

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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Caravan, Manchester Good Yard

Acoustic verification testing (planning condition 3b)

This document presents the results of the acoustic verification measurements carried out for Caravan restaurant to demonstrate compliance with planning condition 3b.

Summary

Sandy Brown has been commissioned to provide acoustic testing to determine noise breakout from the installed amplified sound system at Caravan restaurant at 6 Goods Yard Street, Manchester, M3 3BG.

Manchester City Council (MCC) requires verification measurements be carried out to demonstrate that noise break out from amplified music from the development adheres to the limits set out in Sandy Brown 023622 M001-C *Operational noise break out assessment* dated in 7 June 2024 to discharge Planning Condition 3b under 139384/FO/2024.

Attended measurements were carried out between 22:20 hrs on 29 October 2024 and 02:13 hrs on 30 October 2024 of the following:

- Typical day operations with retractable windows closed
- Typical day operations with retractable windows open
- Typical night operation with retractable windows closed.

Retractable windows and terrace doors will be closed during the night.

Internal noise measurements were carried out to set internal limits to ensure that breakout was controlled to be in line with the external (and noise transfer) criteria given Sandy Brown 023622 M001-C *Operational noise break out assessment*.

Sample noise measurements were carried out outside the nearest noise sensitive premises for the proposed operations with the amplified sound systems operating at the agreed limits.

Amplified music egress was not audible at the nearest noise sensitive premises for the proposed day and night operations during the measurements.

Sample measurements were carried out at the office space above the restaurant, which is currently vacant, with the amplified sound systems operating at the agreed limits. Amplified music was not audible during these measurements.

Amplified sound system equipment settings/limits have been set and agreed to ensure that the external noise criteria and noise transfer criteria are met.

Additional sample measurements were carried out with the entrance and terrace pass doors open (with the amplified sound systems operating at the agreed limits). The predicted worst-case noise level contributions from the three doors when open at the same time are at least 8 dB lower than the measured background noise levels during the day. Terrace doors are closed at night. Based on this, the noise breakout contributions associated with opening door operations are not expected to increase background noise levels at the nearest noise sensitive receptors.

The Caravan restaurant management team have confirmed that operational guidance relating to the set-up and management of the sound system will be provided to relevant staff, as appropriate, to ensure the noise limits within the restaurant are not exceeded.

On the basis that the agreed internal sound limits are not exceeded, Planning Condition 3b can be discharged.

Basis

This document is based on the following:

- Measurements carried out on 29 and 30 October 2024
- Caravan restaurant modes of operation and opening hours discussed on site with Caravan manager
- Sandy Brown 023622 M001-C Operational noise breakout assessment *dated 7 June 2024*
- Planning Conditions under 139384/FO/2024 publicly available online in Manchester City Council Planning portal.

Site description

The location of the Caravan restaurant is outlined in yellow in Figure 1. The nearest noise sensitive premises to the proposed Caravan restaurant are summarised below.

- Union Co-living apartments approximately 30 m to the west, highlighted in red in Figure 1
- Bonded warehouse approximately 34 m to the south, highlighted in green in Figure 1
- Old Granada studios Hotel Development highlighted in green and office building highlighted in orange approximately 58 m to the east in Figure 1.

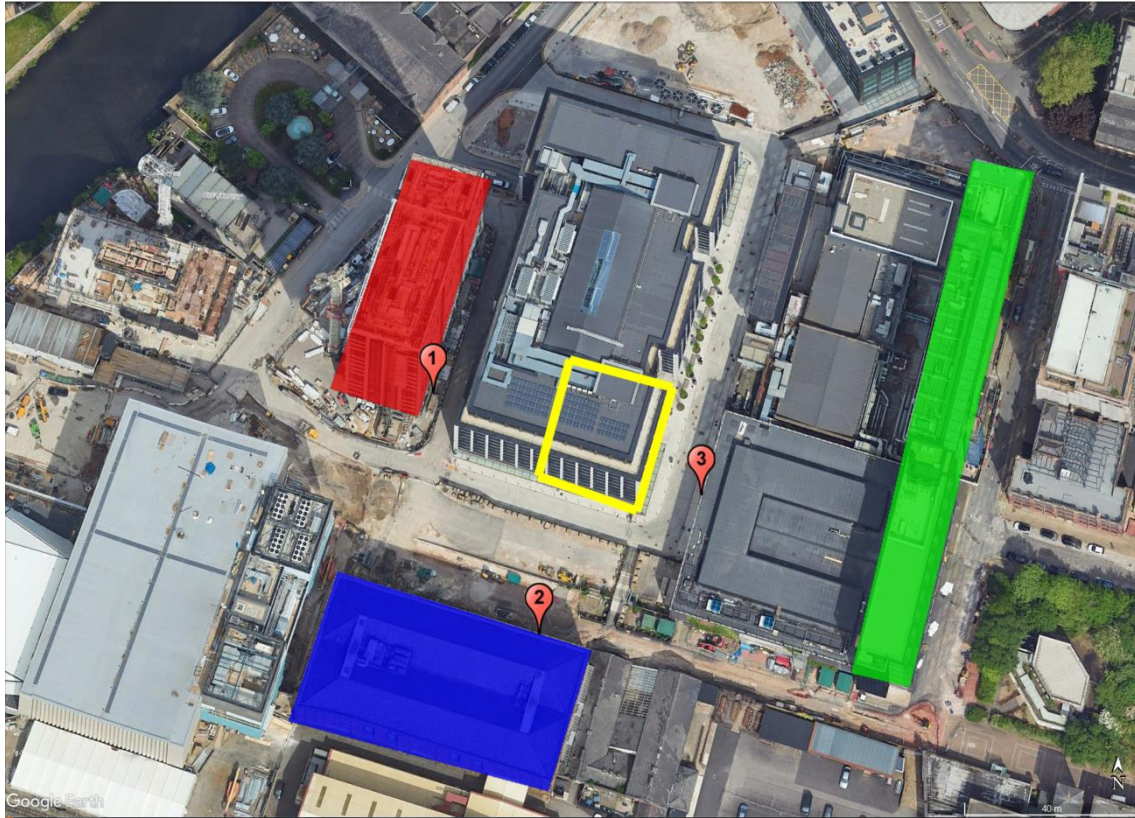


Figure 1 Aerial view of the site (Courtesy of Google Earth Pro)

Planning condition 3

Planning Condition 3a and 3b under 139384/FO/2024 state the following:

Planning Condition 3a

'The premises shall be acoustically insulated and treated to limit the breakout of noise in accordance with a noise study of the premises and a scheme of acoustic treatment that has been submitted to and approved in writing by the City Council as local planning authority. The scheme shall be implemented in full before the use commences. Where entertainment noise is proposed the L_{Aeq} (entertainment noise) shall be controlled to 5 dB above the L_{A90} (without entertainment noise) in each octave band at the façade of the nearest noise sensitive location, and internal noise levels at structurally adjoined residential properties in the 63Hz and 125 Hz octave frequency bands shall be controlled so as not to exceed (in habitable rooms) 47 dB and 41 dB ($L_{eq,5min}$), respectively'.

Planning Condition 3b

'Prior occupation of the development a verification report will be required to validate that the work undertaken throughout the development conforms to the

recommendations and requirements in the approved acoustic consultant's report. The report shall also undertake post completion testing to confirm that acceptable criteria have been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria'.

Acoustic criteria

Background noise levels

An environmental noise survey has been carried out by Sandy Brown, the measurement results are noise egress limits are set out in 18346-R01-A *Acoustic planning report* dated 28 September 2018.

The lowest background noise levels measured during the survey at the nearest noise sensitive premises was $L_{Aeq,5min}$ 50 dB during the day and $L_{Aeq,5min}$ 44 dB at night.

The octave band sound pressure levels corresponding to the minimum background L_{A90} (dB) level measured are provided in Table 1.

Table 1 Octave band background noise levels for lowest measured background noise levels

Time period	Minimum background noise level, $L_{90,5min}$ (dB)						
	Octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Day (07:00 – 23:00)	52	49	48	43	47	41	27
Night (23:00 – 07:00)	49	46	44	39	39	34	24

Noise breakout

The operational noise egress criteria (associated with amplified sound) are provided in Table 2. These limits apply at the surrounding noise sensitive premises.

Table 2 Maximum amplified sound egress limits at noise sensitive premises

Time period	Maximum sound pressure level at 1 m from noise sensitive premises, $L_{eq,5min}$ (dB)						
	Octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Day (07:00 – 23:00)	39	36	35	30	34	28	14
Night (23:00 – 07:00)	36	33	31	26	26	21	11

Internal noise transfer

For the purpose of assessing operational noise transfer, a typical NR 35 FCU spectrum has been considered within the Level 1 tenant unit. This is considered a reasonable worst-case scenario, as such noise levels would be expected within cellular meeting rooms and offices, which would be considered acoustically sensitive spaces. The spectrum considered is provided in Table 3 for reference.

Table 3 NR35 FCU sound pressure spectrum

	Sound pressure level L_{eq} (dB)							
	Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
NR 35 FCU spectrum	42	39	39	35	35	32	27	23

Operational noise transfer to the Level 1 tenant unit from the Caravan demise will need to be suitably controlled such that it does not result in disturbance to its occupants. It is recommended that operational noise transfer be controlled to be at least 10 dB below the internal noise levels within the Level 1 tenant unit in each octave band as per Table 3.

Caravan operations

Day operations

Low volume background music (typically Jazz or R&B) is reproduced in the restaurant and bar spaces between 08:00 - 16:00 hrs during the week and weekend.

From 16:00 hrs and depending on the restaurant occupancy, the music type changes to house type music up to 23:00 hrs Monday to Thursday, and to 00:00 hrs Friday and Saturday, and 22:00 hrs on Sunday, this could be played by a DJ mixing desk in the roastery space or predefined track list and reproduced in all three spaces. This is considered the worst-case scenario.

The installed retractable windows are typically closed, However, these are openable during the summer up to 23:00 hrs Monday to Saturday, and 22:00 hrs on Sunday.

Night operations

On Fridays and Saturdays, the restaurant is open up to 00:00 hrs in which DJ amplified music is reproduced. The installed retractable windows are closed during operations after 23:00 hrs.

Installed amplified sound system and settings

The installed amplified sound system is distributed in 3 different zones, the restaurant, the bar and the DJ/roastery area. The main volume controls are stored in a secure back-office room which is accessible via door keypad lock and only by staff members.

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A photo of the installed volume control unit is provided in Figure 2. These settings remained as shown in this photo for all measurements and should not be increased.



Figure 2 Installed Cloud Z4MK4 four zone volume control unit

On the main restaurant floor, there are source input selectors with volume controllers for each space (RSL-6 volume control units). This provides the flexibility to independently play different music and volumes in each zone of the unit.

The on-floor volume controllers have a music volume level ranging from 0 to 10. A photo of the installed controllers is shown in Figure 3. These are controlled and adjusted by the restaurant manager or staff that are familiar with the installed system and have received training in relation to the amplified sound limits.



Figure 3 Installed RSL-6 type controllers (restaurant and bar spaces)

The locations of these source input selectors and RSL-6 volume controllers are indicated in red in Figure 4.

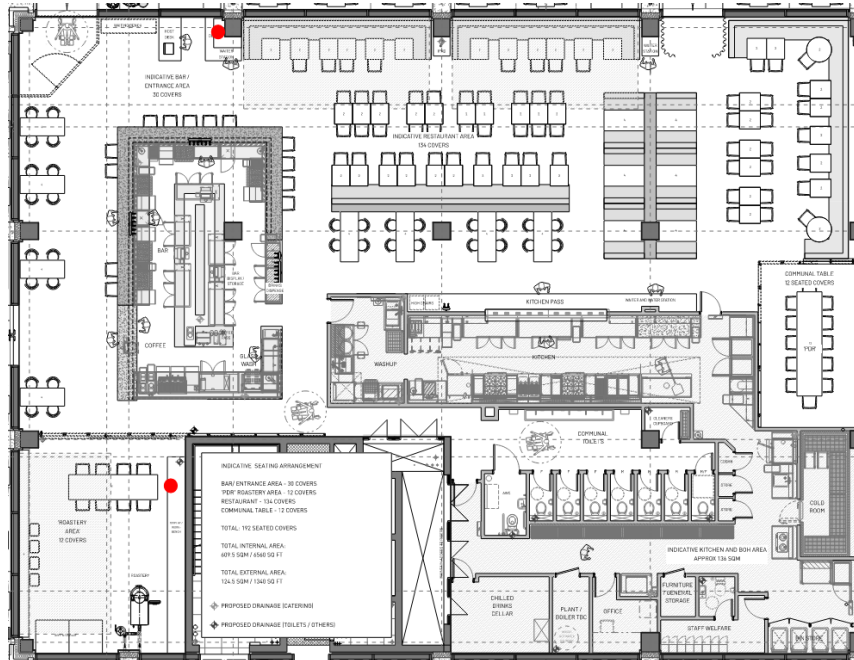


Figure 4 Location of the RSL-6 controllers

The communal table 12 seated covers space can be used as a private room. Although there are speakers in the room, it is understood these are display only and were not in operation during the site visit.

There is a mixing desk located in roastery space which is controlled by the DJ and staff who have received appropriate training. The volume levels on the mixing desk and the RSL-6 controllers (shown in Figure 3) were adjusted to align with the appropriate limits for the day/night operations. The relevant settings are detailed below.

Day operations with windows closed (mixing desk and RSL-6 settings)

The mixing desk settings shown in Figure 5 were used in combination with volume control set at position 8 of 10 (RSL-6 in Figure 3) for day operations with windows closed.

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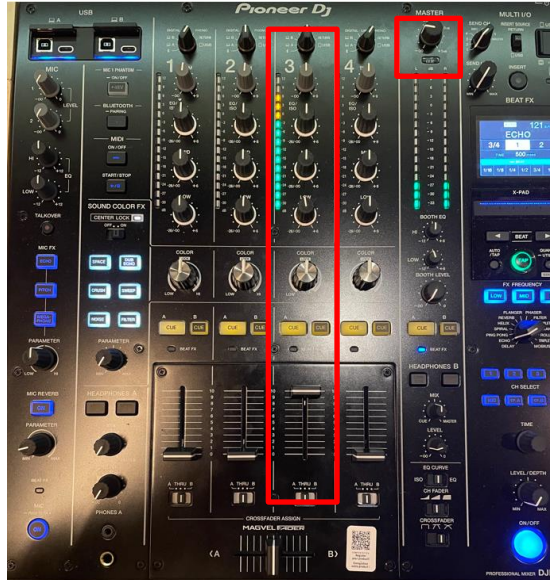


Figure 5 Day operations (windows closed) – mixing desk settings

The mixing desk channels were set with the gain and equalizer controls in the middle position and main master volume output to 25% with the channel fader to its highest position as outlined in red in Figure 5.

Day operations with retractable windows open

The mixing desk settings shown in Figure 6 were used in combination with volume control set at position 6 of 10 (RSL-6 in Figure 3 for day operations with windows open).

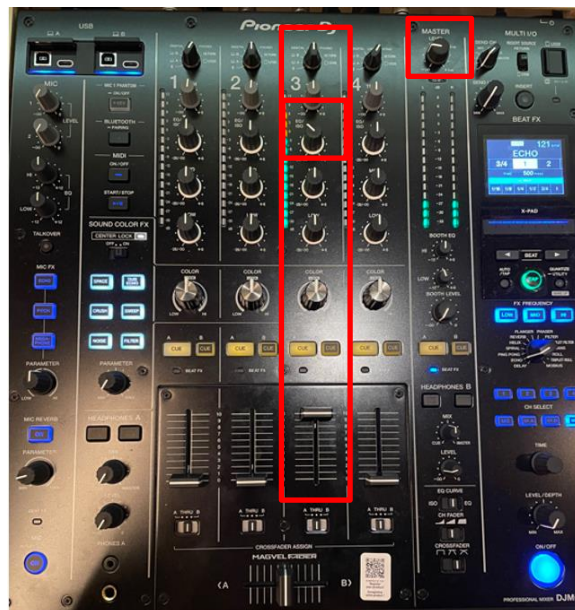


Figure 6 Day operation (windows/door closed)

The mixing desk channels were set with the gain and equalizer controls generally in the middle position, with the exception of the high frequency control which was set to 5 of 9. The main master volume output was set to 25% with the channel fader to its highest position as outlined in red in Figure 6

Night operation with windows closed

The day operation mixing desk settings shown in Figure 5 were used with the volume control (RSL-6 in Figure 3) for each space set at position 7 of 10.

Measurement method

Music system/track

The management team confirmed that the worst-case scenario in terms of volume levels consists of amplified house music in all spaces.

For this, a track was played in loop during the measurements via the mixing desk which was considered to provide be representative of this music type with low frequency content.

Timings and locations

The measurements were carried out during the evening and night to minimise extraneous noise affecting the measurements.

The survey included attended measurements carried out at difference locations, and summarised below:

- Within the Caravan restaurant at the locations indicated I1 to I4 in Figure 7. These measurements were of 1 minute in duration
- Outside the restaurant outside retractable windows and door indicated as R1 and R2, and D1 to D3 in Figure 7. These measurements were of 5 minutes in duration.

Measurements outside the retractable window overlooking Old Granada Studios were not carried out with the window open as this window was not openable during the visit.

- Within the office space above the restaurant indicated as L1 and L2 in Figure 8. These measurements were of 1 minute in duration.
- At the nearest noise sensitive premises indicated as 1 to 3 in Figure 1. These measurements were of 5 minutes in duration.

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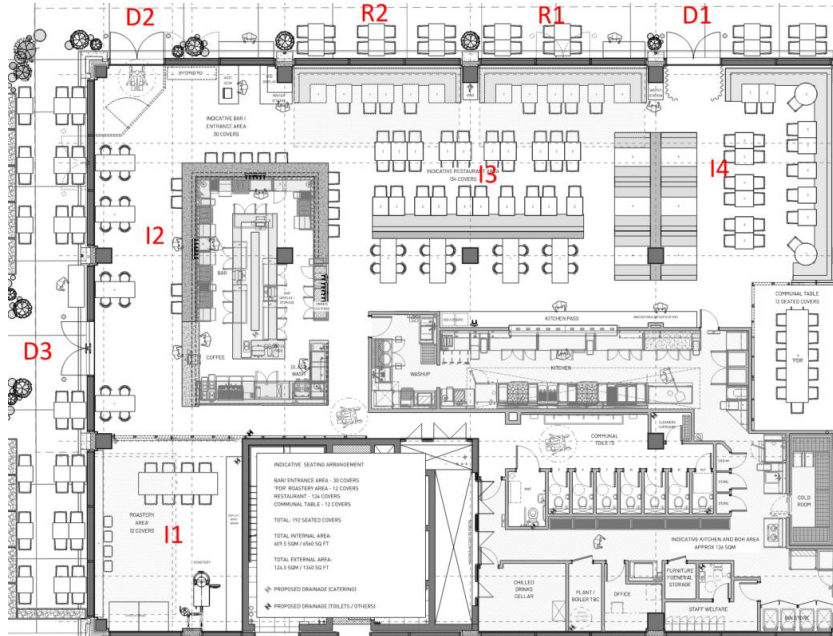


Figure 7 Locations of internal and external measurements

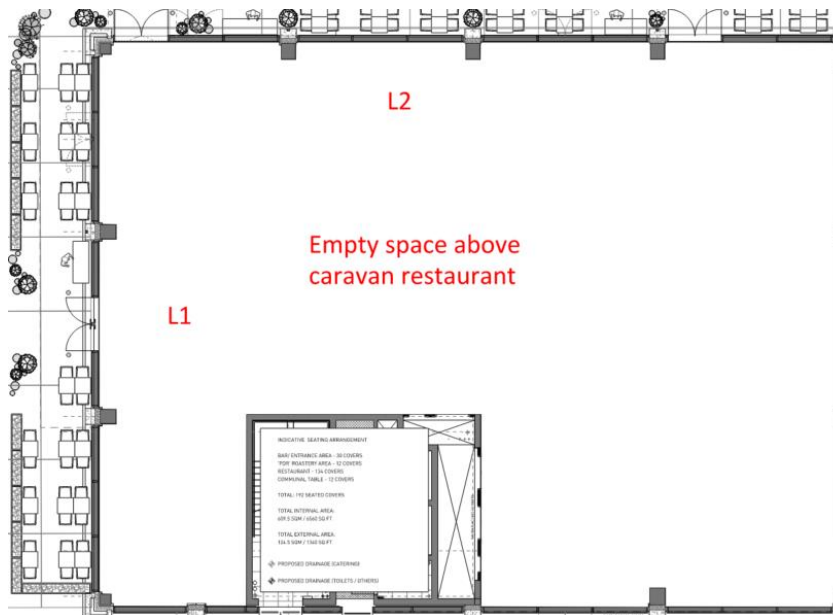


Figure 8 Location of measurements at office space above Caravan restaurant

For all measurements, the sound level meter microphone was mounted on a tripod approximately 1.5 m above the local ground level. Dominant sound sources occurring during the measurements were noted.

For positions 1 to 3 indicated in Figure 1, the microphone was approximately 1 m from a reflective surface.

For positions R1 to R2 and D1 to D3, the measurements were carried out at 3 m from the retractable windows and doors.

For positions L1 and L2, the measurements were carried out at approximately 1.5 m above the floor level and approximately 3 m from any other reflective surface.

The Office space above the Caravan restaurant is empty (shell and core) and was noted to be highly reverberant, and as such worst case in terms of noise transfer.

Measurement method

The measurement method consisted of the following:

- Background noise levels at the nearest noise sensitive premises (during day)
- Amplified sound system set to operate within the internal noise limits for windows closed in line with the assessment set out in 023622 M001-C *Operational noise breakout assessment dated 7 June 2024*, as summarised in Table 4.

Table 4 Day internal limits for amplified sound (windows closed)

	Sound pressure level L_{eq} (dB)						
	Octave-band centre frequency (Hz)						
Windows closed	63	125	250	500	1000	2000	4000
Day (07:00- 23:00)	70	64	68	70	76	69	58

- Measurements at the nearest noise sensitive receptors with external windows closed
- Measurements within the shell office space above caravan restaurant
- Measurements at 3 m from each door held open
- Amplified sound system set to operate within the internal noise limits for windows open in line with the assessment set out in 023622 M001-C *Operational noise breakout assessment dated 7 June 2024* and summarised in Table 5.

Table 5 Day internal limits for amplified sound (windows open)

	Sound pressure level L_{eq} (dB)						
	Octave-band centre frequency (Hz)						
Windows open	63	125	250	500	1000	2000	4000
Day (07:00- 23:00)	63	60	59	54	58	52	38

- Measurements at the nearest noise sensitive receptors with external windows open
- Measurements at 3 m from windows and doors with windows/doors open

- Amplified sound system set to operate within the windows closed at night limits in line with the assessment set out in 023622 M001-C *Operational noise breakout assessment dated 7 June 2024* as summarised in Table 4.

Table 6 Night internal limits for amplified sound (windows closed)

	Sound pressure level L_{eq} (dB)						
	Octave-band centre frequency (Hz)						
Windows closed	63	125	250	500	1000	2000	4000
Night (23:00- 07:00)	67	61	69	66	67	62	55

- Measurements at the nearest noise sensitive receptors with external windows closed
- Background noise levels at the nearest noise sensitive premises (during night).

Weather conditions

During the external measurements, the weather was clear and dry and no rain occurred. Wind speeds were measured to be less than 1 m/s at each position. These weather conditions are considered suitable for obtaining representative measurements.

Measurement results

Background at nearest noise sensitive premises (day)

Sample background noise levels measured at the nearest noise sensitive premises are summarised in Table 7.

Table 7 Background noise levels at the nearest noise sensitive premises

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,5min}$	$L_{AFmax,5min}$	$L_{A90,5min}$	
1	22:20	52	72	49	Dominated by distant plant, with contribution from pedestrians talking, distant car slamming door and car engine
2	22:25	48	57	47	Dominated by distant plant and pedestrians talking with contributions from distant metal trolley

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,5min}$	$L_{AFmax,5min}$	$L_{A90,5min}$	
3	22:32	49	58	48	Dominated by distant plant with contributions from pedestrians passing by talking and distant road traffic on Quay Street

The 1/1 octave band measurement results at each position are summarised in Table 8.

Table 8 Octave band background measurement results (day background levels)

Position	Background sound pressure level L_{90} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
1	55	51	49	46	45	40	36
2	52	49	46	44	42	36	28
3	53	50	46	44	43	39	33

Day operations with windows closed

The measurement results in Table 9 are based on the equipment settings detailed above for this operation.

Table 9 Measured internal sound pressure levels for day operations (windows closed)

Position	Sound pressure level L_{eq} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
I1	73	65	64	61	59	58	52
I2	71	64	64	62	65	58	53
I3	70	68	63	61	65	56	51
I4	71	63	64	61	63	53	47

The average of the measured internal sound pressure levels are set out in Table 10.

Table 10 Average of the internal sound pressure levels day operation (windows closed)

	Sound pressure level L_{eq} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Average	71	65	64	61	64	57	51

The external measurement results with day operational limit and windows closed at the locations indicated as 1 to 3 in Figure 1 are set out in Table 11. These based on the equipment settings detailed above for this operation.

Table 11 Measured noise levels at nearest noise sensitive premises (windows closed)

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,5min}$	$L_{AFmax,5min}$	$L_{A90,5min}$	
1	23:29	50	66	48	Dominated by distant plant, with contribution from pedestrians talking, distant car slamming door and car engine. Music breakout not audible.
2	23:35	46	52	45	Dominated by distant plant with contributions from distant road traffic on Quay St. Music breakout not audible.
3	23:40	49	54	48	Dominated by distant plant with contributions from distant road traffic on Quay St. Music breakout not audible.

The corresponding 1/1 octave band measurement results at each position are summarised in Table 12. These based on the equipment settings detailed above for this operation.

Table 12 Octave band measurement results (day operational music limits and windows closed)

Position	Background sound pressure level L_{90} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
1	55	51	49	45	43	38	34
2	51	48	43	41	40	35	28
3	54	48	46	44	43	40	34

Noise transfer measurements to office above (day operation)

The measurement results within the office space above the caravan restaurant are provided in Table 13. These based on the equipment settings detailed above for this operation.

Table 13 Measurement results within office space above restaurant with day limits

Position	Sound pressure level L_{eq} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
1	49	39	31	25	18	14	13
	50	41	33	27	19	15	13
	49	39	31	25	18	15	13
2	46	39	31	27	19	17	16
	45	38	31	25	18	15	14
	44	39	30	25	21	16	15

The average of the above measured sound pressure levels are set out in Table 14.

Table 14 Average of the internal sound pressure levels within office space above restaurant (day operation)

	Sound pressure level L_{eq} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Average	47	39	31	26	19	15	14

Noise measurements at 3 m from doors held open (day operation)

The measurement results at 3 m from each door held open are summarised in Table 15. These based on the equipment settings detailed above for this operation.

Table 15 Measured internal sound pressure levels day operation (door open at 3m)

Position	Sound pressure level L_{eq} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
D1	54	55	53	53	53	44	41
D2	58	54	47	46	45	39	34
D3	35	56	52	50	51	45	40

Day operations with retractable windows/doors open

The measurement results in Table 16 are based on the equipment settings detailed above for this operation.

Table 16 Measured internal sound pressure levels day operation (windows open)

Position	Sound pressure level L_{eq} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
I1	60	54	53	50	53	46	41
I2	61	54	53	51	53	45	38
I3	60	54	53	52	52	44	36
I4	60	54	53	52	52	44	36

The average of the measured sound pressure levels are set out in Table 17. These are based on the equipment settings detailed above for this operation.

Table 17 Average of the internal sound pressure levels day operation

	Sound pressure level L_{eq} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Average	63	60	59	54	58	52	38

The measurement results with day limits and windows open at the locations indicated as 1 to 3 in Figure 1 are set out in Table 18. These are based on the equipment settings detailed above for this operation.

Table 18 Measured noise levels at nearest noise sensitive premises (windows open)

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,5min}$	$L_{AFmax,5min}$	$L_{A90,5min}$	
1	00:50	49	67	47	Dominated by distant plant, with contribution from pedestrians talking. Music egress not audible.
2	00:56	45	59	44	Dominated by distant plant with contributions from distant road traffic on Quay St and distant bottle drop in bin. Music egress not audible.
3	01:02	48	57	47	Dominated by distant plant with contributions from distant road traffic on Quay St and train passing. Music egress not audible.

The corresponding 1/1 octave band measurement results at each position are summarised in Table 19. These are based on the equipment settings detailed above for this operation.

Table 19 Octave band background measurement results (day operational limits with retractable windows open)

Position	Background sound pressure level L_{90} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
1	52	49	47	44	41	38	33
2	49	47	42	41	40	35	30
3	53	46	44	43	42	39	33

Noise measurements at 3 m from doors held open (day operation with windows open)

The measurement results with day limits and windows open at the locations indicated location is Figure 7 are summarised in Table 20. These are based on the equipment settings detailed above for this operation.

Table 20 Measured sound pressure levels at 3 m from retractable windows open

Position	Sound pressure level L_{eq} (dB) at 3m Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
R1	56	52	47	46	47	40	34
R2	57	53	47	47	46	38	33

Night operations with windows closed

The measurement results in Table 21 are based on the equipment settings detailed above for this operation.

Table 21 Measured internal sound pressure levels night operation

Position	Sound pressure level L_{eq} (dB) Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
I1	68	61	57	54	57	53	51
I2	63	59	55	55	58	51	45
I3	65	57	57	54	60	50	43
I4	64	59	57	55	58	51	45

The average of the measured sound pressure levels are set out in Table 22. These based on the equipment settings detailed above for this operation.

Table 22 Average of the internal sound pressure levels night operation

	Sound pressure level L_{eq} (dB) Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Average	65	59	57	55	58	51	45

Noise measurements at the nearest noise sensitive premises (night)

The measurement results with night limits and windows closed at the locations indicated as 1 to 3 in Figure 1 are set out in Table 23. These based on the equipment settings detailed above for this operation.

Table 23 Measured noise levels at nearest noise sensitive premises at night (with windows closed)

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,5min}$	$L_{AFmax,5min}$	$L_{A90,5min}$	
1	01:31	48	54	47	Dominated by distant plant, with contribution from distant train passing. Music egress not audible.
2	01:38	44	55	43	Dominated by distant plant with contributions from distant road traffic on Quay St. Music egress not audible.
3	01:43	47	57	46	Dominated by distant plant with contributions from occasional distant road traffic on Quay St. Music egress not audible.

The corresponding 1/1 octave band measurement results at each position are summarised in Table 24. These based on the equipment settings detailed above for this operation.

Table 24 Octave band background measurement results (night background levels with windows closed)

Position	Background sound pressure level L_{90} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
1	52	49	47	44	41	38	34
2	49	46	42	40	38	34	27
3	50	46	44	42	41	40	33

Night background measurements at the nearest noise sensitive premises

The measured night background noise levels at the nearest noise sensitive premises without amplified music within the restaurant are set out in Table 25.

Table 25 Measured noise levels at nearest noise sensitive premises during night

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,5min}$	$L_{AFmax,5min}$	$L_{A90,5min}$	
1	01:31	48	54	47	Dominated by distant plant, with contribution from distant train passing.
2	01:38	44	55	43	Dominated by distant plant with contributions from distant road traffic on Quay St.
3	01:43	47	57	46	Dominated by distant plant with contributions from occasional distant road traffic on Quay St.

The corresponding 1/1 octave band measurement results at each position are summarised in Table 26.

Table 26 Octave band background measurement results (night background levels)

Position	Background sound pressure level L_{90} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
1	53	48	46	44	41	38	32
2	49	47	43	41	38	34	27
3	49	46	44	42	40	38	30

Assessment

Based on the measurement results the following assessments are carried out to discharge Planning Condition 13a and 13b.

Internal amplified sound system limits

A comparison of the internal noise limits within the restaurant and measurement results are carried out in Table 27.

Table 27 Comparison between measurement results and limits

Operation	Sound pressure level L_{eq} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Day 07:00 - 23:00 (with windows closed)							
Limits	70	69	68	70	76	69	58
Measured average	71	65	64	61	64	57	51
Comparison	1	-4	-4	-9	-12	-12	-7
Day 07:00 - 23:00 (with windows open)							
Limits	63	60	59	54	58	52	38
Measured average	60	54	53	51	53	45	38
Comparison	-3	-6	-6	-3	-5	-7	0
Night 23:00 - 07:00 (with windows closed)							
Limits	67	61	69	66	67	62	55
Measured average	65	59	57	55	58	51	45
Comparison	-2	-2	-12	-11	-9	-11	-10

Based on the above, internal ambient noise levels are below in each octave band except for 1 dB exceedance at 63 Hz for day operation 07:00-23:00 hrs with retractable window closed. This is considered to be within measurement tolerances.

Noise transfer to office space above

A comparison of the internal noise limits within the restaurant and measurement results are carried out below.

The limits set out within the office space is NR35, based on the measurement results set out in Table 14, this results in NR23 in the existing highly reverberant space.

Noise levels in a finished office space are expected to be lower than those measured. Subjectively, amplified music transfer was not audible during the measurements.

Noise break-out to nearby noise sensitive premises

A comparison of the measured day background noise levels and the measured break out noise for the different operational scenarios is provided below:

Day operations - noise break out (with windows closed)

Table 28 Comparison of measured sound pressure levels with windows closed

Position/operation	Measured sound pressure level L_{90} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Position 1 background	55	51	49	46	45	40	36
Position 2 with day music limits (windows closed)	55	51	49	45	43	38	34
Comparison	0	0	0	-1	-2	-2	-2
Position 2 background	52	49	46	44	42	36	28
Position 2 with day music limits (windows closed)	51	48	43	41	40	35	28
Comparison	-1	-1	-3	-3	-2	-1	0
Position 3 background	53	50	46	44	43	39	33
Position 3/day with day music limits (windows closed)	54	48	46	44	43	40	34
Comparison	1	-2	0	0	0	1	1

A comparison between measured background measurement results with restaurant noise limits set for day with windows/door closed, indicates no significant increases at the nearest noise sensitive premises. The 1 dB increases at position 3 at the 63Hz, 2kHz and 4kHz are within measurement tolerance.

Based on the above, the measurements demonstrate that the planning condition is met during the day with the agreed limits and doors/windows closed.

Day operations - noise break out via open retractable windows

Table 29 Comparison of measured background noise levels and measured day operational levels with windows open

Position/operation	Background sound pressure level L_{90} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Position 1 background	55	51	49	46	45	40	36
Position 1 with limits for windows open	52	49	47	44	41	38	33
Comparison	-3	-2	-2	-2	-4	-2	-3
Position 2 background	52	49	46	44	42	36	28
Position 2 with limits for windows open	49	47	42	41	40	35	30
Comparison	-3	-2	-4	-3	-2	-1	2
Position 3 background	53	50	46	44	43	39	33
Position 3 with limits for windows open	53	46	44	43	42	39	33
Comparison	0	-4	-2	-1	-1	0	0

A comparison between measured background measurement results with restaurant noise limits set for the day with windows open, indicate no significant increases at the nearest noise sensitive premises. The 2 dB increase at position 2 at 4kHz octave band is within measurement tolerances.

Based on the above, the measurements demonstrate that the planning condition is met during the day with the agreed limits and doors/windows open.

Night operations - noise break out with windows closed

Table 30 Comparison of measured background noise levels and measured night operational levels (windows closed)

Position/operation	Background sound pressure level L_{90} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Position 1 background	53	48	46	44	41	38	32
Position 1 with night music limits (windows closed)	52	49	47	44	41	38	34
Comparison	-1	1	1	0	0	0	2

Position/operation	Background sound pressure level L_{90} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Position 2 background	49	47	43	41	38	34	27
Position 2 with night music limits (windows closed)	49	46	42	40	38	34	27
Comparison	0	-1	-1	-1	0	0	0
Position 3 background	49	46	44	42	40	38	30
Position 3 with night music limits (windows closed)	50	46	44	42	41	40	33
Comparison	1	0	0	0	1	2	3

A comparison between background measurement results, and results with restaurant noise limits set to night with windows and doors closed, indicate no significant increase in background noise levels at the nearest noise sensitive premises.

Considering a 2 dB measurement tolerance, there is an exceedance of 1 dB at position 3 at 4kHz. However, the Old Granada studios Hotel Development is at approximately 65 m from the measurement location. Factoring in this distance additional attenuation, no increase in the background noise levels is expected.

Based on the above, the measurements demonstrate that the planning condition is met during the night with the agreed limits and doors/windows closed.

Door operations

Customer access to the restaurant is provided via the main lobbied door.

On summer days when the terraces are in use, waiting staff use the terrace doors which are self-closing doors to minimise open time. The terrace doors are not proposed to be held open at any time and would not be opened during the night. The terrace doors take less than 5 seconds to fully close from fully open position.

The amplified sound breakout levels have been predicted at each noise sensitive receptor based on the measurements carried out 3m from the doors with them held open. These were carried out with the amplified sound system set to day operation (windows closed). Based on a worst case scenario of all three doors to the unit being open simultaneously, the predicted noise breakout levels at each of the nearest noise sensitive premises are detailed in Table 31.

Table 31 Predicted noise levels at noise sensitive premises with 3 doors open simultaneously (day operation)

Noise sensitive premises	Predicted noise breakout level from open doors, $L_{Aeq,5min}$ (dB)
Union Co-living apartments	31
Bonded warehouse	39
Old Granada Studio hotel development	31

The predicted noise levels are 8-18 dB lower than the measured day background levels. On this basis, contributions from door openings during typical operations is not expected to increase the background noise levels at the nearest noise sensitive premises.

At night the only openable door is the main lobbied door, used by customers entering or existing the restaurant, or for occasional late-night smoking. It is recommended the lobbied doors be carefully managed to avoid them both being open at once during the night. Signs should be clearly displayed requesting customers keep noise to a minimum. Use of the areas be limited and managed by site security staff to minimise the risk of noise disturbance.

Management considerations

The Caravan restaurant management team will provide guidance to staff as appropriate on the management and control of the amplified sound systems to ensure the agreed noise limits within the restaurant are met.

A document with instructions and procedures set out will be provided to staff as appropriate. This should clearly state the equipment settings required for the following scenarios:

- Day (07:00-23:00) operations with retractable windows closed
- Day (07:00-23:00) operations with retractable windows open
- Night (23:00- 00:00) operations on Friday and Saturday with retractable windows closed.

Equipment

The attended noise measurements were taken using a Rion NL-52 sound level meter.

Calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	NL-52/01143564	Rion	15 Dec 24	TCRT22/1766
Microphone	UC-59/10153	Rion	15 Dec 24	TCRT22/1766
Pre-amp	NH-25/43581	Rion	15 Dec 24	TCRT22/1766
Calibrator	NC-74/34257023	Rion	15 Dec 24	TCRT22/1765

Calibration of the meters used for the measurements is traceable to national standards. Calibration certificates for the sound level meter used in this survey are available upon request.

Calibration checks were carried out on the meters and their measurement chains at the beginning and end of the survey. No significant calibration deviation occurred.

Noise indices

Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{AFmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a fast time weighting.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg, L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS 7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures*.