

Acoustics Vibration Structural Dynamics

MAGPIES WAITARA, WAITARA

Acoustic Assessment for DA

25 March 2022

Magpies Waitara C/- Architectem

TM161-02F02 Acoustic Assessment for DA (r6)





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1 Introduction

Renzo Tonin & Associates was engaged to undertake an operational noise assessment to support the Development Application (DA) for the proposed alterations and additions at the Magpies Waitara Club, 11-37 Alexandria Parade, Waitara.

The proposed changes to the development, shown in Figure 2, are as follows:

- Alteration of the main building to accommodate a new Gaming Room with capacity for 17 machines.
- Interior fit out works of the existing Bar to accommodate the new Gaming Room.
- Expansion of existing outdoor Terrace 1 and the addition of outdoor Terrace 2 and Terrace 3, to be located between Terrace 1 and the existing Heritage Shop. The work requires leveling off the ground which is currently a driveway ramp to the lower-level carpark at the rear of the site. Vehicles will continue to access the lower-level carpark via the existing driveway (to be retained) off Waitara Ave. Note that this will not result in an increase in noise from vehicles being driven on site as vehicles end up joining the same path of travel into the lower-level carpark (they will drive on the site for a shorter period).
- Installation of two jet fans in the Lower Ground Floor car park which will only operate between 10:00am and 10:00pm. They will be set on a timer to not operate outside peak traffic movements.

No changes are proposed to the existing trading hours of the licensed premises which are as follows:

- Sunday Thursday 10:00am 1:00am
- Friday Saturday 10:00am 2:00am

The new/amended outdoor Terraces 1, 2, and 3 are proposed to operate until 12:00am midnight, Monday to Sunday.

The main sources of noise associated with these changes will be the noise breakout from the internal Bar and the new Gaming Room, outdoor patron, and music noise from the expanded and new Terrace areas as well as the noise emission from the new jet fans. This report quantifies noise emissions from activities associated with the proposal and assesses operational noise on nearby sensitive receivers in accordance with the noise requirements presented in Section 3.1. The licensed premises will be retaining existing plant and equipment, which was previously approved and already operational, with the exception of the two new jet fans.

APPENDIX A contains a glossary of acoustic terms used in this report.

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2 **Project Description**

2.1 Site description and development overview

The site is located on the intersection of Alexandria Parade and Waitara Avenue. It is bound to the south and east by the two roads respectively, to north by a 7-storey residential building, and to the west by a 2-storey commercial building. Across the street on Waitara Avenue are 3-storey residential flat buildings, and on the other side of Alexandria Parade is Waitara Station and the rail corridor.

The proposed development involves fit-out works on the existing Shamrock Inn at the front of the club to add a new Gaming Room, expand the existing outdoor terrace and add two new outdoor terraces adjacent to the existing Heritage Shop, as well as two new jet fans in the existing lower ground floor car park. Figure 1 below presents the subject site location.

R2 Subject Site ANDRIA DE RADERADE SUBSCIELE SUBSCIE

Figure 1: Subject site and noise monitoring locations





2.2 Acoustic aspects

Based on the proposed design and operational parameters, the following aspects are deemed to require acoustic assessment:

- Noise breakout from internal areas (patron and background music played through the in-house system) of the Bar, and Gaming Room
- Noise from patrons and music in the outdoor terraces
- Noise emission from the two new jet fans

2.3 Acoustic assessment methodology

In order to assess the potential noise impact from the proposal, the following methodology was used:

- Identify nearest most potentially affected receiver locations to the subject site
- Determine existing background noise levels at the nearest most potentially affected receiver locations
- Use measured background noise levels to establish noise goals in accordance with the relevant noise criteria
- Using predictive noise modelling, determine the extent of noise impact from the proposal at nearby residential premises
- Identify if noise emission from the area under investigation may exceed the relevant criteria, and
- Where noise emission from the area under investigation may exceed the relevant criteria, provide recommendations to reduce noise impacts from the site.

2.4 Reference material

The following documentation has been referenced for this report:

- Architectural drawing set prepared by Architectem dated 24 November 2021. The following drawings have been revised accordingly during the design iteration process:
 - DA01b Revised Site plan dated 24 March 2022
 - DA03b Revised Proposed G floor Plan dated 24 March 2022
 - DA04b Revised Elevations and Sections dated 24 March 2022
- Jetvent Car Park Fans JV Series technical data provided by Architectem on 19 January 2022 [ref: Car park fans].

3 **Project noise goals**

3.1 Applicable noise criteria

3.1.1 Hornsby Shire Council

Hornsby Shire Council (Council) has required through its Hornsby Development Control Plan (DCP) 2013 that applications for noise generating developments should be accompanied by an acoustic report to minimise the impacts on noise sensitive receivers and to comply with relevant State Government and Council guidelines. The DCP further refers to Council's Policy and Guidelines for Noise and Vibration document.

The document presents noise control guidelines for noise generating developments such as licensed premises, which recommends the following:

The L_{A,eq} noise level emitted from the licensed premises when measured at the boundary of the most affected residence, should not exceed the background noise level up to midnight and should not exceed a level 5 dBA below the background level after midnight when measured at any bedroom window.

Noise associated with patron departure, particularly after 10.00 pm should be given due consideration by management. Points of access and egress should be restricted wherever possible to minimise adverse impact upon noise sensitive receivers. Noise emissions from carparking facilities shall be monitored by management to ensure patrons arrive and/or depart in the quietest manner possible.

The document also requires the acoustic report to cover the following:

In the case of a licensed premises, details of access and egress arrangements in use after 10.00 pm. In addition, the applicant shall supply a statement detailing the means by which noise associated with patron arrival and departure is proposed to be controlled.

Patron arrival and departure will be through the entrance and will be managed by the club in accordance with Plan of Management (PoM). No change is proposed to the access/egress location. Patron access/egress will be via the main entrance on Alexandria Parade.

3.1.2 Liquor and Gaming NSW

Noise emission from licensed premises in NSW, such as restaurants, bars, and clubs, should aim to comply with the standard noise criteria set by Liquor and Gaming NSW (L&GNSW). The L&GNSW criteria applies to all noise emission associated with activities from the licensed area of the premises, including music and patron noise, but excludes mechanical services equipment.

L&GNSW, through the Liquor Act 2007, is the regulatory authority that deals with noise pollution issues pertaining to licensed premises. L&GNSW recommends the use of their standard noise criteria when assessing noise impact from licensed premises and when determining the occurrence of noise nuisance and annoyance. Noise emissions are assessed in terms of the following 'Standard Noise Condition':

"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 12:00 midnight at the boundary of any affected residence.

The LA10* noise level emitted from the licensed premises shall not exceed the background noise level in an Octave Band Centre Frequency (31.5Hz – 8kHz inclusive) between 12:00 midnight 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 12:00 midnight and 7:00am.

Interior noise levels which still exceed safe hearing levels are in no way supported or condoned by the NSW Office of Liquor, Gaming and Racing.

This is a minimum standard. In some instances, the Board may specify a time earlier than midnight in respect of the above condition.

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

For the assessment of inaudibility Renzo Tonin and Associates adopt a design criterion of 10dB below the background noise level in each octave band for intermittent noise sources such as patrons and music. For steady state sources such as mechanical plant, a design criterion of 5dB below the background level in each octave band is adopted.

3.2 Assessment locations

The identified assessment locations are outlined in Table 1 below and shown in Figure 1 above.

Table 1: Assessment lo	ocations
------------------------	----------

ID	Address	Description
R1	49 Alexandria Parade, Waitara	Three-storey residential building on the other side of Waitara Avenue.
R2	5-9 Waitara Avenue, Waitara	Seven-storey residential building on the rear of the site.

3.3 Existing noise environment

As the noise environment of an area almost always varies over time, background and ambient noise levels need to be determined for the operational times of the proposed development. For example, in a suburban or urban area, the noise environment is typically at its minimum at 3:00am in the morning and at its maximum during the morning and afternoon traffic peak hours. The NSW Environment Protection Authority (EPA)'s relevant noise policy outlines the following standard time periods over which the background and ambient noise levels are to be determined:

- Day: 07:00-18:00 Monday to Saturday and 08:00-18:00 Sundays & Public Holidays
- Evening: 18:00-22:00 Monday to Sunday & Public Holidays
- Night: 22:00-07:00 Monday to Saturday and 22:00-08:00 Sundays & Public Holidays

3.3.1 Noise measurement location

Noise measurements are ideally carried out at the nearest or most potentially affected locations surrounding a development. An alternative, representative location should be established in the case of access restrictions or where a safe and secure location cannot be identified. Furthermore, representative locations may be established in the case of multiple receivers as it is usually impractical to carry out measurements at all locations surrounding a site.

The locations at which long-term measurements were undertaken is outlined in Table 2 and shown in Figure 1.

ID	Address	Description
Long-term	noise monitoring	
L1	Heritage Shop, 11-37 Alexandria Parade, Waitara	The noise monitor was located on the Level 1 of the eastern facade of the Heritage Shop facing Waitara Avenue. It is exposed to local traffic and train pass-by. The measured background noise levels are deemed representative for assessment locations R1 from an external perspective.
L2	5-8 Waitara Avenue, Waitara	The noise monitor was located on the Level 1 balcony of the building facing Waitara Avenue. It exposed to the local traffic, and a nearby transformer unit on the street.
		The measured background noise levels are deemed representative for assessment locations R2 from an external perspective.

Table 2: Noise monitoring location

3.3.2 Long-term noise measurement results

Long-term noise monitoring was carried out from Friday, 15 to Monday 25, October 2021. The longterm noise monitoring methodology is detailed in APPENDIX B, and noise level-vs-time graphs of the data are included in APPENDIX C. Table 3 presents the representative background L_{90} and ambient L_{eq} noise levels for each assessment period, determined in accordance with the NSW EPA Noise Policy for Industry (NPfI). Whilst daytime noise levels are included in the following table, the majority of the daytime periods were affected by construction noise from 18 Waitara Avenue and further assessments will be based on the evening and night-time data, which was not construction noise affected. Based on previous projects, evening and night-time noise levels are typically quieter than the daytime period and will therefore be the more stringent criteria.

Descriptor	Period	Overall	Octav	ve band	d centre	e frequ	ency -	Hz (L _{Z1}	0)		
Descriptor		dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
L1 - Heritage Shop Level 1 windo	ow, facing Waitara	Avenue									
L ₉₀ Background Noise Levels	Day ²	54 ³	56	59	55	53	50	48	44	37	27
	10:00 - 18:00 ^{1,2}	52	56	58	54	52	49	48	43	36	26
	Evening	46 ³	49	48	46	46	42	41	35	25	18
	22:00 - 24:00 ¹	39	44	43	42	38	36	35	30	20	16
	24:00 - 02:00 ¹	36	41	39	40	37	33	31	27	20	16
	Night	36	40	40	41	36	33	31	27	20	16
LAeq,period Ambient Noise Levels	Day	63	68	68	61	60	60	58	56	52	46
	Evening	55	63	61	56	54	52	51	47	40	33
	Night	51	59	57	51	49	48	47	44	38	32
L2 - 5-8 Waitara Avenue Level 1	balcony, facing W	aitara Ave	nue								
L ₉₀ Background Noise Levels	Day ²	59 ³	62	59	61	58	55	52	47	42	31
	10:00 - 18:00 ^{1,2}	55	61	56	59	56	52	50	45	39	29
	Evening	47 ³	47	45	49	47	43	42	37	29	20
	22:00 - 24:00 ¹	41	43	38	43	39	37	37	34	26	16
	24:00 - 02:00 ¹	40	39	36	42	37	35	35	34	25	15
	Night	41 ³	39	36	41	37	35	35	34	25	15
LAeq,period Ambient Noise Levels	Day	69 ³	70	70	66	64	65	63	61	57	51
	Evening	53	61	55	55	52	48	49	45	39	32
	Night	53	60	56	54	50	49	48	46	42	35

Table 3: Long-term noise monitoring results

Notes: Day: 07:00-18:00 Monday to Saturday and 08:00-18:00 Sundays & Public Holidays

Evening: 18:00-22:00 Monday to Sunday & Public Holidays

Night: 22:00-07:00 Monday to Saturday and 22:00-08:00 Sundays & Public Holidays

^ As required by the NPfI, the external ambient noise levels presented are free-field noise levels, ie. no facade reflections.

^ Background spectrum data is taken as the median of the daily background noise spectrum.

- 1. Additional time periods have been included to cover the proposed operating hours and relevant periods in the criteria.
- 2. Day time levels are affected by construction noise on 18 Waitara Avenue.
- 3. The broadband background noise levels have been calculated by statistical analysis of the long-term unattended noise monitoring in accordance with the guidance provided in the NPfI.

4. The background noise spectrum has been calculated using the same process (as the NPfl RBL calculation) for each 1/1 octave band centre frequency and given the L90 across all frequencies does not occur simultaneously, the broadband sum of this spectrum is lower than the period L90.

3.4 Project noise goals

3.4.1 Operational noise

The octave band noise goals for operational noise at the identified receivers set out in Table 5 below have been established from measured noise levels set out in Sections 3.3.2 and the L&GNSW criteria presented in Section 3.1. Given the construction noise impacts on the daytime period data, it shall be excluded from further assessment. Based on previous projects, evening and night-time noise levels are typically quieter than the daytime period and will therefore be the more stringent criteria.

	Octave band centre frequency - Hz								
25 2	250	500	1k	2k	4k	8k			
6 40	6	42	41	35	25	18			
51 5 ⁻	51	47	46	40	30	23			
2 38	8	36	35	30	20	16			
43	3	41	40	35	25	21			
10 3	57	33	31	27	20	16			
80 2	27	23	21	17	10	7 ³			
9 4	7	43	42	37	29	20			
54 52	2	48	47	42	34	25			
3 39	9	37	37	34	26	16			
18 44	4	42	42	39	31	21			
2 3	57	35	35	34	25	15			
32 2	27	25	25	24	15	7 ³			
2 16 12 12 12 12 12 12 12 12 12 12	5 2 ; 4 5 2 3 7 4) 3) 2) 2) 4 ; 5 3 3 3 4 2 3 2 2 2	5 250 5 46 51 2 2 38 7 43 0 37 0 27 0 47 4 52 3 39 3 44 2 37 2 27	5 250 500 5 46 42 51 47 2 38 36 7 43 41 0 37 33 0 27 23 0 47 43 4 52 48 33 39 37 34 42 2 2 37 35 2 27 25	5 250 500 1k 5 46 42 41 51 47 46 2 38 36 35 7 43 41 40 0 37 33 31 0 27 23 21 9 47 43 42 43 39 37 37 3 39 37 37 3 44 42 42 2 37 35 35 2 27 25 25	5 250 500 1k 2k 5 46 42 41 35 51 47 46 40 2 38 36 35 30 7 43 41 40 35 0 37 33 31 27 0 27 23 21 17 0 47 43 42 37 4 52 48 47 42 3 39 37 37 34 3 44 42 42 39 2 37 35 35 34 2 27 25 25 24	5 250 500 1k 2k 4k 5 46 42 41 35 25 51 47 46 40 30 2 38 36 35 30 20 7 43 41 40 35 25 0 37 33 31 27 20 0 27 23 21 17 10 0 27 23 21 17 29 4 52 48 47 42 34 3 39 37 37 34 26 3 44 42 42 39 31 2 37 35 35 34 25 2 27 25 25 24 15			

Table 4:	L&GNSW	noise	goals,	L_{10}
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Note: 1. Based on the "background + 5 dB" criteria of the L&GNSW.

2. Based on the inaudibility criteria which is more stringent than the "background + 0 dB" of the L&GNSW. Renzo Tonin & Associates adopts a "background - 10 dB" criteria to assess inaudibility.

3. Threshold of hearing in accordance with AS3657.1, taken as the lowest third octave level for the respective octave band.

The proposed development must also comply with the broadband noise criteria from Council's Policy and Guidelines for Noise and Vibration document which is based on the L_{Aeq} noise descriptor. The following table presents the project broadband noise goals.

Assessment period	Background LA90	Noise goals, L _{Aeq,15min}
Locations R1		
18:00 - 22:00 ¹	46	46
22:00 - 24:00 ¹	39	39
24:00 - 02:00 ²	36	31
Locations R2		
18:00 - 22:00	47	47
22:00 - 24:00	41	41
24:00 - 02:00	40	35

Table 5: Hornsby Council - Guidelines for Noise and Vibration - noise goals, LAeq,15min

Notes:

1. Based on the "background + 0 dB" criteria of Council's document.

2. Based on the "background - 5 dB" criteria of Council's document.

4 Licensed premises noise emission assessment

4.1 Noise sources

The source noise levels used for the predictions, presented in Table 6, were obtained from our library database and measurements of similar types of development.

A.r.o.c	Applicable paice course	Overall	Octave band centre frequency - Hz (dBZ)								
Area	Applicable holse source	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
Bar	Internal patrons with low background music (Reverberant L _p L ₁₀) ¹	84	70	72	72	73	81	81	77	70	68
Gaming Room	Internal patrons with gaming machine noise (Reverberant L_{p} $L_{10})^2$	75	61	61	66	70	75	69	65	60	54
Outdoor Terrace	Loud male voice (Lw per person) 3	82	-	-	64	73	80	79	74	68	59
Outdoor Terrace	Raised male voice (Lw per person) 3	72	-	-	62	67	72	66	62	57	51
Outdoor Terrace	Background music, L _p L ₁₀	81	59	80	90	81	77	73	71	72	67
Notes: 1.	Measured from similar spaces of similar	developme	ents.								

2. Spatial L_p considered occurring at each facade element for the purpose of external noise predictions.

3. Handbook of Acoustical Measurements and Noise Control, Third Edition, Cyril M. Harris.

The following scenarios were considered with respect to the proposed trading hours:

- 18:00 to 24:00 All indoor areas of the Bar and Gaming Room are operating with the windows open (entry doors on either side of the bar set to automatically closed from 10:00pm onwards) and indoor areas of the existing Pavilion are operating with closed fixed windows. All three outdoor Terraces are at full capacity with 150 patrons broken down to the following:
 - Terrace 1 40 Patrons
 - Terrace 2 30 Patrons
 - Terrace 3 80 Patrons
 - Music noise assumed to be background only (comfortable to talk over), uniform sound pressure level of 65dB(A) L₁₀ (or 70dB(A) L₁₀ at 1m from the speaker)
- 24:00 to 02:00 am All indoor areas of the Bar and Gaming Room are operating with the windows and entry doors on either side of the bar set to automatically closed, and indoor areas of the existing Pavilion are operating with closed fixed windows. All three outdoor Terraces are closed and not operating.

In assessing the noise from the outdoor Terrace areas, it is assumed that 1 in 2 patrons are talking at the same time, with 90% speaking with a Raised voice and 10% speaking with a Loud voice.

From 12:00am midnight to 02:00am, noise emission from the use of the new Gaming Room is assessed to 10dB below the project noise emission goal for the site, so that its use does not result in an increase in cumulative noise emissions to neighbours. As such, a screening test of 10 dB less than the inaudibility noise goal is adopted for the gaming room in isolation (ie. background minus 20dB contribution).

A noise wall was also proposed and considered in the assessment to provide acoustic screening between the outdoor terraces to the residential receivers on the other side of Waitara Avenue (R1). Details of the noise walls are discussed in Section 7.3.

4.2 Building envelope

The following assumptions regarding the acoustic performance of the building envelope design have been made for the assessment.

Area	Construction element	Acoustic rating R _w assumed	Indicative construction
Bar and Pavilion	Glazed facade (fixed)	R _w 27	Min. 6mm thick glass in aluminium frame
	Entry door	Rw 27	Min. 6mm thick glass in aluminium frame with acoustic seals
	Roof	Rw 27	Pitched metal roof with raked timber cladded ceiling
Gaming Room	Glazed facade (fixed)	R _w 27	Min. 6mm thick glass in aluminium frame
	Entry door	Rw 27	Min. 6mm thick glass in aluminium frame with acoustic seals
	Louvres	Rw 0	Non-acoustic weatherproof louvres

Table 7:	Building	envelop	e acoustic	performance

The east facade of the Gaming Room facing the terrace is proposed to be solid and shall not have any louvres. It shall have a transmission loss of at least R_W 27.

4.3 Prediction methodology

The noise predictions were based upon the architectural drawing set out in Section 2.4, and carried out in accordance with ISO9613 as implemented by CadnaA computer modelling program. The software considers sound radiation patterns, acoustic shielding and potential reflections from intervening building elements, and noise attenuation due to distance.

4.4 Noise prediction results & assessment

Table 8 summarises the results of the noise assessment, presenting the predicted noise emission levels at the identified assessment locations against the established noise goals. Building levels nominated below are assessed to be the worst affected level of the development.

Time of	According to Comparing	Description	Octave band centre frequency - Hz (L _{Z10})								
day	Assessment Scenario	Description	31.5	63	125	250	500	1k	2k	4k	8k
Location	s R1 - Level 2, 49 Alexandri	a Parade, Waitara									
18:00 -	All indoor areas	Predicted noise levels	28	35	43	36	39	34	28	20	12
22:00	operating and three outdoor Terraces at full	Noise goal BG + 5	54	53	51	51	47	46	40	30	23
22:00 -	capacity with 150	Predicted noise levels	28	35	43	36	39	34	28	20	12
24:00	patrons	Noise goal BG +5	49	48	47	43	41	40	35	25	21
24:00 -	Noise contribution from the new Gaming Room	Predicted noise levels	15	12	14	14	16 ¹	8	4	0	0
02:00		BG – 20 screening test	21	19	20	17	13	11	7	0	0
Location	R2 - Level 7, 5-9 Waitara A	Avenue, Waitara									
18:00 -	All indoor areas	Predicted noise levels	26	33	42	38	42	38	33	27	17
22:00	operating and three outdoor Terraces at full	Noise goal BG + 5	52	50	54	52	48	47	42	34	25
22:00 -	capacity with 150	Predicted noise levels	26	33	42	38	42	38	33	27	17
24:00	patrons	Noise goal BG + 5	48	43	48	44	42	42	39	31	21
24:00 -	Noise contribution from	Predicted noise levels	16	14	16	16	19 ¹	12	7	1	0
02:00	the new Gaming Room	BG – 20 screening test	19	16	22	17	15	15	14	5	0

Table 8: Predicted noise level assessment, L₁₀

Note:

1. Exceedances are highlighted in bold.

For the outdoor gaming area, a minor exceedance of up to 4 dB is predicted at 500 Hz for the 24:00 to 02:00 time period at R1 and R2. These exceedances are considered minor and do not warrant additional treatment, given that the difference to the cumulative level would be approximately 1dB which is not perceptible to the average listener.

Table 9:	Predicted	noise	level	assessment,	L _{Aeq,15min}
----------	-----------	-------	-------	-------------	------------------------

Time of Day	Assessment scenario	Description	L _{Aeq}							
Locations R1 - Level 2, 49 Alexandria Parade, Waitara										
18:00 - 22:00	All indoor areas operating and	Predicted noise levels	36							
	three outdoor Terraces at full _ capacity with 150 patrons	Noise goal BG + 0	46							
22:00 - 24:00		Predicted noise levels	36							
		Noise goal BG + 0	39							
24:00 – 02:00	Noise contribution from the new	Predicted noise levels	13							
	Gaming Room	Noise goal BG – 5 – 10	21							
Locations R2 - Level 7,	5-9 Waitara Avenue, Waitara									
18:00 - 22:00	All indoor areas operating and	Predicted noise levels	39							
	three outdoor Terraces at full capacity with 150 patrons	Noise goal BG + 0	47							
22:00 - 24:00		Predicted noise levels	39							
		Noise goal BG + 0	41							
24:00 - 02:00	Noise contribution from the new	Predicted noise levels	16							
	Gaming Room	Noise goal BG – 5 – 10	25							

Time of Day	Assessment scenario	Description	L _{Aeq}
Notes:			

1. Exceedances are highlighted in bold.

2. The predicted L_{Aeq} values are calculated using the formula $L_{Aeq} = L_{A10}$ - 3dB

Noise emissions from the proposed alterations and additions are predicted to comply with the Council requirements of BG + 0 up to midnight and BG - 5 thereafter.

Provided that the recommendations described in Section 7 are effectively implemented, the proposed use of the development is deemed acceptable for use during the above hours of operation.

5 Mechanical plant noise assessment

5.1 Noise sources

The source noise levels used for the predictions, presented in Table 10, were obtained from Fantech Jetvent Car Park Fans - JV Series technical data and noise level sheet provided by Architectem on 19 January 2022 [ref: Car park fans].

Table 10:	Source noise	levels for	licensed	premises	assessment

	Applicable noise source	Overall dB(A) @3m	Octave band centre frequency - Hz (dBZ)								
Area			31.5	63	125	250	500	1k	2k	4k	8k
Car Park	Fantech R-CPA-400-4-3 Lw re 1pW ¹	54	-	73	89	72	70	58	56	55	53

5.2 Noise prediction results & assessment

Table 11 summarises the results of the mechanical plant noise assessment, presenting the predicted noise emission levels at the identified assessment locations against the established noise goals as set out in Table 5. Building levels nominated below are assessed to be the worst affected level of the development.

Time of Day	Assessment scenario	Description	L _{A,eq} , 15min							
Locations R1 - Level 2, 49 Alexandria Parade, Waitara										
18:00 - 22:00	Two new jet fans operating in the	Predicted noise level	34							
	existing Lower Ground Floor carpark	Noise goal	46							
Locations R2 - Level 7,	5-9 Waitara Avenue, Waitara									
18:00 - 22:00	Two new jet fans operating in the	Predicted noise level	32							
	existing Lower Ground Floor carpark	Noise goal	47							

 Table 11:
 Predicted noise level assessment, LAeq, 15min

The proposed operation time for the two new jet fans is between 10:00am and 10:00pm only. As the background noise level during the daytime is likely to be higher, predicted noise compliance during the evening period (6:00pm to 10:00pm) will mean that the daytime noise goal will be readily achievable.

The noise emissions from the proposed mechanical plant are predicted to comply with the Council requirements of BG + 0dB for the proposed operational time period of 10:00am to 10:00pm.

6 Sleep disturbance

Noise emanating from the project has been assessed for its potential to disturb sleep. The NSW NPfl includes guidance on assessing the likelihood of noise from a premise during the night-time period disturbing sleeping residents:

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:

- LAeq, 15min 40dB(A) or the prevailing RBL plus 5dB, whichever is the greater, and/or
- LAFmax 52dB(A) or the prevailing RBL plus 15dB, whichever is greater,

a detailed maximum noise level event assessment should be undertaken.

The detailed assessment should cover 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.

•••

Maximum noise level assessments should be based on the LAFmax descriptor on an event basis under 'fast' time response.

The detailed assessment should consider all feasible and reasonable noise mitigation measures with a goal of achieving the above trigger levels.

The sleep disturbance criteria employed for this assessment are summarized in Table 12 below.

Table 12. Sleep disturbance criteria	Table 12:	Sleep	disturbance	criteria
--------------------------------------	-----------	-------	-------------	----------

Receiver	Address	Sleep disturbance criteria, 10pm - 7am		
ID		LAeq,15min	LAFmax	
R1	49 Alexandria Parade, Waitara	36 + 5 = 41	(36 + 15 = 51) 52	
R2	5-9 Waitara Avenue, Waitara	41 + 5 = 46	41 + 15 = 56	

6.1 Noise sources

Sleep disturbance would most potentially be caused by a single event of a patron shouting within the outdoor Beer Garden which would potentially generate relatively high LAFmax noise levels. A reference sound power level of a male shouting was used for the purpose of this assessment and is presented in Table 13 below.

Table 13: Sound power levels

Activity	Sound power level re 1pW		
Male shouting* from the outdoor Boar Cardon	Q6		
Male shouling from the outdoor beer Garden	90		

Note: * Source reference - Handbook of Acoustical Measurements and Noise Control, Third Edition, Cyril M. Harris

6.2 Noise prediction results

Predicted noise levels are presented in Table 14 below.

Table 14: Sleep disturbance assessment

Receiver	Address		Sleep disturbance criteria, 10pm - 7am	
ID			LAFmax	
R1	49 Alexandria Parade, Waitara	Predicted noise level	48	
		Noise goal	52	
R2	5-9 Waitara Avenue, Waitara	Predicted noise level	53	
		Noise goal	56	

Noise levels are predicted to comply with sleep disturbance criteria between 10:00pm and 2:00am.

7 Recommendations

Noise levels experienced at all the identified receiver locations are predicted to comply with the noise goals of all assessment periods and scenarios associated with the proposed alterations and additions, with the following recommendations.

7.1 Operational management

Outdoor Terraces 1, 2 and 3 are allowed to operate with 40, 30, and 80 patrons respectively until 12:00am midnight with both doors to the Bar from Terrace 1 open up to 10:00pm and then set to automatically close.

From 12:00am midnight to 2:00am, internal Bar and Gaming Room are operating with all three outdoor Terraces not operating and both doors to Terrace 1 from the Bar remain closed.

The two new jet fans located in the Lower Ground Floor carpark will only be operational between 10:00am and 10:00pm. A timer shall be installed to the units to ensure that the fans do not accidentally come on during the night-time period.

7.2 Building envelope

The building envelope construction as set out in Section 4.2 are to be provided as a minimum.

No louvres are to be built on the eastern facade of the Gaming Room. The facade shall have a minimum transmission loss of R_W 27.

7.3 Noise wall

A solid noise wall is to be built near the eastern boundary of the site, connecting the eastern facade of the Pavilion building with the western facade of the Heritage Shop, to provide acoustic shielding to the nearest receiver location. The noise wall is to be built to extend up to the top of the existing sandstone cladding and on top of that a wall clad with matching roof sheeting continued up to the base of the clerestory roof light following the south-east ridge line of the pavilion roof, with an RL of 186.39 metres. The noise wall is to be constructed from a durable material with sufficient mass (minimum density 20kg/m²) to prevent direct noise transmission, eg. masonry, fibrous-cement, lapped and capped timber fence, glass, etc. and shall be built continuous with no gaps.

Similarly, the partition dividing Terrace 1 and Existing Terrace on the western side of the Pavilion should be extended up to the base of the clerestory roof light (RL186.39) with a wall clad with matching roof sheeting. Figure 3 and Figure 4 below present the layout and extent of the noise walls respectively.

Figure 3: Layout of noise walls







8 Acoustic risk assessment

Risk management is an integral part of good management practice. Australian/New Zealand Standard AS/NZS 4360:2004 "Risk management" has become part of our company's culture and as a consequence it permeates all aspects of the company's work and is actively promoted to our clients.

The risk management process can be applied to any situation where an undesired or unexpected outcome could be significant or where opportunities are identified. Our clients need to know about possible outcomes and the steps that can be taken to control any adverse impact.

There is an opportunity in the design process for the client to actively participate in risk management by providing input into risk reduction strategy. For example, the client may need to know that some aspects of risk reduction could involve passing those risks on to other entities in a better position to treat those risks. Some aspects of risk reduction may involve additional cost or time consequences. On the other hand, there may also be opportunities to avoid or avert risk at no cost to the client by rescheduling processes so that key information becomes available at a critical time.

When the client is properly informed, this supports better decision making by contributing a greater insight into risks and their impacts. It is recommended that the client seek to understand the potential risk during the detailed design phase of the development.

9 Conclusion

Renzo Tonin & Associates has completed an assessment of operational for the proposed alterations and additions at Magpies Waitara Club, 11-37 Alexandria Parade, Waitara. The main aspects with regards to acoustics relate to noise emissions from music and patrons in the outdoor areas as well as music, patrons, and gaming machines in the internal areas, and two new jet fans in the car park.

The proposed works have been assessed against all relevant noise criteria with project specific noise goals established in Section 3.4. With the adoption of the assumed parameters and recommended measures set out in Section 7, the design satisfies the relevant noise criteria.

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

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 all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of everyday sounds:
	0dB The faintest sound we can hear
	30dB A quiet library or in a quiet location in the country
	45dB Typical office space. Ambience in the city at night
	60dB CBD mall at lunch time
	70dB The sound of a car passing on the street
	80dB Loud music played at home
	90dB The sound of a truck passing on the street
	100dBThe sound of a rock band
	130 JB Desferier
dB(A)	A-weighted decibels. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz) but is less effective outside these frequencies.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch, and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L _{Max}	The maximum sound pressure level measured over a given period.
L _{Min}	The minimum sound pressure level measured over a given period.

L ₁	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L ₁₀	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L ₉₀	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L _{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance, and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B Long-term noise monitoring methodology

B.1 Noise monitoring equipment

A long-term unattended noise monitor consists of a sound level meter housed inside a weather resistant enclosure. Noise levels are monitored continuously with statistical data stored in memory for every 15-minute period.

Long term noise monitoring was conducted using the following instrumentation:

Description	Туре	Octave band data	Logger location
RTA06 (NTi Audio XL2, with low noise microphone)	Type 1	1/1	L1 and L2
		C	

Note: All meters comply with AS IEC 61672.1 2004 "Electroacoustics - Sound Level Meters" and designated either Type 1 or Type 2 as per table and are suitable for field use.

The equipment was calibrated prior and subsequent to the measurement period using a Brüel & Kjær Type 4230 calibrator. No significant drift in calibration was observed.

B.2 Meteorology during monitoring

Measurements affected by extraneous noise, wind (greater than 5m/s) or rain were excluded from the recorded data in accordance with the NSW NPfI. Determination of extraneous meteorological conditions was based on data provided by the Bureau of Meteorology (BOM), for a location considered representative of the noise monitoring location(s). However, the data was adjusted to account for the height difference between the BOM weather station, where wind speed and direction is recorded at a height of 10m above ground level, and the microphone location, which is typically 1.5m above ground level (and less than 3m). The correction factor applied to the data is based on Table C.1 of ISO 4354:2009 'Wind actions on structures'.

B.3 Noise vs time graphs

Noise almost always varies with time. Noise environments can be described using various descriptors to show how a noise ranges about a level. In this report, noise values measured or referred to include the L_{10} , L_{90} , and L_{eq} levels. The statistical descriptors L_{10} and L_{90} measure the noise level exceeded for 10% and 90% of the sample measurement time. The L_{eq} level is the equivalent continuous noise level, or the level averaged on an equal energy basis. Measurement sample periods are usually ten to fifteen minutes. The Noise -vs- Time graphs representing measured noise levels, as presented in this report, illustrate these concepts for the broadband dB(A) results.

APPENDIX C Long-term noise monitoring results



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L1

ackground & Ambient Noise Monitorin	na Results - NSW 'N	Noise Policy for li	ndustrv'. 2017

background a random role monitoring results rest roles roley for massivy, 2017							
Periods with insufficient results excluded	L _{A90} Backgr	round Noise Le	evels ⁴	L _{Aeq} Amb	L _{Aeq} Ambient Noise Levels		
Date	Day ¹	Evening ²	Night ³	Day ¹	Evening ²	Night ³	
Friday-15-October-2021	-	46	37	-	56	52	
Saturday-16-October-2021	54	46	36	65	56	51	
Sunday-17-October-2021	46	45	38	56	54	52	
Monday-18-October-2021	54	45	37	63	54	51	
Tuesday-19-October-2021	56	47	36	64	57	52	
Wednesday-20-October-2021	55	46	36	65	55	50	
Thursday-21-October-2021	55	46	37	64	56	52	
Friday-22-October-2021	55	46	36	64	56	50	
Saturday-23-October-2021	50	-	36	62	-	50	
Sunday-24-October-2021	51	45	36	59	54	52	
Monday-25-October-2021	-	-	-	-	-	-	
Representative Weekday ⁵	55	46	37	64	56	51	
Representative Weekend ⁵	50	45	36	62	55	52	
Representative Week ⁵	54	46	36	63	55	51	

Notes:

1. Day is 7:00am to 6:00pm on all days except Sundays and Public Holidays when it is 8:00am to 6:00pm 2. Evening is 6:00pm to 10:00pm

3. Night is the remaining periods 4. Assessment Background Level (ABL) for individual days 5. Rating Background Level (RBL) for L_{Aeq} and logarithmic average for L_{Aeq} 6. Leq is calculated in the free field. 2.5dB is subtracted from results if logger is placed at façade 7. Number in brackets represents the measured (actual) RBL value, which is below the minimum policy value of 30 dB(A) during the evening or night period or 35 dB(A) during the day period.

L1

Road / Rail Noise Monitoring Results (at one metre from façade)							
Periods with insufficient results excluded	L _{Aeq} Nois	e Levels	L _{Aeq 1hr} Nois	e Levels			
Date	Day ¹	Night ²	Day - Up ⁴	Day - Low⁵	Night - Up ⁴	Night - Low⁵	
Friday-15-October-2021	-	54	-	-	56	47	
Saturday-16-October-2021	67	54	70	58	57	48	
Sunday-17-October-2021	58	55	59	55	58	44	
Monday-18-October-2021	64	53	68	56	56	45	
Tuesday-19-October-2021	66	54	70	58	59	43	
Wednesday-20-October-2021	67	53	70	57	56	43	
Thursday-21-October-2021	65	54	68	58	57	44	
Friday-22-October-2021	66	53	69	58	56	46	
Saturday-23-October-2021	-	52	-	-	55	44	
Sunday-24-October-2021	60	55	63	56	57	42	
Monday-25-October-2021	-	-	-	-	-	-	
Representative Weekday ³	66	54	69	58	56	44	
Representative Weekend ³	60	54	63	56	57	44	
Representative Week ³	65	54	68	58	56	44	
Notes:							

1. Day is 7:00am to 10:00pm

Night is 10:00pm to 7:00am
 Lower 10th percentile L_{Aeq 1hr}

3. Median of daily $L_{\mbox{\scriptsize Aeq}}$

4. Upper 10th percentile L_{Aeq 1hr}

6. Values are calculated at the facade. 2.5dB is added to results if logger is placed in the free field





Data File: 2021-10-15_SLM_000_123_Rpt_Report.txt Template: QTE-26 Logger Graphs Program (r38)



Template: QTE-26 Logger Graphs Program (r38)



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L2

Background & Ambient Noise Monitorin	g Results - NSW 'N	Noise Policy for Industry	v', 2017

background & Amblent Holse Montolning Results - Now Holse Folloy for Industry, 2017							
Periods with insufficient results excluded	L _{A90} Backgro	ound Noise Le	vels ⁴	L _{Aeq} Ambier	L _{Aeq} Ambient Noise Levels		
Date	Day ¹	Evening ²	Night ³	Day ¹	Evening ²	Night ³	
Friday-15-October-2021	-	47	41	-	53	57	
Saturday-16-October-2021	58	47	40	74	53	48	
Sunday-17-October-2021	46	48	41	53	52	52	
Monday-18-October-2021	59	47	41	64	52	50	
Tuesday-19-October-2021	58	48	40	64	54	52	
Wednesday-20-October-2021	59	47	41	65	52	53	
Thursday-21-October-2021	59	46	41	72	53	53	
Friday-22-October-2021	59	47	42	66	53	48	
Saturday-23-October-2021	50	-	41	67	-	48	
Sunday-24-October-2021	50	46	41	63	51	52	
Monday-25-October-2021	-	-	-	-	-	-	
Representative Weekday ⁵	59	47	41	67	53	53	
Representative Weekend ⁵	50	47	41	69	52	50	
Representative Week ⁵	58	47	41	68	53	52	

Notes:

1. Day is 7:00am to 6:00pm on all days except Sundays and Public Holidays when it is 8:00am to 6:00pm 2. Evening is 6:00pm to 10:00pm

3. Night is the remaining periods 4. Assessment Background Level (ABL) for individual days 5. Rating Background Level (RBL) for L_{Aeq} and logarithmic average for L_{Aeq} 6. Leq is calculated in the free field. 2.5dB is subtracted from results if logger is placed at façade 7. Number in brackets represents the measured (actual) RBL value, which is below the minimum policy value of 30 dB(A) during the evening or night period or 35 dB(A) during the day period.

L2

Road / Rail Noise Monitoring Results (at one metre from façade)						
Periods with insufficient results excluded	L _{Aeq} Noise Levels		L _{Aeq 1hr} Nois	L _{Aeq 1hr} Noise Levels		
Date	Day ¹	Night ²	Day - Up ⁴	Day - Low⁵	Night - Up ⁴	Night - Low⁵
Friday-15-October-2021	-	60	-	-	56	45
Saturday-16-October-2021	75	50	79	55	52	45
Sunday-17-October-2021	55	55	56	53	60	44
Monday-18-October-2021	65	53	68	54	53	44
Tuesday-19-October-2021	66	54	68	56	55	43
Wednesday-20-October-2021	66	56	69	54	54	44
Thursday-21-October-2021	73	55	77	54	54	44
Friday-22-October-2021	67	51	70	55	54	45
Saturday-23-October-2021	-	49	-	-	52	44
Sunday-24-October-2021	64	54	67	54	54	43
Monday-25-October-2021	-	-	-	-	-	-
Representative Weekday ³	66	55	69	54	54	44
Representative Weekend ³	64	52	67	54	53	44
Representative Week ³	66	54	68	54	54	44
Notes:						

1. Day is 7:00am to 10:00pm

5. Lower 10th percentile $L_{Aeq 1hr}$

2. Night is 10:00pm to 7:00am

3. Median of daily L_{Aeq}

4. Upper 10th percentile L_{Aeq 1hr}

6. Values are calculated at the facade. 2.5dB is added to results if logger is placed in the free field

Unattended Monitoring Results

Location: L2



Template: QTE-26 Logger Graphs Program (r38)



Template: QTE-26 Logger Graphs Program (r38)