



# BURGERMUMA, SHARPE AVENUE KARRATHA NOISE ASSESSMENT

Report 10.00817R-01  
Prepared on 13/12/2024



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## BASIS OF REPORT

This report has been prepared by **Acoustics Consultants Australia (ACA)** with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with the Client. Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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## DOCUMENT CONTROL

REFERENCE	DATE	STATUS / UPDATES	PREPARED	REVIEWED	AUTHORISED
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## Report 10.00817R-01

### 1. INTRODUCTION

ACA has been commissioned to undertake an environmental noise assessment for the 'Burgermuma' restaurant located at 177/26 Sharpe Avenue, Karratha WA 6714 (the site).

The proposal comprises a 'change of use' from a restaurant to small bar. It is understood a monthly DJ event occurring during the hours of 18:00-00:00 has taken place at the site and incurred complaints from nearby residents regarding music noise emissions. The site is adjacent to a number of residential dwellings and commercial businesses.

The City of Karratha requires an acoustic report as part of the site's retrospective change of use application and to address noise complaints received due to the event that has been taking place once every month. It is understood that the intention is for the event to take place twice a month pending the outcome of the assessment.

ACA visited site on Thursday 28<sup>th</sup> November 2024 to determine the current building construction, nearby noise sensitive receivers and to measure noise associated with the event.

The acoustic report shall include the assessment of noise emissions generated by the site operations in accordance with *WA Environmental Protection (Noise) Regulations 1997* (EPNR).

The key stages of the noise assessment detailed in this report are as follows:

- Measure and quantify noise associated with the proposed event and identify the nearest noise sensitive receivers;
- conduct a noise assessment based on noise intrusion/breakout calculations and 3D noise modelling prediction; and
- if necessary, provide noise mitigation recommendations to minimise potential impacts.

The methodology and standards used to conduct the assessment, as well as the numerical assessment results are presented in the following sections of this report.

Acoustic terms used in this report are defined in the Glossary of **Appendix A**.



## 2. BACKGROUND INFORMATION

The City of Karratha has requested an acoustic report as part of the site's change of use application in order to satisfy the requirements of the EPNR. The purpose of the acoustic report is to address noise transmission and environmental noise emissions associated with site operations and its impact on nearby noise sensitive premises.

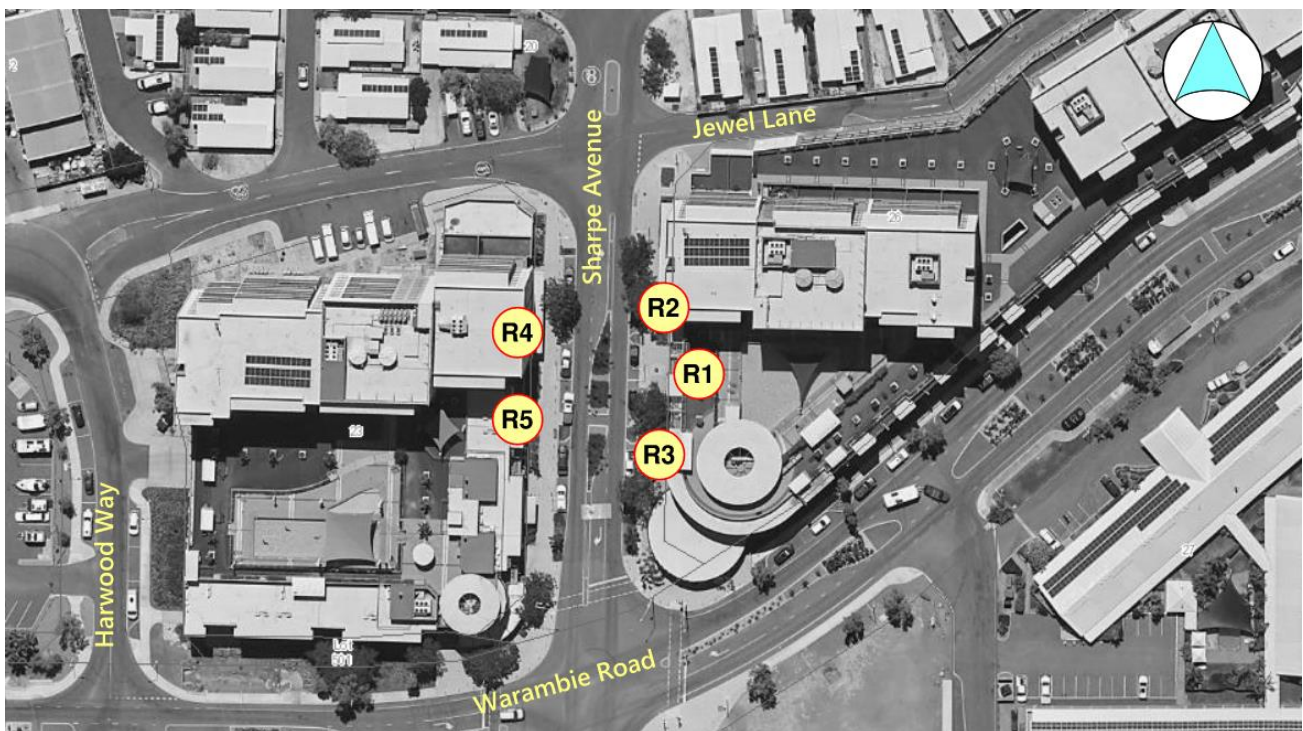
### 2.1. Location

The site is situated off Sharpe Avenue within Karratha's CBD, an area primarily of a commercial and residential nature, and features a number of bars and restaurants with operations similar to the site. The site is located at ground floor level and is situated directly below a residential dwelling. Commercial businesses are located either side of the site also at ground floor level. The site currently operates as a burger restaurant and comprises internal/external seating, external wall mounted speakers, kitchen and toilets. On-site observations indicate that the existing acoustic climate is primarily influenced by local road traffic, patron activity associated with nearby bars and restaurants, birdsong and audio projected by external speakers/televisions associated with the site and other nearby commercial premises.

### 2.2. Noise Sensitive Receivers

The nearest identified noise sensitive receivers are existing residential dwellings immediately above the site and along Sharpe Avenue, and nearby commercial business to the north and south. **Figure 1** presents an annotated aerial view of the site in relation to the nearest sensitive receivers and wider site context.

**Figure 1** Site location and nearest identified noise sensitive receivers



Details of the nearest identified noise sensitive receivers are presented in **Table 1**.

**Table 1**      **Nearest identified noise sensitive receivers**

Noise sensitive receiver	Address	Approximate distance between receiver façade and site boundary	Receiver details / EPNR classification
R1	Pelago East Apartments - 26 Sharpe Ave, Karratha WA 6714	Adjacent (directly above)	Residential dwelling(s) / Noise sensitive premises
R2	Pelago Karratha Leasing Office – 26 Sharpe Ave, Karratha WA 6714	Adjacent (north)	Office / Commercial premises
R3	Stadium 26 – 26 Sharpe Ave, Karratha WA 6714	20 m	Sports bar / Commercial premises
R4	Pelago West Apartments - 23 Sharpe Ave, Karratha WA 6714	25 m	Residential dwelling(s) / Noise sensitive premises
R5		28 m	

Should noise be controlled to minimise impacts at the receivers listed above, it is considered that levels would also be suitably controlled at receivers further away due to increased distance attenuation and shielding from other buildings.

### 2.3. Operations and Site Description

The client's intention is to hold a bi-monthly DJ event on a Saturday night. The DJ is to supply their own equipment (DJ controller, speakers, mixer etc) and will play electronic dance music i.e. house/techno/trance within the restaurant seating area with the entry doors closed.

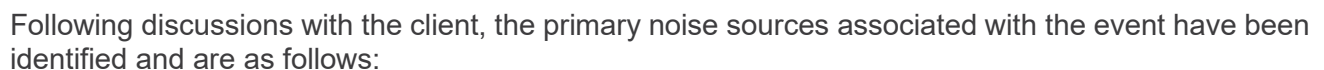
It is understood that the number of attendees for the event will vary; however, 60 people is considered typical and will be assumed for assessment purposes.

The proposed operational hours for the event are as follows:

- 18:00 to 00:00, two Saturdays a month.

The proposed hours of operations fall within the daytime, evening and night-time period as defined by the EPNR Noise Regulations (**Section 3**).

**Figure 2** on the following page presents the floor plan of the site.



- Electronic dance music played via two loudspeakers within the internal seating area;
- Internal crowd noise within the internal seating area; and
- External crowd noise.

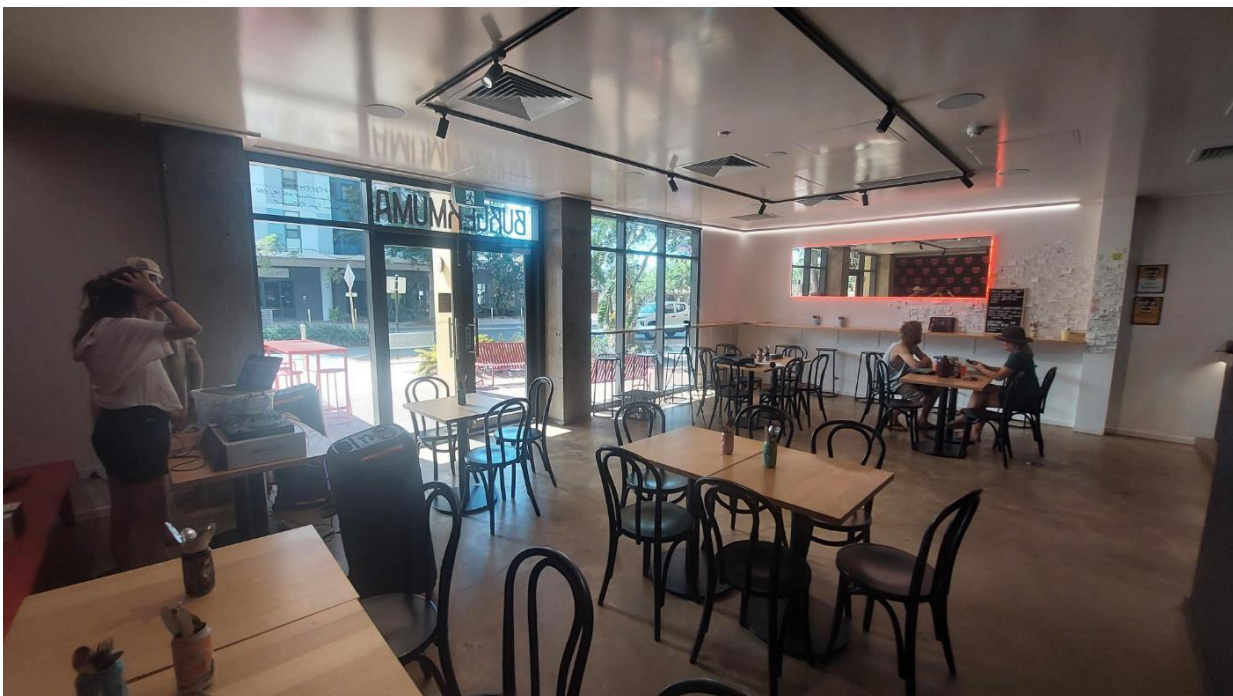
ACA visited site on Thursday 28<sup>th</sup> November 2024 to inspect the existing building/façade, identify the construction of the building elements and potential noise transmission paths. Photographs taken during the site inspection are presented in **Figure 3** on the following page.

- External walls: 150 mm galvanised channel, wall board, steel sheet 26 gauge, HardieFlex and Gyprock plasterboard.



- Ceiling: Suspended plasterboard ceiling, 700 mm void (no insulation) and 300 mm concrete slab.
- Entry door/glazing: 4 mm toughened glass, 2 mm shield, 4 mm toughened glass (cyclone proof glass).

**Figure 3** Site inspection photographs (28/11/2024)



Noise measurements conducted during the site inspection, including details of site conditions, equipment used etc are discussed in detail in Section 4 of this report. For the purposes of assessment, the client co-ordinated a staged DJ event to simulate music noise emissions typical of an event. Measurements of the music noise emissions (without crowd) was undertaken.

## 2.5. Assessment Scenarios

The following noise sources identified in the previous section define the following worst-case operational assessment scenarios:

- Noise intrusion/breakout via separating floor, walls and entry door/glazing – Event music;
- Noise intrusion/breakout via separating floor, walls and entry door/glazing – Internal crowd noise; and
- External crowd noise.

It is understood that the proposed event is to take place with the entry doors closed and music will only be played internally.

It is understood that music noise emissions and crowd noise will operate steadily throughout the event period. Therefore, these scenarios will be assessed under the  $L_{A10}$  metric.

### 3. NOISE CRITERIA

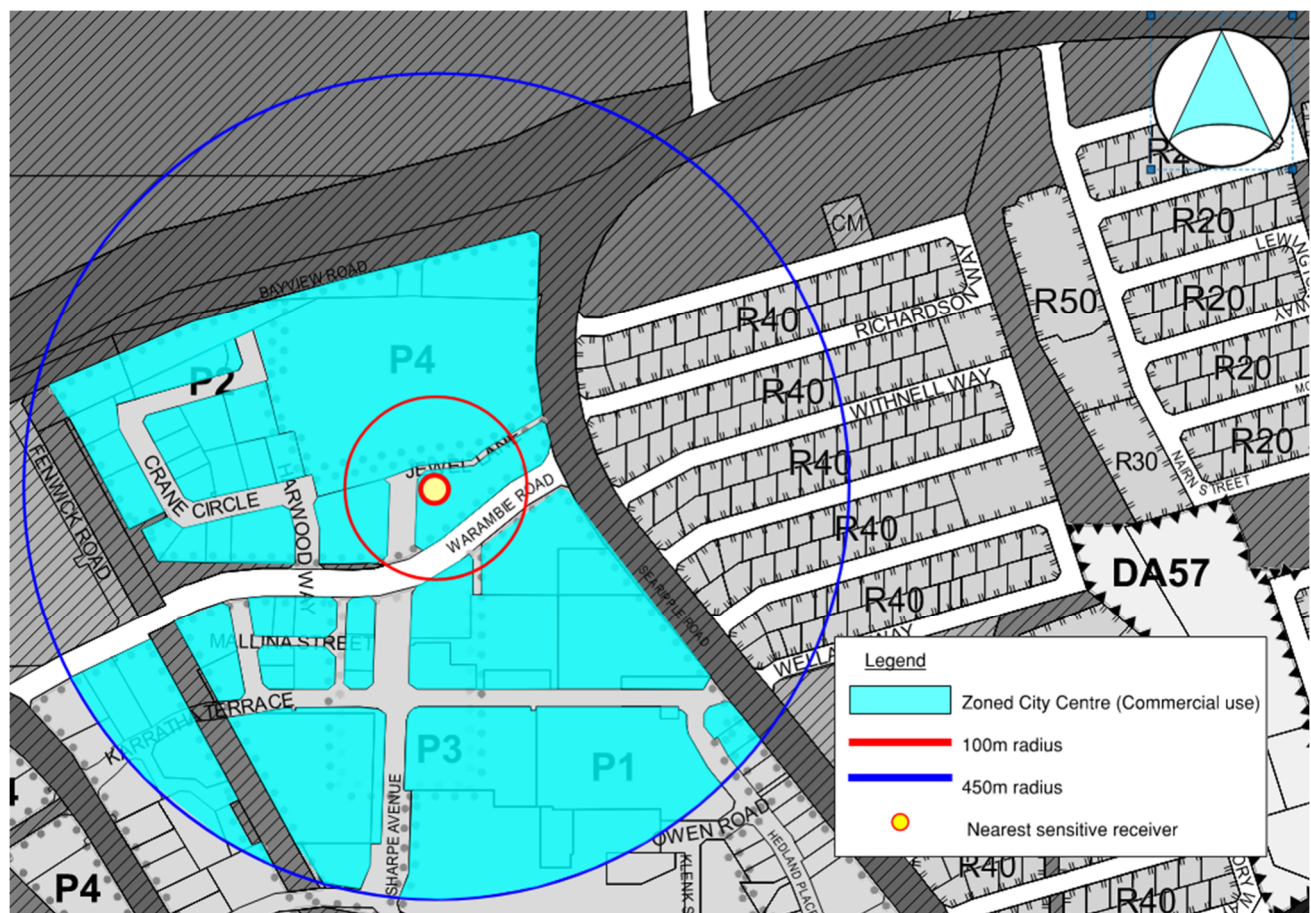
Criteria have been determined in accordance with the Western Australia *Environmental Protection (Noise) Regulations 1997* (EPNR).

#### 3.1. WA Environmental Protection (Noise) Regulations 1997

Noise emissions from commercial premises received at nearby sensitive receivers are covered by state noise policy in the form of the EPNR. To achieve compliance with this policy, noise levels at nearby receivers are not to exceed defined limits. These limits are determined from consideration of prevailing background noise levels and 'influencing factors' that consider the level of commercial and industrial zoning in the locality.

The influencing factor considers zoning and road traffic volumes surrounding the nearest sensitive receiver of interest, within 100 m and 450 m radii (see **Figure 4**).

**Figure 4** Influencing factor calculation map



The site is within the City Centre Precinct, as identified in the Local Planning Scheme No. 8 and zoned as 'Commercial'.



The resulting influencing factor is 5 dB, based on a commercial zoning factor of 5 dB due to 65 % commercial use area within the inner circle, and 40% commercial use area in the outer circle.

A summary of the applicable outdoor noise criteria is provided in the following table.

**Table 2 WA EPNR Assigned Noise Levels**

Type of premises receiving noise	Time of day	Assigned Level (dB)		
		L <sub>A10</sub>	L <sub>A1</sub>	L <sub>Amax</sub>
Noise sensitive premises: highly sensitive area	0700 to 1900 hours Monday to Saturday	50	60	70
	0900 to 1900 hours Sunday and public holidays	45	55	70
	1900 to 2200 hours All days	45	55	60
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	40	50	60
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial premises	All hours	60	75	80

A series of adjustments must be added to the noise source levels if noise received at nearby sensitive premises cannot reasonably be free of intrusive characteristics of tonality, modulation and impulsiveness, and the adjusted level must comply with the assigned level. Definition of these terms (tonality, modulation and impulsiveness) can be read from Regulation 9(1) of the EPNR. **Table 3** summarises the adjustments, as defined by the Regulations.

**Table 3 Noise character adjustments**

Adjustment where noise emission is not music			Adjustment where noise emission is music	
Where tonality is present	Where modulation is present	Where impulsiveness is present	Where impulsiveness is not present	Where impulsiveness is present
+5 dB	+5 dB	+10 dB	+10 dB	+15 dB

### 3.2. Internal Noise Reference Criteria

Part 3 of the EPNR provides technical background for suitable points of measurement for evaluation of noise. In the case where the noise is emitted in another part of the same building of the receiving spaces, the measurement point is recommended to be inside the receiving spaces.

Furthermore, where outdoor measurements are not reasonably possible, as Regulation 20 indicates a measurement point to be at least 3 metres from any substantial sound reflecting surface (i.e. building façade), then internal noise levels are recommended and interpreted for assessment from Regulation 19, subregulation (4).

Regulation 19 states the following:

*‘(4) Where a measurement is made inside a building —*

*(a) external windows and doors must be shut and the measurement must be adjusted by adding 15 dB; or*

*(b) external windows and doors must be open and the measurement must be adjusted by adding 10 dB.’*

Accordingly, in this case, internal noise objectives are interpreted to be those presented in **Table 2** with an adjustment of -15 dB (windows and doors shut).

**Table 4** summarises the nominated internal objectives.

**Table 4** Nominated internal assigned noise levels

Type of Receiver / Period		L <sub>A10</sub> (dB)	L <sub>A1</sub> (dB)	L <sub>Amax</sub> (dB)
<b>R1</b> Residential Premises	Daytime	35	45	55
	Evening	30	40	55
	Night-time	25	35	45
<b>R2</b> Commercial Premises	All times	45	60	65

### 3.3. Australian Standard 2107:2016

For reference on acoustic amenity at internal spaces, Australian Standard 2107:2016 *Acoustics – Recommended design sound levels and reverberation times for building interiors* (AS 2107) provides recommended noise limits for specific room usages.

While AS 2107 does not intend to set out environmental impact criteria, in some situations, indoor targets are considered appropriate to noise sensitive activities such as sleep and residential living since they generally occur indoors. Where it can be shown that the *outdoor* Assigned Noise Levels are impracticable to achieve, consideration may be given to appropriate application of guidelines such as Australian Standard 2107:2016. Furthermore, Regulation 19 of the EPNR provides an alternative to conduct compliance measurements indoors, when measuring outdoors is not a viable option.

The following table presents recommended internal noise levels recommended for residential houses and apartments near major roads in Table 1 of AS 2107.



**Table 5 AS 2107 Recommended design sound levels**

Type of occupancy	Design sound levels ( $L_{Aeq,t}$ range) – dB
Houses and apartments in inner city areas or entertainment districts or near major roads	
Living areas	35 - 45
Sleeping areas (night-time)	35 - 40
Work areas	35 - 45

## 4. ASSESSMENT

The site visit was undertaken from 15:00 hrs on Thursday 28<sup>th</sup> November 2024 with no patrons observed during the entire measurement period. Two DJs, ACA personnel and the client were the only people present during the site visit. A DJ event was staged to simulate a typical night with anticipated music levels. No crowd was present during the staged event.

The assessment has been conducted based on the following steps:

- Site noise measurements to quantify music noise emissions within the restaurant internal seating area and resulting noise levels within the most noise exposed sensitive receiver (R1);
- Noise transmission calculations to determine resulting crowd noise levels at nearby internal receivers;
- Noise breakout calculations and 3D noise modelling to predict resulting levels at nearby external sensitive receivers; and
- Assessment of predictions against the applicable noise criteria.

### 4.1. Music Noise Emissions Measurements

The DJ/audio equipment used to play music during the measurement period are as follows:

- Pioneer DDJ-FLX4 2-channel controller;
- 2x JBL PartyBox 710 speakers; and
- Laptop w/ Serato DJ Pro software.

Figure 5 on the following page presents the typical DJ setup for the proposed event.

**Figure 5** Event DJ/audio setup



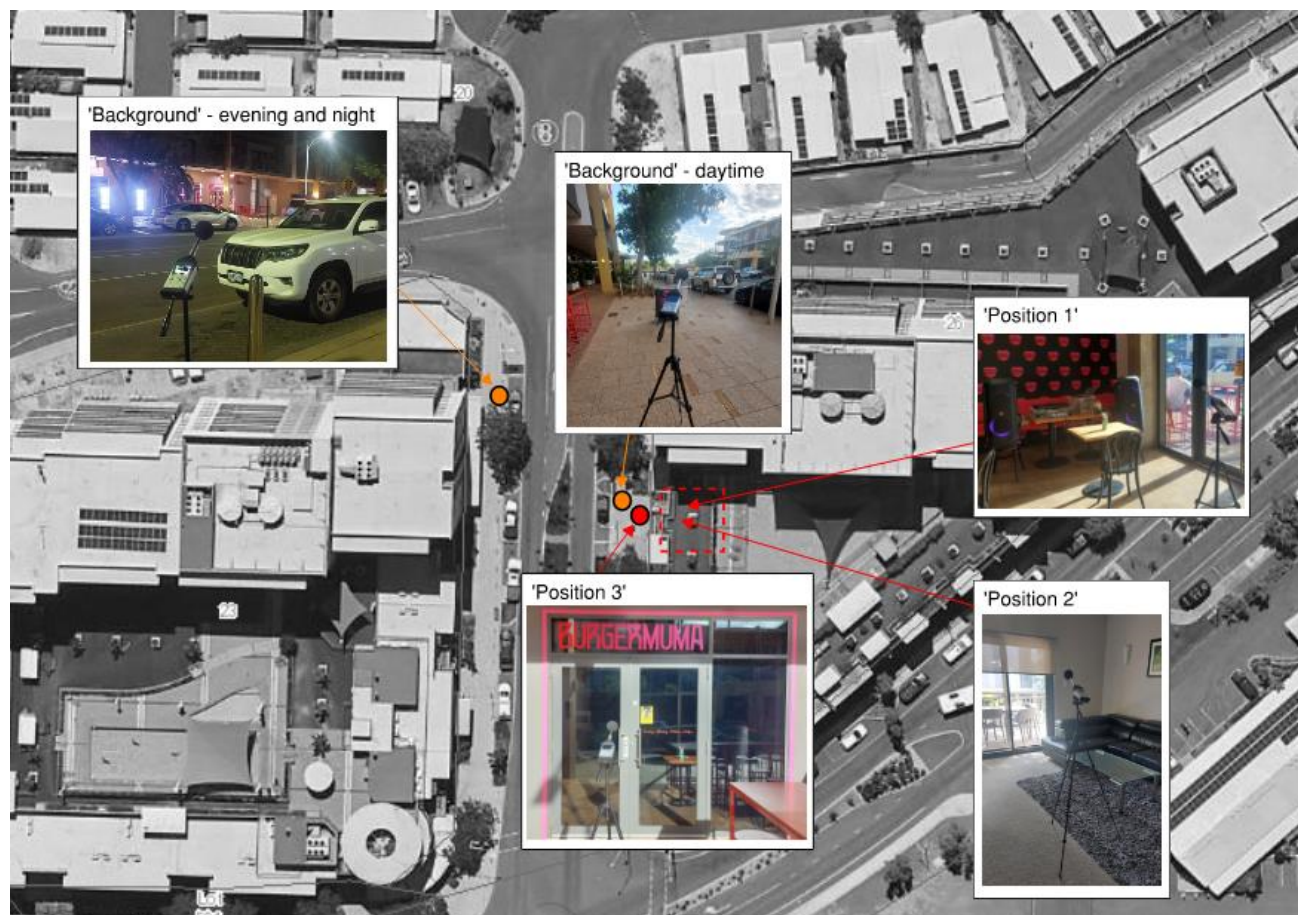
Noise measurements were undertaken at the site using a Svantek 977 Class 1 sound level meter (serial no. 97590). All items of acoustic instrumentation employed for noise measurements were set to A-weighting (frequency weighting) and 'Slow' response. The instrumentation employed during the noise measurements comply with AS IEC 61672.1-2019 *Electroacoustics – Sound level meters – Specifications*. The sound levels meter was field calibrated before and after the measurement period with the calibrator. No significant drift (greater than 0.5 dB) in calibration was detected.

Measurements of music noise emissions were undertaken within the restaurant internal seating area (Position 1), within the worst affected room of the apartment directly above the restaurant (Position 2) and externally at the location of the outdoor seating area (Position 3).

In addition to the measurements of music noise emissions, short-term background noise level measurements were taken externally at the site during the daytime, evening and night-time period as per the EPNR.

All measurement positions are indicated on an aerial image in **Figure 6**.

**Figure 6** Measurement locations



A summary of the noise measurement results is presented in **Table 6** on the following page.

It should be noted that the background measurements were taken on a Thursday, and that the proposed event is to take place on a Saturday. Background noise levels at the site location are expected to be higher on a Saturday, due to increased activity associated with nearby bars and restaurants.



**Table 6 Noise measurements summary**

Measurement Position		Scenario	Measured Noise Levels (dB)				Notes
			L <sub>Aeq</sub>	L <sub>A90</sub>	L <sub>A10</sub>	L <sub>Amax</sub>	
'Background' Daytime – 18:06 (15 minute)		Existing external acoustic climate (no event music)	58	53	60	60	Noise climate dominated by local road traffic, patron conversation at nearby bars/restaurants, pedestrian activity, birdsong and music/audio projected by external speakers/televisions associated with nearby bars. External background music associated with Burgermuma Restaurant ceases at 20:00.
'Background' Evening – 20:31 (15 minute)			55	49	58	57	
'Background' Night-time – 22:06 (15 minute)			53	48	57	56	
'P1'	Meas. 1	Music noise emissions - restaurant internal seating area. Speakers elevated off floor via restaurant chairs.	89	84	92	91	Techno music
	Meas. 2		88	85	91	90	
	Meas. 3		89	83	91	91	
	Meas. 4		87	82	89	89	
'P2'	Meas. 1	Music noise emissions – speakers placed on floor.	35	31	38	36	Music audible, primarily low frequency component i.e. kick drum. Acoustic energy focused at 40 Hz – 80 Hz.
	Meas. 2	Music noise emissions – half cut on low freq. eq, speakers placed on floor.	34	31	36	35	Same as above. Subjective on-site observation indicated a slight reduction of the low frequency component when utilising half cut low freq. eq.
	Meas. 3	Music noise emissions – speakers elevated off floor. Low freq. eq adjusted back to original setting.	34	31	35	35	Music audible, primarily low frequency component i.e. kick drum. Acoustic energy focused at 40 Hz – 80 Hz
'P3'		Music noise emissions – external 3 m from entry door	62	58	64	63	External speakers/background music turned off, DJ music audible. Traffic noise, trees blowing in wind, pedestrian activity also audible. 60 dB L <sub>pASlow</sub> observed when extraneous sources absent.

## 4.2. Noise Source Levels

Each noise source and corresponding sound power data used within the calculations/modelling is presented **Table 7**.

In regard to music noise emissions, octave band sound power levels have been determined via conversion of the worst-case measured sound pressure level summarised in **Table 6** ('Meas. 1').

Internal crowd noise has been calculated using the Rindel method as per Appendix A of AAAC Licensed Premises Noise Assessment Technical Guideline Version 3.0. A 1.0 second reverberation time has been approximated within the restaurant. Resultant external noise levels have been determined using noise breakout calculations and is based on the assumption that entry doors are closed. Crowd calculations have been undertaken assuming half of the patrons may be talking at any given time with raised vocal effort.

External crowd noise has been calculated following the Hayne<sup>1</sup> equation for outdoor gatherings. For assessment purposes, the assumed event attendance of 60 people has been divided, whereby 45 people are assumed to be within the restaurant, and 15 people outside in the external seating area.

**Table 7 Noise source sound power levels**

1/1 Octave Band Sound Level – dB									
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dBA
<b>On-site measured music noise emissions – Techno music played through 2x JBL 710 speakers within restaurant internal seating area</b>									
<b>L<sub>w</sub></b>	127	118	116	111	105	105	103	100	114
<b>Internal crowd noise – 45 people</b>									
<b>L<sub>w</sub></b>	81	86	92	95	91	85	79	70	95
<b>External crowd noise – 15 people</b>									
<b>L<sub>w</sub></b>	39	43	55	75	77	72	64	47	80

## 4.3. Internal Noise Transmission Assessment (Receiver 'R1' and 'R2')

It is understood that the operating hours of Pelago Karratha Leasing Office (R2) are 09:00 – 17:00 Monday to Friday. These operating hours do not coincide with the operating hours of the proposed DJ event, and therefore, does not need further assessment at this time.

Onsite observations indicate that the primary noise transmission path between the restaurant and the above dwelling (R1) is likely to be the separating ceiling/floor. In terms of the existing building construction, the assessment is based on the following site observations and client discussions:

- Ceiling: Suspended plasterboard ceiling (assumed 10 mm), 700 mm void (no insulation) and 300 mm concrete slab:  $R_w$  64 dB

<sup>1</sup> Prediction of Noise from Small to Medium Sized Crowds, Proceedings of Acoustics 2011. Australian Acoustical Society. M.J. Hayne, J.C. Taylor, R.H. Rumble and D.J. Mee

Results of the internal noise transmission calculations for receiver 'R1' are summarised in **Table 8**. The results take into account on site measurements of music noise emissions (**Table 6**) and predicted resulting crowd noise levels determined by desktop noise intrusion calculations.

An adjustment of + 15 dB has been applied to the assessment results to account for music noise emissions with impulsiveness observed. (**Table 3**). The results have been compared to the internal EPNR assigned noise levels and the AS 2107 Recommended design sound levels.

**Table 8 Internal noise transmission assessment results**

Receiver location (Figure 1)	Noise source	Internal noise - Restaurant (dB)	Resultant noise level at receiver (dB)	EPNR Noise criterion (dB) Table 4	Difference (dB)	AS 2107 Design sound levels (dB)	Difference (dB)
R1 – Living room	Music	LA <sub>10</sub> 92 / LA <sub>Aeq</sub> 89	LA <sub>10</sub> 53 / LA <sub>Aeq</sub> 50	LA <sub>10</sub> 35	+ 18	LA <sub>Aeq</sub> 35 – 45	+ 5
				LA <sub>10</sub> 30	+ 23		
				LA <sub>10</sub> 25	+ 28		
	Crowd	LA <sub>10</sub> 90 / LA <sub>Aeq</sub> 87	LA <sub>10</sub> 30 / LA <sub>Aeq</sub> 27	LA <sub>10</sub> 35	- 5		- 8
				LA <sub>10</sub> 30	0		
				LA <sub>10</sub> 25	+ 5		

The assessment results indicate the EPNR noise criteria at 'R1' is exceeded for all periods due to music noise emissions. Onsite observations indicated that the music noise emissions (i.e. electronic dance music) contain prominent low frequency characteristics (kick drum) which is noticeable within the dwelling. ACA understands this component is considered to be the primary cause of complaint from nearby residents. This aspect of the noise emissions is fundamentally captured by the applied noise character adjustment.

The above assessment is based internal assigned noise levels calculated via the outdoor EPNR assigned noise levels, which are not considered to be entirely accurate of the existing acoustic climate in the vicinity of the site. Comparison with the measured background noise levels or the AS2107 design sound levels may be more appropriate in this instance. The venue shall be required to implement reasonable and feasible noise reduction measures in order to minimise health impacts on nearby residents. Further discussion of the assessment results and noise mitigation options is detailed in **Section 4** and **5** of this report.

#### 4.4. Noise Modelling (Receivers 'R3' - 'R5')

##### 4.4.1. 3D Model

Site geometry and surroundings, surfaces, existing buildings, barriers and sound sources were modelled using internationally recognised noise prediction algorithms. A three-dimensional noise model was developed using SoundPLAN Essential V5.1. An adaptation of the algorithm contained

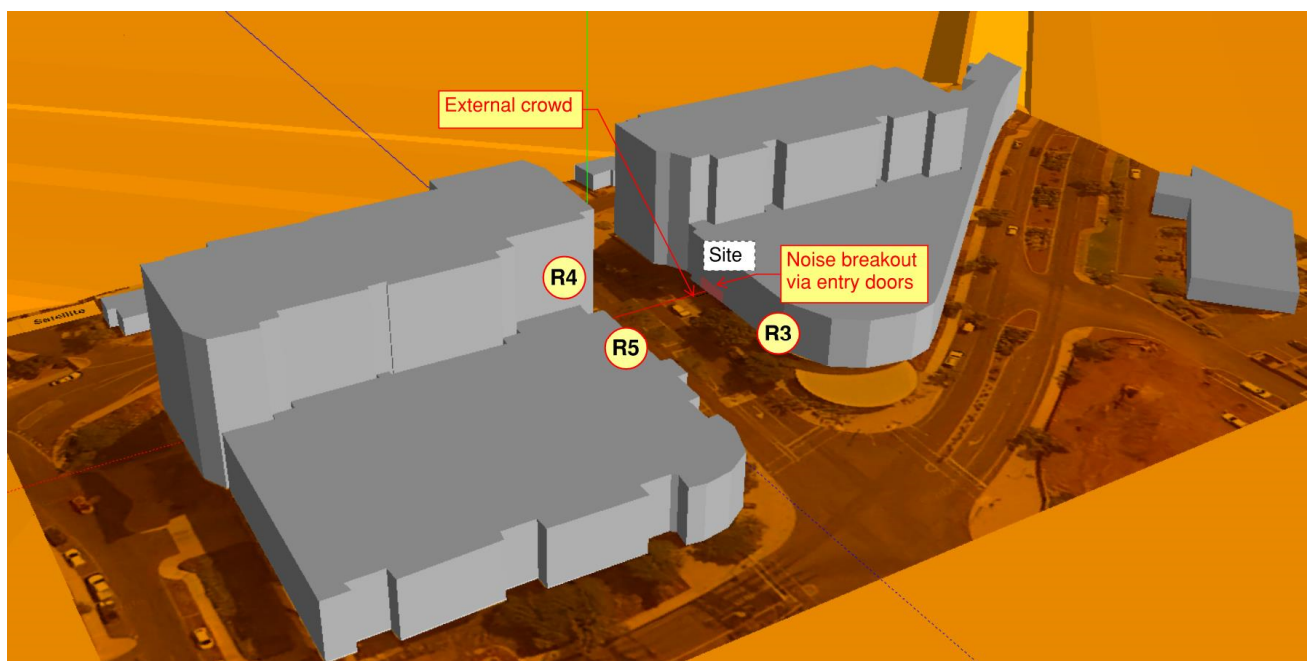
within ISO 9613:1996 *Acoustics – Attenuation of sound during propagation outdoors*<sup>2</sup> was used in this instance.

The following items are considered:

- Three-dimensional location, height and orientation;
- shielding/reflection effects due to surrounding structures (such as awnings, parapets and roofs);
- meteorological/thermal effects; and
- ground absorption has been set at 0.1 (0 meaning reflective and 1 being absorptive);

**Figure 7** presents 3D imagery of the noise model, including the point of assessment (receivers) and the key noise generating sources.

**Figure 7**      **3D imagery of noise model**



#### 4.4.2. Modelling Scenarios

The noise modelling scenarios described in **Section 2.5** are:

- Scenario 1 – Noise breakout via entry door/glazing - music noise emissions;

<sup>2</sup> ISO 9613-2:1996 has since been superseded by ISO 9613-2:2024, however, SoundPLAN Essential V5.1 utilises the former.



- Scenario 2 – Noise breakout via entry door/glazing – internal crowd noise; and
- Scenario 3 – External crowd noise within outdoor seating area.

In regard to 'Scenario 1', onsite measurements (**Table 6** – 'Position 3') has been used to calibrate the model.

#### 4.4.3. Results

Noise contour maps have been generated in SoundPLAN V5.1 and are presented in **Appendix B**. The results from the noise model (not including noise character adjustments) at the external receivers are presented in **Table 9**.

**Table 9** Receiver noise level predictions

Receiver	Predicted Noise Levels (dB)		
	Scenario 1	Scenario 2	Scenario 3
R3	LA10 46	LA10 28	LA10 46
R4	LA10 43	LA10 25	LA10 45
R5	LA10 41	LA10 24	LA10 44

#### 4.5. Assessment

The results presented above have been assessed against the EPNR calculated assigned noise level criteria (**Section 3**) and are presented in **Table 10**. Scenarios 1-3 have been assessed cumulatively to account for all noise sources operating simultaneously. An adjustment of + 15 dB has been applied to the 'Scenario 1' assessment results to account for music noise emissions with impulsiveness (**Table 3**).

Additionally, the assessment results have also been compared to the onsite measured background noise levels.

**Table 10** Assessment of results

Scenario	Receiver	Resultant noise at receiver (dB)	EPNR Noise criterion (dB)	Difference (dB)	Measured background noise level (dB)	Difference (dB)
<b>Cumulative 1 – 3</b> (0700 to 1900 hours Monday to Saturday)	R3	LA10 61	LA10 60	+ 1	-	-
	R4	LA10 58	LA10 50	+ 8	LA90 53	+ 5
	R5	LA10 56		+ 6		+ 3
<b>Cumulative 1 – 3</b> (1900 to 2200 hours All days)	R3	LA10 61	LA10 60	+ 1	-	-
	R4	LA10 58	LA10 45	+ 13	LA90 49	+ 9
	R5	LA10 56		+ 11		+ 7

Scenario	Receiver	Resultant noise at receiver (dB)	EPNR Noise criterion (dB)	Difference (dB)	Measured background noise level (dB)	Difference (dB)
<b>Cumulative 1 – 3</b> (2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays)	R3	L <sub>A10</sub> 61	L <sub>A10</sub> 60	+ 1	-	-
	R4	L <sub>A10</sub> 58	L <sub>A10</sub> 40	+ 18	48 L <sub>A90</sub>	+ 10
	R5	L <sub>A10</sub> 56		+ 16		+ 8

The assessment results indicate that the resulting noise levels at receivers R3 - R5 exceeds the EPNR assigned noise levels and measured background noise levels during the day, evening and night-time period. It is noted that the level of exceedances differs significantly when comparing the EPNR assigned noise levels and measured background noise levels. Further discussion of the assessment results for all receivers is detailed below.

#### 4.6. Discussion

It is considered that an assessment of site noise emissions against the calculated EPNR assigned noise levels does not accurately portray the reality of the acoustic climate when compared to the existing measured background noise levels.

It should be noted that there is a significant discrepancy between the measured existing background noise levels and the EPNR calculated assigned noise levels during the day, evening and night-time period. Furthermore, increased background noise levels are expected on a Saturday.

Context of the site and receiver locations must be considered i.e. reasonable expectations of acoustic comfort **given that Sharpe Avenue is established as a busy and vibrant area during both the day and night time periods.**

It must be noted that the likelihood of noise from commercial premises at this location exceeding the EPNR criteria has always been present due to residential dwellings being located within close proximity to bars and restaurants. Outdoor noise objectives in terms of the EPNR are difficult to achieve in the presence of outdoor entertainment areas.

Therefore, it is considered that reasonable and feasible noise mitigation recommendations minimise noise impacts such that the existing acoustic environment is not negatively altered. That is, the outdoor background noise levels and internal sound levels (as recommended in AS 2107). In this instance, **a 10 dB reduction in noise level in conjunction with controlling the low frequency component of the music and crowd noise management is deemed reasonable and achievable by the venue.**

**Noise control and mitigation shall be applied to minimise impact to nearby residents. Section 5** of this report recommends a number of measures that can be applied to reduce noise emissions associated with the site. Particular care shall be given to minimise reverberant noise indoors as well as outdoors, low frequency emissions shall be minimised as much as possible.

## 5. RECOMMENDATIONS

In summary, outdoor noise levels are predicted to exceed the EPNR criteria, however, it is believed that a series of practical noise mitigation measures should provide the proponent reasonable steer to minimise impacts on sensitive receivers and not exceed the existing background noise levels and recommended internal sound levels. **Table 11** outlines the noise mitigation recommendations to reduce the potential impact at nearby receivers from operations associated with the proposed bi-monthly DJ event. **Table 11** is divided into 3 sections:

- **Treating the source:** This refers to ways of reducing emissions directly at the source of sound generation (i.e. sound system, speakers, mechanical plant).
- **Treating the path:** This refers to treatment to the medium that is physically in between the source and the receivers (i.e. air paths, buildings, reflective surfaces, supporting structures).
- **Management:** This refers to measures that will be required by the bar management to minimise noise from operations

**Table 11 Noise mitigation recommendations**

Item #	Recommendation
<b>Treating the Source</b>	
1	<u>Inside restaurant:</u> Avoid excessive emission of low frequencies below 100 Hz, do not use Subwoofers. Full range speakers shall use a low-cut filter or equaliser to minimise low frequencies.
2	Music noise level not to exceed $L_{pA}$ 79 dB at listeners' locations. It's recommended that the sound system is tested initially with noise measurements, to set this level.
3	If feasible, loudspeakers should be installed with appropriate resilient mounts to stop vibration or resonances being transmitted to the building structure.
4	Locate speakers as far from entry door as practically possible.
5	Use an acoustic limiter device to feed into the sound system and limit the room sound levels not to exceed $L_{Aeq,T}$ 79 dB at listener's ears, where 'T' is the typical assessment period that may vary between 5 and 15 minutes.
<b>Treating the Path</b>	
6	<u>Inside restaurant:</u> Fit sound absorption panelling internally where space allows - cover ceiling and walls with absorption class NRC 0.95. This will help reduce noise build up.
7	<u>Ceiling:</u> <ul style="list-style-type: none"> <li>- Add an additional layer of 13 mm fire rated plasterboard to the ceiling.</li> <li>- Fill ceiling void with dense mineral wool <math>\geq 30 \text{ kg/m}^3</math>.</li> </ul>
<b>Management</b>	
8	Where practical, limit patrons from using the outdoor area from 10 pm. Advise patrons to not shout or make unnecessary noise in the external area.
9	Instruct DJ to maintain appropriate noise levels and be proactive of adjusting low freq. eq.

Item #	Recommendation
9	<p>Keep residents at nearby noise sensitive receivers informed of the event plans. Details to be communicated include:</p> <ul style="list-style-type: none"><li>- Date, times and duration of the event;</li><li>- Explanation that noise levels would be higher than usual during the day/night period;</li></ul> <p>Direct contact of a nominated person during the event for comments/complaints.</p>



## APPENDICES



## APPENDIX A: Glossary of Acoustic Terms

## 1 Sound Level or Noise Level

Sound consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. Noise is often used to refer to unwanted sound.

The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable range by using logarithms.

The symbols SPL, L or  $L_p$  are commonly used to represent Sound Pressure Level.

The symbol  $L_A$  represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is  $2 \times 10^{-5}$  Pa.

## 2 “A” Weighted Sound Levels

The overall level of a sound is usually expressed in terms of dB(A), which is measured using a sound level meter with an “A-weighting” filter. This is an electronic filter with a frequency response corresponding approximately to that of human hearing.

People’s hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dB(A) is a good measure of the loudness of that sound. Different sources having the same dB(A) level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB(A) change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels:

**Typical noise levels and subjective scale**

Sound Pressure Level dB(A)	Noise Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely loud
110	Grinding on steel	
100	Loud car horn at 3 m	Very loud
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (e.g. B, C and D) are less commonly used than A-weighting in environmental acoustics. Sound Levels measured without any weighting are referred to as “linear” and the units are expressed as dB(Lin) or dB.

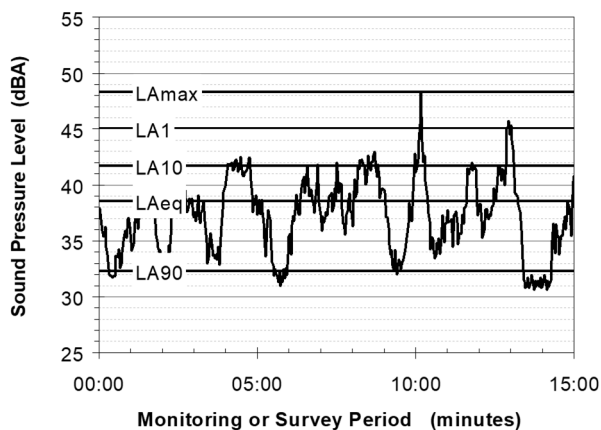
### 3 Sound Power Level

The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units, and these may be identified by the symbols SWL or  $L_W$ . The Sound Power definitions expressed in dB are typically referenced to the acoustic energy unit  $10^{-12}$  W.

### 4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels  $L_{AN}$ , where  $L_{AN}$  is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the  $L_{A1}$  is the noise level exceeded for 1% of the time,  $L_{A10}$  the noise exceeded for 10% of the time.

The following figure presents a hypothetical 15-minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

- $L_{A1}$  The noise level exceeded for 1% of the 15-minute interval.
- $L_{A10}$  The noise level exceeded for 10% of the 15-minute interval. This is commonly referred to as the average maximum noise level.
- $L_{A90}$  The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.
- $L_{Aeq}$  The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

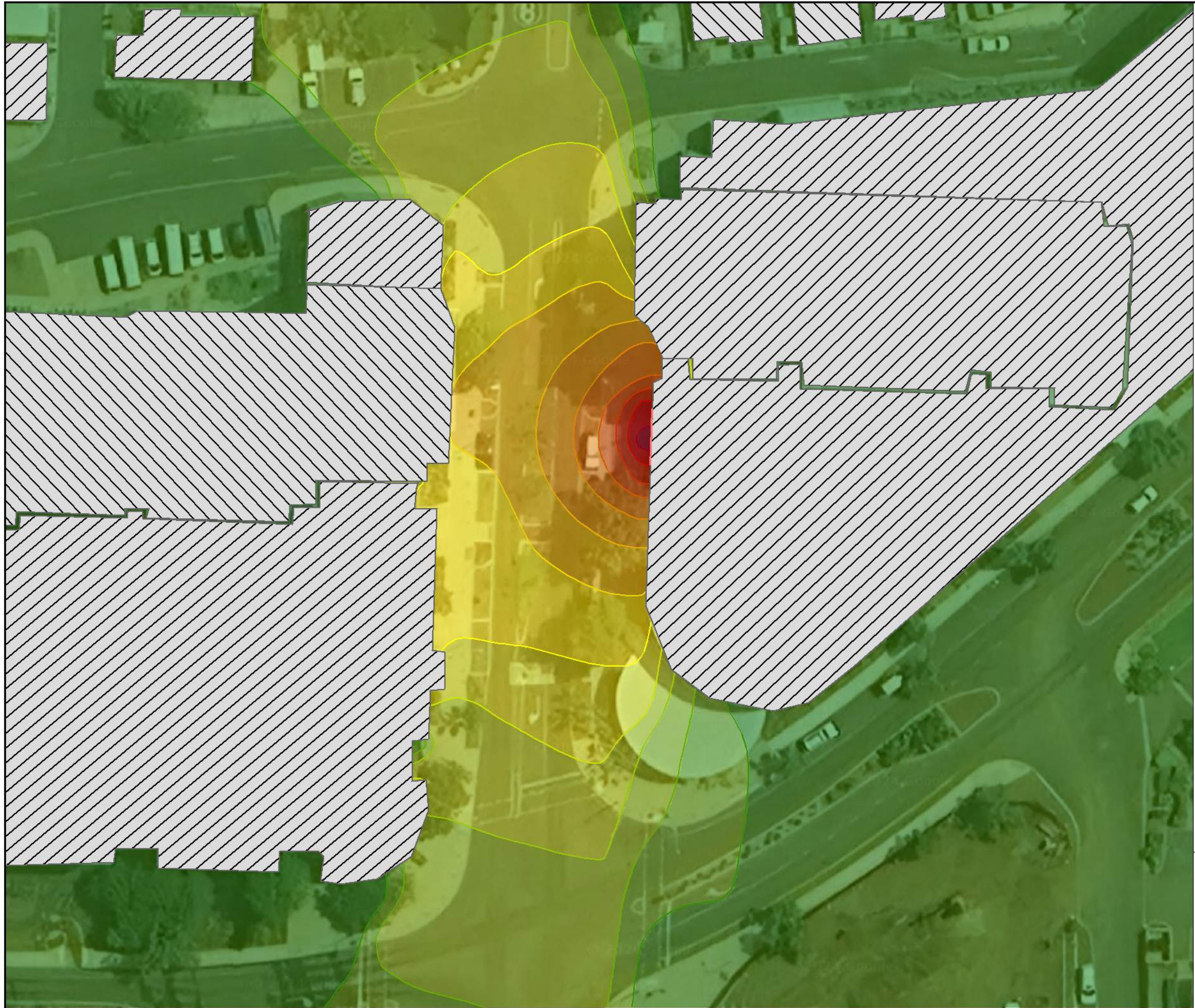
When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. Standardised methods are available for determining these representative levels. Different jurisdictions would choose to define their own preferred Standard.





## APPENDIX B: NOISE MODELLING CONTOURS





**Burgermuma Restaurant  
Sharpe Avenue, Karratha**

**Predicted Environmental  
Noise Emissions**



J:\01 PER\02 MODELLING\JOBS SOUNDPLAN\  
10.00817 Burgermuma\0817 Burgermuma V1S1

Project No: 10.00817  
Consultant: SS  
Date:11/12/2024

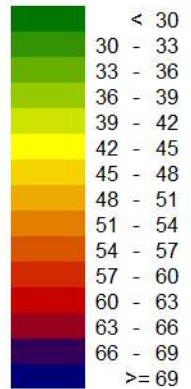
Scenario 1  
- Parameter represented L<sub>A10</sub>  
- Noise Sources:  
Music noise emissions L<sub>w</sub> 114 dB

- Reflective ground (Alpha = 0.1)  
- Meteorological conditions:  
T = 20deg / RH = 70%  
- Noise contours @ 1.5m above the ground

**Signs and symbols**

 Ground effects  
 Area source

**Levels in dB(A)**



1 : 500  
0 2.5 5 10 15 20 m







**Burgermuma Restaurant  
Sharpe Avenue, Karratha**

**Predicted Environmental  
Noise Emissions**



J:\01 PER\02 MODELLING\JOBS SOUNDPLAN\  
10.00817 Burgermuma\0817 Burgermuma V1S2

Project No: 10.00817  
Consultant: SS  
Date:11/12/2024

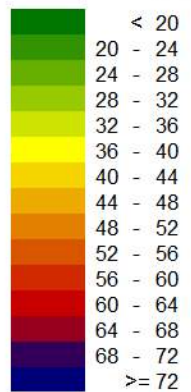
Scenario 2  
- Parameter represented L\_A10  
- Noise Sources:  
Internal crowd Lw 95 dB

- Reflective ground (Alpha = 0.1)  
- Meteorological conditions:  
T = 20deg / RH = 70%  
- Noise contours @ 1.5m above the ground

**Signs and symbols**

 Ground effects  
 Area source

**Levels in dB(A)**



1 : 500

0 2.5 5 10 15 20 m





# Burgermuma Restaurant Sharpe Avenue, Karratha

## Predicted Environmental Noise Emissions

J:\01 PER\02 MODELLING\JOBS SOUNDPLAN\10.00817 Burgermuma\0817 Burgermuma V1S3

Project No: 10.00817  
Consultant: SS  
Date: 11/12/2024

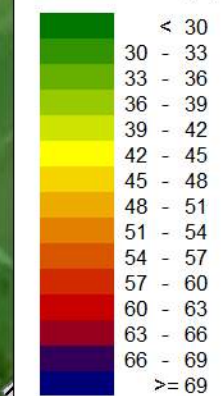
Scenario 3  
- Parameter represented L<sub>A10</sub>  
- Noise Sources:  
External Crowd L<sub>w</sub> 80 dB

- Reflective ground (Alpha = 0.1)  
- Meteorological conditions:  
T = 20deg / RH = 70%  
- Noise contours @ 1.5m above the ground

### Signs and symbols

 Ground effects  
 Area source

### Levels in dB(A)



1 : 500

0 2.5 5 10 15 20 m

