

**Noise Impact Assessment  
New Outdoor Area  
East Maitland Bowling Club  
23 Banks Street  
East Maitland NSW**

**May 2024**

**Prepared for East Maitland Bowling Club Limited  
Report No. 24-2923-R1**

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**Building Acoustics-Council/EPA Submissions-Modelling-Compliance-Certification**

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## 1 INTRODUCTION

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Reverb Acoustics has been commissioned to conduct a noise impact assessment for a New Outdoor Area at East Maitland Bowling Club, 23 Banks Street, East Maitland. The assessment considers likely sources of noise that may impact upon nearby residential receivers from operation of the new outdoor area. The purpose of this report is to recommend appropriate acoustic measures that must be implemented to ensure compliance with the requirements of Office of Liquor and Gaming NSW (L&G NSW), the NSW Environment Protection Authority (EPA) and Maitland City Council (MCC).

The assessment was requested by East Maitland Bowling Club Limited in support of and to accompany a Development Application to MCC and to ensure any required noise control measures are incorporated during the design stages.

## 2 TECHNICAL REFERENCE / DOCUMENTS

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NSW Environment Protection Authority (2017). *Noise Policy for Industry*

Department of Environment and Climate Change NSW (2007). *Noise Guide for Local Government*.

Liquor Administration Board “*Noise Control Guidelines*”

Van den Berg G.P. and Passchier-Vermeer W. (1999). *Assessment of low frequency noise complaints, Proc, Internoise 99*.

W.J. Davies, P. Hepworth, A. Moorhouse, R. Oldfield (2005). *Noise from Pubs and Clubs, Ph 1*.

A. Moorhouse, D. Waddington, M. Adams (2005). *Proposed criteria for the assessment of low frequency noise disturbance*.

Plans supplied by EJE Architecture Pty Ltd, Rev 01, Preliminary DA Issue, dated 11 April 2024. Note that variations from the design supplied to us may affect our acoustic recommendations.

A Glossary of commonly used acoustical terms is presented in Appendix A to aid the reader in understanding the Report.

### COMMERCIAL IN CONFIDENCE

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### 3 PROJECT DESCRIPTION

Potential noise sources associated with the new outdoor area, which may impact upon nearby residential receivers, include amplified entertainment, patron activity, TV monitors, and children playing in the new Children’s Play Area. We understand that amplified entertainment will cease in the outdoor area by 10pm. We further understand that no new mechanical plant is proposed as part of the alterations, therefore mechanical plant has not been considered further in this assessment.

Nearest receivers identified during our site visits are shown below on Figure 1.

Figure 1: Site Plan



Source: Google Earth

**LEGEND:**

- |                 |                       |                 |
|-----------------|-----------------------|-----------------|
| R1. Residence   | R2. Residence         | R3. Hairdresser |
| R4. Auto Repair | R5. Commercial/Retail | R6. Bank Hotel  |
| R7. Residence   | R8. Residence         | R9. Residences  |

### 4 EXISTING ACOUSTIC ENVIRONMENT

A background noise level survey was conducted for a previous nearby development at the rear of the Bank Hotel (Monitoring Location 1). Table 1 shows a summary of our noise survey, including the Rating Background Level’s (RBL’s) that were from the calculated from the day, evening and night Assessment Background Levels (ABL’s), according to the procedures described in the EPA’s NPfI and by following the procedures and guidelines detailed in Australian Standard AS1055-1997, "Acoustics - Description and Measurement of Environmental Noise, Part 1 General Procedures". A complete set of logger results is not shown, but available on request.

**Table 1: Summary of Noise Logger Results, dB(A)**

Time Period	Background L90			Ambient Leq		
	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am
RBL	49.6	50.4	40.6	--	--	--
LAeq	--	--	--	53.0	53.2	51.1
<b>Background Noise Level 10pm-12am 45dB(A),L90</b>						

Additional attended background noise level surveys have been completed using a Class 1, Svan 977 environmental noise logging monitor, at residential locations near the Club at Monitoring Locations M1 and M2 (see Figure 1).

Table 2 shows a summary of our noise surveys at each monitoring location, while Table 3 shows the measured background (L90) frequency spectrum in the receiver areas.

**Table 2: Attended Noise Surveys – April 2024**

Time	Date	L90	L10	Leq
<b>M1 – Grant Street</b>				
20:55	12/04/24	46	62	57
<i>Noise Source Contributions: Passing cars 60-72. People on streets 48-56</i>				
23:35	12/04/24	42	59	54
<i>Noise Source Contributions: Passing cars 64-70. People on streets 50-52</i>				
<b>M2 – Banks Street</b>				
20:20	12/04/24	45	66	62
<i>Noise Source Contributions: Passing cars 60-72.</i>				
23:00	12/04/24	43	65	59
<i>Noise Source Contributions: Passing cars 60-66.</i>				

**Table 3: Measured Background Noise Level Spectrum, L(A)90**

Location	1/1 Octave dB(A)	Before 10pm	10pm-12am
<b>M1 – Grant Street</b>	31.5 Hz	29	25
	63 Hz	34	29
	125 Hz	35	31
	250 Hz	38	32
	500 Hz	40	35
	1 kHz	41	36
	2 kHz	36	37
	4 kHz	36	32
	8 kHz	27	23
	Total A	46	42
<b>M2 – Banks Street</b>	31.5 Hz	24	26
	63 Hz	28	31
	125 Hz	34	32
	250 Hz	36	34
	500 Hz	39	38
	1 kHz	40	36
	2 kHz	37	35
	4 kHz	36	33
	8 kHz	27	27
	Total A	45	43

## 5 CRITERIA

### 5.1 Liquor & Gaming NSW

Since this assessment relates to control of noise from licensed premises, together with determination of a Development Application, two relevant criteria apply. Reproduced below are the LA10 Noise Conditions adopted for assessment purposes:

“The LA10 noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5Hz - 8kHz inclusive) by more than 5dB between 07:00 am and 12:00 midnight at the boundary of any affected residence.

The LA10 noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5Hz - 8kHz inclusive) between 12:00 midnight and 07:00 am at the boundary of any affected residence.

Notwithstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00 midnight and 07:00 am.” (NOTE: The Club will not trade beyond midnight, therefore clauses relating to criteria after 12am do not apply).

For the purposes of this condition, the LA10 can be taken as the average maximum deflection of the noise emission from the licensed premises.

Alternate criteria that may apply are those taken from the EPA's NPfl, which considers noise from industrial noise sources scheduled under the Protection of Environment Operations Act. Since the premises is licensed and the LA10 criteria are more stringent in this case, we have adopted criteria shown above and in Table 4.

**Table 4: Noise Planning Levels, L(A)10**

Location	1/1 Octave dB(A)	Before 10pm	10pm-12am
<b>Residential Receivers</b>	31.5 Hz	34	30
	63 Hz	39	34
	125 Hz	40	36
	250 Hz	43	37
	500 Hz	45	40
	1 kHz	46	41
	2 kHz	41	42
	4 kHz	41	37
	8 kHz	32	28
	<b>Total A</b>		<b>51</b>

### 5.2 Noise Guide for Local Government – Sleep Arousal

Section 2.2.4 of EPA's Noise Guide for Local Government, 2013 suggests that a screening test should be carried out to ensure short-term noise events do not interrupt the sleep of occupants of a residence. The Guide recommends that intruding noise should not exceed the prevailing background (L90) noise level by more than 15dB(A), expressed as either an L(A)1(1 minute) or L(A)max noise level.

Based on an average minimum background noise level of 42dB(A),L90 for night (10pm-12am) the sleep arousal criterion is set at **57dB(A),Lmax** at the bedroom window of any affected residential receiver.

## 6 METHODOLOGY

### 6.1 Amplified Entertainment

A theoretical assessment of amplified entertainment in the new Outdoor Area has been carried out to predict the noise level at the nearest potentially affected residential boundaries. Consultation with our client reveals that soloists, duos and DJ's are proposed up until 10pm, with no live bands. Using noise data for the above scenario and the known criteria at nearby residences enabled calculation of the required transmission loss of each building element and barrier design.

The Sound Power Levels,  $L_w$  dB(A), of typical entertainment types expected at the premises are shown in the following Tables. The noise source was placed along the north wall adjacent to the Service Area/Storage, with speakers directed to the south and centre of the outdoor area away from nearest residences, and theoretically propagated to nearest residences taking into account reverberant field loss to internal surfaces and barrier loss from intervening structures.

The Sound Power Levels,  $L_w$  dB(A), of anticipated entertainment types are shown in the following Table. The noise sources have been placed in the nominated areas and theoretically propagated to nearest residences taking into account reverberant field loss to internal surfaces and transmission loss through each building element.

**Table 5:  $L_w$ , Acoustic Performer No Amplified Base, dB(A),L10**

Octave Band Centre Frequency, Hz									
dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
<b>98</b>	56	64	77	87	91	93	92	88	82

**Table 6:  $L_w$ , Soloist/Duo with Drum Machine, dB(A),L10**

Octave Band Centre Frequency, Hz									
dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
<b>102</b>	60	68	81	91	95	97	96	92	86

**Table 7:  $L_w$ , Typical DJ, dB(A),L10**

Octave Band Centre Frequency, Hz									
dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
<b>105</b>	63	71	83	94	98	100	98	93	89

## 6.2 Patrons

Reverb Acoustics has completed a detailed analysis of patron noise levels under various situations in licensed premises with the following findings:

**Table 8: Noise Levels from Various Types of Occupied Areas within Licensed Premises**

Situation/Location	Noise Rating	Typical Noise Levels # dB(A),L10	Comments
Auditorium courtyard <i>Breakout for patrons during functions</i>	1	85	During functions up to 1/3 of patrons may occupy outdoor area. Monitoring recommended.
General courtyard <i>Servicing lounge areas, public bars, etc</i>	2	80	Patrons may remain in area for extended periods. Monitoring recommended.
Bistros <i>Internal eating area</i>	3	75-80	Continuous conversation typical at self-service areas.
Outdoor dining <i>Seating outdoors</i>	4	70-80	Patrons generally quiet, although may remain for extended periods and produce higher noise levels.
Restaurant <i>Internal eating area with open doorway</i>	5	70-75	Generally quiet. Only low level conversation. Patrons typically vacate area once meal completed.
Club Gaming area <i>Poker machine, TAB areas</i>	6	65-70	Patrons typically quiet. Rarely talk. Some noise from machines, TV's, monitors, etc.
Gaming courtyard <i>Smokers breakout</i>	7	<70	Patrons typically quiet. Rarely talk. Anxious to return to gaming area.

# Typical noise level at inside surfaces.

Table 8 reveals that the New Courtyard would have a noise rating of 2 or 3, i.e. 75-80dB(A). Additional potential noise sources that may be present within the outdoor areas include television monitors and raised voices of patrons.

The above events have been measured by Reverb Acoustics at various licensed premises under worst-case situations. Calculations to determine the Sound Pressure Level (SPL) at the inside surfaces of the new alfresco gaming area were carried out using the following in-house equation.

Equation 2:

$$L_{eq,T} = L_w - 10 \log(2 \pi r^2) + 10 \log \frac{(D \times N)}{T}$$

Where  $L_w$  is sound power level of source (dB(A))  
 $R$  distance to receiver (m)  
 $D$  is duration of noise for each event (sec)

$N$  is number of events  
 $T$  is total assessment period (sec)

The combined sound pressure level (SPL) at the receiver is then compared to the criteria. Where noise impacts above the criteria are identified, suitable noise control measures are implemented and reassessed to demonstrate satisfactory received noise levels.

Tables 9 shows calculations to determine the SPL at the inside surfaces of the new outdoor area.

Note that PA system has not been included in our calculations, given that we recommend that PA system should not be permitted in the new outdoor area, with the exception of emergency announcements.

**Table 9: SPL Noise Sources – Inside Surfaces New Outdoor Area**

Activity/Item	Patrons	Children	Television Monitors	Raised Speech
SPL at perimeter dB(A)	80	75	75	96
Ave Dist to rec (m)	1.5-3.0	1.5-3.0	1.5-3.0	1.5-3.0
Duration event (sec)	900	900	900	10
No. of events	Continuous	Continuous	Continuous	10
<b>Rec dB(A),Leq</b>	<b>80</b>	<b>75</b>	<b>75</b>	<b>73</b>
<b>Combined</b>	<b>82</b>			

Note that assessment of short term events, such as shouted speech has also been assessed against the EPA’s Sleep Arousal Criterion.

The sources were placed randomly over the available area and the resulting sound pressure level at each surface opening was propagated to nearest residences using an equation<sup>1</sup> giving the sound field due to an incoherent plane radiator. The combined sound pressure level (SPL) at the receiver is then compared to the criteria. Where noise impacts above the criteria are identified, suitable noise control measures are implemented and reassessed to demonstrate satisfactory received noise levels.

## 7 ANALYSIS AND DISCUSSION

### 7.1 Received Noise Levels – Amplified Entertainment

The following Table shows calculations of noise propagated from the New Outdoor Area while a DJ is operating and the resulting impact at the nearest residential boundaries north of the site (R1/R2).

**Table 10: Calculated SPL (Amplified Entertainment) – New Outdoor Area Propagated to Nearest Residential Boundaries (R1/R2)**

Item	dB(A)	Octave Band Centre Frequency, Hz								
		31.5	63	125	250	500	1k	2k	4k	8k
Source Lw	<b>105</b>	63	71	83	94	98	100	98	93	89
Barrier loss/TL <sup>1</sup>		6	6	7	9	11	13	16	19	22
<b>SPL at rec</b>	<b>49</b>	<b>16</b>	<b>24</b>	<b>35</b>	<b>42</b>	<b>44</b>	<b>44</b>	<b>39</b>	<b>30</b>	<b>23</b>
<b>Crit (before 10pm)</b>	<b>51</b>	<b>34</b>	<b>39</b>	<b>40</b>	<b>43</b>	<b>45</b>	<b>46</b>	<b>41</b>	<b>41</b>	<b>32</b>
<b>Impact</b>	-	-	-	-	-	-	-	-	-	-

1. Intervening structures. Open Courtyard. Plus TL of east wall/roof Covered Courtyard.

The above calculations have been based on the following:

- Entertainment provider located in shielded location along north wall of New Outdoor area.
- Speakers directed to the south & centre of New Outdoor Area.
- Absorbent treatment to underside of roof/ceiling over New Outdoor Area (excludes areas with polycarbonate & Operable Roof).
- Amplified entertainment to cease by 10pm. Background music only after this time.

<sup>1</sup> Equation (5.104), DA Bies and CH Hansen, *Engineering Noise Control*, E & FN Spon, 1996.



**Table 11: Calculated SPL Amplified Entertainment in New Outdoor Area Propagated to Nearest Residential Receivers dB(A),L10**

Noise Path	dB(A)	Octave Band Centre Frequency, Hz								
		31.5	63	125	250	500	1k	2k	4k	8k
R1 Residence N	49	16	24	35	42	44	44	39	30	23
R2 Residence N	49	16	24	35	42	44	44	39	30	23
R7 Residence S	46	6	14	26	35	39	41	39	33	29
R8 Residence S	45	6	14	26	35	39	40	37	30	24
<b>Crit (before 10pm)</b>	<b>51</b>	<b>34</b>	<b>39</b>	<b>40</b>	<b>43</b>	<b>45</b>	<b>46</b>	<b>41</b>	<b>41</b>	<b>32</b>

Should any valid complaint occur due to entertainment, we recommend the installation of an electronic Noise Limiter in the New Outdoor Area. These devices have been proven capable of controlling low frequency emissions and are a cost effective solution for minor noise exceedances.

We recommend the following limiters:

If DJ/Duo uses own sound system:

Electronic Sound Limiter

Suppliers: <https://www.technologysoundandvision.com.au>  
<https://www.waveformacoustics.com.au/noise-and-sound-limiters>  
<https://www.acousticaldesign.com.au/noise-volume-limiters-indicators>

If using in-house sound system for all providers:

DSP Controller with inbuilt rms limiting.

Suppliers: <https://www.a1audio.com.au>

To ensure compliance, limits on output of entertainment providers will be required. The following limiting SPL's at a distance of 10 metres from entertainment provider's speakers.

**Table 12: Limiting SPL Entertainment New Outdoor Area (Before 10pm), dB(A),L10**

dB(A)	Octave Band Centre Frequency, Hz								
	31.5	63	125	250	500	1k	2k	4k	8k
<b>94</b>	52	60	72	83	87	89	87	82	78

See Sections 8 for further noise control strategies.

## 7.2 Received Noise Levels –Courtyard Activities

Table 13 shows sample calculations to predict the noise impact from patrons, TV’s and children in the New Outdoor Area, propagated to the nearest residential boundaries (R1/R2). Tables 14 and 15 show summaries of calculations to predict the noise impact from the outdoor areas at all nearby receivers.

**Table 13: Sample Calculations - Noise Impact, Outdoor Areas Before Midnight Propagated North to Nearest Residential Boundaries (R1/R2) dB(A),L10**

Item	dB(A)	Octave Band Centre Frequency, Hz								
		31.5	63	125	250	500	1k	2k	4k	8k
SPL at perimeter	82	20	50	64	72	75	77	74	72	58
Barrier loss/dir <sup>1</sup>		5	5	6	6	7	9	11	14	17
<b>SPL at rec</b>	<b>40</b>	-	<b>12</b>	<b>25</b>	<b>33</b>	<b>35</b>	<b>35</b>	<b>30</b>	<b>25</b>	<b>8</b>
<b>Crit (before 10pm)</b>	<b>51</b>	<b>34</b>	<b>39</b>	<b>40</b>	<b>43</b>	<b>45</b>	<b>46</b>	<b>41</b>	<b>41</b>	<b>32</b>
<b>Impact</b>	-	-	-	-	-	-	-	-	-	-
<b>Crit (10pm-12am)</b>	<b>47</b>	<b>30</b>	<b>34</b>	<b>36</b>	<b>37</b>	<b>40</b>	<b>41</b>	<b>42</b>	<b>37</b>	<b>28</b>
<b>Impact</b>	-	-	-	-	-	-	-	-	-	-

1. Intervening structures.

**Table 14: SPL Patrons in Outdoor Areas – Short Term Noise Events Propagated to Nearest Residences dB(A),Lmax**

Location	Residence S R1/R2	Residence SE R7	Residence NW R8
New Outdoor area	47	42	42
Crit. (10pm-12am)	57dB(A),Lmax		
Impact	0	0	0

**Table 15: Combined Noise Impact – Outdoor Areas Propagated to Nearest Receivers, dB(A),L10**

Location	dB(A)	Octave Band Centre Frequency, Hz								
		31.5	63	125	250	500	1k	2k	4k	8k
R1 Residence N	40	-	12	25	33	35	35	30	25	8
R2 Residence N	40	-	12	25	33	35	35	30	25	8
R7 Residences S	34	-	3	17	25	27	29	26	23	9
R8 Residences S	33	-	3	16	24	26	28	24	22	8
<b>Crit (before 12am)</b>	<b>51</b>	<b>34</b>	<b>39</b>	<b>40</b>	<b>43</b>	<b>45</b>	<b>46</b>	<b>41</b>	<b>41</b>	<b>32</b>
<b>Crit (10pm-12am)</b>	<b>47</b>	<b>30</b>	<b>34</b>	<b>36</b>	<b>37</b>	<b>40</b>	<b>41</b>	<b>42</b>	<b>37</b>	<b>28</b>

Theoretical results in the above Tables show that the noise impacts from patrons, TV’s and children in the New Outdoor Area are predicted to be compliant with the overall LA10 criteria at nearest residential receivers. Due to some uncertainty in theoretical calculations, there is a possibility that minor exceedances of the criteria may occur on occasion. However, given that the children’s outdoor area is expected to be vacant by 8-9pm, and reduced capacity is expected after this time, compliance is implied. See Section 8 for required noise control modifications.

## 8 NOISE CONTROL RECOMMENDATIONS

8.1 The New Outdoor area may be used at any time during trading hours up until 12am.

8.2 Amplified entertainment may occur in the New Outdoor area up until 10pm.

8.3 Entertainment providers must set up in a shielded location along north wall of the New Outdoor area. Speakers are to be directed to the south & centre of the New Outdoor Area.

8.4 Background "incidental" music is permitted in New Outdoor Area at all times during trading hours. A limiting SPL of **70dB(A),Lmax** is to be set at a distance of 3000mm from each speaker. Once this output limit is achieved, corresponding references should be assigned to the sound system controls and should only be accessed by responsible staff familiar with the system settings.

8.5 Amplified entertainment in the New Outdoor Area should be restricted to DJ's, duos, soloists, acoustic performances, etc. No live bands.

8.6 The following limiting SPL's at a distance of 10 metres from entertainment provider's speakers.

**Table 16: Limiting SPL Entertainment Covered Courtyard (Before 10pm), dB(A),L10**

Octave Band Centre Frequency, Hz									
dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
94	52	60	72	83	87	89	87	82	78

8.7 In the event of valid complaint, we recommend installation of an electronic sound limiter in the New Outdoor area. The following options are available:

If DJ/Provider uses own sound system:

Electronic Sound Limiter

Suppliers: <https://www.technologysoundandvision.com.au>  
<https://www.waveformacoustics.com.au/noise-and-sound-limiters>  
<https://www.acousticaldesign.com.au/noise-volume-limiters-indicators>

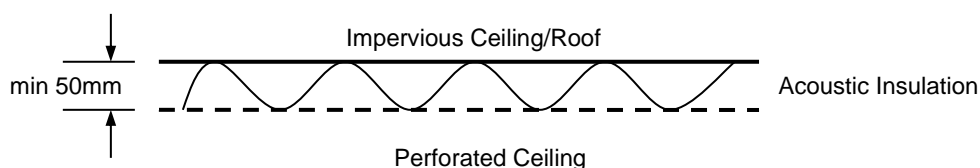
If using in-house sound system for all providers:

DSP Controller with inbuilt rms limiting.

Suppliers: <https://www.a1audio.com.au>

8.8 The ceiling/roof over the New Outdoor area (excluding polycarbonate and operable roof) must have an absorbent underside to reduce reflected sound. We recommend perforated/slotted timber, or perforated Colorbond backed with insulation (minimum 0.7NRC). Final selection is to be approved by the Acoustic Consultant.

*Figure 2: Absorbent Underside Ceiling Detail to Covered Courtyard*



8.9 Access between the existing Bowls Lounge and the New Outdoor Area must be restricted to the proposed airlock only when amplified entertainment takes place within the Bowls Lounge area.

## 9 CONCLUSION

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A noise impact assessment for the New Outdoor Area at Eat Maitland Bowling Club has been completed, resulting in noise control recommendations summarised in Section 8 of this Report. The assessment has shown that the new area is acceptable and may operate during hours specified in this report, subject to our recommendations. With these or equivalent measures in place, noise from the site will be either within the criteria or generally below the existing background noise level in the area for the majority of the time.

The existing average L10 noise levels already impacting the residential areas are above that predicted by the proposal and since the character and amplitude of activities associated with the proposal will be similar to those already impacting the area, it will be less intrusive than an unfamiliar introduced source.

Theoretical results show no exceedance of the LA10 and EPA noise criteria, during allowable time periods, due to entertainment and patron activity. Providing the recommendations presented in this report are implemented, we see no acoustic reason why the proposal should be denied.

**Steve Brady M.A.S.A. A.A.A.S.**  
*Principal Consultant*

# APPENDIX A

## Definition of Acoustic Terms

## Definition of Acoustic Terms

Term	Definition
dB(A)	A unit of measurement in decibels (A), of sound pressure level which has its frequency characteristics modified by a filter ("A-weighted") so as to more closely approximate the frequency response of the human ear.
ABL	<i>Assessment Background Level</i> – A single figure representing each individual assessment period (day, evening, night). Determined as the L90 of the L90's for each separate period.
RBL	<i>Rating Background Level</i> – The overall single figure background level for each assessment period (day, evening, night) over the entire monitoring period.
Leq	Equivalent Continuous Noise Level - which, lasting for as long as a given noise event has the same amount of acoustic energy as the given event.
L90	The noise level which is equalled or exceeded for 90% of the measurement period. An indicator of the mean minimum noise level, and is used in Australia as the descriptor for background or ambient noise (usually in dBA).
L10	The noise level which is equalled or exceeded for 10% of the measurement period. L <sub>10</sub> is an indicator of the mean maximum noise level, and was previously used in Australia as the descriptor for intrusive noise (usually in dBA).

