

Noise Monitoring Assessment

Wallerawang Quarry
August 2021

Prepared for: Walker Quarries Pty Ltd
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Document Information

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Prepared for: Walker Quarries Pty Ltd



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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Walker Quarries Pty Ltd to complete a bi-annual Noise Monitoring Assessment (NMA) for Wallerawang Quarry ('the quarry'). This assessment has been undertaken as the second bi-annual assessment for 2021.

The NMA involved quantifying the noise contribution of the quarry by direct attended measurements to compare quarry emissions against relevant criteria. Monitoring has been conducted at four representative receiver locations in accordance with the Walker Quarry Noise Management Plan (NMP) and the quarry's Environmental Protection License (ref: 13172). An additional measurement at a nearfield reference location was also conducted to verify the operation of quarry plant and to quantify the noise contribution from site.

The assessment has been conducted in accordance or with reference to the following documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- Environment Protection Licence EPL 13172 (EPL);
- Development Consent 344-1-2001 (Mod 3), February 2020;
- Australian Standard AS 1055:2018 - Acoustics - Description and measurement of environmental noise - General Procedures;
- Muller Acoustic Consulting Pty Ltd (MAC), Noise and Vibration Impact Assessment (NVIA), 2019; and
- Umwelt, Wallerawang Quarry Noise Management Plan (NMP), 2019.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

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2 Noise Criteria

2.1 Environmental Protection License Noise Limits

Table 1 reproduces the noise criteria for the quarry as per Condition L4.1 of EPL 13172.

Table 1 EPL Noise Limits, dBA			
Location	Day	Evening	Night
	LAeq(15min)	LAeq(15min)	LAeq(15min)
All privately owned residences	43	43	39

Note: Day Period is 7am to 6pm, Evening Period is 6pm to 10pm, Night Period is 10pm to 7am.

It is noted that Condition L4.3 of EPL 13172 identifies conditions under which the noise criteria do not apply and include:

- a) Wind speeds greater than 3m/s at 10m above ground level;
- b) Temperature inversion conditions greater than 3 degrees Celsius / 100m; or
- c) Under “non-significant weather conditions”.

2.2 Development Consent Noise Limits

Schedule 3 of the site’s Development Consent (DA344-11-2001) outlines applicable noise criteria for the operation of the quarry. **Table 2** reproduces the criteria as outlined in the development consent.

Table 2 Development Consent Noise Limits, dBA			
Location	Day	Evening	Night
	LAeq(15min)	LAeq(15min)	LAeq(15min)
All privately owned residences	43	43	35

Additionally, Condition 3B of Schedule 3 of the Development Consent states, ‘*The noise criteria in Table 2 do not apply if the Applicant has an agreement with the owner/s of the relevant residence or land to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.*’

2.3 Variance in noise limits

It is noted that the night-time criteria presented in the Development Consent differs from that outlined in the EPL. This is due to the consent being updated to reflect the recent modification for site. Hence, the more conservative criteria outlined in the consent have been adopted for this assessment. Notwithstanding, as the quarry is not operational during the night period, the variance in the applicable noise criteria is inconsequential.

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3 Methodology

3.1 Locality

Wallerawang is located approximately 10km to the north west of Lithgow, NSW. Receivers in the locality surrounding the quarry are primarily rural/residential and for consistency the naming conventions for each receiver has been retained from the NMP. It is noted that N4 has been added to the assessment, although has not been retained from the NMP. The monitoring locations with respect to the quarry are presented in **Table 3** and graphically in the locality plan shown in **Figure 1**.

Table 3 Receiver Locations

ID	Address	Distance to Quarry Boundary
RL1	Reference Location (adjacent to site office)	N/A
N1	139 Gemalong, Marrangaroo, NSW	1200m
N2	987 Great Western Highway, Marrangaroo, NSW	400m
N3	2 Cypress Close, Wallerawang, NSW	550m
N4	42 Rocky Waterhole Drive, Wallerawang, NSW	980m

3.2 Environmental Noise Assessment Methodology

The attended noise surveys were conducted in general accordance with the procedures described in Australian Standard AS 1055:2018, "Acoustics - Description and Measurement of Environmental Noise", the EPL and NMP. The measurements were carried out using a Svantek Type 1, 971 noise analyser on Wednesday 18 August 2021. The acoustic instrumentation used carries current NATA calibration and complies with AS IEC 61672-2019-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed $\pm 0.5\text{dBA}$.

Two daytime measurements of 15-minutes in duration were completed at each monitoring location during standard onsite operations. Where possible, throughout each survey the operator quantified the contribution of each significant noise source. Extraneous noise sources were excluded from the analysis to calculate the $L_{Aeq}(15\text{min})$ quarry noise contribution for comparison against the relevant EPL limits.

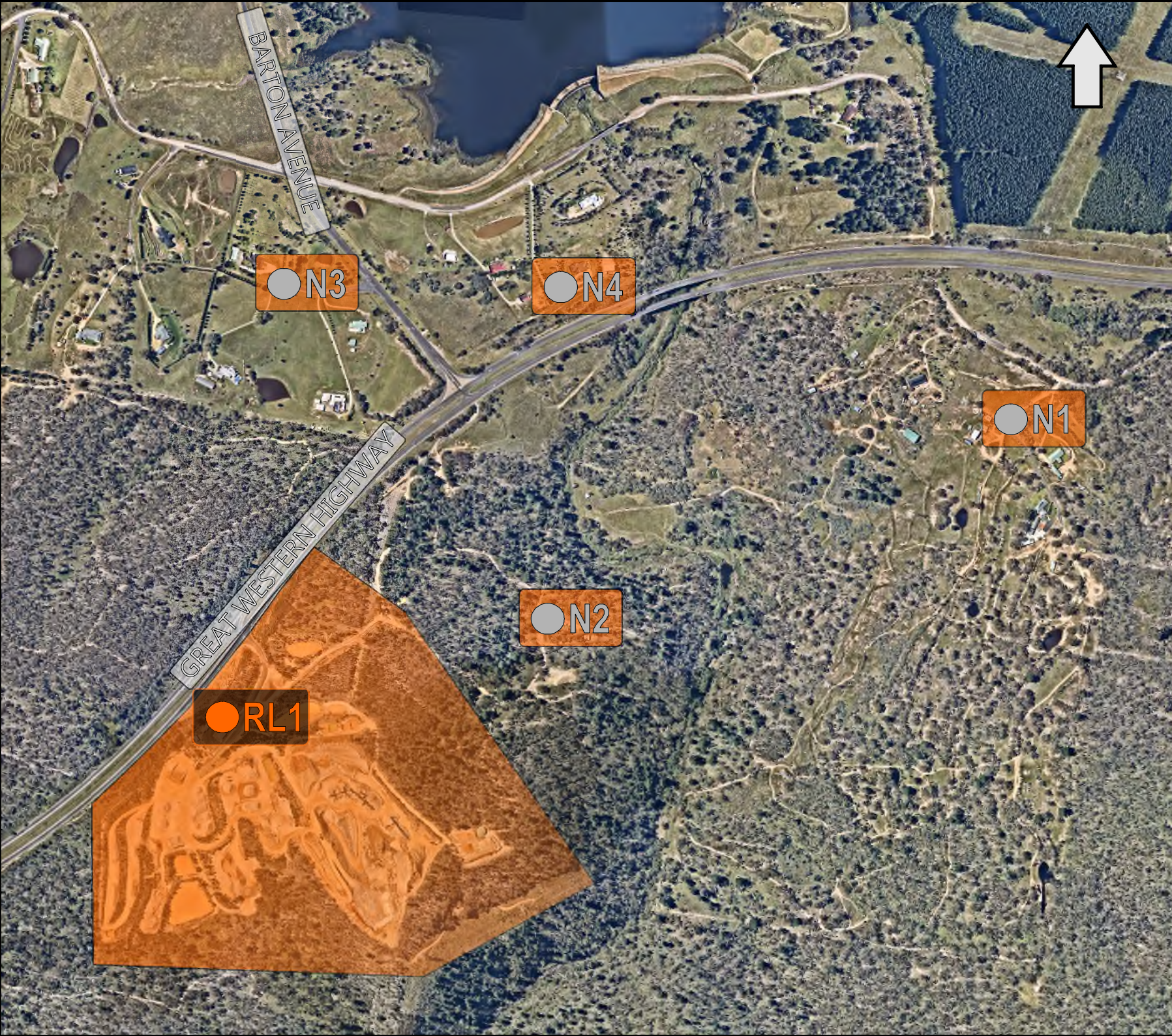





FIGURE 1
LOCALITY PLAN
REF: MAC160392



KEY	
 N1	RECEIVER/MONITORING LOCATION
 RL1	REFERENCE LOCATION
	SITE LOCATION



4 Results

4.1 Assessment Results – Onsite Reference Location (RL1)

Operational attended noise monitoring was completed at RL1 on Wednesday 18 August 2021. **Table 4** presents the monitored noise level contributions and observed meteorological conditions for each measurement.

Table 4 Operator-Attended Noise Survey Results – Reference Location 1 (RL1)							
Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit ¹	Meteorology	Comments
		L _{Amax}	L _{Aeq}	L _{A90}			
18/08/2021	08:25	69	65	64	N/A	WS: 0.1m/s	Birds 63-66
						WD: SW	Quarry Trucks 63-69
						Rain: Nil	Quarry Generator 63-66
Quarry Site L _{Aeq} (15min) Contribution							62
18/08/2021	10:08	69	64	62	N/A	WS: 0.1m/s	Quarry Trucks 61-69
						WD: SW	Quarry Generator 62-64
						Rain: Nil	
Quarry Site L _{Aeq} (15min) Contribution							62

Note 1: EPL not applicable for this onsite reference location.

4.2 Assessment Results – Location N1

Operational attended noise monitoring was completed at N1 on Wednesday 18 August 2021. **Table 5** presents the monitored noise level contributions and observed meteorological conditions for each measurement.

Table 5 Operator-Attended Noise Survey Results – Location N1							
Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology	Comments
		L _{Amax}	L _{Aeq}	L _{A90}			
18/08/2021	07:38	63	52	49	43	WS: 0.2m/s	Traffic 45-63
						WD: SW	Birds 45-57
						Rain: Nil	Quarry Inaudible
Quarry Site L _{Aeq} (15min) Contribution							<43
18/08/2021	09:27	67	49	43	43	WS: 0.2m/s	Traffic 41-67
						WD: SW	Birds 41-52
						Rain: Nil	Quarry Inaudible
Quarry Site L _{Aeq} (15min) Contribution							<43

Note 1: Quarry Site L_{Aeq}(15min) calculated based on nearfield measurements.

4.3 Assessment Results – Location N2

Operational attended noise monitoring was completed at N2 on Wednesday 18 August 2021. **Table 6** presents the monitored noise level contributions and observed meteorological conditions for each measurement.

Table 6 Operator-Attended Noise Survey Results – Location N2							
Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology	Comments
		L _{Amax}	L _{Aeq}	L _{A90}			
18/08/2021	08:05	59	50	48	43	WS: 0.1m/s	Traffic 48-59
						WD: SW	Birds 48-59
						Rain: Nil	Quarry Inaudible
Quarry Site L _{Aeq} (15min) Contribution							<43
18/08/2021	09:49	61	47	44	43	WS: 0.1m/s	Traffic 41-56
						WD: SW	Birds 41-61
						Rain: Nil	Quarry Inaudible
Quarry Site L _{Aeq} (15min) Contribution							<43

Note 1: Quarry Site L_{Aeq}(15min) calculated based on nearfield measurements.

4.4 Assessment Results – Location N3

Operational attended noise monitoring was completed at N3 on Wednesday 18 August 2021. **Table 7** presents the monitored noise level contributions and observed meteorological conditions for each measurement.

Table 7 Operator-Attended Noise Survey Results – Location N3							
Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology	Comments
		L _{Amax}	L _{Aeq}	L _{A90}			
18/08/2021	08:45	62	48	42	43	WS: 0.2m/s	Traffic 42-62
						WD: SW	Birds 42-54
						Rain: Nil	Quarry Inaudible
Quarry Site L _{Aeq} (15min) Contribution							<43
18/08/2021	10:30	65	50	38	43	WS: 0.8m/s	Traffic 35-65
						WD: SW	Birds 35-52
						Rain: Nil	Quarry Inaudible
Quarry Site L _{Aeq} (15min) Contribution							<43

Note 1: Quarry Site L_{Aeq}(15min) calculated based on nearfield measurements.

4.5 Assessment Results – Location N4

Operational attended noise monitoring was completed at N4 on Wednesday 18 August 2021. **Table 8** presents the monitored noise level contributions and observed meteorological conditions for each measurement.

Table 8 Operator-Attended Noise Survey Results – Location N4							
Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology	Comments
		L _{Amax}	L _{Aeq}	L _{A90}			
18/08/2021	09:05	67	54	50	43	WS: 0.2m/s	Traffic 48-67
						WD: SW	Birds 48-64
						Rain: Nil	Quarry Inaudible
						Quarry Site L _{Aeq} (15min) Contribution	
18/08/2021	10:48	65	47	41	43	WS: 1.2m/s	Traffic 38-62
						WD: SW	Birds 38-65
						Rain: Nil	Local residential noise <38
						Quarry Site L _{Aeq} (15min) Contribution	

Note 1: Quarry Site L_{Aeq}(15min) calculated based on nearfield measurements.

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5 Discussion

5.1 Discussion of Results – Reference Location (RL1)

Noise measurements conducted on Wednesday 18 August 2021 when Wallerawang Quarry was operating at normal production levels, which included use of crusher train, mobile screen, excavator, road trucks and water cart.

The noise contribution from the quarry at the reference location was 62dB LAeq(15min) for both measurements. The noise environment at the reference location was primarily dominated by a nearby generator and onsite traffic.

To verify the offsite noise levels, calculations were undertaken to estimate the attenuation from the site to each monitoring location. The attenuation calculations incorporated loss due to distance, and conservative topography (ie barrier attenuation) and air absorption losses. The results of the attenuation calculations identified received noise level and the results of the attended surveys are discussed for each monitoring location in **Section 5.2** to **Section 5.4**.

5.2 Discussion of Results – Location N1

Measurements conducted on Wednesday 18 August 2021 identified that Wallerawang Quarry noise was inaudible during both measurements conducted, and therefore satisfied the relevant noise limits of 43dB LAeq(15min). Extraneous non-quarry related sources included highway traffic and birds, that were significant contributors to the ambient noise environment.

The calculated attenuation between the quarry site and N1, considering distance loss, the surrounding topography and air absorption, was 76dB. Based on the site Lw established from the near field measurements, the resulting received quarry contribution at N1 is <41dBA. This level is significantly lower than the ambient dominant sources which generally masks site noise and confirms the quarry was audible as a background noise source at this location for both measurements conducted.

5.3 Discussion of Results – Location N2

Measurements conducted on Wednesday 18 August 2021 identified that Wallerawang Quarry noise was inaudible during both measurements conducted at N2, and therefore satisfied the relevant noise limits of 43dB LAeq(15min). Extraneous non-quarry related sources included highway traffic and birds, that were significant contributors to the ambient noise environment.

The attenuation between the quarry site and N2 taking into account distance between the locations, the loss due to surrounding topography (ie ground attenuation) and air absorption is 66dB. Based on the current site sound power level established from the near field measurements of the screening/crushing plant, the resulting received quarry contribution at N2 is 51dBA. This estimated noise level is generally higher than the measured noise contribution from the attended monitoring. This may be attributed to underestimating the barrier effect of topography between the monitoring location and the current location of the crushing plant.

5.4 Discussion of Results – Location N3

Measurements conducted on Wednesday 18 August 2021 for N3 were dominated by local and highway traffic which masked quarry noise. Quarry operations were inaudible during all measurements at this location, notwithstanding quarry contributions remained below the relevant criteria of 43dB LAeq(15min) for both measurements conducted at the location.

The total attenuation due to distance, air absorption and surrounding topography for N3 was estimated to be 73dB. This resulted in an estimated site noise contribution of <44dBA which is consistent with the measured noise contribution from the attended monitoring.

5.5 Discussion of Results – Location N4

Measurements conducted on Wednesday 18 August 2021 for N4 were dominated by local and highway traffic which masked quarry noise. Quarry operations were inaudible during all measurements at this location, notwithstanding quarry contributions remained below the relevant criteria of 43dB LAeq(15min) for both measurements conducted at the location.

The total attenuation due to distance, air absorption and surrounding topography for N4 was estimated to be 72dB. This resulted in an estimated site noise contribution of <45dBA which is consistent with the measured noise contribution from the attended monitoring.

6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment on behalf of Walker Quarries Pty Ltd. The assessment was completed to assess Wallerawang Quarry noise emissions against relevant criteria presented in EPL 13172 and DA 344-11-2001.

Quarry noise remained inaudible at all residential locations conducted on Wednesday 18 August 2021, which satisfies the specified noise limits in the Noise Management Plan and Environmental Protection Licence. These monitoring locations were dominated by extraneous sources that predominantly masked quarry operations.

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Appendix A – Glossary of Terms

Several technical terms have been used in this report and are explained in **Table A1**.

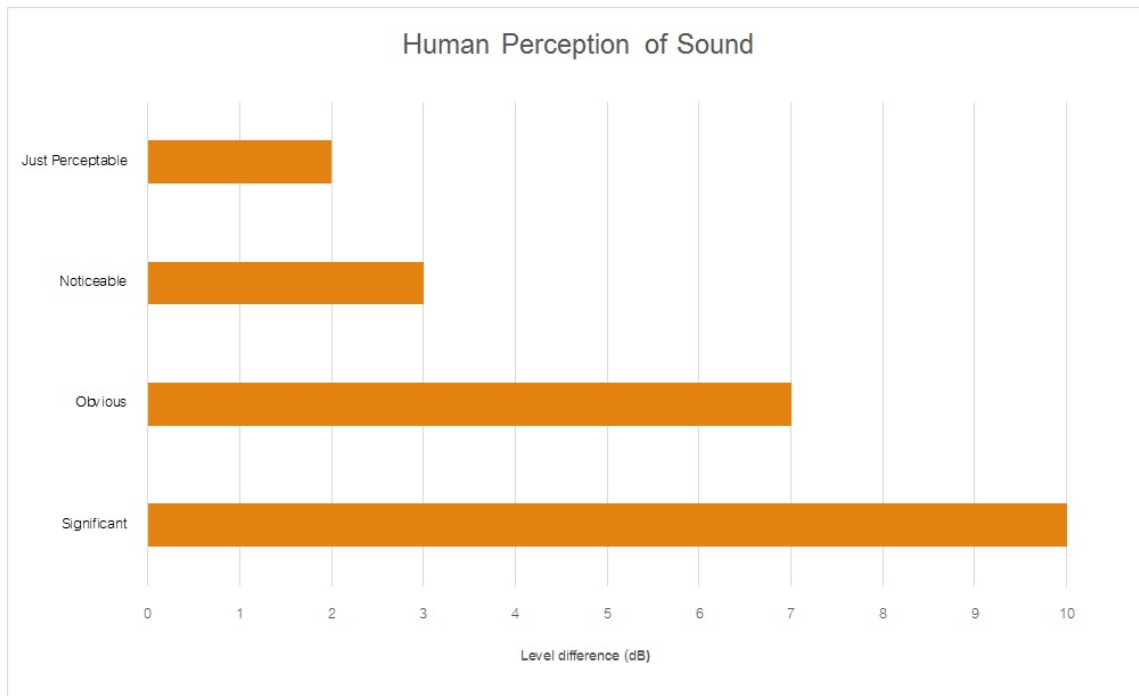
Table A1 Glossary of Terms	
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L90 statistical noise levels.
Ambient Noise	The noise associated with a given environment. Typically, a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAmx	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (SWL)	<p>This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by :</p> $= 10 \cdot \log_{10} (W/W_0)$ <p>Where : W is the sound power in watts and W₀ is the sound reference power at 10-12 watts.</p>

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA

Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



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Appendix B – Correspondence Register

Table B1 Correspondence Register

Date	Contact Between	Phone/Email	Comment
Monday 2 August 2021	R Heaton, A Irwin	Phone Call	Initial contact to schedule environmental compliance survey and sound power audit in August 2021.
Monday 2 August 2021	R Heaton, A Irwin	Email	Email to discuss new site manager and additional monitoring location confirm go ahead for survey.
Tuesday 10 August 2021	A Irwin, W Chapman and R Heaton	Email	Email confirming monitoring schedule
Monday 16 August 2021	W Chapman and R Heaton	Phone Call	Call to confirm access to all monitoring location including additional location
Wednesday 18 August 2021	N Shipman	Onsite meeting	Meeting prior to survey to confirm operations for the day, survey completed.

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