121 Broad Street
Noise Impact Assessment

19 December 2022

Report For:

Venue 121

Report reference

2122252_NIA1 (DRAFT)

TIMBRAL

Timbral Ltd., registered at 88 North Street, Hornchurch, RM11 1SR

Table of Contents

Reference	Date	Comments	Issued by
2122252_NIA1(Draft)	19 December 2022	Draft issue	Tony Trup, BMus MSc, MIOA MAES

1.0 Introduction

Venue 121 has submitted an application for a Premises Licence at 121 Broad Street, Dagenham, RM10 9HP. As part of the application, the London Borough of Barking and Dagenham (LBBD) as requested a noise impact assessment to determine the potential impact of entertainment noise arising from the site. Timbral have been instructed to undertake a noise breakout survey and provide a noise impact assessment for this purpose. This report contains our findings.

1.1 Site history

We understand the site was previously used as a Working Men's Club, and most recently as a bar and night club.

LBBD has informed us that 18 noise complaints have been received relating to music noise from the site in 2022, and approximately 20 complaints in 2021. We understand these relate to the previous owners of the venue (perhaps with the exception of one very recent complaint).

The new owners (Venue 121), wish to use the site as a wedding and function venue, and have applied for a Premises Licence to play amplified music between the hours during the day and until 02:00, more than once per week.

2.0 Site description

2.1 Location

The site is located at 121 Broad Street, Dagenham, RM10 9HP, within the London Borough of Barking and Dagenham.

Approximately 650 m to the north is the District Line, and approximately 1.3 km to the south is the A13.

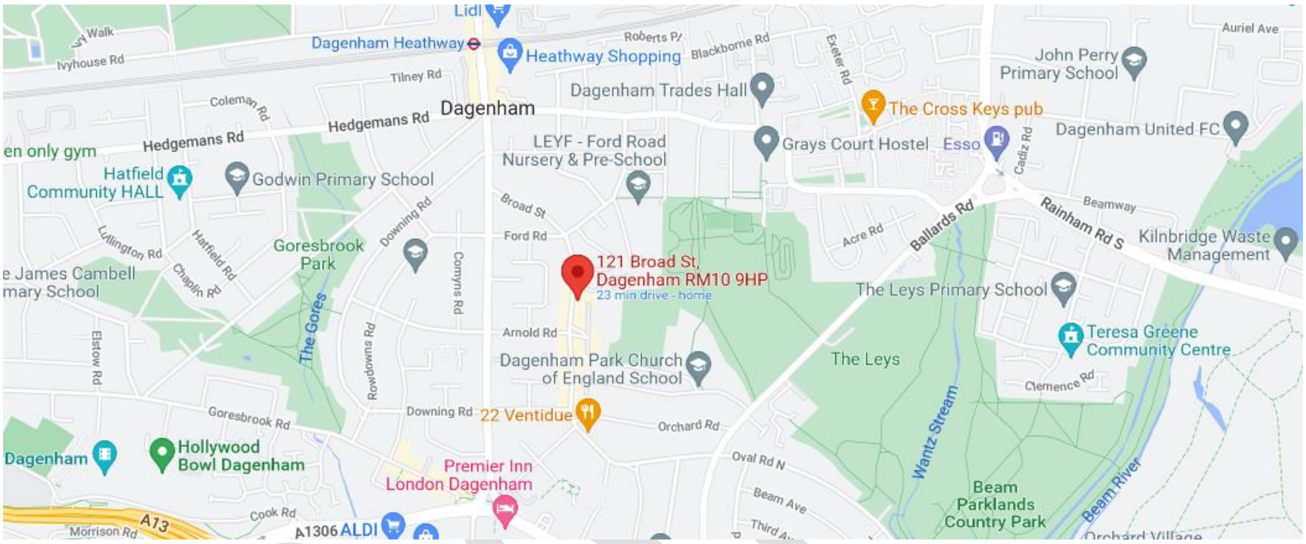

Figure 1 Site location map (maps.google.co.uk)

2.2 Context

The site is located on a secondary high street with residential premises to the west and north, mixed-use premises to the south, and a care home (Park View) to the east and southeast.

Approximately 70 m to the south on Broad Street is the Admiral Vernon pub, where regular live music and events take place. Other commercial premises on the high street include convenience stores, hairdressers and takeaway restaurants.

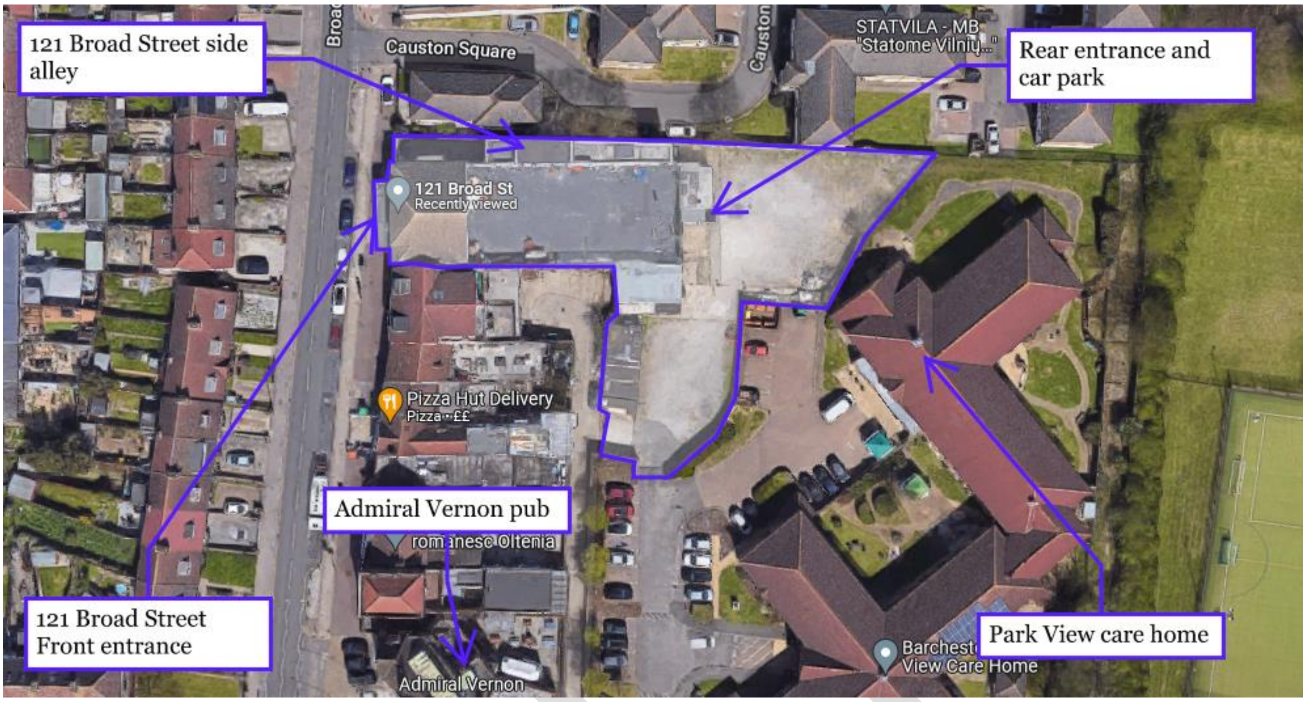

Figure 2 Satellite image (Google, Bluesky, Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Maps)

2.3 Ambient and background noise

During our visits to site, the primary sources of ambient noise were noted to be cars on Broad Street (primarily before 23:30), patrons leaving the Admiral Vernon, occasional aircraft and distant road traffic from the A13.

3.0 Assessment methodology

3.1 Good Practice Guide on the Control of Noise from Pubs and Clubs

The Good Practice Guide was published by the Institute of Acoustics in March 2003. While it provides general guidance and discussion around assessing the impact of entertainment noise, it does not prescribe a specific assessment methodology.

3.2 Local Authority requirements

The London Borough of Barking and Dagenham does not have set requirements or guidance for assessing the impact of entertainment noise or amplified music. The Environmental Health Case Officer, Chris Hurst, has requested an assessment in accordance with the Good Practice Guide on the Control of Noise from Pubs and Clubs – Criteria and measurement guidelines (1).

3.3 Hinton and Somerville

The Criteria and Measurement Guidelines by Hinton and Somerville seek to fill in the gaps in the IOA Good Practice Guide, by providing prescriptive criteria for assessing noise emissions from entertainment venues.

The assessment criteria proposed in the Good Practice Guide are summarized in

Regularity of entertainment	Hours	Criteria
Fewer than 30 times per year, not more than once in a single week	Ending by 23:00 hours	$L_{Aeq,15min,Ent} \leq L_{A90,Bg}$ + 5 dB at 1m from external façade
More than 30 times per year, not more than in a single week	Ending by 23:00 hours	Internal and external assessments $L_{Aeq,Ent} \leq L_{A90,Bg}$ + 5 dB $L_{10,Ent} \leq L_{90,Bg}$ + 5 dB in 1/3 octave bands 40 to 160 Hz
More than once per week	Beyond 23:00 hours	Internal and external assessments $L_{Aeq,Ent} \leq L_{A90,Bg}$ dB $L_{10,Ent} \leq L_{90,Bg}$ dB in 1/3 octave bands 40 to 160 Hz

Table 1 Summary criteria from Hinton and Somerville

$L_{Aeq,Ent}$ denotes the L_{Aeq} of entertainment noise. This can be thought of as the 'average' noise level of entertainment noise.

$L_{A90,Bg}$ denotes the representative background noise level without entertainment noise.

L_{10} denotes the L_{10} statistical index of entertainment noise. This can be thought of as the loudest 10% of the entertainment noise.

Hinton and Somerville state that,

"If the above criteria are met, entertainment noise will be virtually inaudible inside noise-sensitive property."

The paper does not specify the assessment period for entertainment which occurs more than 30 times per year, but it is assumed that a 15-minute period is assumed for all the criteria.

3.4 Other noise sources

Other noise sources arising from the site which may require management or mitigation include:

- External plant and machinery
- Rowdy behaviour
- Car parks and access roads
- Delivery/collection/storage activities

These activities do not form part of the licence application and are therefore not considered in this report.

3.5 Noise Sensitive Receptors (NSR)

We consider there to be four primary clusters of noise-sensitive receptors around the site. These are summarized in Table 2, along with the building element of 121 Broad Street which is thought to be the main contributor to noise levels at that receptor.

Reference	Description	Building element contributing most to noise emissions at NSR
NSR1	Front facades of properties on Broad Street in the immediate vicinity of the venue.	Front façade.
NSR2	Southern façade of apartment building to the north of site, which faces the northern side alley of 121 Broad Street.	Northern façade into side alley.
NSR3	Rear facades of properties on Broad Street.	Flat roof (first floor level).
NSR4	Residential dwellings and care home to the east of site.	Flat roof (first floor level).

Table 2 Noise sensitive receptors around 121 Broad Street

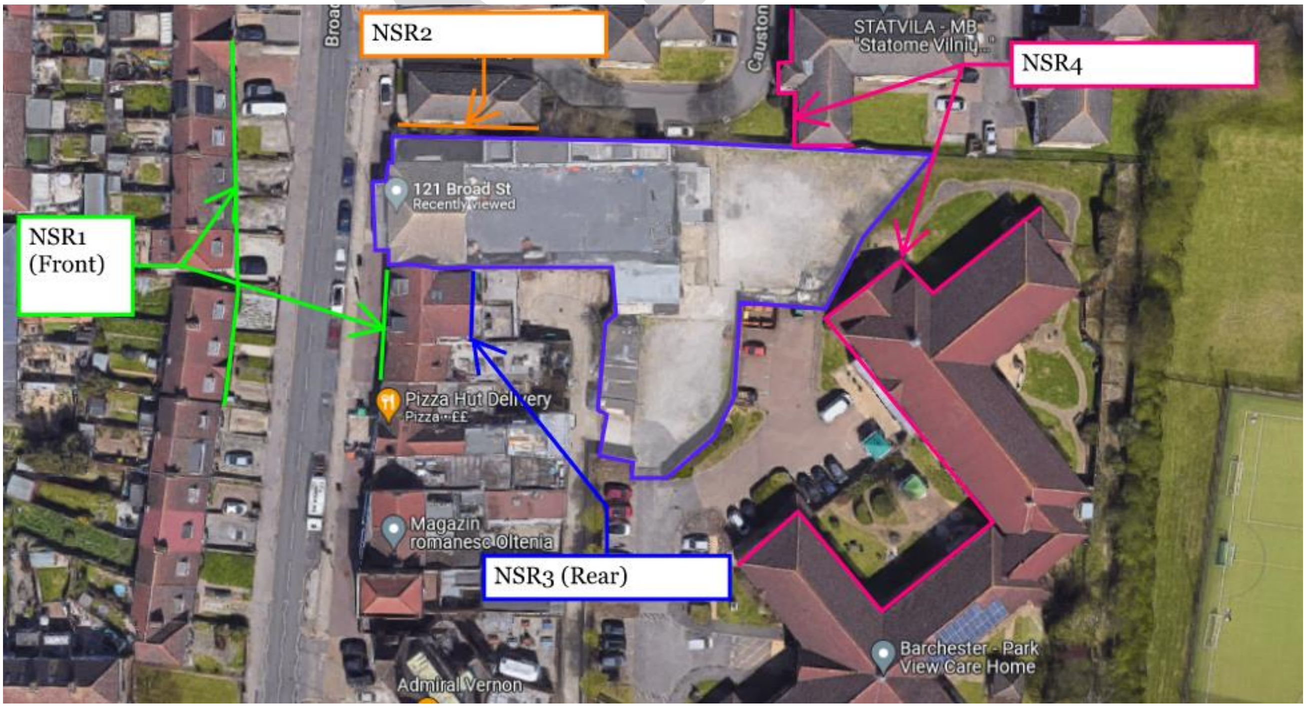

Table 3 Noise sensitive receptors

5.0 Surveys

5.1 Personnel

The surveys and assessment were undertaken by Tony Trup BMus MSc MIOA MAES. Tony possesses the industry-standard Postgraduate Diploma in Acoustics and Noise Control (2013), and an MSc in Sound and Music Computing. Tony has over ten years of experience in measuring and assessing noise impact as well as designing mitigation and control of noise and vibration on buildings and infrastructure projects, including previous experience with entertainment noise impact.

5.2 Site description

5.2.1 Building description and layout

An approximate site plan is presented in Figure 4 in the Appendices.

External photographs are presented in Photo 3 to Photo 6 in the Appendices.

Internal photographs are presented in Photo 7 to Photo 9 in the Appendices.

The site consists of a main hall, measuring 38.6 m long by 14.5 m wide by 2.7 m tall to the underside of the ceiling bulkhead.

The main hall is carpeted with a thick carpet.

The internal walls and columns are treated with a combination of non-sound-absorbing cladding and mirrors.

The ceiling has a lightweight plasterboard bulkhead throughout, in which are contained lights and house loudspeakers.

The house sound system comprises the ceiling-mounted loudspeakers (approximately 6 inch diameter cones), and an amplifier and basic mixer contained in the Back of House area at the front and north of the site. There is no subwoofer as part of the house system.

The front, rear and side entrances are lobbied. The fire exit to the north is not lobbied.

It is believed the soffit / roof comprises a basic concrete slab, but no further details are available. The facades are thought to be brickwork, but it is unknown whether they contain a cavity.

A side alley runs along the north of the building, which provides access to Broad Street, the rear car park, the northern fire exit, and also to a number of small commercial properties which are located at first floor level to the north and west. These commercial properties are leased to third parties, and are in use as a nail salon and small events space among other uses. See Photo 3 and Photo 6.

5.3 Unattended background noise survey

An unattended background noise survey was undertaken from approximately 16:00 on Tuesday 13 December to 12:00 on Wednesday 14 December. A longer unattended survey was not undertaken due to concerns about the security of our equipment.

The purpose of this survey was to understand the range of background sound levels in the vicinity of site, particularly at the front and rear of site. The results of these surveys are used in determining a typical 'background' sound level when assessing the impact of entertainment noise.

Measurements were taken of L_{Aeq} and L_{A90} sound pressure level indices, along with 1/3 octave-band levels over 5-minute periods. These 5-minute periods have been integrated to approximate 15-minute measurement periods were appropriate.

5.3.1 Unattended measurement locations

Unattended surveys were undertaken at 2No. locations, to determine typical ambient and background sound levels at the front and rear of site.

Measurement position	Description
UA1	The microphone was located at first floor level on the fire escape in the northern side alley, with line of site to Broad Street. This position is thought to be representative of NSR1 and NSR2. The microphone was secured approximately 1m from the façade of 121 Broad Street. See Photo 1.
UA2	The microphone was located at ground floor level in the rear car park to the east of site. This position is thought to be representative of NSR3 and NSR4. The microphone was secured flat against a fence rail, approximately 1.5m from ground level. See Photo 2.

Table 4 Unattended survey measurement positions

Both microphones were fitted with windshields, and connected by extension cable to sound level meters with data loggers.

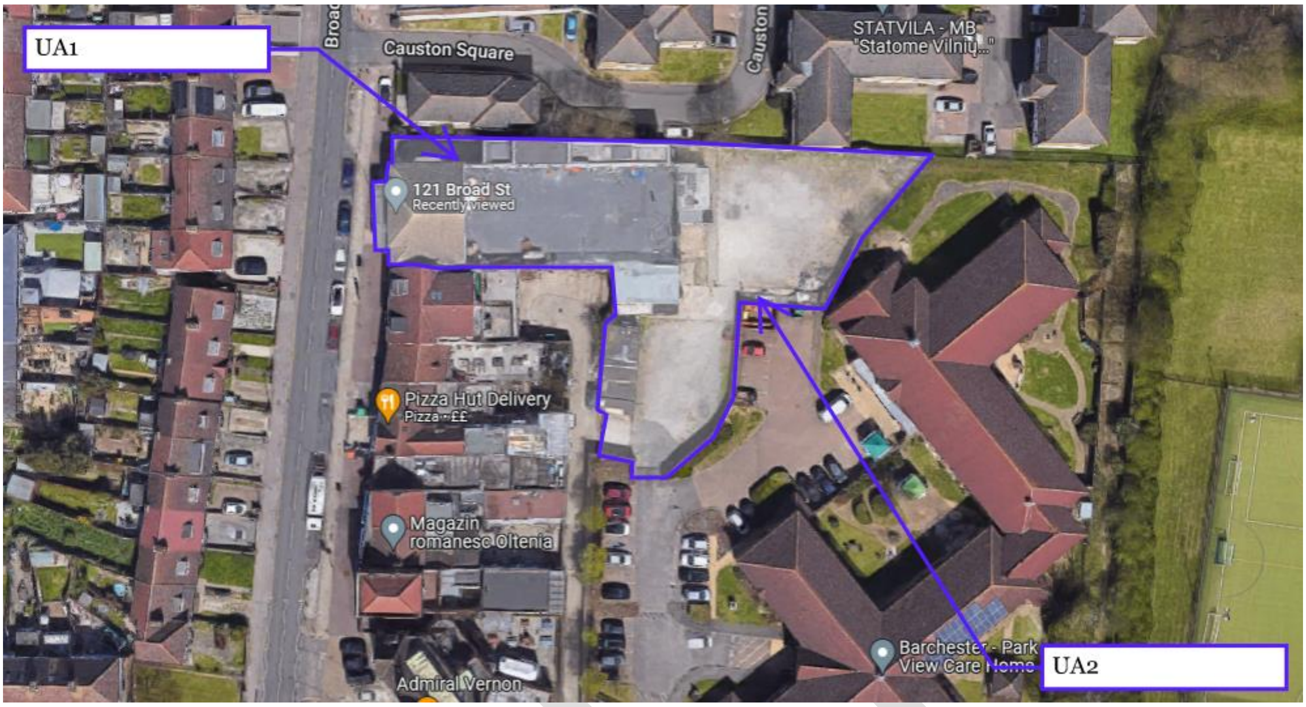

Figure 3 Unattended background survey locations

5.3.2 Equipment

Position	Item	Make and model	Serial No.	Laboratory calibration due
UA1	Type 1 Sound Level Meter	Norsonic Nor-140	1402823	August 2024
UA2	Type 1 Sound Level Meter	Norsonic Nor-140	1403294	February 2024
-	Field calibrator	Norsonic Nor-1251	32120	February 2023

Table 5 Survey equipment

The sound level meters were calibrated before and after the survey. No significant drift was observed (<0.1 dB).

5.3.3 Meteorological conditions

The ambient temperature at the time of survey was approximately 0 degrees Celsius. Snow had fallen approximately 48 hours before survey set-up. However, by the time of the survey, main roads had been gritted and de-iced, and we believe traffic levels were close to typical.

5.4 Noise breakout survey

A noise breakout survey was undertaken from approximately 22:00 on Thursday 15 December to 01:00 on Friday 16 December. The purpose of the survey was to determine transfer functions from the main hall to locations representative of the Noise Sensitive Receptors.

5.4.1 Noise breakout measurement positions

Noise breakout measurements were undertaken at four locations, thought to be representative of the nearest Noise Sensitive Receptors.

Measurement position	Description
A	Ground level on Broad Street, approximately 3.5m from the front façade of 121 Broad Street and 123 Broad Street, and 1.5 m from the ground. This position is thought to be representative of the façade of 123 Broad Street, and other residential facades on the opposite side of the road (NSR1).
B	Ground level in the northern side alley, beneath the cantilevered commercial units at first floor, and approximately 3 m from the northern fire exit. This position was 1.5 m from ground level, 1m from the northern boundary wall, and approximately 2m from the soffit above. This position is thought to be broadly representative of the residential façade to the north of site (NSR2). Although this area is almost fully enclosed, the residential façade is exposed to a long stretch of this area by virtue of a gap between the party wall and the first floor cantilever. See Photo 3 Northern side alley.
C	First floor level on the flat roof of the main hall, close to the centre, approximately 1.5m from the roof and further than 3.5m from other reflective surfaces. This location is thought to be representative of the residential facade to the rear of 123 Broad Street (NSR3).
D	Ground floor level in the rear car park, aligned with the western façade of the residential block to the north. 1.5m from ground level and 3.5m from other reflective surfaces. This position is thought to be representative of the residential façade at ground floor level at NSR4, though we would note that noise exposure may vary at first or second floor level, given that some of the noise from site emanates from the flat roof.

Table 6 Unattended survey measurement positions

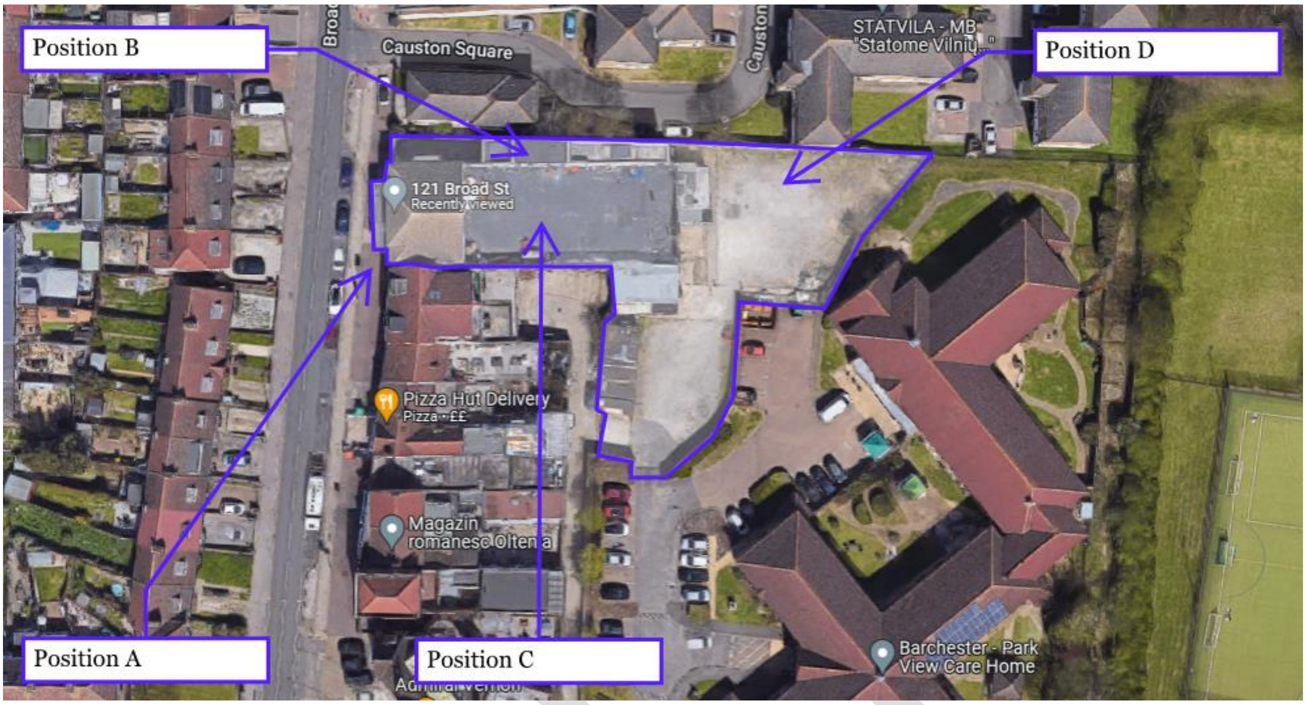

Table 7 Noise breakout measurement locations

5.4.2 Equipment

The equipment used during the noise breakout survey was the same as that in Table 5, with the addition of a Vonyx portable loudspeaker with 15-inch mid cone.

The sound level meters were calibrated before and after the survey. No significant drift was observed (<0.1 dB).

5.4.3 Meteorological conditions

During the noise breakout measurements, the ambient temperature was approximately 0 degrees Celsius. There was no rain fall, though roads may have been slightly wet due to melting snow and ice.

5.4.4 Method

The noise breakout survey measured the transfer function of noise from the main hall to selected external measurement positions, representative of Noise Sensitive Receptors.

The first part of the noise breakout survey used pink noise for this purpose, while the second part of the survey used a dance music song on loop (The Motto by Tiesto). External background sound level measurements were undertaken prior to commencement of the transfer function measurements, and reverberation time and background measurements were also undertaken in the hall.

5.4.5 Transfer function measurements

The transfer function between the main hall and external locations was measured using steady pink noise.

Two source positions were used, with the loudspeaker relocated and facing in a different direction.

The L1 source noise level was a 2-minute spatial average of sound in the hall.

The L2 receive measurements were 2-minutes long. Extraneous noise levels were excluded where possible (aircraft and cars).

During the measurements with dance music, only one source position was used, and receive measurements were 1-minute long.

The source noise level was played at a level where external contributions resulted in an increase to the C-weighted sound pressure level at the receptor locations, over and above the existing background and ambient sound level.

We did investigate using the in-house sound system, though it was decided that the low-frequency content was lacking compared to our portable loudspeaker, and so it was not used.

6.0 Results

6.1 Unattended survey

Table 8 presents a summary of the measured noise levels during the unattended survey. These represent the modal values of each index at the corresponding 1/3 octave band frequency (or A-weighted where relevant). The daytime and night-time periods reflect the relevant periods of proposed entertainment noise (07:00 until 23:00, and 23:00 to 02:00 respectively).

It should be noted that results at UA1 were affected by noise from condenser units located in the northern side alley serving 121 Broad Street during the day, until approximately 16:30 when workers left site and they were turned off. However, it could be argued that this forms a legitimate part of the existing noise climate around site.

Position	Period	$L_{A90,15min}$	$L_{90,15min}$						
			40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz
UA1 (front)	Daytime	40	45	43	43	43	39	33	33
	Night-time	31	34	33	33	34	30	23	25
UA2 (rear)	Daytime	42	41	43	39	36	37	33	32
	Night-time	37	37	34	35	31	29	27	26

Table 8 Unattended survey summary results, sound pressure levels dB, broadband and 1/3 octave band centre frequencies, Hz

These results have been corrected to free-field values. Results at UA1 have had a -3dB correction applied, while those at UA2 have had a -6dB correction applied.

6.2 Attended survey

Table 9 presents a summary of the measured transfer function for pink noise and dance music.

The L2 receive levels were corrected for background noise.

For the pink noise measurements, the L_{90} was used as the receiver sound level instead of an L_{eq}, to mitigate the effect of extraneous noise sources. The L_{eq} was used as the source noise level. Results from the two source positions were averaged before arriving at an 'average' transfer function.

For the dance music measurements, the L_{eq} was used as both the source and receiver sound levels.

Position	Source	Transfer function						
		40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz
A	Pink noise	-24	-24	-29	-37	-39	-43	-39
	Dance music	-23	-27	-28	-34	-45	-43	-43
B	Pink noise	-24	-20	-25	-26	-23	-24	-26
	Dance music	-21	-22	-23	-24	-19	-19	-23
C	Pink noise	-29	-29	-42	-34	-35	-35	-36
	Dance music	-24	-28	-35	-34	-35	-36	-34
D	Pink noise	-24	-27	-34	-47	-49	-57	-53
	Dance music	-23	-31	-33	-37	-44	-48	-48

Table 9 Transfer function summary results, dB at 1/3 octave band centre frequencies, Hz

We would note that the transfer function measured at Position B is significantly lower than at other positions. This is primarily due the single, unlobbied fire-exit, the length of façade exposed to this area, and the fact that this area is almost fully enclosed on all sides, increasing the reverberant level of noise breaking out from the main hall.

The following table presents background-corrected L_{10} sound pressure levels measured at each receptor location during the dance music.

Position	$L_{Aeq,1min}$	L_{10} level at receptor						
		40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz
A	51	44	47	50	47	51	47	43
B	63	47	52	55	58	68	69	64
C	45	43	46	43	51	53	53	54
D	39	44	43	45	44	42	39	38

Table 10 L_{Aeq} and L_{10} sound pressure levels, dB, broadband and at 1/3 octave band centre frequencies, Hz

7.0 Discussion

7.1 Hinton and Somerville assessment

Table 11 presents the assessment proposed by Hinton and Somerville (1). This compares the representative background sound level during daytime (07:00 to 23:00) and night-time (23:00 to 02:00) periods to L_{10} sound pressure levels from dance music at locations thought to be representative of the nearest receptors. Source room sound pressure levels are presented in Table 13 the appendix.

Position		$L_{Aeq,1min}$	$L_{10,1min}$ level at receptor						
			40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz
A	L2 Measured	51	44	47	50	47	51	47	43
	Daytime $L_{A90,15min}$	≤40	≤45	≤43	≤43	≤43	≤39	≤33	≤33
	Exceedance	9	1	4	7	7	12	14	10
	Night-time $L_{A90,15min}$	≤31	≤34	≤33	≤33	≤34	≤30	≤23	≤25
	Exceedance	20	10	14	17	13	21	24	18
B	L2 Measured	63	47	52	55	58	68	69	64
	Daytime $L_{A90,15min}$	≤40	≤45	≤43	≤43	≤43	≤39	≤33	≤33
	Exceedance	17	2	9	12	15	29	36	31
	Night-time $L_{A90,15min}$	≤31	≤34	≤33	≤33	≤34	≤30	≤23	≤25
	Exceedance	32	13	19	22	24	38	46	39
C	L2 Measured	45	43	46	43	51	53	53	54
	Daytime $L_{A90,15min}$	≤42	≤41	≤43	≤39	≤36	≤37	≤33	≤32
	Exceedance	3	2	3	4	15	14	20	22
	Night-time $L_{A90,15min}$	≤37	≤37	≤34	≤35	≤31	≤29	≤27	≤26
	Exceedance	8	6	12	9	20	24	26	28
D	L2 Measured	39	44	43	45	44	42	39	38
	Daytime $L_{A90,15min}$	≤42	≤41	≤43	≤39	≤36	≤37	≤33	≤32
	Exceedance	3	3	0	6	8	5	6	6
	Night-time $L_{A90,15min}$	≤37	≤37	≤34	≤35	≤31	≤29	≤27	≤26
	Exceedance	2	7	9	10	13	13	12	12

Table 11 Assessment in accordance with Hinton and Somerville 2003.

It is clear from Table 11 that the criteria proposed in Hinton and Somerville are not met at Positions A, B, C and D.

7.2 Limiting noise levels

The following table presents limiting noise levels within the Main Hall to comply with the criteria proposed in Hinton and Somerville at all assessment locations, on the basis of the existing transfer functions and without works to improve the sound insulation of the building envelope.

Period	$L_{Aeq,15min}$	$L_{10,15min}$						
		40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz
Daytime (07:00 to 23:00)	68	69	63	68	69	62	57	59
Night-time (23:00 to 02:00)	60	62	58	64	64	56	52	53

Table 12 Limiting sound pressure levels, dB L_{Aeq} and L_{10} at 1/3 octave band centre frequencies, Hz

The 1/3 octave band limiting noise levels are based on our transfer function and background sound level measurements using pink noise.

The A-weighted limiting noise level is based on the source and receiver measurements using dance music as the sound source. The measured A-weighted L2 receptor sound levels were compared to the requirements of Hinton and Somerville, and the L1 source level was adjusted accordingly, to determine a limiting internal noise level.

We would note the following:

- These limiting noise levels assume no works are undertaken to improve the existing level of sound insulation at the site.
- These limiting noise levels are not considered compatible with typical sound levels expected during a DJ or live music set (except for relaxed, acoustic music).
- We have not had an opportunity to assess noise break-in to structurally-adjoining residential premises at 123 Broad Street, and these noise levels apply only to noise break-out through the building envelope of 121. More stringent requirements may be required following a survey in 123 Broad Street.
- The $L_{Aeq,15min}$ criteria should be treated with caution. A-weighted levels are a summation of sound at all frequencies, and therefore do not accurately represent frequency-dependent nuances when comparing different sound sources. Low-frequency sound escapes through building fabric easier than mid- and high-frequency sound. Other noise sources, such as speech sounds from a large group of people, are easily capable of exceeding these $L_{Aeq,15min}$ criteria, but they are not as effective at breaking out of buildings, and the emotional reaction of nearby receptors may not be the same as to music. **We therefore recommend that only spectral limiting noise levels are adopted, and not a broadband A-weighted limiting noise level.**

7.3 Mitigation measures

The Main Hall at 121 Broad Street is largely fitted out and complete. We understand the client is therefore keen to avoid major intrusive works, and our recommendations reflect this.

The three primary routes of transmission for noise out of the main hall are through the front façade, through the northern façade and fire escape, and through the ceiling / roof.

Of these three routes, the ceiling / roof provides the highest level of sound insulation. Uplifting the sound insulation of the ceiling or roof further would require destructive work to the existing decorative ceiling, and to provide a mass-barrier ceiling on specialist hangers. We assume the client would like to avoid these works, and therefore recommend that improvements are made to the sound insulation of the front and northern facades.

7.3.1 Front façade

The front façade comprises a brick construction with punched windows and lobbied doors. A ventilation louvre is also present above the window; we assume this is a termination for an air handling unit serving the venue.

Looking at the front façade, the window to the left opens into a small room separate from the main hall. This provides an effective sound lobby, attenuating sound from the main hall before it reaches street.

We would recommend a similar room is constructed on the right hand side, so that the main hall does not have windows directly onto the façade overlooking Broad Street. The wall should comprise an independent double stud partition with a minimum laboratory rating of R_w+C_{tr} 52 dB, and an acoustic doorset with a minimum laboratory rating of R_w 30 dB. We are not aware of the acoustic performance of the wall and door to the left of the front door. We would suggest this is confirmed and uprated, if necessary. The wall should span through the ceiling bulkhead into the soffit, so that the room is fully closed off from the main hall except for the door.

The lobbied front doors leading into the main hall comprise an unsealed single-pane glass double doorset, followed by a lightweight timber double doorset.

We would recommend the second doorset is uprated with an acoustic double doorset with a minimum laboratory acoustic rating of R_w 35 dB.

If practicable, the glass doors should be uprated with an acoustic double doorset with a minimum laboratory rating of 30 dB.

All doors should be fitted with closers, and the potential for installing an access control vestibule (mantrap) should be investigated, such that one set of doors must be closed before the other can be opened. The compliance of this type of door arrangement with fire escape requirements should be checked with a suitably-qualified building control officer.

The duct serving the louvre(s) on the front façade should be treated with a suitably-specified cross-talk attenuator (requirements to be determined following receipt of further information about the ventilation system). Additional pressure drops should be submitted to the mechanical engineer who designed the system for comment.

7.3.2 Northern façade

The northern façade of 121 Broad Street faces the side alley.

A fire escape also opens into this alley. At first floor level, separate commercial units cantilever over the side alley. See Photo 3.

The Client has suggested enclosing the area underneath the cantilever to provide a sound lobby to the fire escape and façade. Enclosing this area of the façade with a suitably-specified independent stud construction and acoustic doorset would provide a substantial uplift to the sound insulation of the façade. However, it should be noted that any remaining portions of the façade of the main hall which remain exposed would still be an acoustic weakpoint.

There are a number of considerations in closing off this area, including the existing wall-mounted condenser units, fire egress, drainage, access to the basement and interaction with existing fire escape staircase. **We would recommend investigating the potential to enclose the area underneath the cantilevered commercial units, and any additional exposed areas of main hall façade with a suitably-qualified architect.**

7.3.3 Sound limiters and noise level warning systems

We would recommend installing electronic sound limiters into the in-house sound system.

In addition to a sound limiter on the in-house sound system, we recommend installing a noise warning system. This warning system will measure noise levels from sound systems which are brought into the venue by customers, and not part of the house system.

Any such sound limiters or warning systems should be hardwired into the in-house sound system (where appropriate) and installed in a locked, tamper-proof box. If no works are undertaken to improve the sound insulation of the front (western) and northern facades, the internal sound levels should be limited to the 1/3 octave band sound pressure levels specified in Table 12. If works are undertaken to improve the sound insulation provided by the western and northern facades, a new noise breakout survey should be undertaken to determine the new transfer functions, before specifying limiting noise levels.

Additional frequency bands may require limiting, beyond the 40 to 160 Hz bands discussed in Hinton and Somerville (1).

8.0 Conclusions

Noise surveys have been undertaken at 121 Broad Street, Dagenham, to assess the extent of noise breakout from the venue, and to assess its impact in accordance with industry guidance.

No measurements were undertaken in the adjoining residential premises at 123 Broad Street, and the conclusions of this report may change if this needs to be considered.

The assessment of external noise breakout indicates significant exceedances of the criteria, assuming sound pressure levels similar to those measured (see Table 13).

We have proposed limiting noise levels before and after 23:00 hours on the basis of achieving the requirements of Hinton and Somerville, though we would recommend only implementing 1/3 octave-band spectral limiting noise levels, and not an A-weighted limit.

Consideration should also be given to the timing and regularity of events, as these may allow a level of service to operate while the Client is making preparations to implement further mitigation measures.

The noise limits required to achieve the criteria proposed by Hinton and Somerville are not considered compatible with a DJ set or amplified live music, but may be compatible with background music from the house system and acoustic music. In order to enable louder music, we recommend that suitable design and construction works are undertaken to improve the sound insulation of the building envelope (particularly at the front and northern side, as it is assumed works will not be done to the ceiling or roof).

We recommend uprating the sound insulation of the front façade by improving the doors and creating a small, separate room on to the right of the main entrance, similar to the room to the left.

We recommend speaking to a suitably-qualified architect about enclosing the area underneath the cantilevered commercial premises in the northern alley, to uplift the sound insulation of the building envelope in this area.

If these works are suitably designed and constructed, they could allow an uplift in the limiting noise levels of approximately 10 dB at low frequencies (a confirmatory acoustic survey would be required to determine the true extent), assuming no works are undertaken to the ceiling or roof.

We would recommend electronic noise limiters and noise level warning systems are also installed to prevent exceedances of the limiting noise levels.

9.0 References

1. **Somerville, John Hinton and Alistair.** Good Practice Guide on the Control of Noise from Pubs and Clubs - Criteria and measurement guidelines. *Acoustics Bulletin.* s.l. : Institute of Acoustics, November / December 2003.

Appendix A Glossary

Decibel (dB)

The ratio of sound pressures which we can hear is a ratio of 106:1 (one million:one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' (Lp) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

dB(A)

The unit used to define a weighted sound pressure level, which correlates well with the subjective response to sound. The 'A' weighting follows the frequency response of the human ear, which is less sensitive to low and very high frequencies than it is to those in the range 500Hz to 4kHz.

In some statistical descriptors the 'A' weighting forms part of a subscript, such as LA10, LA90, and LAeq for the 'A' weighted equivalent continuous noise level.

Equivalent continuous sound level, Leq

An index for assessment for overall noise exposure is the equivalent continuous sound level, Leq. This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

Lden

Day-evening-night noise level, the A-weighted, Leq (equivalent noise level) over a whole day, but with a penalty of 10 dB(A) for night-time noise (23:00-07:00) and 5 dB(A) for evening noise (19:00-23:00), also known as the day evening night noise indicator

Lnight

The A-weighted, Leq (equivalent noise level) over the 8 hour night period of 23:00 to 07:00 hours, also known as the night noise indicator.

Frequency

Frequency is the rate of repetition of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the hertz (Hz), which is identical to cycles per second. A 1000Hz is often denoted as 1kHz, eg 2kHz = 2000Hz. Human hearing ranges approximately from 20Hz to 20kHz. For design purposes the octave bands between 63Hz to 8kHz are generally used. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. For more detailed analysis, each octave band may be split into three one-third octave bands or in some cases, narrow frequency bands.

Maximum noise level, LAmax

The maximum noise level identified during a measurement period. Experimental data has shown that the human ear does not generally register the full loudness of transient sound events of less than 125ms duration and fast time weighting (F) has an exponential time constant of 125ms which reflects the ear's response. Slow time weighting (S) has an exponential time constant of 1s and is used to allow more accurate estimation of the average sound level on a visual display.

The maximum level measured with fast time weighting is denoted as LAmax, F. The maximum level measured with slow time weighting is denoted LAmax, S.

Structure-borne noise

This is the transmission of noise energy as vibration of building elements. The energy may then be re-radiated as airborne noise. Structureborne noise is controlled by structural discontinuities, i.e. expansion joints and floating floors.

Appendix B Typical levels

Some typical dB(A) noise levels are given below:

Noise Level, dB(A)	Example
130	Threshold of pain
120	Jet aircraft take-off at 100m
110	Chain saw at 1m
100	Inside disco
90	Heavy lorries at 5m
80	Kerbside of busy street
70	Loud radio (in typical domestic room)
60	Office or restaurant
50	Domestic fan heater at 1m
40	Living room
30	Theatre
20	Remote countryside on still night

Vibration

Vibration may be expressed in terms of displacement, velocity and acceleration. Velocity and acceleration are most commonly used when assessing human comfort or structureborne noise issues.

Vibration amplitude may be quantified as a peak value, or as a root mean squared (rms) value. The rms value is of benefit because it takes into account both time history variation and energy content. The rms value is equal to 0.707 times the peak value and experience has shown that the overall rms value of vibration velocity, over the range of 10Hz to 1kHz, gives the best indication of vibration severity.

Vibration amplitude can be expressed as an absolute value e.g. 1mms-1 or as a ratio on a logarithmic scale in decibels, i.e.

- vibration velocity level, dB = 20 log (V/Vref),
- where Vref, for vibration velocity = 1x10-9 ms-1.

Appendix C Approximate site plan

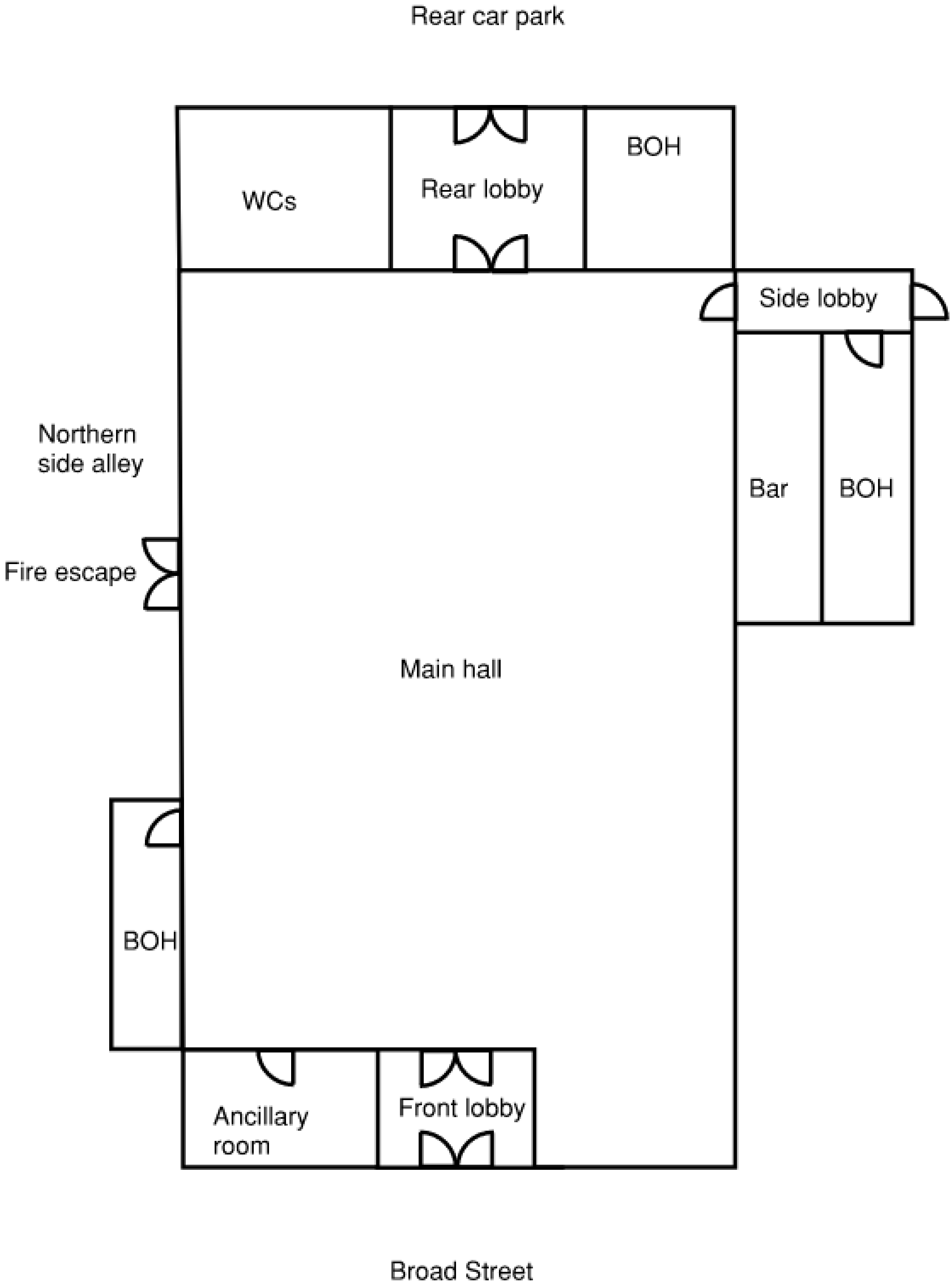

Figure 4 Approximate site plan

Appendix D Unattended survey locations

Photo 1 Unattended survey location UA1.

Photo 2 Unattended survey location UA2.

Appendix E External photographs

Photo 3 Northern side alley

Photo 4 Front façade

Photo 5 Rear facade and entrance (view from rear car park)

Photo 6 Flat roof (first floor level), facing west

Appendix F Internal photographs

Photo 7 Internal photograph facing front. Front lobby and bay window visible.

Photo 8 Internal photograph facing rear. Loudspeaker visible in ceiling.

Photo 9 Internal photograph facing northern fire exit.

Appendix G Sound levels

Item	dB(A)	40	50	63	80	100	125	160	200	250	315	400	500
Dance music source levels $L_{eq,2min}$	88	65	72	76	79	84	85	84	84	83	83	86	84

Table 13 Measured sound pressure levels, dB at 1/3 octave band centre frequencies, Hz