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Q8462-03F01 (Rev 0) Jupiters Pool Party Noise Testing.doc

26 August 2011

Craig Peachey

Jupiters Hotel & Casino

Cnr Gold Coast Hwy & TE Peters Drive

Broadbeach QLD 4218

Dear Craig,

RE: JUPITERS HOTEL & CASINO POOL AREA – SUMMARY OF NOISE TESTING CONDUCTED ON THURSDAY 18TH AUGUST 2011

1 Introduction

This technical report summarises recent noise testing within the outdoor pool area at Jupiter's Casino. The purpose of noise testing was to investigate the possible use of the 'Sound Ceiling' system and compare the results against a conventional Line Array sound system.

2 Background Information

The 'Sound Ceiling' system incorporates a number of small directional speakers set in a panel arrangement. Refer to the JBN website http://www.jbn.com.au/) for further information.

The test set of the day consisted of 72 panels with 9 directional speakers per panel. Figure 1 presents the Sound Ceiling arrangement located within the pool area. Figure 2 shows a photograph above the Sound Ceiling. High density fibreglass panels are laid over the ceiling system in order to reduce noise travelling upwards.

Figure 1 – Sound Ceiling speaker system by JBN

Figure 2 – Sound Ceiling panel from above

A second standard Line Array sound system was setup near the pool area in order to compare noise levels against the Sound Ceiling system. Figures 3 and 4 show photographs of the Line Array system from front and rear views.

Figure 3 – Line Array sound system (front view)

Figure 4 – Line Array sound system (rear view)

Noise measurements were conducted between 2pm and 6pm on Thursday 18th August 2011 at various locations within the pool area, inside a hotel room overlooking the pool area and at two local residential locations.

Noise testing involved playing a test track repeatedly in order to compare music levels at the various locations. The test track selected on the day was Hip Hop music 'It's you, It's me' by Kaskade.

The measurement locations were selected directly under the Sound Ceiling at two volume settings namely -15dB and -5dB. The -15dB volume setting was subjectively considered within the range of typical music volumes heard within a music venue such as a pub or hotel. The -5dB volume was twice as loud as the -15dB setting and best described as uncomfortably loud under the speakers. This -5dB volume setting would lead to hearing damage over short time periods.

Additional noise measurements were conducted at the edge of the Sound Ceiling, 3m from the edge and 6m from the edge for comparison purposes.

Figures 5 and 6 show photographs of the typical measurement locations.

Figure 5 – Sound Ceiling measurement location centre of panels.

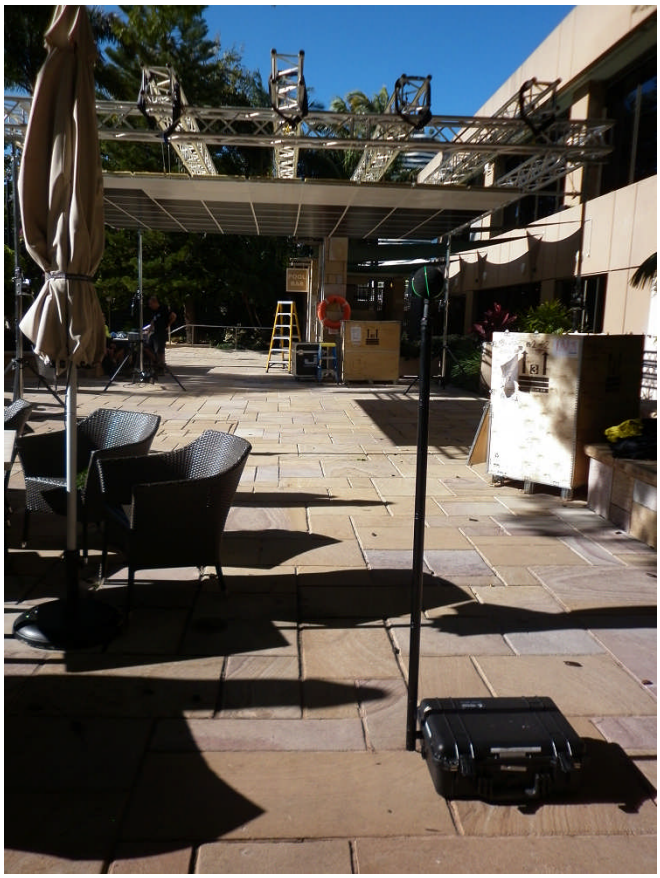

Figure 6 – Sound Ceiling measurement location at 6m from edge

Spot noise measurements were conducted at selected locations around the pool area with both the -15dB and -5dB volume settings.

A typical hotel room was selected for testing noise intrusion into the Casino. Room 808 was overlooking the pool area and suitable for testing purposes.

Two residential properties located in the surrounding area were also selected for noise testing. The first location was at the rear yard of 20 Rebecca Court, facing the canal and Jupiters Casino. The location is approximately 240m south west of the Line Array sound system and 225m south west of the Sound Ceiling system. Refer to Figure 7 for view to Casino from noise meter.

Figure 7 – Noise Measurement location at 20 Rebecca Court

The second location was at the rear yard of 12 Lakeland Key, facing the canal and Jupiters Casino. The location is approximately 115m east of the Line Array sound system and 130m east of the Sound Ceiling system. Refer to Figure 8 for view to Casino from noise meter.

Figure 8 – Noise Measurement location at 12 Lakeland Key

The following figure shows the two sound system locations and neighbouring residential measurement locations.

Figure 9 – Speaker System Locations & Residential Measurement Locations

3 Results

Table 1 below presents measured music levels at various locations around the outdoor pool area using the JBN Sound Ceiling.

Table 1: Music Levels at Various Locations using Sound Ceiling

Location	Sound Ceiling Volume Setting		Comments
	-15dB	-5dB	
Centre Sound Ceiling	109dBA	115dBA	Very loud music, uncomfortable leading to hearing damage
Edge Sound Ceiling	101dBA	106dBA	Difference noticeable
3m from edge Sound Ceiling	90dBA	96dBA	Difference noticeable
6m from edge Sound Ceiling	85dBA	91dBA	Difference noticeable
Room 808	50dBA	56dBA	Music audible
12 Lakeland Key	50 - 55dBA	55 - 60dBA	Music audible
20 Rebecca Court	50 - 55dBA	55 - 60dBA	Music just audible

Table 2 below presents measured music levels at various locations around the outdoor pool area using the standard Line Array system.

Table 2: Music Levels at Various Locations using Line Array

Location	Music Volume (0dB setting)	Comments
3m from Line Array	113dBA	Very loud music, uncomfortable leading to hearing damage
20m from Line Array	96dBA	Loud music
Room 808	70dBA	Clearly audible, window frame rattled
12 Lakeland Key	60 – 65dBA	Music beat clearly audible, some echoes from the building noticeable
20 Rebecca Court	60 – 65dBA	Music beat clearly audible

4 Discussion

Reference to Table 1 shows that music volumes were considered very loud in the centre of the Sound Ceiling. Sound Ceiling test recorded music levels of 109dBA (based on the -15dB setting) and 115dBA (based on the -5dB) setting. The 115dBA volume was similar to the Line Array volume of 113dBA measured at 3m from the speakers. The main difference was the amount of low frequency bass content.

Music volume levels dropped off significantly from the centre of the Sound Ceiling to say a point only 6m from the edge of the Sound Ceiling. For the -15dB setting, volumes at the centre were 109dBA and 85dBA at 6m from the edge. This represents a 24dB drop off.

Similarly For the -15dB setting, volumes at the centre were 115dBA and 91dBA at 6m from the edge. This represents a 23dB drop off.

Music levels were previously measured during the Snoop Dogg concert within pool area. Typical levels ranged from 80dBA to up 110dBA depending on the distance to the nearest speaker. There were multiple speakers and a significant amount of low frequency bass content.

The low frequency bass beat noise is one of the main problems associated with venue. This 'doof doof' type sound travels large distances before reducing to acceptable levels.

Music levels were previously measured during the Snoop Dogg concert within Room 509 and 1510. Typical levels ranged from 45dBA to 60dBA with significant low frequency bass content. The Line Array test track averaged slightly higher around 70dBA within Room 808 again with significant low frequency bass content. We found that the window frame starting rattle in tune with the beat. The music was considered extremely intrusive. We understand that a number of hotel guests registered noise complaints during tests involving the Line Array system.

In comparison the Sound Ceiling test recorded music levels of 50dBA (based on the -15dB setting) and 56dBA (based on the -5dB) setting. The most important point however is that low

frequency content was significantly reduced using the Sound Ceiling. Music volumes with the -15dB setting were just audible but subjectively not as annoying as the Line Array system. Music levels using the -5dB setting were audible and slightly more noticeable than the -15dB setting.

The Sound Ceiling system uses highly directional speakers pointed downwards. This also reduces noise emissions upwards towards the hotel rooms. High density glasswool is positioned over the Sound Ceiling in order to assist noise reductions in the upward direction. Further noise reductions may be realised by installing the Sound Ceiling under a roof system.

Music levels were measured with the three test scenarios (-15dB, -5dB and Line Array) at the two residential properties. At both 12 Lakeland Key and 20 Rebecca Court, music levels using the Line Array system were clearly audible above background noise. The low frequency bass beat was clearly audible and intrusive. At 12 Lakeland Key there was a notable echo or late sound reflection generated off the Casino's façade.

The tests involving the Sound Ceiling were promising. Music was audible however the bass beat levels were significantly lower than the Line Array system. The audibility was subjectively considered less intrusive. Switching between the -15dB and -5dB volumes was noticeable however both were still within a reasonable range.

The Liquor Licensing (OLGR) noise limits are based on existing background noise levels plus a correction. This is roughly +10dBA before 10pm and +8dBA after 10pm. We are currently conducting long term noise monitoring at both 12 Lakeland Key and 20 Rebecca Court. The purpose of monitoring is to establish existing background noise levels thereby determining noise limits. By working backwards we aim to determine allowable music volumes at the Casino's pool area.

Use of the standard Line Array system has led to multiple noise complaints from local residences in the past. Reducing the speaker volume is one method to comply with OLGR noise limits however this method may lead to dissatisfied patrons.

Installing the Sound Ceiling system will provide some benefits by reducing the low frequency bass beat at the nearest noise sensitive receivers both onsite and offsite. With careful placement, orientation and volume control the Sound Ceiling is considered possibly the best option for the venue.

5 Conclusion

Testing the Sound Ceiling found significantly low bass frequency content than using the standard Line Array speaker system. The low frequency beat is typically associated with noise complaints from residences in the local area. Reducing this low frequency bass beat should form part of an overall plan to comply with OLGR noise limits at the nearest noise sensitive receivers.

The results of music testing using the JBN Sound Ceiling were very promising and we recommend that Jupiter's Casino management consider this option.

We trust that the information provided is adequate for your purpose at this stage. If you have any queries or require any further information, please do not hesitate to contact me.

Yours faithfully,

RON RUMBLE RENZO TONIN
Paul Johnson
State Manager (Queensland)

DOCUMENT CONTROL

Date	Revision History	Non-Issued Revision	Issued Revision	Prepared By (initials)	Instructed By (initials)	Reviewed & Authorised by (initials)
26/08/2011	First Issue		0	PJ	PJ	PJ

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