ENVELOP, VINTRY BUILDING

TERRACE NOISE ASSESSMENT FOR PLANNING

Acoustics Report A2142 R01a

9th July 2024

Report for:	Envelop Vintry House Bristol Attention: Caroline McIvor
Report to:	Planning Ventures Attention: Lyn Jones
Prepared by: Jonathan Croft BA AMIOA Acoustic Consultant	Checked by: David O'Neill BEng MSc CEng MIOA Director
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Ion Acoustics Ltd
Georges House
9 – 10 Bath Street
BRISTOL
BS1 6HL

www.ionacoustics.co.uk

0117 911 3765
mail@ionacoustics.co.uk

Consultants in Acoustics Noise & Vibration
Registered in England & Wales No. 5920418

Contents

1 Introduction

Ion Acoustics is appointed by Envelop to assess noise levels emitted from a terrace proposed to be used for social activities and meeting outside their office on the sixth floor of Vintry House, Wine St, Bristol. There are existing residential flats in the adjacent building, Southey House, which have an outdoor terrace nearby. This assessment is in respect of potential noise impact to the most affected flat and its terrace.

A baseline noise survey was conducted to measure the ambient noise levels on the terrace. An assessment of noise from outdoor activity has been made against noise limits in BS8233, and in respect of the change of noise level using guidance from the Institute of Environmental Management and Assessment and following liaison with Mark Curtis of Bristol City Council.

This report:

- Discusses the proposed scheme and operational proposals
- Gives a discussion of relevant guidance
- Details a baseline noise survey and the noise levels measured
- Sets out calculations of noise emissions and demonstrates compliance at the nearest sensitive receptors

A glossary of acoustic terminology is provided in Appendix A.

2 Scheme Details

Envelop has an office in central Bristol as part of Vintry Building on the sixth floor. Vintry Building overlooks Wine Street, which is reasonably busy with road traffic, and is affected by steady distant road noise from various busier roads including the A4044. Pedestrians also use the surrounding streets (Wine Street, High Street, and Union Street) and Castle Park opposite, and there is general city hubbub affecting the building.

Envelop is proposing to develop an existing balcony into a terrace that Envelop's staff could use for lunchtimes, meetings, and very occasional larger work gathering events.

The standard operational times for the terrace will be 10:00 – 18:30 daily for regular use, and only when weather permits. This operation could be five days a week during the summer months, but not at weekends. The current capacity for daily use would typically be up to 20 people as we understand it is rare with the Envelop's hybrid working procedures for there to be many more staff than that in on any given day. A forecast of the maximum capacity staff in the future for the office has been made and the maximum capacity is expected to increase to 30 people. It is not certain that this occupancy will ever occur, but it provides for future growth.

Additionally, special events may occur on an ad hoc basis. But these events are not expected to occur any more than twice a year and would be for staff only (including staff from another UK offices). The capacity for these events would be up to 60 people at most. The operational times may be until 20:00 and only on weekdays. The terrace door will be automatically locked at 20:00; it will not be possible for the terrace to be operational after this time. However, the special events would be a rare occurrence and sufficiently rare to not normally be considered to need a planning noise assessment, however we do consider the potential noise from these events in the report.

For all of these activities, the only noise will be from voices, there is no intent to have any form of music. So the noise source is considered to be people talking, and the assessment considers a worst case with animated discussion.

There is one key sensitive receptor, which is AP1, a residential balcony adjacent to the terrace and to the east of. AP1 is slightly raised and overlooks the proposed terrace, but has a glazed balustrade separating the two.

A satellite image of Vintry House (highlighted in red), along with the monitoring position for the noise survey and AP1, is shown in Figure 1.

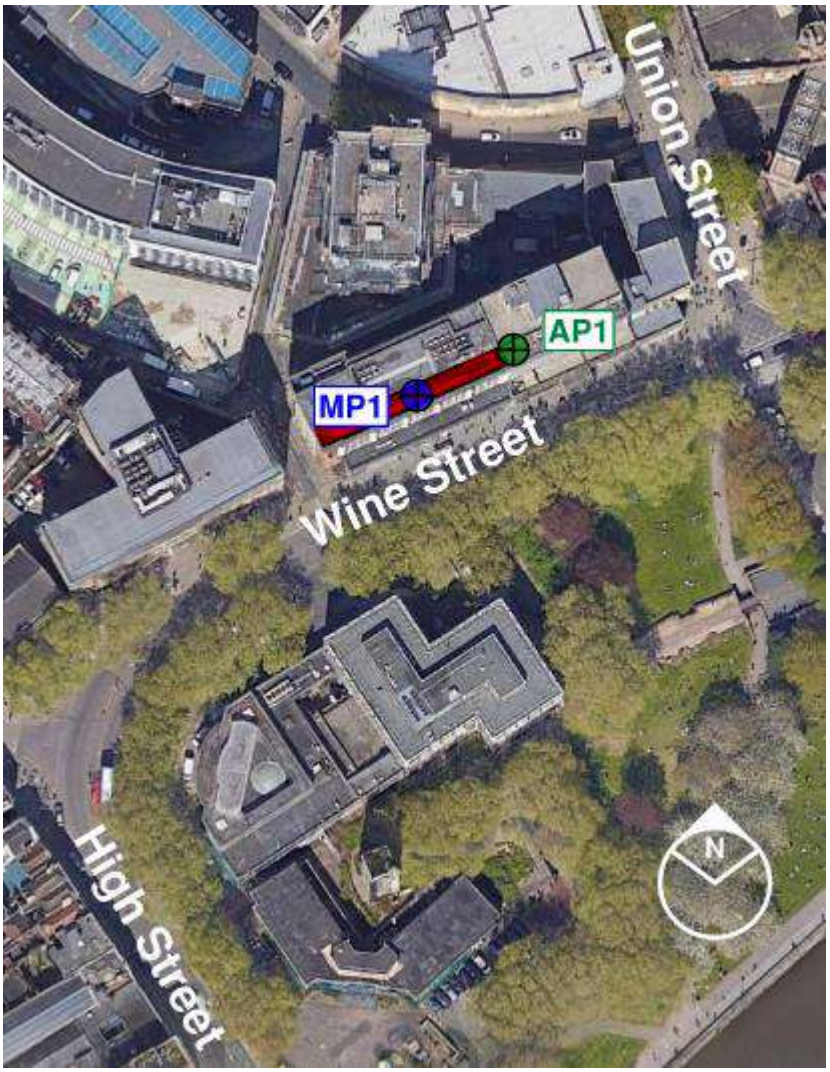

Figure 1 – A satellite image of the Vintry Building

3 Planning Criteria

The noise emissions from voices on the proposed terrace will be assessed at AP1 using current guidance and liaison with Bristol City Council.

3.1 Bristol City Council

The scheme was summarised and an appropriate assessment methodology was discussed between Mark Curtis Environmental Health Officer of Bristol City Council and Ion Acoustics by

telephone. Mr Curtis advised that the assessment should be made against noise limits published in BS 8233:2014 on the residential balcony of AP1, and in particular the limit and in comparison with the existing ambient noise levels (L_{Aeq}) during the operational hours of the proposed terrace (10:00 – 20:00 hrs).

3.2 BS 8233: 2014

BS 8233: 2014 "Guidance on sound insulation and noise reduction for buildings" contains noise limits for developments usually set in terms of two noise parameters: the ambient level, L_{Aeq}, and the maximum level, L_{AFmax}.

The external ambient noise level, L_{Aeq}, at AP1 is being assessed. BS 8233 addresses the design criteria for external noise to amenity areas:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments."

Furthermore, the guidance suggests in higher noise areas "*development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."*

It is noted that the noise levels from general ambient noise on the terrace are higher than L_{Aeq} 50dB already from other city noise sources.

3.3 Guidance on Noise Change

The proposal can be assessed to determine whether the new noise will result in a significant change in the existing noise environment. Guidance on the impact of changes in noise level adopted by the Institute of Environmental Management and Assessment (IEMA) guidelines can be used, as shown in Table 1. The table gives a description of the effect of a change in noise level when a new noise source is introduced.

Table 1 – Noise Effect Descriptors from IEMA Guidelines

Effect	Change
Very Substantial	Greater than 10dB L_{Aeq} change in sound level perceived at a receptor of great sensitivity to noise.
Substantial	Greater than 5dB L_{Aeq} change in sound level at a noise-sensitive receptor, or a 5 to 9.9dB L_{Aeq} change in sound level at a receptor of great sensitivity to noise.
Moderate	A 3 to 4.9dB L_{Aeq} change in sound level at sensitive or highly sensitive noise receptor, or a greater than 5dB L_{Aeq} change in sound level at a receptor of some sensitivity.
Slight	A 3 to 4.9dB L_{Aeq} change in sound level at a receptor of some sensitivity.
None/Not significant	Less than 2.9dB L_{Aeq} change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals.

3.4 Noise Limits and Summary

Regarding the liaison between Mark Curtis and the further guidance. The proposed noise limits for this scheme are to ensure that the increase in noise compared to baseline conditions is not significant and to not exceed the BS8233 limits of L_{Aeq} 55dB on the residential balcony.

4 Noise Survey

4.1 Methodology and Equipment

A 24-hour noise survey was conducted to determine baseline noise levels on the terrace at a position representing the residential balcony from 10:40 on 9th May to 11:10 on 10th May. A Rion NL52 sound level meter was used for logging various acoustic parameters in 10-minute samples, including the L_{Aeq}, L_{A90}, and L_{AMax}. It was also set up to measure two-minute audio recordings in ten-minute intervals or when an event exceeds 70dB, triggering the recording to identify any specific noise sources if required after collection. The microphone was set up at the height of 1.3m above the existing terrace representing the location of AP1 and has an equivalent shielding from the roads as the residential balcony. The sound level meter was calibration checked using a Brüel & Kjær 4231 Calibrator on set up and at collection. No significant drift was noted on collection. Other than at set up and collection, the sound level meter was left unattended. The microphone was 1m from the façade of the building and is affected by reflections.

The source calculations given later also included reflections in the measurement data, therefore the predicted levels reported will be used without a correction for reflections throughout this assessment. An image of MP1 is shown in Figure 2.

The weather was hot and sunny, wind speeds were low, and there was no precipitation. The weather was conducive for noise monitoring.

Figure 2 – An image of MP1 on the existing terrace facing east towards AP1 (seen at an elevated position at the end of office terrace)

4.2 Noise Survey Results

The measurement results are shown in a time-history graph in Figure 3. Full measurement data are tabulated in Appendix B.

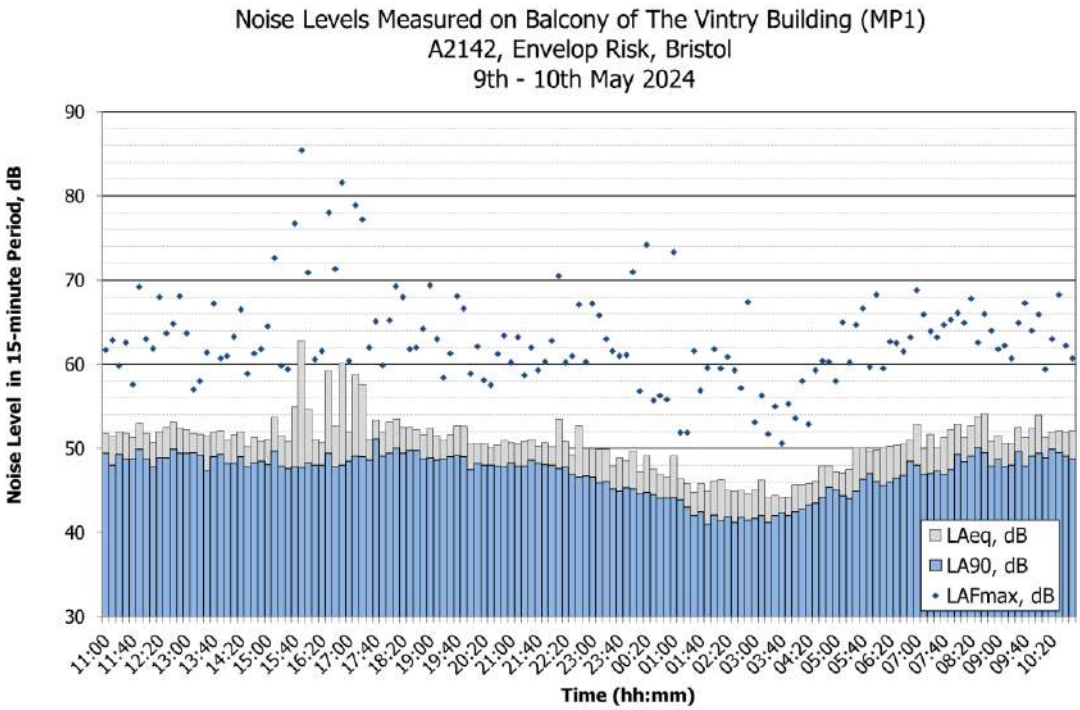

Figure 3 – A 24-hour Time History Graph measured at MP1

Although the position is on 6th floor and some distance from ground level, and well shielded from individual road noise sources, the site is reasonably loud from traffic and general city noise including construction and sirens. However, due to the distance from the ground most noises were anonymous and gave a fairly consistent typical urban noise scape,. There were some elevated noise levels between 15:30-17:00 which were from emergency vehicles.

The difference between the ambient sound level, L_{Aeq}, and the background sound level, L_{A90}, was generally between 2-3dB, which shows good consistency. The night time noise levels reduced by approximately 5dB L_{Aeq} compared to daytime. The typical background noise level, L_{A90}, for the operational period 10:00-20:00 hrs is 48dB L_{A90}.

There are slight increases in the noise levels during rush hour periods. Although, the noise levels were reasonable consistent during the operational hours, 09:00 – 20:00.

A summary of noise levels measured over the 24-hour survey is:

- Full Day (07:00 – 23:00) – L_{Aeq} 53dB
- Night Time (23:00 – 07:00) – L_{Aeq} 48dB
- Full Operational Daytime (09:00 – 20:00) – L_{Aeq} 54dB
- Daytime Work Hours (09:00 – 17:00) – L_{Aeq} 54dB
- Operational After Work Hours (17:00 – 20:00) – L_{Aeq} 54dB

5 Noise Assessment

5.1 Noise Levels used in Calculations

The noise levels that were used in the calculations are from Ion Acoustics' library measurements from outdoor areas of a pub in Bristol. This measured sounds of voices in animated conversation, so would be regarded as potentially conservatively high for the typical uses of the proposed terrace here. All calculations have been based on this noise level with a reference source level from 38 people of 58dB L_{Aeq} measured at 17m reference distance.

Example calculations to AP1 are a provided in Appendix C.

5.2 Receptors

There is one receptor to the east of the proposed terrace as mentioned in Section 2. Calculations have been made to the external balcony of this receptor, AP1.

The balcony of the residence has a deck level 1.2m higher than the existing office terrace, and has a 1.2m high glass balustrade along the edge of the balcony giving some shielding to someone sitting on the balcony from voices on the terrace. The balustrade will give some shielding to noise, however, there are some gaps where the balustrade meets the balcony junction which will reduce the amount of shielding the balustrade will provide. So, only a nominal amount of shielding is assumed for this assessment. The assessment position used is set 2m further onto the balcony from the balustrade, which is approximately where some outdoor seating is currently located.

The new Envelop terrace is proposed to have new decking installed on pedestals which will raise the floor level up slightly, but only by around 150mm-200mm.

5.3 Noise Sources

For the modelling, noise source locations distributed across the terrace has been assumed to simulate typical use. The proposed terrace area has been separated into three areas to calculate noise levels to AP1 for different scenarios. Each area is assumed to accommodate a third of the capacity of the balcony i.e. when there is a maximum daily capacity of 30 people, it is assumed that there could be 10 people in each area. The central point of each area has been used for the source position to calculate noise emissions. The proposed terrace layout with calculation points, CP1, CP2, and CP3, and AP1 is shown below in Figure 4.

Figure 4 – Layout of the Proposed Terrace

5.4 Calculations

Using the noise source levels and measured distances, predictions have been made to AP1 from each of the calculation points as described below.

The noise source levels have been corrected for the number of people using each area of the terrace [$10\text{Log}(n/n_o)$]. Simple point source distance loss has been applied to the calculations [$20\text{Log}(r/r_o)$] and each area has been logarithmically summed to give predicted the noise levels AP1. Calculations may be a slight overestimate as the outdoor space may comprise distributed

moving point sources (rather than a singular stationary point source), which will form a robust assessment.

It is assumed that the balustrade would give shielding, probably of up to 5dB while AP1 is in a sitting position, although the amount of screening is difficult to calculate due to the air gaps around the balustrades edge. For a robust and conservative assessment, a slightly lower 3dB shielding reduction is included in the calculations to AP1 at average sitting height (1.2m) with some shielding provided by the balustrade. For people standing on the balcony (1.6m ear height) it is expected that no shielding will be provided.

Two calculations have been made. One with the operation of the forecasted 30 person maximum capacity to futureproof the development, and another with a 60 person maximum capacity for ad hoc events.

Typical Operation (10:00 – 18:30) – 30 person maximumcapacity

The predicted noise level for typical operation with 30 people using the proposed terrace at AP1 at a standing position (no shielding) is **L_{Aeq} 51dB**. The predicted noise level at AP1 without any shielding is therefore still 3dB lower than the existing ambient noise level measured at MP1 (L_{Aeq} 54dB).

Maximum Operation for Events (17:00 – 20:00) – 60 person maximum capacity

The predicted noise levels for maximum operation with 60 people, the full capacity of the proposed terrace at AP1 at a standing position (no shielding) is **L_{Aeq} 54dB**. The predicted noise level at AP1 without any shielding is at parity with the ambient noise level measured at MP1. It is also less than the upper limit of L_{Aeq} 55dB from BS8233. However, this is not a regular activity.

5.5 Assessment

The typical operation times will generally be during lunch hours or after work (until approximately 18:30), although may be used at any time of the day. The operation will likely be weather permitting, during the summer months, five days a week (Monday – Friday). It is likely that the typical operation will actually see far fewer than 30 people on the proposed terrace at any one point. However, a worst case assessment of up to 30 people maximum capacity has been made. The staff at Envelop work on a hybrid working schedule; 30 people using the terrace is unlikely and deemed the worst-case scenario for daily operation.

The assessment of the change in noise levels is given in Table 2.

Regarding BS8233:2014, the typical daily operation the proposed noise limits are L_{Aeq} 50-55dB for outdoor amenity spaces. Under maximum daily operation, the noise levels are within the BS8233 limits although slightly over the lower preferred L_{Aeq} 50 dB limit. However, the predictions show the noise levels from the terrace are still 4dB below the existing ambient noise level L_{Aeq} 54dB, so is comfortably less than the existing ambient sound level. The additional noise sources will result in an increase of overall noise level by only 1.7dBA, which considering IEMA guidance is not significant.

There may be occasion that the proposed terrace will be used for events on an ad hoc and very occasional basis. It is understood that this scenario will occur approximately twice a year and would not be a regular occurrence. Whilst such intermittent activities would not normally need to be assessed, the levels are considered for completeness. The maximum capacity of the proposed

terrace is 60 people for these occasions. The noise limits for such events are L_{Aeq} 55dB. The noise levels are 1dB below the noise limit and only 1dB above the existing ambient level. The additional noise sources will result in an increase of noise by 3.0dB, which considering IEMA guidance will just be a slight intensification. However, this operation is so irregular that this would not be significant.

The predictions are summarised in Table 2.

Table 2: Assessment of Terrace Voice Noise Level Predictions

No. of Ppl	Measured Ambient Noise Level, L_{Aeq} dB	BS8233 Noise Limit, L_{Aeq} dB	Operational Noise Level, L_{Aeq} dB	Operational Noise Level and Ambient Noise Level, L_{Aeq} dB	Increase of Noise Level, dBA	IEMA Effect
30	54	50-55	50.9	55.7	1.7	Not Significant
60		55	54.0	57.0	3.0	Slight

The predicted noise levels are when the receptor is at standing height, where there is no shielding. The shielding from the balustrade is assumed to reduce the noise levels by at least 3dB, that is when the receptors are at sitting level. However, the assessment has been made to be conservative. The predicted noise levels to receptors at sitting height are L_{Aeq} 47.9, and 50.9 dB for 30, and 60 person capacity, respectively. Each of these predictions are below their respective noise limits from BS 8233.

All noise levels are to the outside amenity space of the receptor.

5.6 Uncertainty

The baseline noise data, calculations, and measured library data. However, the approach has been robust and conservative to minimise any uncertainties. There are factors within calculations that are not included such as atmospheric absorption and the worst-case scenarios have been calculated.

The values used within the predictions are calculated with a robust approach to estimate noise levels and protect the amenity of the nearby receptor.

To that end, the uncertainty would be negligible in the context of this project.

6 Summary

Envelop is seeking to use an existing terrace for day to day office use, some social activities and occasional meetings. The proposed terrace is expected to only be in operation during the summer months or when the weather permits. It will only be used by Envelop's Team, during daytime and early evening of weekdays. There is no weekend use nor is any music or other entertainment proposed..

This reports forms a noise assessment of the proposed activity. Guidance has been followed by BS8233:2014, IEMA Guidelines, and in discussion with the environmental health team at Bristol City Council.

A baseline noise survey was made onsite to measure the ambient noise levels that could be compared with prediction noise emissions from the terrace to the nearest receptor.

Calculations were made using a reference noise source level to include distance loss and shielding at the receptor. Predictions were made to include the worst-case levels at the receptor while the terrace is in operation. Noise levels from the terrace are expected to be below or at the worst case at parity with the existing ambient noise levels.

The change in noise levels during the loudest event is expected to give a slight effect for the receptor if they were using the outside amenity space, otherwise there will be not be a significant effect.

The loudest events are expected to take place approximately twice a year and on an ad hoc basis. This noise impact is low and can permit planning to be granted in respect of noise issues.

dB – Decibel. The unit used to describe noise levels. It is a logarithmic ration of the sound pressure.

A Weighting – A frequency weighted applied to the measured sound spectrum which corrects the level to simulate the frequency response of the hearing system to sound levels of varying frequencies.

L_{eq}– This is a quasi-average noise level which includes all the sound energy during the measurement period averaged out across the period. It is typically used to describe the ambient noise level. The A weighted value is the L_{Aeq}.

L_{90} – This is the level exceeded for 90% of the measurement period and indicates the steady underlying background noise level. The A weighted Level is the L_{A90}.

R_w - Weighted sound reduction index of a single element only: dB. This is generally tested in a laboratory and does not account for any flanking or other sound paths.

D_w - Weighted level difference: dB. This is the sound level difference between two rooms and also includes the effect of flanking, other sound paths, workmanship, on site construction and absorption in the receiver room.

RT - Reverberation Time: seconds. This is the time taken for reverberant sound in the room to decay by 60 dB. A dead space with many soft finishes would have a short RT whereas a lively space, comprising mainly hard surfaces, would have a long RT.

NR - The Noise Rating, NR, is used to describe steady noise levels such as mechanical services noise. A family of curves is defined in octave frequency bands and the NR rating for a particular noise is the lowest NR curve which is entirely above the spectrum of the noise under consideration.

Time	L_{Aeq} dB	$L_{Amax,F}$ dB	L_{AF90} dB	Time	L_{Aeq} dB	$L_{Amax,F}$ dB	L_{AF90} dB
09/05/2024 10:40	53.1	79.3	48.5	09/05/2024 18:50	51.6	64.2	48.8
09/05/2024 10:50	52.7	66.4	49.7	09/05/2024 19:00	52.4	69.4	48.9
09/05/2024 11:00	51.8	61.7	49.4	09/05/2024 19:10	51.5	63.0	48.6
09/05/2024 11:10	51.4	62.9	48.0	09/05/2024 19:20	50.9	58.4	48.8
09/05/2024 11:20	52.0	59.8	49.3	09/05/2024 19:30	51.6	61.3	49.0
09/05/2024 11:30	51.8	62.6	48.8	09/05/2024 19:40	52.7	68.1	49.2
09/05/2024 11:40	51.3	57.6	48.8	09/05/2024 19:50	52.6	66.6	49.0
09/05/2024 11:50	53.0	69.2	49.9	09/05/2024 20:00	50.5	58.9	47.5
09/05/2024 12:00	51.8	63.0	48.7	09/05/2024 20:10	50.6	62.1	48.2
09/05/2024 12:10	50.7	61.9	47.8	09/05/2024 20:20	50.6	58.1	48.0
09/05/2024 12:20	52.0	68.0	48.9	09/05/2024 20:30	50.1	57.5	48.0
09/05/2024 12:30	52.5	63.7	48.9	09/05/2024 20:40	50.4	61.2	47.9
09/05/2024 12:40	53.1	64.8	49.9	09/05/2024 20:50	50.9	63.4	47.8
09/05/2024 12:50	52.4	68.1	49.4	09/05/2024 21:00	50.7	60.2	48.3
09/05/2024 13:00	52.2	63.7	49.4	09/05/2024 21:10	50.6	63.2	47.9
09/05/2024 13:10	51.8	57.0	49.5	09/05/2024 21:20	50.8	58.7	47.9
09/05/2024 13:20	51.7	58.0	49.2	09/05/2024 21:30	51.1	62.0	48.6
09/05/2024 13:30	51.4	61.4	47.3	09/05/2024 21:40	50.3	59.3	48.2
09/05/2024 13:40	51.9	67.2	49.0	09/05/2024 21:50	50.7	60.3	48.1
09/05/2024 13:50	52.1	60.7	49.3	09/05/2024 22:00	50.2	62.8	48.0
09/05/2024 14:00	51.0	61.0	48.2	09/05/2024 22:10	53.5	70.5	47.6
09/05/2024 14:10	51.6	63.3	48.2	09/05/2024 22:20	50.8	60.2	47.8
09/05/2024 14:20	52.0	66.5	49.0	09/05/2024 22:30	49.3	61.0	46.9
09/05/2024 14:30	50.2	58.9	47.8	09/05/2024 22:40	52.7	67.1	46.6
09/05/2024 14:40	51.3	61.3	48.3	09/05/2024 22:50	50.0	60.3	46.7
09/05/2024 14:50	50.8	61.8	48.5	09/05/2024 23:00	50.0	67.2	46.6
09/05/2024 15:00	51.1	64.5	48.1	09/05/2024 23:10	49.9	65.8	45.9
09/05/2024 15:10	53.7	72.6	49.7	09/05/2024 23:20	49.9	63.0	46.1
09/05/2024 15:20	51.5	59.8	47.9	09/05/2024 23:30	47.9	61.6	45.2
09/05/2024 15:30	50.8	59.4	47.6	09/05/2024 23:40	48.9	61.0	44.9
09/05/2024 15:40	54.9	76.7	47.8	09/05/2024 23:50	48.5	61.1	45.3
09/05/2024 15:50	62.8	85.4	47.7	10/05/2024 00:00	49.7	71.0	45.2
09/05/2024 16:00	54.7	70.9	48.3	10/05/2024 00:10	47.2	56.8	44.6
09/05/2024 16:10	51.1	60.6	48.0	10/05/2024 00:20	49.1	74.2	44.8
09/05/2024 16:20	50.7	61.6	48.0	10/05/2024 00:30	47.6	55.7	44.5
09/05/2024 16:30	59.2	78.0	49.4	10/05/2024 00:40	46.9	56.3	44.1
09/05/2024 16:40	52.6	71.3	47.8	10/05/2024 00:50	46.6	55.8	44.1
09/05/2024 16:50	60.1	81.6	48.0	10/05/2024 01:00	49.1	73.3	44.2
09/05/2024 17:00	51.9	60.4	48.5	10/05/2024 01:10	46.4	51.9	43.9
09/05/2024 17:10	58.8	78.9	49.1	10/05/2024 01:20	45.8	51.9	43.0
09/05/2024 17:20	57.6	77.2	49.0	10/05/2024 01:30	44.8	61.6	42.0
09/05/2024 17:30	51.1	62.0	48.6	10/05/2024 01:40	45.8	56.9	42.5
09/05/2024 17:40	53.4	65.1	51.1	10/05/2024 01:50	44.9	59.6	41.0
09/05/2024 17:50	51.9	59.9	49.1	10/05/2024 02:00	46.1	61.8	42.1
09/05/2024 18:00	53.1	65.2	49.4	10/05/2024 02:10	46.3	59.5	41.4
09/05/2024 18:10	53.5	69.3	50.0	10/05/2024 02:20	45.0	60.9	41.9
09/05/2024 18:20	52.5	68.0	49.4	10/05/2024 02:30	44.9	59.3	41.2
09/05/2024 18:30	52.5	61.8	49.8	10/05/2024 02:40	45.0	57.2	41.8
09/05/2024 18:40	52.2	62.0	49.8	10/05/2024 02:50	44.7	67.4	41.5

Time	L_{Aeq} dB	$L_{Amax,F}$ dB	L_{AF90} dB
10/05/2024 03:00	45.1	53.1	41.7
10/05/2024 03:10	46.2	56.3	42.0
10/05/2024 03:20	44.1	51.7	41.2
10/05/2024 03:30	44.4	55.0	42.0
10/05/2024 03:40	44.2	50.6	42.4
10/05/2024 03:50	44.2	55.3	42.0
10/05/2024 04:00	45.7	53.6	42.5
10/05/2024 04:10	45.7	58.0	42.8
10/05/2024 04:20	45.8	52.9	43.3
10/05/2024 04:30	46.1	59.3	43.5
10/05/2024 04:40	47.9	60.4	44.2
10/05/2024 04:50	47.9	60.3	45.4
10/05/2024 05:00	47.2	58.0	45.1
10/05/2024 05:10	47.1	65.0	44.4
10/05/2024 05:20	47.5	60.2	44.0
10/05/2024 05:30	50.1	64.7	44.9
10/05/2024 05:40	50.1	66.6	46.3
10/05/2024 05:50	49.7	59.7	47.0
10/05/2024 06:00	49.8	68.3	46.1
10/05/2024 06:10	50.1	59.5	45.6
10/05/2024 06:20	50.3	62.7	46.0
10/05/2024 06:30	50.4	62.5	46.5
10/05/2024 06:40	50.5	61.5	46.8
10/05/2024 06:50	51.0	63.2	48.5
10/05/2024 07:00	52.9	68.8	48.0
10/05/2024 07:10	50.0	65.9	46.9
10/05/2024 07:20	51.7	63.9	47.0
10/05/2024 07:30	50.1	63.2	47.3
10/05/2024 07:40	51.3	64.7	46.9
10/05/2024 07:50	52.2	65.3	47.5
10/05/2024 08:00	52.9	66.1	49.3
10/05/2024 08:10	51.3	64.9	48.4
10/05/2024 08:20	52.7	67.8	49.1
10/05/2024 08:30	53.8	62.6	50.1
10/05/2024 08:40	54.1	66.0	49.5
10/05/2024 08:50	50.8	64.0	47.9
10/05/2024 09:00	51.5	61.8	48.7
10/05/2024 09:10	50.6	62.2	47.8
10/05/2024 09:20	50.6	60.7	48.0
10/05/2024 09:30	52.5	64.9	49.6
10/05/2024 09:40	51.3	67.3	47.9
10/05/2024 09:50	52.4	64.0	49.1
10/05/2024 10:00	54.0	65.9	49.4
10/05/2024 10:10	51.3	59.4	48.9
10/05/2024 10:20	52.0	63.0	49.9
10/05/2024 10:30	52.1	68.3	49.5
10/05/2024 10:40	52.0	62.2	49.1
10/05/2024 10:50	52.1	60.7	48.8
10/05/2024 11:00	52.5	64.4	48.7
10/05/2024 11:10	58.0	71.1	49.3

				Octave Band Centre Frequency, Hz							
				63	125	250	500	1000	2000	4000	dBA
9th July 2024											
Calcs to Balcony (AP1)											
=Reference noise level corrected to number of people (10log(n/no)-distance loss (xlog(d/do)-shielding											
Typical Daytime Use											
Refence noise source											
Source noise level, measured at the Brewhouse, Cotham				47.1	43.3	49.4	55.9	54.4	48.8	46.0	**58.0**
Refence Number of People (no)		38									
Reference Distance (do)		17	m								
Closest Third to AP1											
Assumed no. people on in area (n)		10									
Correction to assumed no. of people (10log(n/no))				-5.8	-5.8	-5.8	-5.8	-5.8	-5.8	-5.8	
Reference noise level on terrace (@17m)				**41.3**	**37.5**	**43.6**	**50.1**	**48.6**	**43.0**	**40.2**	**52.2**
Horizontal distance from Terrace to AP1 (d)		29.9	m								
Distance Loss (*x* log(d/do))	*x* =	20		4.9	4.9	4.9	4.9	4.9	4.9	4.9	
Distance to top of bacony fence		27.97	m								
Distance from balcony fence to AP1		2.00	m								
Shielding				3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Noise Level at AP1 when standing (no shielding)				36.4	32.6	38.7	45.2	43.7	38.1	35.3	**47.3**
Noise Level at AP1 when sitting (with shielding)				33.4	29.6	35.7	42.2	40.7	35.1	32.3	**44.3**
Middle Third to AP1											
Assumed no. people on in area (n)		10									
Correction to assumed no. of people (10log(n/no))				-5.8	-5.8	-5.8	-5.8	-5.8	-5.8	-5.8	
Reference noise level on terrace (@17m)				**41.3**	**37.5**	**43.6**	**50.1**	**48.6**	**43.0**	**40.2**	**52.2**
Horizontal distance from Terrace to AP1 (d)		34.9	m								
Distance Loss (*x* log(d/do))	*x* =	20		6.3	6.3	6.3	6.3	6.3	6.3	6.3	
Distance to top of bacony fence		33.02	m								
Distance from balcony fence to AP1		2.00	m								
Shielding				3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Noise Level at AP1 when standing (no shielding)				35.0	31.2	37.3	43.8	42.3	36.7	33.9	**45.9**
Noise Level at AP1 when sitting (with shielding)				32.0	28.2	34.3	40.8	39.3	33.7	30.9	**42.9**
Furthest Third to AP1											
Assumed no. people on in area (n)		10									
Correction to assumed no. of people (10log(n/no))				-5.8	-5.8	-5.8	-5.8	-5.8	-5.8	-5.8	
Reference noise level on terrace (@17m)				**41.3**	**37.5**	**43.6**	**50.1**	**48.6**	**43.0**	**40.2**	**52.2**
Horizontal distance from Terrace to AP1 (d)		39.9	m								
Distance Loss (*x* log(d/do))	*x* =	20		7.4	7.4	7.4	7.4	7.4	7.4	7.4	
Distance to top of bacony fence		37.93	m								
Distance from balcony fence to AP1		2.00	m								
Shielding				3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Noise Level at AP1 when standing (no shielding)				33.9	30.1	36.2	42.7	41.2	35.6	32.8	**44.8**
Noise Level at AP1 when sitting (with shielding)				30.9	27.1	33.2	39.7	38.2	32.6	29.8	**41.8**
Total noise level at AP1											
Without Shielding				40.0	36.2	42.3	48.8	47.3	41.7	38.9	**50.9**
With Shielding				37.0	33.2	39.3	45.8	44.3	38.7	35.9	**47.9**
									Ambient sound level LAeq		**54.0**
									Total noise with ambient noise level		**55.7**
									difference		**1.7**