Noise Impact Assessment

Modification to Trading Hours
The George Tavern
5 Molly Morgan Drive
Greenhills, NSW.

Prepared for: Design Collaborative Pty Ltd
August 2021
MAC201112-02RP1V1

Muller Acoustic Consulting

Document Information

Noise Impact Assessment

Modification to Trading Hours

The George Tavern

5 Molly Morgan Drive, Greenhills, NSW.

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Design Collaborative Pty Ltd (DC) to prepare a Noise Impact Assessment (NIA) for the proposed modification to trading hours of the George Tavern (the 'project'), located at 5 Molly Morgan Drive, Greenhills, NSW. The Noise Impact Assessment has been prepared to accompany the Development Application for the project and quantifies noise emissions from the project to surrounding receivers. This assessment has been completed in accordance with the following policies and guidelines:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI) 2017;
- Australian Standard AS 1055:2018 - Acoustics - Description and measurement of environmental noise - General Procedures;
- The Independent Liquor and Gaming Authority (ILGA) criteria related to licensed premises;
- Association of Australasian Acoustical Consultants (AAAC) - Consultants Guideline for Report Writing, 2017;
- Association of Australasian Acoustical Consultants (AAAC) – Licensed Premises Noise Assessment Technical Guideline, 2019; and
- International Standard ISO 9613:1993 - Acoustics - Attenuation of sound during propagation outdoors.

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

1.1 Trading Hours

The current approved trading hours of the tavern are 9am to 1.30am Monday to Saturday and 10am to 10pm Sundays. Approval is being sought to extend the tavern trading hours to be 9am to 4am Monday to Saturday and 10am to 12am Sundays. The assessment has quantified the emissions associated with the additional trading hours of the tavern on the surrounding noise environment. **Table 1** provides a summary of the existing and proposed trading hours of the tavern.

Table 1 Tavern Trading Hours

Day	Existing Trade Hours	Proposed Trade Hours
Monday	9:00am – 1:30am	9:00am – 4:00am
Tuesday	9:00am – 1:30am	9:00am – 4:00am
Wednesday	9:00am – 1:30am	9:00am – 4:00am
Thursday	9:00am – 1:30am	9:00am – 4:00am
Friday	9:00am – 1:30am	9:00am – 4:00am
Saturday	9:00am – 1:30am	9:00am – 4:00am
Sunday	10:00am – 12:00am	10:00am – 12:00am

1.2 Receiver Review

A review of receivers in close proximity to the project has been completed and are summarised in **Table 2. Figure 1** provides a locality plan showing the position of these receivers in relation to the project. Receiver heights were set to 1.5m and 4.0m above relative ground level for ground and first floor receivers.

It is noted that commercial receivers are not anticipated to be affected as a result of the proposed modification of trading hours as they will be unoccupied during the night assessment period. Accordingly, they have not been included as part of this assessment.

Table 2 Receiver Locations

Receiver	MGA56 Coordinates		Receiver Height	Receiver Type
	Easting	Northing		
R1	368439	6374108	1.5/4.0m	Residential
R2	368443	6374090	1.5/4.0m	Residential
R3	368440	6374073	1.5/4.0m	Residential
R4	368438	6374055	1.5/4.0m	Residential
R5	368437	6374038	1.5/4.0m	Residential
R6	368440	6374018	1.5/4.0m	Residential
R7	368340	6374069	1.5/4.0m	Residential
R8	368323	6374034	1.5m	Residential
R9	368306	6374036	1.5m	Residential
R10	368288	6374024	1.5m	Residential
R11	368278	6373998	1.5m	Residential
R12	368250	6373975	1.5m	Residential
R13	368232	6373971	1.5m	Residential
R14	368196	6373950	1.5m	Residential
R15	368163	6373913	1.5m	Residential

FIGURE 1

LOCALITY PLAN

REF: MAC201112

0 100m

KEY	
R1	RECEIVER LOCATION
L1	LOGGER LOCATION
	SITE LOCATION

MAC
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*Imagery Source : nearmaps

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2 Noise Policy and Guidelines

2.1 Noise Policy for Industry

The EPA released the Noise Policy for Industry (NPI) in October 2017 which provides a process for establishing noise criteria for consents and licenses enabling the EPA to regulate noise emissions from scheduled premises under the Protection of the Environment Operations Act 1997.

The objectives of the NPI are to:

- provide noise criteria that is used to assess the change in both short term 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; and
- support a process to guide the determination of achievable noise limits for planning approvals and/or licences, considering the matters that must be considered under the relevant legislation (such as the economic and social benefits and impacts of industrial development).

The policy sets out a process for industrial noise management involving the following key steps:

1. Determine the Project Noise Trigger Levels (PNTLs) (ie criteria) for a development. These are the levels (criteria), above which noise management measures are required to be considered. They are derived by considering two factors: shorter-term intrusiveness due to changes in the noise environment; and maintaining the noise amenity of an area.
2. Predict or measure the noise levels produced by the development with regard to the presence of annoying noise characteristics and meteorological effects such as temperature inversions and wind.
3. Compare the predicted or measured noise level with the PNTL, assessing impacts and the need for noise mitigation and management measures.
4. Consider residual noise impacts - that is, where noise levels exceed the PNTLs after the application of feasible and reasonable noise mitigation measures. This may involve balancing economic, social and environmental costs and benefits from the proposed development against the noise impacts, including consultation with the affected community where impacts are expected to be significant.

5. Set statutory compliance levels that reflect the best achievable and agreed noise limits for the development.

6. Monitor and report environmental noise levels from the development.

2.1.1 Project Noise Trigger Levels (PNTL)

The policy sets out the procedure to determine the PNTLs relevant to an industrial development. The PNTL is the lower (ie, the more stringent) of the **Project Intrusiveness Noise Level** (PINL) and **Project Amenity Noise Level** (PANL) determined in accordance with Section 2.3 and Section 2.4 of the NPI.

2.1.2 Project Intrusiveness Noise Level (PINL)

The PINL ($LA_{eq(15min)}$) is the RBL + 5dB and seeks to limit the degree of change a new noise source introduces to an existing environment. Hence, when assessing intrusiveness, background noise levels need to be measured.

Background noise levels need to be determined before intrusive noise can be assessed. The NPI states that background noise levels to be measured are those that are present at the time of the noise assessment and without the subject development operating. For the assessment of modifications to existing premises, the noise from the existing premises should be excluded from background noise measurements. It is note that the exception is where the premises has been operating for a significant period of time and is considered a normal part of the acoustic environment; it may be included in the background noise assessment under the following circumstances:

- the development must have been operating for a period in excess of 10 years in the assessment period/s being considered and is considered a normal part of the acoustic environment; and,
- the development must be operating in accordance with noise limits and requirements imposed in a consent or licence and/or be applying best practice.

Where a project intrusiveness noise level has been derived in this way, the derived level applies for a period of 10 years to avoid continuous incremental increases in intrusiveness noise levels. This approach is consistent with the purpose of the intrusiveness noise level to limit significant change in the acoustic environment. The purpose of the project amenity noise level is to moderate against background noise creep.

2.1.3 Project Amenity Noise Level (PANL)

The PANL is relevant to a specific land use or locality. To limit continuing increases in intrusiveness levels, the ambient noise level within an area from all combined industrial sources should remain below the recommended amenity noise levels specified in Table 2.2 (of the NPI). The NPI defines two categories of amenity noise levels:

- **Amenity Noise Levels (ANL)** – are determined considering all current and future industrial noise within a receiver area; and
- **Project Amenity Noise Level (PANL)** – is the recommended level for a receiver area, specifically focusing the project being assessed.

Additionally, Section 2.4 of the NPI states: "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":

PANL for new industrial developments = recommended **ANL** minus 5dBA.

The following exceptions apply when deriving the PANL:

- areas with high traffic noise levels;
- proposed developments in major industrial clusters;
- existing industrial noise and cumulative industrial noise effects; and
- greenfield sites.

The NPI states with respect to high traffic noise areas:

The level of transport noise, road traffic noise in particular, may be high enough to make noise from an industrial source effectively inaudible, even though the LAeq noise level from that industrial noise source may exceed the project amenity noise level. In such cases the project amenity noise level may be derived from the LAeq, period(traffic) minus 15 dB(A).Where relevant this assessment has considered influences of traffic with respect to amenity noise levels (ie areas where existing traffic noise levels are 10dB greater than the recommended amenity noise level). The recommended amenity noise levels as per Table 2.2 of the NPI are reproduced in **Table 3**.

Table 3 Amenity Noise Levels			
Receiver Type	Noise Amenity Area	Time of day	Recommended amenity noise level dB LAeq(period)
Residential	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks.	See column 4	See column 4	5dB above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School Classroom	All	Noisiest 1-hour period when in use	35 (internal) 45 (external)
Hospital ward			
- internal	All	Noisiest 1-hour	35
- external	All	Noisiest 1-hour	50
Place of worship - internal	All	When in use	40
Passive Recreation	All	When in use	50
Active Recreation	All	When in use	55
Commercial premises	All	When in use	65
Industrial	All	When in use	70

Notes: The recommended amenity noise levels refer only to noise from industrial noise 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 rural residential; suburban residential; urban residential; industrial interface; commercial; industrial – see Table 2.3 and Section 2.7 of the NPI.

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night – the period from 10pm to 7am.

2.1.4 Maximum Noise Assessment Trigger Levels

The potential for sleep disturbance from maximum noise level events from a project during the night-time period needs to be considered. The NPI considers sleep disturbance to be both awakenings and disturbance to sleep stages.

Where night-time noise levels from a development/premises at a residential location exceed the following criteria, a detailed maximum noise level event assessment should be undertaken:

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

A 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.

Other factors that may be important in assessing the impacts on sleep disturbance include:

- how often the events would occur;
- the distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the development;
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods); and
- current understanding of effects of maximum noise level events at night.

2.2 Independent Liquor and Gaming Authority (ILGA)

The NSW EPA's Noise Guide for Local Government (NGFLG) (2013) summaries criteria related to licensed premises. The Independent Liquor and Gaming Authority (ILGA) (formerly OLGR) criteria are reproduced from NGFLG below and have been adopted as the principle criteria for residential receivers in this assessment:

'The LA10 noise level emitted from the licensed premises shall not exceed the background noise level in an Octave Band Centre Frequency (31.5Hz – 8kHz inclusive) by more than 5dB between 7:00am and 12:00midnight at the boundary of any affected residence.

The LA10 noise level emitted from the licensed premises shall not exceed the background noise level in an Octave Band Centre Frequency (31.5Hz – 8kHz inclusive) between 12:00midnight and 7:00am at the boundary of any affected residence. Notwithstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00midnight and 7:00am.'

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3 Noise Criteria

Noise Criteria for this assessment was sourced from 'Noise Assessment – Proposed Alterations and Additions, The George Tavern, 5 Molly Morgan Drive, Greenhills, NSW' (Report Ref MAC201112-01RP1, Muller Acoustic Consulting Pty Ltd, 25 May 2020) (the 'historic report').

3.1 Operational Noise Criteria

The night time Project Noise Trigger Levels (PNTLs) applicable to residential receivers surrounding the project were outlined in **Table 8** of the historic report and are reproduced in **Table 4**.

Table 4 Project Noise Trigger Levels

Receiver	Period[1]	PINL dB $L_{Aeq(15min)}$	PANL dB $L_{Aeq(15min)}$	PNTL dB $L_{Aeq(15min)}$
Residential	Night	42	44	42

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

3.1.1 Maximum Noise Assessment Trigger Levels

The maximum noise trigger levels outlined in **Table 5** were sourced from **Table 9** of the historic report.

Table 5 Maximum Noise Assessment Trigger Levels

Residential Receivers			
$L_{Aeq(15min)}$		LAmax	
40dB $L_{Aeq(15min)}$ or RBL + 5dB		52dB LAmax or RBL + 15dB	
Trigger	40	Trigger	52
RBL 37+5dB	42	RBL 37+15dB	52
Highest	**42**	**Highest**	**52**

Note: Monday to Saturday; Night 10pm to 7am. On Sundays and Public Holidays; Night 10pm to 8pm.

Note: As per Section 2.5 of the NPI, the highest of the two criteria are adopted as the trigger level.

3.2 Independent Liquor and Gaming Authority (ILGA) Criteria

Historic background noise data has been adopted as part of this assessment. Historic background noise data was conducted as part of the noise assessment prepared for the historic report.

The relevant ILGA criteria for the proposed additional trading hours has been derived by analysing the single octave L_{A90} statistical levels from the unattended noise monitoring data. The periods analysed were 1.30am to 4am from Friday 8 May 2020 and Monday 18 May 2020. This is representative of the proposed additional trading hours of the tavern. Table 6 reproduces the adopted ILGA noise criteria.

Table 6 ILGA Criteria

L_{A10} Noise Criteria, Octave Band Centre Frequency (Hz), dBA									
	31.5	63	125	250	500	1 k	2 k	4 k	8 k
1:30am – 4:00am									
Octave Background (L_{A90})	0	15	23	24	25	28	28	29	16
L_{A10} criteria (background +0dB)	0	15	23	24	25	28	28	29	16

4 Noise Modelling Methodology

A computer model was developed to quantify project noise emissions to neighbouring receivers using DGMR (iNoise, Version 2021) noise modelling software. iNoise is an intuitive and quality assured software for industrial noise calculations in the environment. 3D noise modelling is considered industry best practice for assessing noise emissions from projects.

The model incorporated a three-dimensional digital terrain map giving all relevant topographic information used in the modelling process. Additionally, the model uses relevant noise source data, ground type, attenuation from barrier or buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers. Where relevant, modifying factors in accordance with Fact Sheet C of the NPI have been applied to calculations.

The model calculation method used to predict noise levels was in accordance with ISO 9613-1 'Acoustics – Attenuation of sound during propagation outdoors. Part 1: Calculation of the absorption of sound by the atmosphere' and ISO 9613-2 'Acoustics – Attenuation of sound during propagation outdoors. Part 2: General method of calculation' including corrections for meteorological conditions using CONCAWE[1]. The ISO 9613 standard from 1996 is the most used noise prediction method worldwide. Many countries refer to ISO 9613 in their noise legislation. However, the ISO 9613 standard does not contain guidelines for quality assured software implementation, which leads to differences between applications in calculated results. In 2015 this changed with the release of ISO/TR 17534-3. This quality standard gives clear recommendations for interpreting the ISO 9613 method. iNoise fully supports these recommendations. The models and results for the 19 test cases are included in the software.

[1] Report no. 4/18, "the propagation of noise from petroleum and petrochemical complexes to neighbouring communities", Prepared by C.J. Manning, M.Sc., M.I.O.A. Acoustic Technology Limited (Ref.AT 931), CONCAWE, Den Haag May 1981

4.1 Sound Power Levels

An assessment of potential noise emissions associated with the project has been completed. The assessment has identified several noise sources that may contribute to potential acoustic impacts at surrounding residences and include moderately amplified music and speech/conversation impacts from patrons. **Table 7** presents the sound power levels for each source assessed in this report.

Table 7 Sound Power Levels[1]

Item	Octave Band Sound Power Level									Total dBA[2]
	31.5	63	125	250	500	1000	2000	4000	8000	
Operational Assessment (dB $LA_{eq(15min)}$)										
Group of 4 patrons and low-level amplified music on front Balconies (x28)	36	48	53	59	65	64	62	55	58	70
Group of 4 patrons and low-level amplified music in sports bar (x20)	36	48	53	59	65	64	62	55	58	70
Group of 4 patrons and low-level amplified music in gaming lounge (x15)	36	48	53	59	65	64	62	55	58	70
Customer Light Vehicles in Carpark (x20)	45	52	2	59	7	66	68	61	54	73
Live music – DJ/Live Music	41	73	77	83	86	89	89	85	74	94
ILGA/NCC Technical Guideline Assessment (dB LA_{10})[3]										
230 Balcony patrons	52	64	69	75	81	80	78	71	74	85
Live DJ music and sports bar patrons	53	76	80	86	90	92	92	88	79	97
Sleep Disturbance Assessment (dB LA_{max})										
Patron Yelling[4]	45	62	73	80	85	87	84	78	87	92
Car Door Slam	50	53	67	75	83	79	72	60	55	85

Note 1: Source - MAC database.

Note 2: Total dBA is sound power level per item.

Note 3: As per the ILGA policy, the LA_{10} sound power is required rather than the LA_{eq}.

Note 4: External noise level.

A worst case operational scenarios have been developed for the assessment of the additional trading hours of the tavern. The worst scenario assumed the operation of the external balconies, sports bar, gaming lounge, customer vehicles in the car park and a live DJ or band within the sports bar. All areas were assessed for their maximum occupancy. **Table 8** provides a summary of project noise sources for each scenario and the assessment period in which they propose to occur.

Table 8 Noise Generating Activities

Activity/Source	Period	Operational
Conversation and low-level music in the Sports Bar, Gaming lounge and Front Balconies	Day	✓
	Evening	✓
	Night	✓
Customer Light Vehicles	Day	✓
	Evening	✓
	Night	✓
Live DJ or Small Band	Day	✓
	Evening	✓
	Night	✓

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.2 Noise Modelling Assumptions

The noise model incorporated the following assumptions:

- the sports bar wall is assumed to be constructed of a minimum of 100mm light brick;
- the sports bar area will host occasional DJ, small band or children/family act;
- 2 patrons per machine in the gaming lounge areas of the tavern;
- the sports bar area of the tavern is 240m^2 in size;
- the external balcony areas of the tavern are 224m^2 in size; and
- the modelling assumes approximately one person per square metre in the sports bar and balcony areas of the bar.

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5 Results

5.1 Operational Noise Results

The coincidence of all plant and patron sources occurring onsite simultaneously for an entire 15-minute period is unlikely. However, it is probable that several sources may be audible simultaneously on occasion for a limited duration. To account for this, modelling has adopted the $LA_{eq(15min)}$ contribution of sources which were derived from in-field measurements of operation sources or activities.

Noise predictions from all sources have been quantified at surrounding residential receivers to the project site during both operational scenarios with results of the operational scenario are presented in **Table 9** .The received noise levels from combined activities predicted to satisfy the relevant NPI criteria at all assessed receivers.

Table 9 Combined Noise Predictions – 1:30am to 4:00am

Receiver	Predicted Noise Level dB $LA_{eq(15min)}$	PNTL dB $LA_{eq(15min)}$	Compliant
R1	<35	42	✓
R2	<35	42	✓
R3	<35	42	✓
R4	<35	42	✓
R5	<35	42	✓
R6	<35	42	✓
R7	<35	42	✓
R8	<35	42	✓
R9	<35	42	✓
R10	<35	42	✓
R11	<35	42	✓
R12	<35	42	✓
R13	<35	42	✓
R14	<35	42	✓
R15	<35	42	✓

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

5.2 Maximum Noise Levels Assessment Results

In assessing maximum noise events, typical L_{Amax} noise levels from transient events were assessed to the nearest residential receivers. For the maximum noise assessment, a sound power level of 92dBA for patron yelling impact noise within the new entrances to the tavern and 85dBA for a car door slam in the new parking spaces are adopted for this assessment with the night-time operational scenario adopted for the $L_{Aeq(15min)}$ assessment.

Predicted noise levels from $L_{Aeq(15min)}$ and L_{Amax} events for assessed receivers are presented in **Table 10.** Results identify that the maximum noise events trigger level will be satisfied for all assessed receivers.

Table 10 Maximum Noise Levels Assessment (Night)[1]

Rec	Predicted Noise Level				Trigger Level		Compliant
		dB L_{Amax}					
	dB $L_{Aeq(15min)}$	Door Slam	Yell South Entrance	Yell East Entrance	dB $L_{Aeq(15min)}$	dB L_{Amax}	
R1	<35	<35	<35	<35	42	52	✓
R2	<35	<35	<35	<35	42	52	✓
R3	<35	<35	<35	<35	42	52	✓
R4	<35	<35	<35	<35	42	52	✓
R5	<35	<35	<35	<35	42	52	✓
R6	<35	<35	<35	<35	42	52	✓
R7	<35	<35	<35	<35	42	52	✓
R8	<35	<35	<35	<35	42	52	✓
R9	<35	<35	<35	<35	42	52	✓
R10	<35	<35	<35	<35	42	52	✓
R11	<35	<35	<35	<35	42	52	✓
R12	<35	<35	<35	<35	42	52	✓
R13	<35	<35	<35	<35	42	52	✓
R14	<35	<35	<35	<35	42	52	✓
R15	<35	<35	<35	<35	42	52	✓

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

5.3 Independent Liquor and Gaming Authority (ILGA) Noise Assessment

Noise assessment calculations have been completed to assess against the ILGA requirements for patron and occasional live DJ or band within the sports bar of the tavern. Results of the calculations are presented in **Table 11** for evening period for the nearest potentially most affected residential receiver, R7 on Molly Morgan Drive.

Table 11 ILGA Noise Assessment Results

LA10 Noise Criteria, Octave Band Centre Frequency (Hz), dBA									
dBA	31.5	63	125	250	500	1 k	2 k	4 k	8 k
1:30am to 4:00am - Patrons on External Balconies									
Received level	0	6	11	17	23	22	20	13	16
Criteria	0	15	23	24	25	28	28	29	16
Exceedance	**Nil**	**Nil**	**Nil**	**Nil**	**Nil**	**Nil**	**Nil**	**Nil**	**Nil**
1:30am to 4:00am - Patrons and DJ in Sports Bar									
Received level	0	0	0	0	3	0	0	0	0
Criteria	0	15	23	24	25	28	28	29	16
Exceedance	**Nil**	**Nil**	**Nil**	**Nil**	**Nil**	**Nil**	**Nil**	**Nil**	**Nil**

Calculations of noise emissions from the project to the nearest most affected residential receivers are identified to satisfy the ILGA noise criteria.

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6 Conclusion and Recommendations

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Impact Assessment associated with the proposed modification to trading hours of The George Tavern, located at 5 Molly Morgan Drive, Greenhills, NSW.

The assessment quantified noise levels from patron noise from the external balconies, sports bar, gaming lounge, car park and occasional live music in the sports bar of the tavern to nearby residential receivers during the hours of 1.30am to 4am.

The results of the assessment demonstrate that taking into account noise modelling assumptions in Section 4.2 noise levels comply with relevant NPI and ILGA criteria for the proposed additional trading hours.

Based on the Noise Impact Assessment results of this report, there are no noise related issues which would prevent Council approving the project.

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Appendix A – Glossary of Terms

Table A1 provides a number of technical terms have been used in this report.

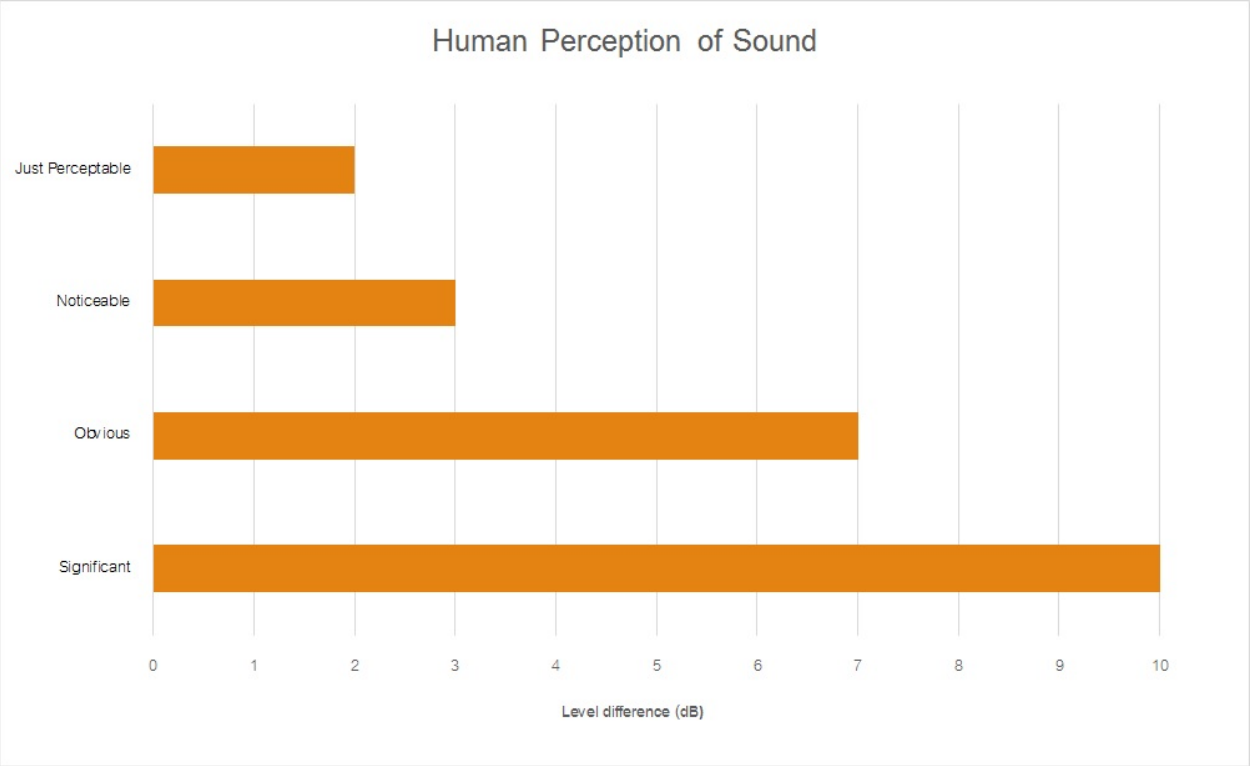
Table A1 Glossary of Terms	
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels.
Adverse Weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear. In some cases the overall change in noise level is described in dB rather than dBA, or dBZ which relates to the weighted scale.
dB(Z)	Linear Z-weighted decibels.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.log10 (W/Wo) Where : W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

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

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

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

Figure A1 – Human Perception of Sound



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