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Environmental Noise Assessment

Mixed Use Tourist and Agricultural Development at:

37 Annie Pyers Drive,
Gundagai, NSW 2722

Prepared For:

The Price Group Pty Ltd.
C/- 37 Annie Pyers Drive
Gundagai NSW 2722

Attention: Mr Brendan Price

Reference: 2303020E-R

Prepared by:

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The Price Group Pty. Ltd. commissioned Harwood Acoustics Pty. Ltd. to carry out an environmental noise assessment for a mixed-use development to be constructed at 37 Annie Pyers Drive, Gundagai, NSW 2722.

The development will comprise four buildings with various commercial tenancies such as cafes, restaurants and retail premises as well as associated outdoor spaces. This assessment is based on the current draft concept masterplan.

Accordingly, Harwood Acoustics Pty. Ltd. has prepared this report for the exclusive use of the Client identified on the title page. The report is prepared in accordance with the brief and scope of works agreed between the Client and Harwood Acoustics Pty. Ltd. and may not be suitable for use beyond that scope.

Harwood Acoustics Pty. Ltd. undertakes no duty nor accepts any responsibility to any third party who may rely upon this report.

Advice and recommendations provided in this report are in relation to acoustical issues only. No claims of expertise are made, and no liability is accepted, in relation to issues falling outside the field of acoustical consulting. These may include, but are not limited to, structural and waterproofing considerations, fire rating or thermal rating. Relevant authorities and / or experts should be consulted regarding areas other than acoustics.

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1. INTRODUCTION AND SUMMARY

The Price Group Pty. Ltd. commissioned Harwood Acoustics Pty. Ltd. to carry out an environmental noise assessment for the proposed conversion of 37 Annie Pyers Drive, Gundagai, NSW (the Site) into a tourist and visitor attraction centre.

The Site is located on land zoned SP3 Tourist under Cootamundra - Gundagai Regional Council's *Gundagai Local Environmental Plan* 2011 (LEP). The Site is in close proximity to the Hume Motorway with existing commercial facilities to the south and east. There are isolated rural residential properties located to the north west in Five Mile Creek Road and to the south west in Annie Pyers Drive. A location plan is shown in Figure 1.

The proposal is to revitalise the Site with a focus on using the Dog on the Tuckerbox as a theme and creating an Australian farm station. A draft Site Plan has been prepared and the design comprises four separate buildings with capacity for approximately seven (7) various tenancies and associated outdoor areas. The specific tenancies have not been finalised at this Stage, however are likely to include:-

- General Store
- Bakery
- Retail Store
- Bakery / Café
- Restaurants & Brew House
- General Store

External Areas will include:-

- Flower Garden
- Courtyards & Beer Garden
- Children's Playground
- Plaza & Amphitheatre

A concept site plan is shown in Figure 2 and full details can be seen in DDD Projects Pty. Ltd. Concept Master Plan - Draft, dated March 2023.

It is a requirement of Council that an Environmental Noise Assessment be prepared to be submitted with the development application to consider the potential for noise impacts arising from the operation of the development on existing neighbouring receptors.

Noise emission from the operation of the commercial tenancies is required to be assessed against noise goals derived from the NSW Environment Protection Authority's (EPA) *Noise Guide for Local Government* 2013 *Noise Policy for Industry* 2017. Consideration is also given to the potential for sleep disturbance.

The noise design goals are 46 dBA ($L_{eq,\ 15\ minute}$) during the day time period from 7 am to 6 pm, 46 dBA ($L_{eq,\ 15\ minute}$) during the evening time period from 6 pm to 10 pm and 44 dBA ($L_{eq,\ 15\ minute}$) during the night time period from 10 pm to 7 am at the nearest residential receptors.

A noise model has been developed for all noise sources potentially associated with the development, these include indicative mechanical plant servicing each of the buildings, adult voice noise, children at play, customer vehicles and delivery vehicles.

Calculations and predictions in Section 6 of this Report show that the noise design goals can be readily achieved at all nearby residential receptor locations for full operation of the Site.

This is based on typical use for patrons and accompanying music associated with restaurants, Brew House and cafes. If significantly high levels of live or amplified music are proposed in

future within any premises, then individual assessments may be undertaken at the time. Any noise controls, if required at all, will not be onerous and Liquor and Gaming NSW noise limits can readily be achieved.

2. SITE AND BUILDING DESCRIPTION

2.1 Site Description

The Site is located on the western side of Annie Pyers Drive to the west of the Hume Motorway on land zoned SP3 Tourist under Cootamundra – Gundagai Regional Council's Gundagai *Local Environmental Plan* 2011 (LEP). Bounding the Site to the south is an Oliver's restaurant with a 24 hour service station beyond, and to the east of the Site, across Annie Pyers Drive are commercial premises with the Hume Motorway beyond. To the south west, west and north west of the Site are rural residential premises.

The nearest residential receptors to the Site are shown in Figure 1 below and their addresses are as follows:-

R1 – Annie Pyers Drive*

R2 – 108 Five Mile Creek Road

R3 – 12 Five Mile Creek Road

Figure 1. Location Plan – 37 Annie Pyers Drive, Gundagai, NSW 2722

(source: www.earth.google.com ©)

** Property number unknown*

** Background noise monitoring was conducted closer to receptor location R3, rather than R1 which is potentially closer to the subject Site, as background noise levels at Receptor R3 are likely to be lower given the additional distance that R3 is located from the Olivers store and Truck Stop. Applying the background noise levels as measured at receptor R3 to all residential receptors provides for conservatively low noise goals as a worst-case scenario.

2.2 Development Description

It is proposed to construct a mixed-use commercial development on the Site comprising four buildings and associated external areas.

The specific tenancies have not been finalised at this Stage, however are likely to include:-

- General Store
- Bakery
- Retail Store
- Bakery / Café
- Restaurants & Brew House
- General Store

External Areas will include:-

- Flower Garden
- Courtyards & Beer Garden
- Children's Playground
- Plaza & Amphitheatre

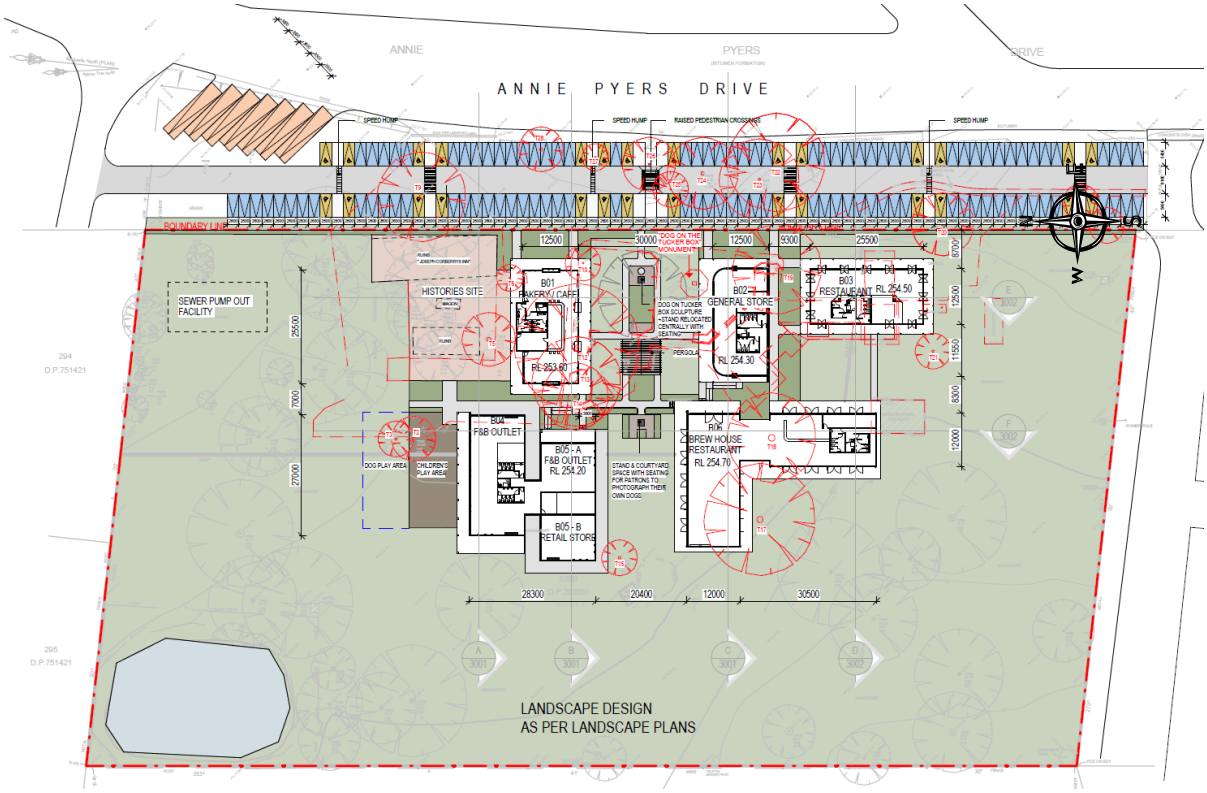

Figure 2. Proposed Site Plan

(source: SN Architect's drawing A1003, for Project No. 210804 dated 18 August, 2023.)

3. NOISE CRITERIA

This section outlines the noise guidelines applicable to this proposal and establishes the project specific noise trigger levels and noise design goals.

3.1 NSW Environment Protection Authority's Noise Guide for Local Government

The Environment Protection Authority (EPA) published the *Noise Guide for Local Government* in June 2013 (NGLG). The NGLG is specifically aimed at assessing noise from light industry, shops, entertainment, public buildings, air conditioners, pool pumps and other noise sources in residential areas.

The EPA in Section 2.2.1 of the NGLG states that a noise source is generally considered to be intrusive if the noise from the source, when measured over a 15-minute period ($L_{eq,\ 15\ minute}$), exceeds the background noise ($L_{90,\ 15\ minute}$) by more than 5 dB.

These criteria are in keeping with the EPA's *Noise Policy for Industry* (2017) Intrusiveness Criteria and generally with NSW Councils' standard noise conditions.

The noise from the source is measured or assessed at the most affected point within the residential property boundary, or if that is more than 30 metres from the residence, at the most affected point within 30 metres of the residence. For upper floors the noise is assessed outside the nearest upstairs window. In this instance, the nearest residential receptors are single storey dwellings on rural properties.

3.2 NSW Environment Protection Authority's Noise Policy for Industry

3.2.1 Introduction

The NSW Environment Protection Authority (EPA) published the NSW *Noise Policy for Industry* in October 2017 (the Policy).

The policy is designed for large industrial and agricultural sources and specifies substantial monitoring and assessment procedures that may not always be applicable to the types of sources councils need to address.

The Policy is not therefore strictly applicable to this development however it is used as a guide to determine an appropriate noise design goal for the commercial receptor at Receptor location R4 in the absence of such being provided in the *Noise Guide for Local Government*.

It is also used to provide a reference for the assessment of the potential for sleep disturbance events that can occur at night, again in the absence of such in the Noise Guide.

This Policy sets out the NSW Environment Protection Authority's (EPA's) requirements for the assessment and management of noise from industry in NSW. It aims to ensure that noise is kept to acceptable levels in balance with the social and economic value of industry in NSW.

The Policy is designed to assist industry and authorities to ensure that potential noise impacts associated with industrial projects are managed effectively.

The purpose of the Policy is to ensure noise impacts associated with particular industrial developments are evaluated and managed in a consistent and transparent manner. It provides noise levels for assessing the potential impact of noise from industry and includes a framework for considering feasible and reasonable noise mitigation measures.

The objectives of the Policy are to:

- provide the noise levels that are used to assess both change in noise level and long-term noise levels,

- provide a clear and consistent framework for assessing environmental noise impacts from industrial premises and industrial development proposals,
- promote the use of best-practice noise mitigation measures that are feasible and reasonable where potential impacts have been identified,
- support a process to guide the determination of achievable noise limits for planning approvals and/or licences, taking into account the matters that must be considered under the relevant legislation (such as the economic and social benefits and impacts of industrial development).

3.2.2 Amenity Noise Levels and Project Amenity Noise Levels

To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise levels within an area from **all** industrial noise sources combined should remain below the recommended amenity noise levels specified in Table 2.2 where feasible and reasonable. (EPA NPfI Table 2.2 is replicated in Table 1 below).

The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and some sleep disturbance.

The recommended amenity noise levels represent the objective for **total** industrial noise at a receiver location, whereas the **project amenity noise level** represents the objective for noise from a **single** industrial development at a receiver location.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a **project amenity noise level** applies for each new source of industrial noise as follows:

Project amenity noise level for industrial developments = recommended amenity noise level (NPfI Table 2.2) minus 5 dB

Table 1 Amenity Noise Levels (EPA NPfI Table 2.2)

Receiver	Noise Amenity Area	Time of Day	L_{Aeq}, dBA
(see Table 2.3 to determine which residential receiver category applies)			**Recommended amenity noise level**
Residential	Rural	Day Evening Night	50 45 40
	Suburban	Day Evening Night	55 45 40
	Urban	Day Evening Night	60 50 45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks *	See column 4	See column 4	5 dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School classroom – internal	All	Noisiest 1-hour period when in use	35 (see notes for table)
Hospital ward internal external	All	 Noisiest 1-hour Noisiest 1-hour	 35 50
Place of worship – internal	All	When in use	40

Notes: The recommended amenity noise levels refer only to noise from industrial sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration. The levels represent outdoor levels except where otherwise stated.

Types of receivers are defined as follows:

- rural residential
- suburban residential
- urban residential
- industrial interface – an area that is in close proximity to existing industrial premises and that extends out to a point where the existing industrial noise from the source has fallen by 5 dB or an area defined in a planning instrument. Beyond this region the amenity noise level for the applicable category applies. This category may be used only for existing situations.
- **commercial – commercial activities being undertaken in a planning zone that allows commercial land uses**
- industrial – an area defined as an industrial zone on a local environment plan; for isolated residences within an industrial zone the industrial amenity level would usually apply.

Time of day is defined as follows:

- day – the period from 7 am to 6 pm Monday to Saturday or 8 am to 6 pm on Sundays and public holidays
- evening – the period from 6 pm to 10 pm
- night – the remaining periods.

Section 2.2 of the policy states

*The L_{Aeq} is determined over a 15-minute period for the project intrusiveness noise level and over an assessment period (day, evening and night) for the project amenity noise level. This leads to the situation where, because of the different averaging periods, the same numerical value does not necessarily represent the same amount of noise heard by a person for different time periods. To standardise the time periods for the intrusiveness and amenity noise levels, this policy assumes that the $L_{Aeq,15min}$ will be taken to be equal to the **$L_{Aeq,\ period}$ + 3 decibels (dB)**, unless robust evidence is provided for an alternative approach for the particular project being considered.*

3.3 Sleep Disturbance Criteria

3.3.1 EPA's Noise Policy for Industry 2017

Section 2.5 'Maximum noise level event assessment' states: -

"The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.

Where the subject development/premises night-time noise levels at a residential location exceed:

- *$L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
- *L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,*

a detailed maximum noise level event assessment should be undertaken.

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the NSW Road Noise Policy."

3.3.2 EPA's Road Noise Policy 2011 (Sleep disturbance)

Section 5.4 of the NSW EPA's *Road Noise Policy* states: -

> *"Further studies by the enHealth Council (2004) and the guidelines published by the World Health Organisation (1999) were reviewed and analysed in terms of the guidance on noise exposure and sleep disturbance. The enHealth report states that:*
>
> *'as a rule for planning for short-term or transient noise events, for good sleep over 8 hours the indoor sound pressure level measured as a maximum instantaneous value should not exceed approximately 45 dB(A) L_{Max} more than 10 or 15 times per night'."*

3.3.3 EPA's Environmental Criteria for Road Traffic Noise 2009

Appendix B5 of the NSW EPA's Environmental Criteria for Road Traffic Noise (ECRTN) reviews the current level of knowledge and concludes that maximum internal noise levels below 50–55 dBA are unlikely to cause awakening reactions, and that one or two noise events per night with maximum internal noise levels of 65–70 dBA are not likely to affect health and wellbeing significantly.

3.4 Measured Background Noise Levels

In order to establish the Intrusiveness Criteria, it is necessary to determine the background noise levels in the vicinity of all potentially affected residential receptors.

The background noise level is defined by the EPA as 'the underlying level of noise present in ambient noise when all unusual extraneous noise is removed' and is considered to be represented by the $L_{A90,\ 15\ minute}$ descriptor. This is a statistical measure of the sound pressure level that is exceeded for 90 % of the time.

The Rating Background Level (RBL) is the single-figure background noise level derived from monitoring $L_{A90,\ 15\ minutes}$ over a representative period of time. The Rating Background Level is established for the day, evening and night time periods and is used for assessment purposes.

When measuring background noise levels, it is important to undertake sufficient monitoring of background noise to allow intrusive noise to be assessed adequately.

The criteria and methodology provided in the guideline is derived from the NSW EPA's *Noise Policy for Industry* (2017). The Policy provides minimum rating background noise levels (RBLS) for each period of the day, evening and night.

In this instance background noise monitoring was undertaken near receptor R3 as shown in Figure 1 between Tuesday 2 and Monday 8 May 2023. The results of the noise survey are summarised in Table 2 below and provided in graphical format in Appendix B. Instrumentation used during the noise survey is shown in Appendix A.

Table 2 Rating Background Noise Levels (RBLs)– Hakea Place, Albion Park Rail

Period / Time of Day	Rating Background Level dBA ($L_{90,\ 15\ minute}$)	Existing Ambient Noise Level ($L_{eq,\ 15\ minute}$ dBA)
Day Time Period (7 am to 6 pm)	**41**	**59**
Evening Time Period (6 pm to 10 pm)	**41**	**57**
Night Time Period (10 pm to 7 am)	**39**	**52**

3.5 On-Road Traffic Noise Criteria – *Road Noise Policy* 2011

The NSW EPA published the *NSW Road Noise Policy* in March 2011 (RNP) and the RNP replaced the *Environmental Criteria for Road Traffic Noise* in July 2011.

The RNP contains strategies to address the issue of road traffic noise from, among other things, traffic generating developments.

Section 2.3.1 of the RNP *'Noise assessment criteria – residential land uses'* sets out the assessment criteria for residences to be applied to particular types of project, road category and land use.

The relevant parts of the EPA's RNP Table 3 are replicated in Table 3 below.

Table 3 Road Traffic Noise Assessment Criteria (EPA RNP, Table 3)

Road Category	Type of Project / Land Use	Assessment Criteria, dBA	
		Day (7 am – 10 pm)	**Night (10 pm – 7 am)**
Local Roads	6. Existing residences affected by **additional traffic** on existing local roads generated by land use developments	$L_{Aeq\ (1\ hour)}$ 55 (external)	$L_{Aeq\ (1\ hour)}$ 50 (external)

3.6 Project Specific Noise Goals

The most relevant noise design goals are as follows: -

All Residential Receptors

- (41 + 5 =) **46 dBA** $L_{eq,\ 15\ minute}$ during the day time period,
- (41 + 5 =) **46 dBA** $L_{eq,\ 15\ minute}$ during the evening time period,
- (39 + 5 =) **44 dBA** $L_{eq,\ 15\ minute}$ during the night time period,
- (39 + 15 =) **54 dBA** $L_{1,\ 1\ minute}$ or L_{max} as an initial assessment for sleep disturbance outside residential premises,
- **45 dBA** to **55 dBA** $L_{1,\ 1\ minute}$ or L_{max} inside residential dwellings for further potential sleep disturbance assessment

On-Road Traffic Noise Goals – Residential receptors

- **55 dBA** $L_{eq,\ 1\ hour}$ from on-road traffic on local roads during the day, and
- **50 dBA** $L_{eq,\ 1\ hour}$ from local on-road traffic on local roads during the night.

4. MODIFYING FACTOR ADJUSTMENTS

Where a noise source contains certain characteristics, such as tonality, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. On the other hand, some sources may cause less annoyance where only a single event occurs for a limited duration.

Fact Sheet C of the *Noise Policy for Industry* (2017) outlines the correction factors to be applied to the source noise level at the receiver before comparison with the project noise trigger levels, to account for the additional annoyance caused by these modifying factors.

The modifying factor corrections should be applied having regard to:

- the contribution noise level from the premises when assessed/measured at a receiver location, and
- the nature of the noise source and its characteristics (as set out in this fact sheet).

Table C1 NPfI sets out the corrections to be applied. The corrections specified for tonal, intermittent and low-frequency noise are to be added to the measured or predicted noise levels at the receiver before comparison with the project noise trigger levels. The adjustments for duration are to be applied to the criterion.

Table C1 of Fact Sheet C is replicated in the attached Appendix C.

In this instance, there is potential for some of the future mechanical plant to cycle on and off at least on occasion. Where this occurs during the night time period a + 5 dB penalty may be applied to each noise source that displays intermittent characteristics. This is taken into account in calculations in Section 5 of this Report and is discussed in further detail in Section 6.2.1 of this Report.

5. SOURCE NOISE LEVELS

The main sources of noise associated with the proposed development will be as follows: -

- Mechanical plant servicing the buildings,
- Adult voice noise and background music,
- Children at play noise, and
- Customer vehicles and delivery vehicles attendant to the various tenancies.

5.1 Mechanical Plant and Equipment Source Noise Levels

The selection of mechanical plant has not been finalised at this stage, however Harwood Acoustics Pty. Ltd. has undertaken numerous acoustical assessments of fast food outlets, restaurants pubs, micro breweries, retail and commercial stores throughout NSW .

Table 4 below shows the 'A' frequency weighted sound power levels for indicative items of plant or equipment, in decibels re: 1 pW, derived from manufacturer's data.

Table 4 $L_{eq,\ 15\ minute}$ Sound Power Levels – Typical Mechanical Plant and Equipment

Item / Model	Sound Power Level (L_w) dBA
Air Conditioning Condenser	78 – 84
Coolroom / Freezer Condenser	78 – 86
Kitchen Exhaust Fan	76 – 81
Make Up Air Fan	76 – 78
Toilet Exhaust Fan	76 – 80

5.2 Adult Voice and Background Music Noise

Patrons Indoors and Music

A noise model has been developed for the calculation of noise generated by people indoors as well as amplified music. This is based on sound pressure level data for one person as given in Kryter[1], Harris[2] and from the author's database compiled over many years of similar assessments.

Table 5 below shows the calculated sound power levels for human voice noise and amplified music to be used in noise modelling.

Table 5 L_{eq} Sound Power Levels – Patrons Talking and Music Noise

Type of Voice	Sound Power Level (dBA)	Estimated Time spent at each type of voice (minutes in 15)	Resultant Sound power Level 15 minute average ($L_{Aeq,\ 15\ minute}$) dBA
Casual	61	3	54
Normal	64	5	61
Raised	73	6	69
Loud	83	1	71
15-minute Average for 1 Person			74
15-minute Average for 40 guests indoors (assumes 50% vocal)			87
Amplified Music – low background level			80 – 85

Table 6 below shows the sound power level of guest and music noise for assessment against the sleep disturbance assessment trigger level.

Table 6 L_{max} Sound Power Levels – People Shouting (Night time period)

Description	Sound Power Level (L_{max}) dBA
Typical Female / Male Shout	**88 – 98**

Patrons Outdoors – Beer Garden & Courtyards

The prediction of crowd noise is frequently required by development applications and yet there is little published research on the topic.

Using noise data for individual vocal efforts to derive an overall noise level for a crowd of people outdoors can be problematic as there are a number of variables to consider. These include for example, the number of people, the age demographic, the venue itself, the area over which people are spread, whether the noise is directional or of random orientation, random or synchronized vocal efforts (sporting contests compared to beer gardens for example) and whether there is alcohol involved.

[1] *'The Effects of Noise on Man'* by Karl Kryter, Academic Press (1985)

[2] *'Handbook of Acoustical Measurements and Noise Control*' 3rd Edition by Cyril M. Harris, McGraw-Hill Inc (1991)

To assist acoustical consultants in predicting crowd noise a '*Draft Licensed Premises Noise Assessment Technical Guideline*' has been produced by the Association of Australasian Acoustical Consultants (AAAC) 2014.

The guideline provides source noise levels for a variety of scenarios of small to medium sized crowds located outdoors in a variety of spaces and venues.

In addition to the Guideline, research has been conducted by Hayne, Taylor, Rumble and Mee[3] which has derived a set of equations suitable for use by consultants to predict noise emission from small to medium crowds in outdoor, free field settings.

To derive a sound power level for the energy average sound pressure level parameter (L_{eq}), the equation is:-

$$L_{WAeq} = 15\ Log_{10}\ N + 64\ dB$$

Where:

L_{WAeq} is the energy average A weighted sound pressure level in decibels,

N is the number of people in the crowd.

Typical worst-case scenarios are assumed in the predictions in Section 6 of this Report whereby all courtyards and the beer garden are at full capacity simultaneously during day time and evening hours.

5.3 Children at Play

A noise model has been developed to establish the noise level of children at play. This model is based on measurements taken of children at play in groups undertaken during previous assessments of child care centres by the author as well as from sound pressure level data for children given in Kryter[4].

The data was used to establish the sound power level for individual children shown in Table 7 below. These levels are in line with the sound power levels provided in the AAAC '*Guideline for Child Care Centre Acoustic Assessment*'.

Table 7 Children at Play - L_{eq} Sound Power Levels

Child's Age Group / Description	L_{eq} Sound Power Levels (dBA)
Group of 10 children 0 to 2 years	77 to 80
Group of 10 children 2 to 3 years	83 to 87
Group of 10 children 3 to 6 years	84 to 90

5.4 Motor Vehicle Noise Levels

The 'A' frequency weighted 15 minute sound power levels for various customer and delivery vehicle types are shown in Table 8 below.

[3] *Hayne, MJ, Mee, DJ, Rumble, RH, Taylor, JC,* 2010, 'Prediction of Noise from Small to Medium Sized Crowds', *Proceedings of Acoustics 2011*, *Paper 133*

[4] *'The Effects of Noise on Man'* by Karl Kryter, Academic Press (1985)

All noise levels are derived from a database of sound pressure measurements of trucks and cars undertaken at various locations throughout NSW and compiled by the author over the past 20 years.

Table 8 $L_{eq,\ 15\ minute}$ Sound Power Levels – Various Vehicle Movements

Vehicle Activity / Description	Individual Sound Power Level $L_{eq,\ 15\ minute}$ (dBA)
Delivery Truck (small rigid or refrigerated)	**89**
Car / 4WD movement < 30 kph through car park	**54 per metre one car**
Car / 4WD carparking manoeuvre (door open / close + engine start and move)	**69**

Table 9 below shows the $L_{1,\ 1\ minute}$ sound power levels of 'one-off' instantaneous potential noise sources that may occur during night time hours from vehicles prior to 7 am or after 10 pm.

Table 9 L_{max} Sound Power Level – One Off Noise Sources

Vehicle Activity / Description	L_{max} Sound Power Level (dBA)
Car door closing / slamming	**84 / 94**
Car starting / accelerating	**89 / 98**

At the time of writing this Report a Traffic Impact Assessment has not been completed, however Harwood Acosutics Pty. Ltd. was advised that the Site is predicted to generate an average of approximately 200 vehicle trips in the peak hour during the am day time or pm evening time periods. Previous assessments indicate that the traffic during the hours immediately either side of the peak hours typically generate traffic flows that are approximately 50 % of the peak hour flows. Night time hours and hours well outside of peak times typically generate traffic flows that are approximately 10 – 15 % of the peak hour flows.

For the purpose of predicting typical worst-case noise emission from customer vehicles attendant to the Site, the following number of vehicle movements are considered:-

- 50 vehicle trips in any given 15 minute period during the day time and evening,
- 8 vehicle trips per tenancy in any given 15 minute period in the night time period, and
- 200 vehicle trips in the busiest one hour period.

6. NOISE LEVEL PREDICTIONS

6.1 Noise Modelling Details and Parameters

A noise model was prepared using *SoundPLAN Essential* noise prediction software *Version 5.1*. Table 10 below provides details on the specific parameters used to develop the noise model.

Table 10 Computer Noise Model Parameters

Parameter	Details
Buildings, structures and topography	Local buildings including the commercial buildings have been included in constructing the model. This includes the proposed tenancies. The topography of the site and surrounding area is imported into the model.
Source noise levels	The higher of the noise levels for all items of mechanical plant shown in Table 4 are used as a worst-case. All mechanical plant sis assumed to be located on the roof of each building and include 1 x AC unit, 1 x cool room or freezer condenser and 1 x toilet exhaust fan on all tenancies and a kitchen exhaust on all tenancies other than the general store and retail store. For adult and children's voice noise all courtyards, the beer garden and the children's playground are assumed to be at capacity, simultaneously.
Algorithm & Meteorological conditions	Noise sources were modelled in accordance with the International Standard ISO 9613-2 (1996(E)) *'Acoustic – Attenuation of sound during propagation outdoors Part 2 General method of calculation'*. The method described in the Standard is general in the sense that it may be applied to a wide variety of noise sources, and covers the major mechanism of attenuation. • The method allows for downwind propagation conditions namely:- • wind direction within an angle of ± 45° of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and • wind speed between approximately 1 m/s and 5 m/s measured at a height of 3 m to 11 m above the ground, The equations for calculating downwind sound pressure level, including the equations for attenuation, are the average for meteorological conditions within these limits. These equations also hold, equivalently, for average propagation under well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights.

6.2 Predicted Noise Levels

The $L_{eq,\ 15\ minute}$ predicted noise levels are shown in Table 11 below at each receptor location. Table 12 shows the predicted $L_{1,\ 1\ minute}$ for assessment of the potential for sleep disturbance at night.

Table 11 Predicted L_{eq} Noise Levels – All Receptors – All Time Periods

Noise Goal and Timer Period / Description	Predicted Noise Level $L_{eq,\ 15\ minute\ /\ period}$ (dBA) at Receptor Location		
	R1	R2	R3
Design Noise Goal – Day & Evening	**46**	**46**	**46**
Operational Noise Level Day and evening time periods	43	40	33
Complies	Yes	Yes	Yes
Design Noise Goal – Night	**44**	**44**	**44**
Operational Noise Level Night time period	44	38	34
Complies	Yes	Yes	Yes

Predictions in Table 11 assume the following:-

- Mechanical plant includes:-
  - 1 x AC Unit, 1 x Cool room or freezer condenser and 1 x toilet fan on the roof of every building, and
  - 1 x kitchen exhaust fan on the roof of every building other than B02 (general store)
- Day time and evening time operation includes:-
  - All mechanical plant operating simultaneously for a minimum 15 minutes,
  - All courtyards, the beer garden and the children's play ground in use simultaneously,
  - 38 vehicle trips in 15 minutes along Annie Pyers Drive in the same 15 minute period,
  - 38 vehicle movements in the car park in the same 15 minute period, and
  - Two delivery vehicles (medium rigid trucks) attendant to he Site in the same 15 minute period.
- Night time operation includes:-
  - All mechanical plant operating simultaneously for a minimum 15 minutes,
  - A 5 dB penalty for intermittent noise is applied to ALL items of mechanical plant (refer Section 6.2.1 below),
  - All courtyards, the beer garden and the children's play ground in use simultaneously,
  - 6 vehicle trips* in 15 minutes along Annie Pyers Drive in the same 15 minute period, and
  - 6 vehicle movements* in the car park in the same 15 minute period.

** It is worth noting that the night time noise goal of 44 dBA $L_{eq,\ 15\ minute}$ is still met at each receptor if the peak hour day time and evening time traffic flows are applied to the night time period.*

Table 12 Predicted L_{max} Noise Level (Sleep Disturbance During Night Time)

Noise Goal and Vehicle Activity / Description	Predicted Noise Level $L_{1,\ 1\ minute\ /\ period}$ (dBA) at Receptor Location		
	R1	R3	R4
Sleep disturbance assessment trigger level	**54**	**54**	**54**
Engine starting, car doors closing, people shouting, etc	47	44	38
At or below trigger level	Yes	Yes	Yes

SoundPLAN Noise Model diagrammatical representations of the predicted noise levels from Tables 11 and 12 are shown in Appendices D to I.

6.2.1 Intermittent Noise Sources

As mentioned above, the selection of mechanical plant is not finalised at this stage for any tenancy. It is likely to include that which is listed in Table 4 in Section 5.1 of this Report.

A + 5 dB penalty is to be applied to any noise sources that are considered to be intermittent in nature during night time hours, i.e. after 10 pm and before 7 am (or 8 am on Sundays and public Holidays).

The EPA states (refer Appendix C) that intermittency is subjectively assessed but should be assisted with measurement to gauge the extent of change in noise level. The source noise heard at the receiver varies by more than 5 dB and the intermittent nature of the noise is clearly audible.

Modelling in this instance assumes that all plant is potentially intermittent at night and a 5 dB penalty has been applied to individual noise sources in the model accordingly as worst-case scenario.

Individual assessment will be required for each tenancy in the future once mechanical plant selections are finalised.

7. ON-ROAD TRAFFIC NOISE EMISSION

In order to predict the level of noise emission from vehicles attendant to the development Site whilst traversing Annie Pyers Drive, the following number of vehicle movements were assumed for the day and night time peak hour periods:-

- 200 vehicle trips per peak hour in the day or evening time periods, and
- 30 vehicle trips per peak hour in the night time period (being 15 % of the AM / PM peak).

Formulae are given in the *Calculation of Road Traffic Noise* (CoRTN) from the UK Department of Transport and Welsh Office (1988) for the calculation of on-road vehicle noise. However, the calculation procedure given in CoRTN is untested for small traffic flows (under 200) and typically yields lower levels than occur in practice.

Therefore, a calculation based on the sound exposure level for various vehicles were carried out. The sound exposure level (L_{Ae}) is a summation of the sound energy produced during a single event (i.e. a motor vehicle pass-by, train pass-by, etc).

The average maximum measured sound exposure levels of a range vehicles, normalised to a distance of 10 metres is as follows:-

- Cars / utes / 4wd– 69 to 72 dBA,

Once established, a sound exposure level (L_{Ae}) can be used to calculate an energy average, sound pressure level ($L_{eq, time}$) using the following formula:-

$$L_{eq,\ 1\ hour} = L_{ae} + 10\ log_{10}(N) - 10\ log_{10}(T)$$

Where N is the number of vehicle trips and T is the time in seconds. The calculated level can then be adjusted to various distances from the 10-metre location.

The closest dwelling to Annie Pyers Drive is approximately 165 metres from the road.

The predicted noise level from on-road vehicle movements during peak flows is shown in Table 13 below.

Table 13 Predicted $L_{eq,\ period}$ Noise Levels – Passing Vehicles

Time Period / Description	Predicted Noise Level $L_{eq,\ 1\ hour}$ (dBA) at Nearest Receptor Locations Annie Pyers Drive
Day Time Road Traffic Noise Limit	**55**
Predicted day time traffic noise level (to 10 pm)	47
Complies	Yes
Night Time Road Traffic Noise Limit	**50**
Predicted night time traffic noise level (to 10 pm)	37
Complies	Yes

8. RECOMMENDATIONS

8.1 Future Use

It can be seen from Section 6 in this assessment that the predicted level of noise emission from all indicative noise sources associated with the typical potential operation of the development satisfies the relevant noise goals at all receptor locations.

The predicted noise levels in this assessment are based on restaurant, café and bar style use for all hospitality (food and beverage) tenancies. This includes lower level amplified music levels in cafes and restaurants and a low to medium level in the Brew House and beer garden, as detailed in Table 5 in Section 5.2.

Recommendations also assume that all licensed venues close at midnight.

Based on these assumptions and modelling scenarios the standard noise conditions required to be met for licenced premises by Liquor and Gaming NSW and Council will be achieved for this proposal.

Any future licensed tenancies within the development that propose to trade past midnight or provide entertainment with a focus on amplified or live music should submit individual acoustical assessments to ensure that the noise limits can be achieved at all receptor locations.

Any noise controls required will not be particularly onerous and may include, for example, a limit on the level of amplified music to be played and / or closing of doors and windows after a certain time.

9. CONCLUSION

An assessment of the potential noise emission arising from the proposed conversion of the Dog on the Tuckerbox Site at 37 Annie Pyers Drive, Gundagai, NSW in to a tourist and visitor attraction was undertaken.

A noise model has been developed for the draft concept master plan and includes mechanical plant, adult and children voice noise, background music, motor vehicles and delivery vehicles.

Calculations and predictions from the acoustical modelling show that the level of noise emission from the potential operation of the overall development can readily satisfy the EPA's and Council's standard noise goals for commercial developments at all nearby receptor locations.

It is recommended that any future tenancies proposing to trade past midnight or provide entertainment with a focus on live music or high levels of amplified music prepare and submit individual noise assessments to Council.

Any future noise controls, if required at all, will not be onerous and there is no reason acoustically that the proposed development could not operate at full capacity and be easily controlled, if required, to meet all relevant noise criteria.

The EPA's *Road Noise Policy* 2011 noise criteria will also be complied with at all receptors for traffic generated by the proposal whilst traversing the Annie Pyers Drive.

Matthew Harwood, MAAS

Director and Principal Consultant

Harwood Acoustics Pty. Ltd.

Attachments:-

Important Note
Appendix A – Noise Survey Instrumentation
Appendix B – Noise Survey Results
Appendix C – Modifying Factor Corrections (EPA 2017)
Appendix D – *SoundPLAN* Noise Model – predicted $L_{eq,\ 15\ minute}$ (dBA) noise contours day & evening
Appendix E – *SoundPLAN* Noise Model – predicted $L_{eq,\ 15\ minute}$ (dBA) noise levels day & evening
Appendix F – *SoundPLAN* Noise Model – predicted $L_{eq,\ 15\ minute}$ (dBA) noise contours night time
Appendix G – *SoundPLAN* Noise Model – predicted $L_{eq,\ 15\ minute}$ (dBA) noise levels night time
Appendix H – *SoundPLAN* Noise Model – predicted $L_{1,\ 1\ minute}$ (dBA) noise contours night time (sleep)
Appendix I – *SoundPLAN* Noise Model – predicted $L_{eq,\ 15\ minute}$ (dBA) noise levels night time (sleep)

Important Note

All products and materials suggested by Harwood Acoustics Pty Ltd are selected for their acoustical properties only. Recommendations made in this report are intended to resolve acoustical problems only, therefore all other properties such as aesthetics, air flows, chemical, corrosion, combustion, construction details, decomposition, expansion, fire rating, fumes, grout or tile cracking, loading, shrinkage, smoke, ventilation etc. are outside Harwood Acoustic's field of expertise and ***must*** *be checked with the supplier or suitably qualified specialist before purchase.*

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Opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal opinions.

Noise Survey Instrumentation	Appendix A

The instrumentation used during the noise surveys consisted of the following: -

Description	Model No.	Serial No.
Bruel & Kjaer Sound Level Meter	2250	3009189
Bruel & Kjaer Acoustical Calibrator	4321	3003242
Infobyte Noise Logger Im4	Im4	104

The Bruel and Kjaer Model 2250 sound level meter conforms to Australian Standards AS IEC 61672.1-2004: 'Electroacoustics - Sound level meters – Specifications' as a Class 1 precision sound level meter and has an accuracy suitable for both field and laboratory use. The Infobyte

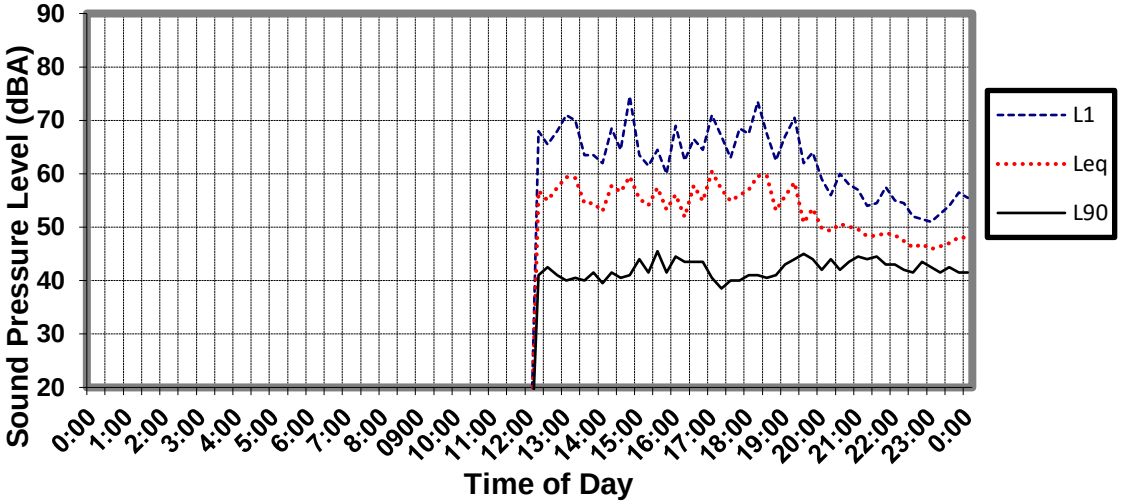
The infobyte Model Im4 noise logger conforms to Australian Standard AS1259:2-1990 'Acoustics - Sound Level Meters' as a Type 2 precision sound level meter and has an accuracy suitable for field use.

The calibration of the sound level meter and logger was checked before and after the measurement periods. No significant system drift occurred over the measurement periods.

The sound level meter, logger and calibrator were previously checked, adjusted and aligned to conform to the factory specifications and issued with conformance certificates as required by the regulations.

Noise Survey Results	Appendix B

Tuesday May 2nd 2023



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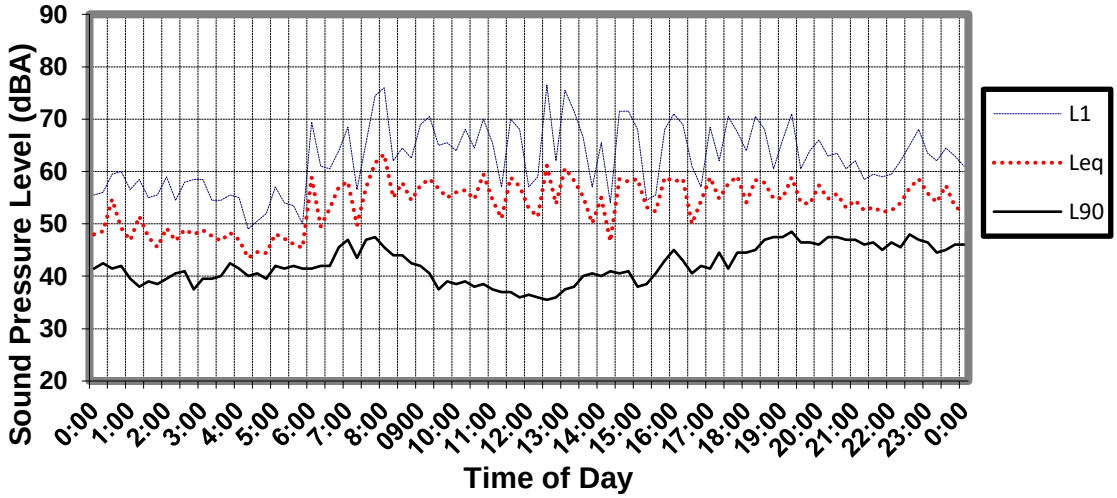
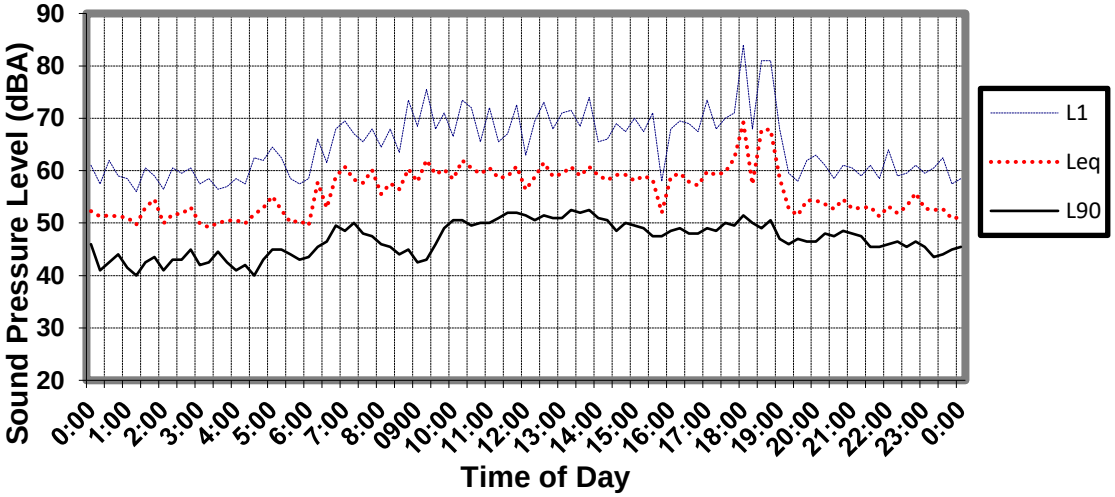
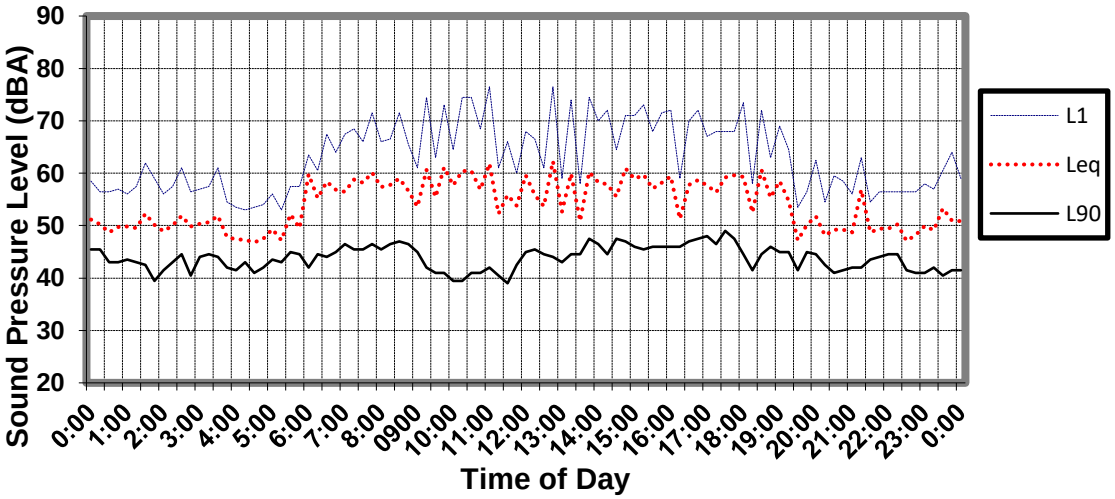


Thursday May 4th 2023



Friday May 5th 2023



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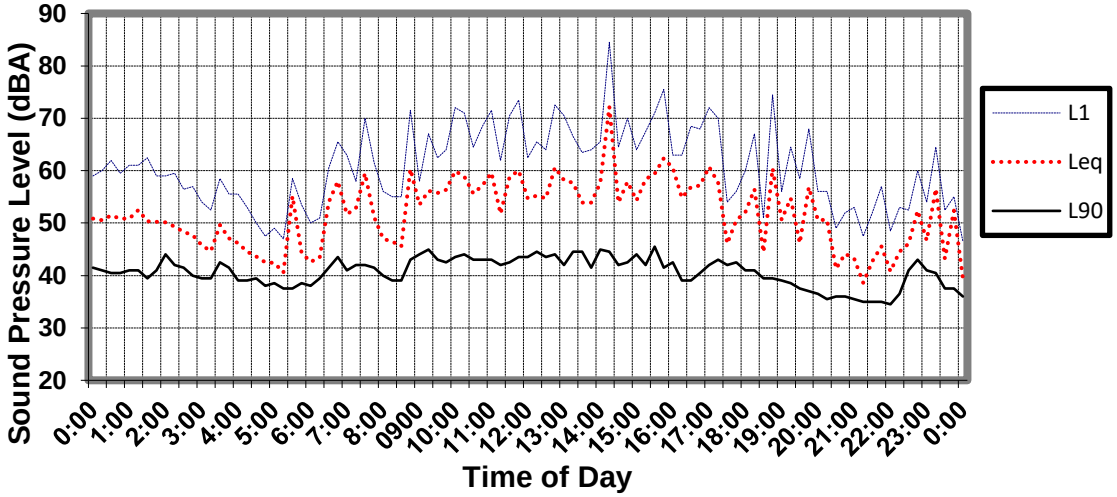
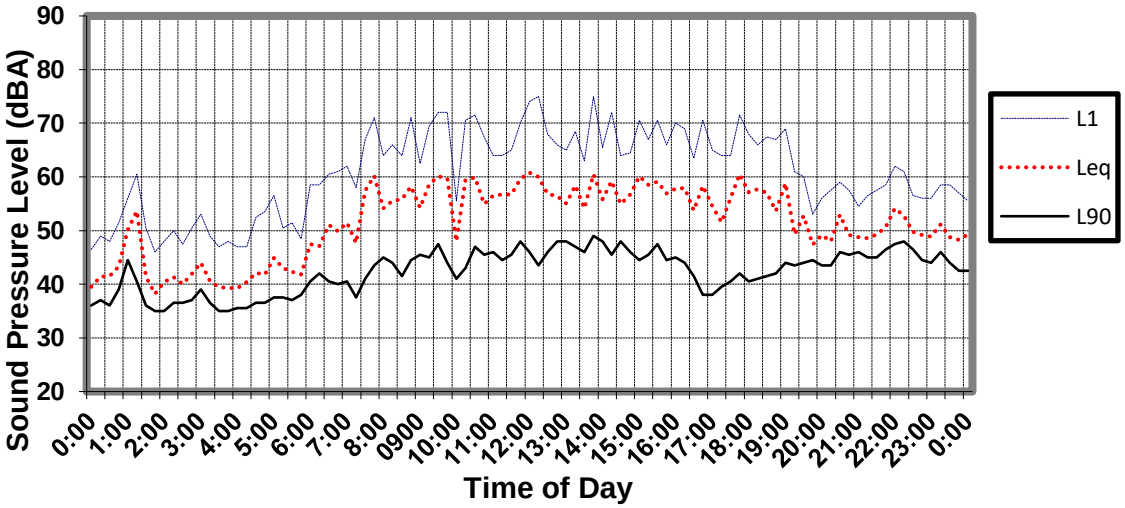
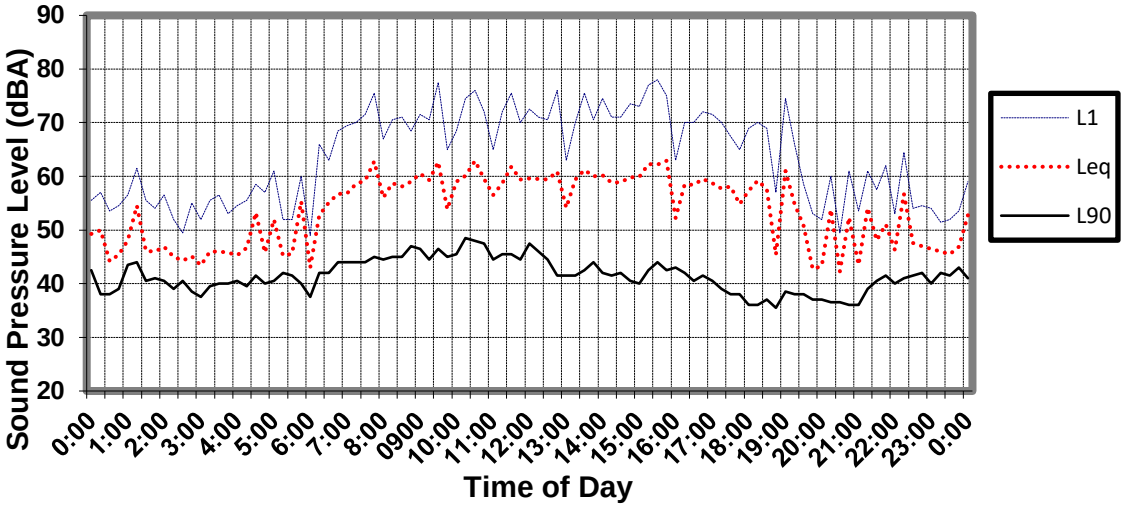


Sunday May 7th 2023



Monday May 8th 2023



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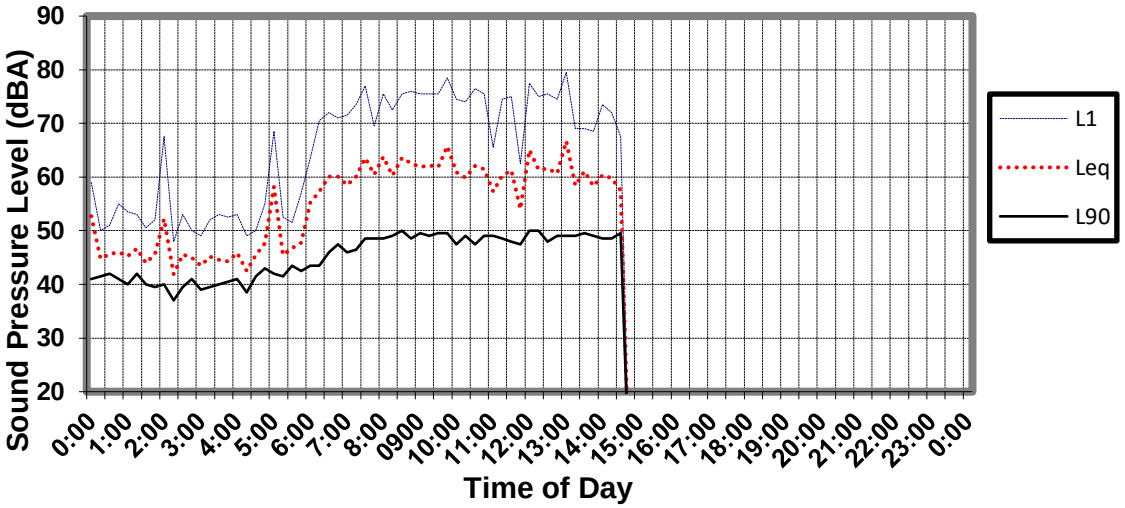

Modifying Factor Corrections (EPA 2017) | Appendix C

Table C1 Modifying Factor Corrections (from Table C.1 of the NSW Noise Policy for Industry 2017)

Factor	Assessment/ Measurement	When to Apply	Correction	Comments
Tonal Noise	One-third octave band analysis using the objective method for assessing the audibility of tones in noise – simplified method (*ISO1996.2-2007 – Annex D*).	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: • 5 dB or more if the centre frequency of the band containing the tone is in the range 500–10,000 Hz • 8 dB or more if the centre frequency of the band containing the tone is in the range 160–400 Hz • 15 dB or more if the centre frequency of the band containing the tone is in the range 25–125 Hz.	5 dB	Third octave measurements should be undertaken using unweighted or Z-weighted measurements. **Note:** Narrow-band analysis using the reference method in *ISO1996-2:2007, Annex C* may be required by the consent/regulatory authority where it appears that a tone is not being adequately identified, e.g. where it appears that the tonal energy is at or close to the third octave band limits of contiguous bands.
Low Frequency Noise	Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements in the range 10–160 Hz	Measure/assess source contribution C- and A-weighted Leq,T levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and: • where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period • where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dB and cannot be mitigated, a 5-dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period and a 2-dB(A) positive adjustment applies for the daytime period.	2 or 5 dB	A difference of 15 dB or more between C- and A-weighted measurements identifies the potential for an unbalance spectrum and potential increased annoyance. The values in Table C2 are derived from Moorhouse (2011) for DEFRA fluctuating low-frequency noise criteria with corrections to reflect external assessment locations.

Table C1 Modifying Factor Corrections (from Table C.1 of the NSW Noise Policy for Industry 2017) *Cont…*

Factor	Assessment/ Measurement	When to Apply	Correction	Comments
Intermittent Noise	Subjectively Assessed but should be assisted with measurement to gauge the extent of change in noise level.	The source noise heard at the receiver varies by more than 5 dB(A) and the intermittent nature of the noise is clearly audible.	5 dB	Adjustment to be applied for **night-time only**.
Duration	Single-event noise duration may range from 1.5 m to 2.5 h	One event in any 24-hour period	0 to -20dBA	The acceptable noise trigger level may be increased by an adjustment depending on duration of noise (see Table C.3)
Maximum adjustment	Refer to individual modifying factors	Where two or more modifying factors are indicated	Maximum correction of 10 dBA[2] (excluding duration correction)	

Notes:

1. Corrections to be added to the measured or predicted levels, except in the case of duration where the adjustment is to be made to the criterion.

2. Where a source emits tonal and low-frequency noise, only one 5-dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.

3. Where narrow-band analysis using the reference method is required, as outlined in column 5, the correction will be determined by the ISO1996-2:2007 standard.

Dog on the Tuckerbox
Proposed Development - Concept Plan
Example Predicted Noise Contours
Leq, 15 minute Day Time

Proposed buildings

Mechanical Plant & Delivery Vehicles

Traffic on entry road

Beer garden, courtyard, children at play & car park

Levels in dB(A)

= 30
= 32
= 34
= 36
= 38
= 40
= 42
= 44
= 46
= 48
= 50
= 52
= 54
= 56
= 58

1 : 4767

0 25 50 100 150 200 m

N

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Dog on the Tuckerbox
Proposed Development
Concept Plan
Example Predicted Noise Levels
Leq, 15 minute Day Time

Signs and symbols

- Proposed buildings
- Receiver
- Mechanical Plant & Delivery Vehicles
- Traffic on entry road
- Beer garden, courtyard, children at play & car park

1 : 4767

0 25 50 100 150 200 m

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Dog on the Tuckerbox
Proposed Development - Concept Plan
Example Predicted Noise Contours

Signs and symbols

- Proposed buildings
- Mechanical Plant
- Traffic on entry road
- Beer garden, courtyard, children at play & car park

Levels in dB(A)

- = 30
- = 32
- = 34
- = 36
- = 38
- = 40
- = 42
- = 44
- = 46
- = 48
- = 50
- = 52
- = 54
- = 56
- = 58

1 : 4767

0 25 50 100 150 200 m

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Dog on the Tuckerbox
Proposed Development
Concept Plan
Example Predicted Noise Levels
Leq, 15 minute Night Time

Signs and symbols

- Proposed buildings
- Receiver
- Mechanical Plant
- Traffic on entry road
- Beer garden, courtyard, children at play & car park

1 : 4767

0 25 50 100 150 200 m

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Dog on the Tuckerbox
Proposed Development - Concept Plan
Example Predicted Noise Contours
L1, 1 minute Night Time (Sleep disturbance)

Proposed buildings

Mechanical Plant, People shouting, car doors closing, etc

Traffic on entry road

Beer garden, courtyard, children & car park

Levels in dB(A)

= 30
= 32
= 34
= 36
= 38
= 40
= 42
= 44
= 46
= 48
= 50
= 52
= 54
= 56
= 58

1 : 4767

0 25 50 100 150 200 m

N

HARWOOD ACOUSTICS
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Dog on the Tuckerbox
Proposed Development
Concept Plan
Example Predicted Noise Levels
L1, 1 minute Night Time (Sleep disturbance)

Proposed buildings

Receiver

Mechanical Plant, People shouting, car doors closing, etc

Traffic on entry road

Beer garden, courtyard, children & car park

1 : 4767

0 25 50 100 150 200 m

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