the stockpiles. During this time, no other machines operate on the site.

The number of truck movements is highly dependent on demand for sand. The extraction site operates, subject to weather conditions, generally up to ten truck vehicle movements per day during the winter months (May to September) and 10 to 40 truck movements (entering and exiting) per day during the summer months (October to April). This equates to between one and the upper limit of 20 trucks per day. It is unlikely that there are than more than 2 trucks on site at any one time. Trucks on site waiting do so with engines off to conserve fuel.

All access and egress from the site is via a driveway located approximately to the north of the site on Lot 6 Wesco Rd, Nowergup. The road is constructed from gravel.

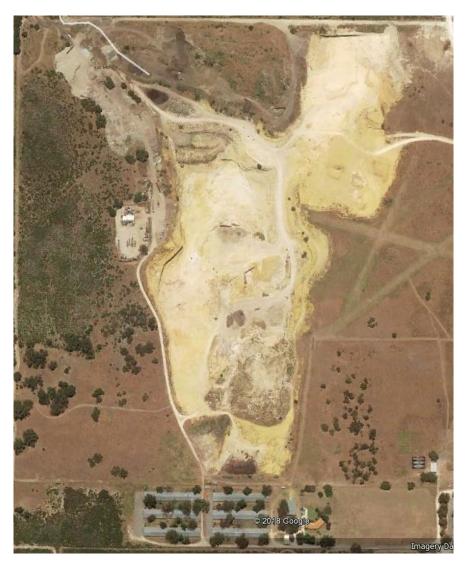


Figure 2.1: Site Layout (source: Google Earth)



2 Environmental Criteria

In Western Australia all Environmental noise is regulated by the *Environmental Protection Act 1986* and the *Environmental Protection (Noise) Regulations 1997*. Noise emissions from the quarry are required to satisfy the assigned noise levels specified in Regulations 7, 8 and 9.

The standard stipulated in Regulation 7 of the Environmental Protection (Noise) Regulations 1997 states:

- 7. (1) Noise emitted from any premises or public place when received at other premises
 - a) Must not cause or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind; and
 - *b) Must be free of*
 - Tonality;
 - o Impulsiveness; and
 - o Modulation.

Regulation 9 defines tonality, impulsiveness and modulation. It is regarded that noise is free of these characteristics if:

- a) Tonality, impulsiveness and modulation cannot be equitably removed by means other than decreasing the overall level of noise emission; and
- b) Subsequent to any adjustments as displayed in *Table 3.1* noise emissions remain compliant with the required standards when measured at the point of reception.

Table 3.1 Adjustments for Intrusive Characteristics

Tonality	Modulation Impulsiveness	
+ 5dB	+ 5dB	+ 10dB

The baseline assigned levels (prescribed standards) are specified in Regulation 8 and are shown below in *Table 3.2*.



Table 3.2 Baseline Assigned Noise Levels

Premises Receiving	Time Of Day	Assigned Level (dB)		
Noise		L_{A10}	L_{Ai}	L _{Amax}
	0700 to 1900 hours Monday to Saturday (Day)	45 + influencing factor	55 + influencing factor	65 + influencing factor
All nearby residential premises	0900 to 1900 hours Sunday and public holidays (Sunday)	40 + influencing factor	50 + influencing factor	65 + influencing factor
including highly sensitive areas ¹	1900 to 2200 hours all days (Evening)	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	35 + influencing factor	45 + influencing factor	55 + influencing factor
Commercial All hours		60	75	80
Industrial All hours		65	80	90

- . Highly sensitive area means that area (if any) of a noise sensitive premises comprising
 - a. A building, or a part of a building on the premises that is used for a noise sensitive purpose; and
 - b. Any other part of the premises within 15 metres of that building or that part of the building.

The nearby residences are located on land zoned Rural Resource. *Figure 3.1* shows the extent of the 100m and 450m radius circles used to calculate the influencing factor associated with each of the three noise sensitive premises noted in *Section 1.1*.

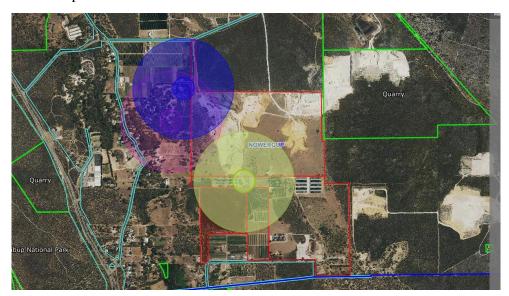


Figure 3.1: Influencing Factor Circles (source: Intramaps)



Based on the locations of the three premises, the following influencing factors have been determined:

- ➤ R1 172 Gibbs Road, IF 2
- R2 140 Gibbs Road, IF 2
- R3 79 Dayrell Road, IF 14

Table 3.3 shows the daytime assigned noise levels at each location with the inclusion of the influencing factor. As discussed in Section 2, that the site operates during the daytime only.

Table 3.3: Daytime Assigned Noise Levels

Premises Receiving Noise	Daytime Assigned Level (dB)			
(at highly sensitive area) ¹	$L_{ m A10}$	L_{A_1}	$L_{ m Amax}$	
R1	47	57	67	
R2	47	57	67	
R ₃	59	69	79	

- 2. Highly sensitive area means that area (if any) of a noise sensitive premises comprising
 - a. A building, or a part of a building on the premises that is used for a noise sensitive purpose; and
 - b. Any other part of the premises within 15 metres of that building or that part of the building.



3 Noise Monitoring Methodology

The Regulations specify certain requirements when conducting noise measurements. These requirements are defined in Regulations 19, 20, 22 and 23 and Schedule 4. Site noise measurements have satisfied these requirements, with the following detailed:

- ➤ Measurements were completed on the site using a Type 1 Sound Level Meter, Norsonic 140 (S/N 1405472);
- External logging was completed using a Rion NL-21 Sound Level Meter (S/N:00409175)
- ➤ Both sound level meters hold current laboratory certificate of calibration, available upon request;
- ➤ The microphone was fitted with a standard wind screen;
- During the measurements, the microphone was at least 1.3 metres above the ground level and at least 3 metres from reflecting facades (other than the ground plane); as such no adjustments have been applied for reflected noise;

Noise level measurements were completed at the site on 25th November 2019 Meteorological conditions at the time, recorded at the Bureau of Meteorology's site, were:

25th November 2019

➤ Temperature: 29°C

➤ Relative Humidity: 15%

➤ Wind Speed: 17 km/h (4.72 m/s)

➤ Wind Direction: E



4 Noise Level Measurements

4.1 Boundary Noise Measurements

Noise level measurements were completed at various locations along the boundary of the site to determine the noise emissions. *Figure 5.1* shows the locations of the measurements. The results of the measurements are presented in *Table 5.1*. The boundary noise measurements include all existing site operations (except crushing and screening), trucks, loaders and dozers traversing the site.



Figure 5.1: Boundary Measurement Locations

Table 5.1 Summary of Boundary Measurements

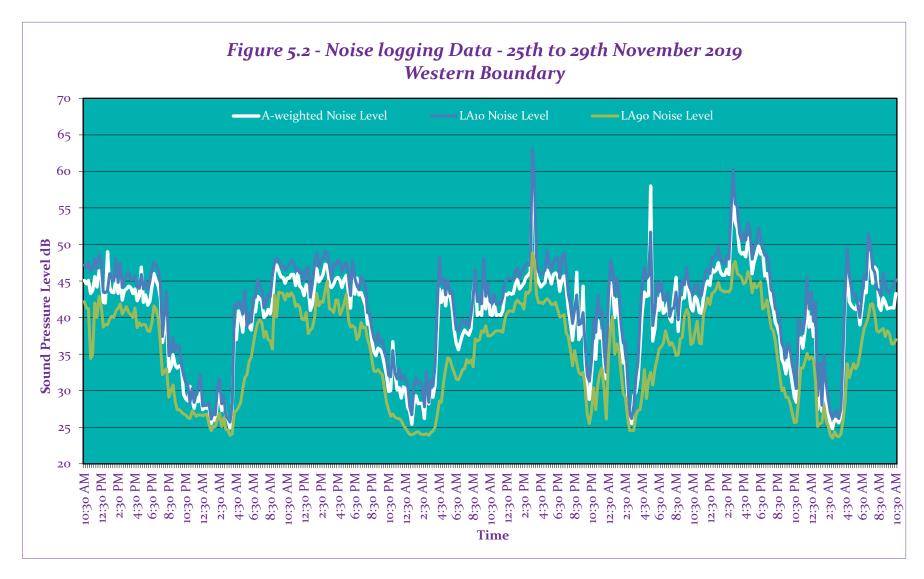
Location (ref Figure 5.1)	Noise Level, dB(A)		
Location (lef Figure 5.1)	$ m L_{A1o}$	$ m L_{Amax}$	
South Boundary	36 to 45	40 to 62	
East Boundary	38 to 45	44 to 62	
West Boundary	37 to 44	43 to 61	



4.2 Logging Results

Noise logging was completed from 25th to 29th November 2019, to determine the noise emissions from the site onto the nearby residential area. The noise logger was located on the western boundary as shown in *Figure 5.1*. The results of the noise level measurements are presented in *Figure 5.3*. Observations taken during the installation and the collection of the noise logger noted that the site was audible at the boundary location.







4.3 Predicted Noise Levels at Closest Residences

Noise levels taken at the site boundary have been extrapolated to the closest residential premises to the southwest and northeast of the site to determine compliance, or otherwise with the Regulatory levels. The predicted noise levels associated with trucks entering and leaving the site on the main haul route has been based on 8 trucks per hour. This represents the likely busiest hour during the daytime period, based on the maximum of 40 vehicle movements per day (discussed in *Section 1.2*).

The extrapolations include distance attenuation, building attenuation and barrier effects, and have been completed using standard acoustical theories. Based on the measurements taken from the site boundary, the appropriate parameter is the L_{A10} as this includes all of the constant noise sources operating within the site (including dozers, loaders and trucks). The predicted noise levels are shown below in *Table 5.3*. Owing to the distance from the site to the residences, it is unlikely that tonal characteristics will be applicable, however, *Table 5.3* shows the penalty adjusted predictions and compares these to the assigned noise levels. Note that the main entry and exit haul route is located at a significant distance from R₃, therefore the noise levels will be significantly lower than at R₁ and R₂. The main noise source at the R₃ location is from the pit operations.

Table 5:3 Predicted Noise Levels at Residences

Location (ref Figure 5.1)	Predicted Noise Level ${ m L}_{{ m A10}},{ m dB(A)}$	$\begin{array}{c} \text{Predicted Noise Level} \\ \text{L_{A10}, $dB(A)$} \\ \text{With Tonality Included} \end{array}$	Assigned Noise Level L _{A10} , dB(A)	Complies with Assigned Noise Level
Residence R1	41 (Haul Route) 39 (Pit)	46 (Haul Route) 44 (Pit)	47 (Day)	Complies
Residence R2	38 (Haul Route) 40 (Pit)	43 (Haul Route) 45 (Pit)	47 (Day)	Complies
Residence R3 (caretaker)	45 (Pit)	50 (Pit)	59 (Day)	Complies

The results show that the site complies at daytime assigned noise level period at the closest residential premises. It follows that all other premises located further from the site will similarly comply with the daytime assigned noise level.

Ref: 19110781-01a Page 12 of 19



5 Conclusion

The results of the noise measurements and the predicted noise levels at nearby noise sensitive premises show that the site complies with the daytime assigned noise levels from the *Environmental Protection (Noise) Regulations 1997*.



Appendix A

Terminology



Terminology

Ambient Noise

Ambient noise refers to the level of noise from all sources, including background noise as well as the source of interest.

A-Weighting

An A-weighted noise level is a noise level that has been filtered as to represent the way in which the human ear distinguishes sound. This weighting indicates the human ear is more sensitive to higher frequencies than lower frequencies. The A-weighted sound level is described as L_A dB.

Background Noise

Background noise is the noise level from sources other than the source of interest. Background may originate from such things as traffic noise, wind induced noise, industrial noise etc.

Decibel (dB)

The decibel is the unit that characterises the sound power levels and sound pressure of a noise source. It is a logarithmic scale with regard to the threshold of hearing.

Impulsive Noise

An impulsive noise source is a short-term impact noise which may originate from such things as banging, clunking or explosive sound.

Influencing factor

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=1/10 (% Type A_{100} + % Type A_{450}) + 1/20(% Type B_{100} + % Type B_{450})
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Where:

% Type A_{100} = The percentage of industrial land within a 100m radius of the premises receiving noise

% Type A_{450} = The percentage of industrial land within a 450m radius of the premises receiving noise

% Type B₁₀₀ = The percentage of commercial land within a 100m radius of the premises receiving noise

% Type B_{450} = The percentage of commercial land within a 450m radius of the premises receiving noise

- + Traffic factor (maximum 6 dB)
- = 2 for each secondary road within 100m
- = 2 for each major road within 450m
- = 6 for each major road within 450m



 L_{A_1}

An L_{A_1} level is the A-weighted noise level which is overreached for one percent of a measurement period. It represents the average of the maximum noise levels measured.

 L_{A_1} assigned level

An assigned L_{A1} level which is not to be exceeded for more than 1% of a delegated assessment period.

L_{A10} assigned level

An assigned L_{A10} level which is not to be exceeded for more than 10% of a delegated assessment period.

 $L_{A_{10}}$

An L_{A10} level is the A-weighted noise level which is exceeded for 10 percent of the measurement period and is considered to represent the "*intrusive*" noise level.

 L_{Ago}

An L_{A90} level is the A-weighted noise level which is overreached for 90 percent of the measurement period. It is represents the "background" noise level.

 L_{Aeq}

L_{Aeq} refers to the comparable steady state of an A-weighted sound which, over a specified time period, contains the same acoustic energy as the time-varying level during the specified time period. It represents the "average" noise level.

 L_{AFast}

The noise level in decibels, obtained using the A frequency weighting and the F time weighting as specified in AS1259.1-1990. LAFast is used when examining the presence of modulation.

 L_{Amax}

The L_{AMax} level is the maximum A-weighted noise level throughout a specified measurement.

L_{Amax} assigned level

The L_{Amax} assigned level describes a level which is not to be exceeded at any time.

 L_{APeak}

The L_{APeak} level is the maximum reading (measured in decibels) during a measurement period, using the A frequency weighting and P time weighting AS1259.1-1990.

Ref: 19110781-01a Page 16 of 19



LASlow

A L_{ASlow} level is the noise level (measured in decibels) obtained using the A frequency weighting and S time weighting as specified in AS1259.1-1990

Major Road

A Major road has an estimated average daily traffic count of more than 15,000 vehicles.

Maximum Design Sound Level

Maximum Design Sound Level is the level of noise beyond hearing range of most people occupying the space start, become dissatisfied with the level of noise.

Modulating Noise

A modulating source is an audible, cyclic and regular source. It is present for at least 10% of a measurement period. The quantitative definition of tonality is:

a fluctuation in the discharge of noise which;

- a) is more than 3 dB L_{A Fast} or is more than 3 dB L_{A Fast} in any one-third octave band;
- b) is present for at least 10% of the representative

One-Third-Octave Band

One-Third-Octave-Band are frequencies that span one-third of an octave which have a centre frequency between 25 Hz and 20 000 Hz inclusive.

Representative Assessment Period

Representative Assessment Period describes a period of time not less than 15 minutes, and not surpassing four hours. It is determined by an inspector or authorised person to be suitable for the assessment of noise emissions.

Reverberation Time

Reverberation time refers to an enclosure for a sound of a specified frequency or frequency band as well as the time that would be necessary for the reverberantly decaying sound pressure level in the enclosure to decrease by 60 decibels.

RMS

The root mean square level is used to represent the average level of a wave form such as vibration.

Satisfactory Design Sound Level

Satisfactory Design Sound Level refers to the level of noise that has been found to be acceptable for the environment in question, which is also to be non-intrusive.

Ref: 19110781-01a Page 17 of 19



Secondary / Minor Road

A Secondary / Minor road has an estimated average daily traffic count of between 6,000 and 15,000 vehicles.

Sound Pressure Level (L_p)

Sound Pressure Level refers to a noise source which is dependent upon surroundings, and is influenced by meteorological conditions, topography, ground absorption; distance etc. Sound Pressure Level is what the human ear actually hears. Noise modelling predicts the sound pressure level from the sound power levels whilst taking into account the effect of relevant factors (meteorological conditions, topography, ground absorption; distance etc).

Sound Power Level (L_w)

A sound power level of a noise source cannot be directly measured using a sound level meter. It is calculated based on measured sound pressure levels at recognised distances. Noise modelling includes source sound power levels as part of the input data.

Specific Noise

Specific Noise relates to the component of the ambient noise of interest. It can be specified as the noise of interest or the noise of concern.

Tonal Noise

A tonal noise source can be designated as a source that has a specific noise emission over one or several frequencies, such as droning. The quantitative definition of tonality is:

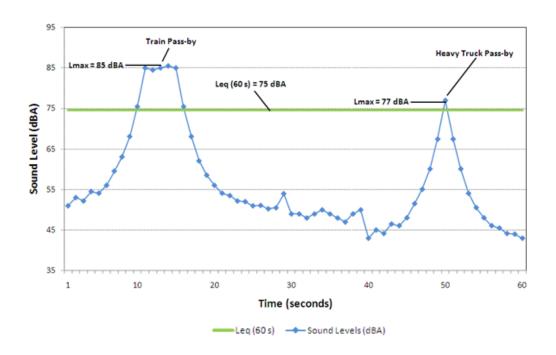
the presence in the noise emission of tonal characteristics where the difference between —

- a) the A-weighted sound pressure level in any one-third octave band; and
- b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands, is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels.

Ref: 19110781-01a Page 18 of 19



Chart of Noise Level Descriptors



Typical Noise Levels

