Monthly Noise Monitoring Assessment

Tomingley Gold Mine, June 2016

Prepared for : Tomingley Gold Operations Pty Limited

July 2016

MAC
Muller Acoustic Consulting

Document Information

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Tomingley Gold Operations Pty Ltd (TGO) to complete a Noise Monitoring Assessment (NMA) for Tomingley Gold Mine ('the mine').

The monitoring assessment involved quantifying the noise contribution of the mine by direct attended measurements to determine mining noise emission data on a monthly basis so that effective management and controls can be implemented to minimise levels within the surrounding community. The monitoring has been conducted in accordance with the TGO Noise Management Plan and in general accordance with Conditions L4.2 to L4.7 of the EPL at six representative receiver locations. It is noted that this assessment has not been completed as part of the annual noise monitoring program to address conditions of the Environmental Protection License (EPL).

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

- NSW Environment Protection Authority (EPA), Industrial Noise Policy (INP), 2000;
- Environment Protection Licence EPL 20169 (EPL); and
- Standards Australia AS 1055.1:1997 - Acoustics - Description and measurement of environmental noise - General Procedures.

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

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2 Environmental Protection License Noise Limits

Historic assessments for the mine categorise receivers into Noise Assessment Groups (NAGs). The NAGs were derived based on ambient noise data that controlled receiver RBLs.

Table 1 reproduces the noise limits for assessed receivers referenced from the EPL that have been adopted for this NMA and are consistent with historic EPL monitoring locations.

Table 1 Noise Limits, dBA

Noise Assessment Group	Receivers	Day	Evening	Night	
		LAeq(15-min)	LAeq(15-min)	LAeq(15-min)	LA1(1-min)
NAG A	R1, R6	36	36	36	45
	R5	37	37	37	45
	R4	35	35	35	45
NAG B	R2	36	36	36	45
NAG C	R3	49	38	38	45
	R29	48	37	37	45
NAG D	R23	43	38	38	46

Note : Refer to figure in Appendix 4 of Project Approval 09-0155 for noise locations. However, these criteria do not apply if the Proponent has an agreement with the relevant owner(s) of these residences / land to generate higher noise levels, and the Proponent has advised the Department of Planning and Infrastructure and EPA in writing of the terms of this agreement.

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3 Methodology

3.1 Locality

TGO is located to the south of the village of Tomingley NSW. Receivers in the locality surrounding the mine are primarily rural/residential and for consistency the naming conventions for each receiver has been retained from historic noise assessments. The monitoring location with respect to the mine is presented in the locality plan shown in **Figure 1**.

3.2 Assessment Methodology

The attended noise survey was conducted in general accordance with the procedures described in Australian Standard AS 1055-1997, "Acoustics - Description and Measurement of Environmental Noise" and the EPL. The measurements were carried out using Svantek Type 1, 971 noise analyser from Monday 27 June 2016 to Wednesday 29 June 2016. The acoustic instrumentation used carries current NATA calibration and complies with AS IEC 61672.1-2004-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5dBA.

Both evening and night measurements were of 15 minutes in duration at each location over three consecutive dates. Where possible, throughout each survey the operator quantified the contribution of each significant noise source. Extraneous noise sources were excluded from the analysis as to calculate the $L_{Aeq(15\text{-}min)}$ mine noise contribution for comparison against the relevant EPL limit.

Prevailing meteorological conditions for the monitoring period were sourced from TGO's meteorological station and analysed in accordance with Appendix E4 of the INP to determine the stability category present at the time of each measured sample. This was undertaken to determine applicability of results in accordance with Condition L4.3 of the EPL. Results obtained during non-prevailing meteorological conditions (ie F Class Stability in conjunction with a 2m/s drainage wind or a G Class Stability) are considered not applicable against the EPL criteria.

Figure 1 - Locality Plan and Assessment Locations

Tomingley Gold Mine Noise Monitoring

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4 Results

4.1 Location R2 – Assessment Results

The monitoring and assessment results are presented in individual tables for each day of consecutive monitoring. The results of the attended noise measurements at location R2 for 27 June to 29 June 2016 are summarised in **Table 2** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution.

Table 2 Operator-Attended Noise Survey Results – Location R2

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		LAmax	L_{Aeq}	L_{A90}			
27/06/2016	21:11	62	33	25	36	Dir: SE 1 m/s Stab Class: NA	TGO inaudible Road traffic dominant 33
TGO Site LAeq(15-min) Contribution							Site not audible
27/06/2016	23:07	65	34	22	36	Dir: SE 1 m/s Stab Class: NA	TGO just audible Road traffic dominant 34
TGO Site LAeq(15-min) Contribution							25
28/06/2016	19:45	61	49	45	36	Dir: WSW 2 m/s Stab Class: E	TGO mine hum audible Road traffic dominant 52
TGO Site LAeq(15-min) Contribution							36
28/06/2016	22:26	56	39	36	36	Dir: WSW 1 m/s Stab Class: E	TGO mine hum audible Road traffic dominant 53
TGO Site LAeq(15-min) Contribution							36
29/06/2016	19:09	58	35	30	36	Dir: NNE 1 m/s Stab Class: E	TGO mine hum audible Road traffic and farm animals dominant 42
TGO Site LAeq(15-min) Contribution							28
29/06/2016	22:25	60	43	25	36	Dir: ENE 2 m/s Stab Class: F	TGO just audible Road traffic dominant 50
TGO Site LAeq(15-min) Contribution							25

Note 1: Meteorological data obtained from TGO's Hill on-site weather station. Data from weather station unattainable on the 27/06/2016. Operator attended meteorological data reported.

4.2 Location R3/29 – Assessment Results

The results of the attended noise measurements at location R3/R29 for 27 June to 29 June 2016 are summarised in **Table 3** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution. It is noted that both locations R3 and R29 are within 10m of each other and therefore have been assessed simultaneously.

Table 3 Operator-Attended Noise Survey Results – Location R3/R29

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		LAmax	LAeq	LA90			
27/06/2016	21:56	82	63	42	38	Dir: SE 1 m/s Stab Class: NA	TGO just audible Road traffic and birds dominant 71
TGO Site LAeq(15-min) Contribution							33
27/06/2016	23:51	86	64	41	38	Dir: SW 1 m/s Stab Class: NA	TGO audible Road traffic dominant 64
TGO Site LAeq(15-min) Contribution							37
28/06/2016	20:07	84	64	42	38	Dir: SSW 2 m/s Stab Class: E	TGO just audible Road traffic dominant 70
TGO Site LAeq(15-min) Contribution							39
28/06/2016	23:08	83	66	44	38	Dir: W 1 m/s Stab Class: F	TGO just audible Road traffic dominant 72
TGO Site LAeq(15-min) Contribution							40
29/06/2016	19:55	85	66	43	38	Dir: NE 1 m/s Stab Class: E	TGO audible Road traffic dominant 68
TGO Site LAeq(15-min) Contribution							39
29/06/2016	23:09	87	65	41	38	Dir: ENE 2 m/s Stab Class: E	TGO inaudible Road traffic dominant 86
TGO Site LAeq(15-min) Contribution							TGO inaudible

Note 1: Meteorological data obtained from TGO's Hill on-site weather station. Data from weather station unattainable on the 27/06/2016. Operator attended meteorological data reported.

The results of the attended noise measurements at location R4 for 27 June to 29 June 2016 are summarised in **Table 4** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution.

Table 4 Operator-Attended Noise Survey Results – Location R4

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		LAmax	LAeq	LA90			
27/06/2016	20:02	60	38	33	35	Dir: SE 1 m/s Stab Class: NA	TGO audible Road traffic audible 35
TGO Site LAeq(15-min) Contribution							33
27/06/2016	23:10	62	36	29	35	Dir: SW 1 m/s Stab Class: NA	TGO audible Road traffic audible 35
TGO Site LAeq(15-min) Contribution							29
28/06/2016	19:41	50	34	30	35	Dir: SSW 2 m/s Stab Class: E	TGO audible Road traffic audible 35
TGO Site LAeq(15-min) Contribution							33
28/06/2016	22:39	60	32	19	35	Dir: E 1 m/s Stab Class: F	TGO barely audible, Road traffic and dog barking dominant 50
TGO Site LAeq(15-min) Contribution							20
29/06/2016	19:13	63	33	27	35	Dir: NE 1 m/s Stab Class: E	TGO barely audible Road traffic and wind dominant 28 to 32
TGO Site LAeq(15-min) Contribution							29
29/06/2016	22:32	65	40	35	35	Dir: ENE 2 m/s Stab Class: F	TGO audible Road traffic dominant 35 to 40
TGO Site LAeq(15-min) Contribution							33

Note 1: Meteorological data obtained from TGO's Hill on-site weather station. Data from weather station unattainable on the 27/06/2016. Operator attended meteorological data reported.

The results of the attended noise measurements at location R5 for 27 June to 29 June 2016 are summarised in **Table 5** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution.

Table 5 Operator-Attended Noise Survey Results – Location R5

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		LAmax	L_{Aeq}	L_{A90}			
27/06/2016	20:34	60	46	36	37	Dir: SE 1 m/s Stab Class: NA	TGO inaudible Road traffic and wind dominant 49
		TGO Site LAeq(15-min) Contribution					TGO inaudible
27/06/2016	00:05	57	40	22	37	Dir: NE 1 m/s Stab Class: NA	TGO inaudible Road traffic dominant 47
		TGO Site LAeq(15-min) Contribution					TGO inaudible
28/06/2016	20:09	63	44	33	37	Dir: SSE 2 m/s Stab Class: E	TGO inaudible Road traffic dominant 56
		TGO Site LAeq(15-min) Contribution					TGO inaudible
28/06/2016	23:36	59	46	30	37	Dir: E 0.5 m/s Stab Class: F	TGO inaudible Road traffic dominant 45
		TGO Site LAeq(15-min) Contribution					TGO inaudible
29/06/2016	19:43	72	51	34	37	Dir: NE 2 m/s Stab Class: E	TGO inaudible Road traffic dominant 63
		TGO Site LAeq(15-min) Contribution					TGO inaudible
29/06/2016	23:24	65	48	34	37	Dir: NE 2 m/s Stab Class: E	TGO just audible Road traffic and insects dominant to 55
		TGO Site LAeq(15-min) Contribution					34

Note 1: Meteorological data obtained from TGO's Hill on-site weather station. Data from weather station unattainable on the 27/06/2016. Operator attended meteorological data reported.

The results of the attended noise measurements at location R6 for 27 June to 29 June 2016 are summarised in **Table 6** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution.

Table 6 Operator-Attended Noise Survey Results – Location R6

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		LAmax	LAeq	LA90			
27/06/2016	19:17	79	44	30	36	Dir: SE 1 m/s Stab Class: NA	TGO inaudible Road traffic dominant 44
TGO Site LAeq(15-min) Contribution							TGO inaudible
27/06/2016	22:36	59	34	26	36	Dir: SW 2 m/s Stab Class: NA	TGO inaudible Road traffic dominant 44
TGO Site LAeq(15-min) Contribution							TGO inaudible
28/06/2016	19:04	73	40	28	36	Dir: SW 2 m/s Stab Class: F	TGO inaudible Road traffic dominant 40
TGO Site LAeq(15-min) Contribution							TGO inaudible
28/06/2016	22:03	63	44	29	36	Dir: E 1 m/s Stab Class: E	TGO inaudible Road traffic dominant 43
TGO Site LAeq(15-min) Contribution							TGO inaudible
29/06/2016	18:41	60	29	22	36	Dir: NE 1 m/s Stab Class: E	TGO inaudible Road traffic 30
TGO Site LAeq(15-min) Contribution							TGO inaudible
29/06/2016	22:00	54	36	34	36	Dir: ENE 2 m/s Stab Class: F	TGO trucks audible Wind and highway traffic audible 35 to 45
TGO Site LAeq(15-min) Contribution							33

Note 1: Meteorological data obtained from TGO's Hill on-site weather station. Data from weather station unattainable on the 27/06/2016. Operator attended meteorological data presented.

The results of the attended noise measurements at location R23 for 27 June to 29 June 2016 are summarised in **Table 7** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution.

Table 7 Operator-Attended Noise Survey Results – Location R23

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		LAmax	LAeq	LA90			
27/06/2016	21:37	63	45	41	38	Dir: SE 1 m/s Stab Class: NA	TGO audible Wind and highway traffic audible 35 to 50
TGO Site LAeq(15-min) Contribution							38
27/06/2016	23:32	57	46	39	38	Dir: SE 1 m/s Stab Class: NA	TGO audible Highway traffic audible 39 to 57
TGO Site LAeq(15-min) Contribution							37
28/06/2016	20:02	70	55	45	38	Dir: SSE 2 m/s Stab Class: E	TGO audible Highway traffic audible 39 to 57
TGO Site LAeq(15-min) Contribution							41
28/06/2016	22:51	66	46	39	38	Dir: E 1 m/s Stab Class: E	TGO audible Road traffic audible 39 to 50
TGO Site LAeq(15-min) Contribution							36
29/06/2016	19:35	60	47	41	38	Dir: NE 1 m/s Stab Class: E	TGO audible Road traffic audible 39 to 57
TGO Site LAeq(15-min) Contribution							Site not audible
29/06/2016	22:50	59	48	43	38	Dir: E 2 m/s Stab Class: F	TGO audible Road traffic audible
TGO Site LAeq(15-min) Contribution							37

Note 1: Meteorological data obtained from TGO's Hill on-site weather station. Data from weather station unattainable on the 27/06/2016. Operator attended meteorological data presented.

In addition to the standard EPL noise monitoring locations, two locations (341 Kyalite Road and 147 Lovers Lane) were included in the June 2016 noise monitoring assessment.

The additional locations were assessed during the night period on three consecutive dates from 27 June to 29 June 2016 are summarised in **Table 8** along with prevailing meteorological conditions at the time of each survey, relevant EPL limits and the mining noise contribution.

Table 8 Operator-Attended Noise Survey Results – Additional Noise Monitoring Locations

Date	Location	Time	Descriptor (dBA re 20 µPa)			EPL	Meteorology[1]	Description and
		(hrs)	LAmax	LAeq	LA90	Limit		SPL, dBA
27/06/2016	341 Kyalite Road	23:39	60	35	31	35	Dir: SE 1 m/s Stab Class: NA	TGO audible Road traffic dominant 42
			TGO Site LAeq(15-min) Contribution					31
27/06/2016	147 Lovers Lane	22:40	57	34	25	35	Dir: SE 1 m/s Stab Class: NA	TGO audible Highway traffic dominant 42
			TGO Site LAeq(15-min) Contribution					28
28/06/2016	341 Kyalite Road	23:09	76	40	24	35	Dir: WNW 1 m/s Stab Class: F	TGO just audible Farm animals and road traffic dominant 42
			TGO Site LAeq(15-min) Contribution					24
28/06/2016	147 Lovers Lane	22:01	79	47	24	35	Dir: SE 1 m/s Stab Class: E	TGO inaudible Road traffic and sheep dominant 55
			TGO Site LAeq(15-min) Contribution					Site inaudible
29/06/2016	341 Kyalite Road	22:59	59	33	29	35	Dir: E 2 m/s Stab Class: E	TGO just audible Road traffic and sheep dominant 42
			TGO Site LAeq(15-min) Contribution					28
29/06/2016	147 Lovers Lane	22:01	66	46	20	35	Dir: ENE 2m/s Stab Class: F	Site not audible, Road traffic and sheep dominant 56
			TGO Site LAeq(15-min) Contribution					TGO Inaudible

Note 1: Meteorological data obtained from TGO's Hill on-site weather station. Data from weather station unattainable on the 27/06/2016. Operator attended meteorological data presented.

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5 Discussion

5.1 Discussion of Results – Location R2

Attended measurement results for monitoring conducted at R2 identified that mine noise was audible on all but one noise monitoring event, although was masked by distant highway traffic noise which was constant and dominant during all measurements. Notwithstanding, the noise contribution from TGO was measured at between 26dBA to 36dBA and satisfied the relevant evening and night noise limits of 36dBA $LA_{eq(15min)}$ for all measurements. LA_{max} emissions from the mine remained below the sleep disturbance criterion.

5.2 Discussion of Results – Location R3/R29

Monitoring results for R3/29 were dominated by highway traffic and heavy vehicles that were generally constantly audible for all measurements. Mine noise was audible during breaks in traffic on all but one occasion and contributed to noise levels of between 33dBA to 40dBA over the three-day monitoring period.

On two occasions on 28 June and 29 June 2016, the $LA_{eq(15\text{-}min)}$ noise contribution was measured above the relevant EPL limit, although these levels are deemed in compliance as they are within the 2dB in-field tolerance specified in Section 11.1.3 of the INP. LA_{max} emissions from the mine remained below the sleep disturbance criterion.

5.3 Discussion of Results – Location R4

Mine noise was audible during each attended survey at R4, with the $LA_{eq(15\text{-}min)}$ mine noise contribution ranging between 20dBA to 33dBA and satisfied the EPL criteria during all attended measurements during the June 2016 survey period. Non mining noise sources included highway traffic (and road trucks), dogs and wind noise. LA_{max} emissions from the mine remained below the sleep disturbance criterion for all assessed periods.

5.4 Discussion of Results – Location R5

Mining noise emissions remained inaudible during all but one attended noise monitoring survey at this location. Highway traffic noise was the dominant source at this receiver for the entire three consecutive day assessment period and masked mining emissions. The $LA_{eq(15\text{-}min)}$ mine noise contribution was 34dBA measured on 29 June 2016 and below the EPL noise limit of 37dBA. LA_{max} emissions from the mine also remained below the sleep disturbance criterion for all assessed periods.

5.5 Discussion of Results – Location R6

TGO was audible on one occasion throughout the six attended monitoring surveys at R6. When audible, $LA_{eq(15\text{-}min)}$ mine noise contribution was 33dBA and below the relevant EPL noise limit of 36dBA $LA_{eq(15\text{-}min)}$. LA_{max} emissions from the mine also remained below the sleep disturbance criterion for all assessed periods.

5.6 Discussion of Results – Location R23

Mining noise was audible at this location during breaks in highway traffic on five of six monitoring events. Generally, the noise contribution of the mine ranged between 37dBA to 41dBA and it was noted that winds were directly from the mine to this monitoring location. In summary, mining noise emissions complied with the relevant EPL noise criteria on all but one occasion (28 July 2016) when taking into account the 2dB in-field tolerance as per Section 11.1.3 of the INP.

5.7 Discussion of Results – Additional Monitoring Locations

Attended measurement were completed at two additional locations; 341 Kyalite Road and 147 Lovers Lane, during the June 2016 attended noise surveys. The monitoring locations were at the front gate of each property to minimise disturbance to residences. In summary, mining noise from TGO was just audible on several locations but the noise contributions remained at or below 30dBA when audible.

Therefore, the relevant evening and night noise limits of 35dBA $LA_{eq(15min)}$ were satisfied at these locations for all measurements. LA_{max} emissions from the mine also remained below the sleep disturbance criterion.

6 Conclusion

MAC has completed a noise monitoring assessment on behalf of Tomingley Gold Operations. The assessment was completed to provide monthly monitoring data so that TGO can actively quantify and manage site noise emissions.

Attended monitoring for three consecutive days, from 27 June 2016 to 29 June 2016, has identified that noise emissions generated by TGO generally comply with relevant statutory noise limits specified in EPL conditions at all assessed locations, with the exception of a 1dB exceedance at R23 on the evening of the 28 July 2016 during worst case noise enhancing conditions.

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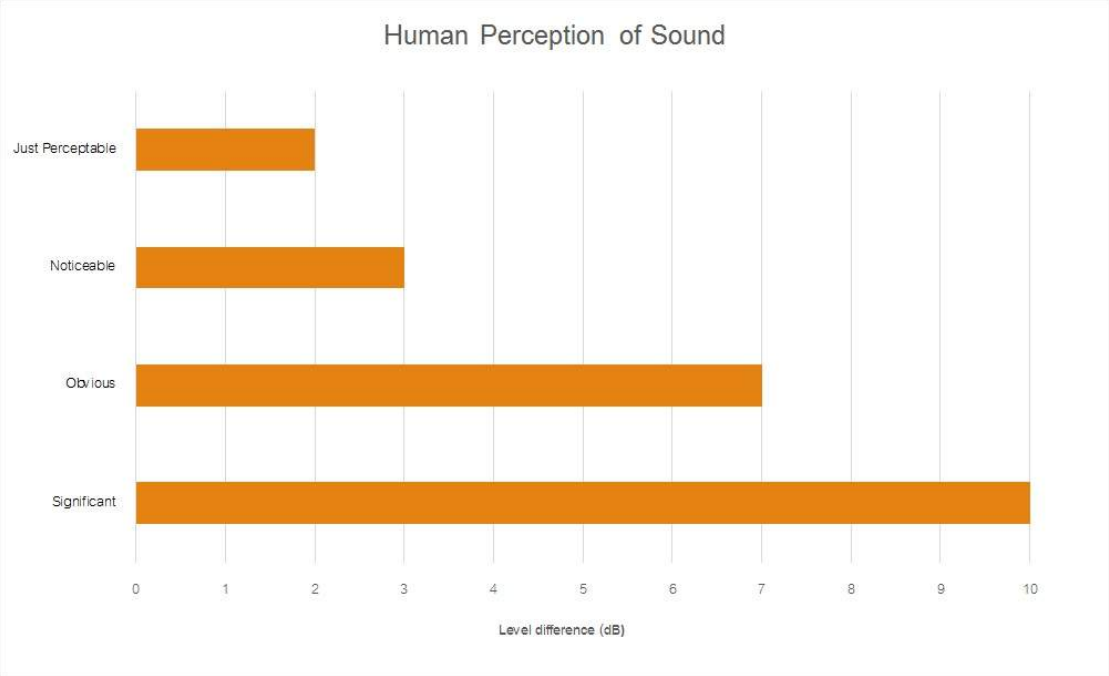
Appendix A - Glossary of Terms

A number of technical terms have been used in this report and are explained in the following table.

Glossary of Terms

Term	Description
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
dBA	A-weighted decibel - A-weighting refers to a standardised frequency response used in sound measuring instruments and corresponds to approximately the human ear response at normal sound levels.
dBZ	Z-weighted decibel – Z-weighting refers to a 'linear' spectrum with no weighting applied
SPL	Sound Pressure Level - The incremental variation of sound pressure above and below atmospheric pressure and expressed in decibels. The human ear responds to pressure fluctuations, resulting in sound being heard.
LAeq	Equivalent Noise Level - the average continuous noise level having the same energy over the measuring period as the measured, fluctuating noise.
Lpk dB(C) or Lc,pk	The C-weighted maximum instantaneous noise level to which a person is exposed. C-weighting refers to a standardised frequency response used in sound measuring instruments and corresponds to approximately the human ear response at high sound levels.
EA,T	A-weighting noise exposure - in Pascal-squared-hours (Pa2h), is the time integral of the squared, instantaneous A-weighted sound pressure over a particular time period.
SLC_{80}	Sound Level Conversion. Is a rating system used in Australia and New Zealand that estimates the amount of hearing attenuation provided to 80% of users wearing a specific type of PHP.

Figure A1 – Human Perception of Sound



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