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19-21 George Street,
Manchester

10 March 2026

19373-NIA-02-AA-R1

Noise Impact Assessment

Project Number
19373

Issued For
Mr Jason Zeng

EXECUTIVE SUMMARY

This noise impact assessment has been undertaken in order to assess the site at 19-21 George Street, Manchester for use as a mini-market at basement level and restaurant premises with kitchen and dining areas at ground floor level. The site is currently in use as a storage and refrigeration area.

Planning drawings indicate that the restaurant could seat approximately 70 diners at one time and will be accessed by steps up from a ground level entrance at the front of the site.

A background noise survey has been undertaken as detailed in the report, in order to determine an appropriate noise emission criterion, in accordance with identified Local Authority requirements.

Calculations were undertaken for the nearest identified receivers, identified as residential apartments at 46 George Street to the west of the front façade of the site and Faulkner Court directly south of the site. It should be noted that if there are closer receivers that Clement Acoustics is not aware of, a reassessment will be necessary, and this should therefore be confirmed by the Client.

The proposed plant installation comprises the following plant units:

- 1 No. NFAN CBF560-43 – 450 PA Fresh Air Fan
- 1 No. NFAN CBF560-43 – 500 PA Fresh Air Fan
- 1 No. NFAN CBF630/120C-43 – 850 PA Kitchen Extract Fan
- 1 No. Helios 710/4T 120 Kitchen Extract Fan
- 2 No. GREE KF-120TW Condenser Units

A background noise survey has been undertaken as detailed in the report, in order to determine an appropriate noise emission criterion, in accordance with identified Local Authority requirements.

It has been demonstrated that compliance with the established criterion is feasible, dependent on the following material considerations:

- Considerations for Plant Noise:
 - The plant could be in use at any time over during daytime hours (07:00 – 23:00)
 - The noise emissions data for the proposed units, as obtained from available manufacturer information
 - Plant and receiver locations are as established in this report and marked on the attached site plan
- Considerations for Internally Generated Noise:
 - Any building element replacement works to follow the general advice in this assessment.
 - The site will be in use between 11:00 – 22:00, at which time the site will be vacated and non-operational.
 - Noise limiters to be installed and set to appropriate levels (anticipated limiting levels are discussed in this report).

If there is any deviation from the above, Clement Acoustics must be informed, in order to establish whether a reassessment is necessary.

Although not required for compliance with the stated criterion, mitigation measures have been recommended in the form of in line attenuators to fresh air ducts, in order to protect the amenity of upper floor commercial users of the building.

Clement Acoustics has used all reasonable skill and professional judgement when preparing this report. The report relies on the information as provided to us at the time of writing and the assumptions as made in our assessment.

This report is designed to be suitable to discharge typical plant noise planning conditions, as per our original scope of work. The report should not be relied upon for further reasons, such as the detailed design of mitigation measures.

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LIST OF ATTACHMENTS

19373-SP1	Indicative Site Plan
19373-TH1	Environmental Noise Time History
Appendix A	Glossary of Acoustic Terminology
Appendix B1 to B2	Acoustic Calculations

REVISION HISTORY

Issue	Date of Issue	Author	Reviewed	Authorised
R1	10/03/2026	<div></div>		
		Jamie Newton Senior Consultant BEng (Hons) MIOA	Andy Thomas Director BSc (Hons) MIOA	Duncan Martin Director BSc (Hons) MIOA

Issue	Comment
R0	First Issue
R1	Revision due to change in plant scheme, duct layout and confirmation of planning conditions

1.0 INTRODUCTION

Clement Acoustics has been commissioned by Mr Jason Zeng to measure existing background noise levels to inform an assessment of proposed restaurant and mini-market use at 19-21 George Street, Manchester. Measured noise levels have been used to determine noise emissions criteria for a proposed plant installation and operation of a restaurant in agreement with the planning requirements of the Manchester City Council.

This report presents the results of the environmental survey followed by noise impact calculations and outlines any necessary mitigation measures.

An acoustic terminology glossary is provided in Appendix A.

2.0 SITE DESCRIPTION

The site is an existing basement storage area and first floor retail unit at 19-21 George Street, Manchester. The building is bound by an existing commercial building to the north, a car park to the east and south, and George Street, housing a mix of restaurants, offices and apartments, to the west. The surrounding area is predominantly commercial in nature, although the presence of residential apartments is noted.

Current proposals are for restaurant at ground floor level of the site with a kitchen space, dining area and storage refrigeration areas proposed, and a mini-market with on-site bakery at ground floor level.

Operating hours set by Manchester City Council are as follows:

- Operating Hours
 - Ground Floor: 11:00 – 22:00
 - Basement: 11:00 – 21:00
- Deliveries, Servicing and Collection Operations
 - Monday – Sat: 07:30 – 22:00
 - Sunday / Bank Holiday: 10:00 – 18:00

In order to present a more onerous assessment, it will be assumed that all plant could operate at any time during daytime hours (07:00 – 23:00), resulting in a lower criterion for plant noise emissions.

Residential apartments have been identified at 46 George Street and Faulkner Court. These receivers were identified through onsite observations and an online Council Tax search. If there are any receivers closer than those identified within this report then a further assessment will need to be carried out.

Locations are shown in attached site plan 19373-SP1.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Unattended Noise Survey Procedure

An environmental noise survey was undertaken over a weekend period when the restaurant is expected to be busiest.

Measurements were undertaken at one position as shown on indicative site drawing 19373-SP1. The choice of this position was based both on accessibility and on collecting representative noise data in relation to the nearest affected receiver.

The surroundings and position used for the monitoring location are described in Table 3.1.

Position No.	Description
UN1	The microphone was mounted on a tripod on the main roof of 19-21 George Street, facing the identified receivers. The microphone was positioned away from reflective surfaces. ^[1]

Table 3.1 Description of unattended monitoring locations

Note [1]: The position was considered to be free-field according to guidance found in British Standard 4142: 2014+ A1: 2019 '*Methods for rating and assessing industrial and commercial sound*' [BS 4142], and a correction for reflections has therefore not been applied.

Continuous automated monitoring was undertaken for the duration of the survey between 16:00 on 19 September 2024 and 04:00 on 22 September 2024.

The measurement procedure generally complied with ISO 1996-2: 2017: '*Description, measurement and assessment of environmental noise*'.

3.2 Weather Conditions

At the time of set-up and collection of the monitoring, the weather conditions dry with light winds. It is understood that the weather conditions during the unattended survey were generally dry with wind speeds below 5 m/s.

It is considered that the weather conditions did not adversely affect the measurements and are therefore considered suitable for the measurement of environmental noise.

3.3 Equipment

The equipment calibration was verified, by means of a field verification check, before and after use and no abnormalities were observed.

The equipment used was as follows.

- 1 No. Svantek Type 958 Class 1 Sound Level Meter
- Norsonic Type 1251 Class 1 Calibrator

4.0 RESULTS

4.1 Unattended Noise Survey Results

The $L_{Aeq}: 5min$, $L_{Amax}: 5min$, $L_{A10}: 5min$ and $L_{A90}: 5min$ acoustic parameters were measured at the location shown in site drawing 19373-SP1. Measured noise levels are shown as a time history in Attachment 19373-TH1.

Average ambient and typical background noise levels are summarised in Table 4.1.

Position	Time Period	Average ambient noise level $L_{Aeq}: T, dB$	Typical background noise level $L_{A90}: 5min, dB$
UN1	Daytime (07:00 - 23:00)	58	57
	Night-time (23:00 - 07:00)	57	48

Table 4.1 Average ambient and typical background noise levels

5.0 NOISE CRITERIA

5.1 Plant Noise

It is understood that the following planning condition has been imposed by Manchester City Council regarding plant noise:

“4) a) Prior to the installation of the internal and external extraction within the internal riser hereby approved, either a scheme that demonstrates that the riser and rooftop extraction point will achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level in each octave band at the nearest noise sensitive location, or a scheme showing a method to acoustically treat/insulate the riser and rooftop extraction point so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level in each octave band at the nearest noise sensitive location, shall be submitted to and approved in writing by the Local Planning Authority.”

Due to the ambiguity of the above planning condition, a worst-case reading of the requirement of “a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level in each octave band at the nearest noise sensitive location” has been applied, and will be met by the combined noise of all plant, rather than just a riser or rooftop extraction point.

Based on the above requirements and the measured spectral background sound levels, Table 5.3 shows the noise limits to be achieved at the identified receivers.

Period	Limiting Noise Level, dB in each Frequency Band, Hz for plant								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Daytime (07:00 – 23:00)	52	50	49	48	48	43	37	36	52

Table 5.1 Plant noise limits, 5 dB below the typical background noise level in each octave band

As the above planning condition refers to a rating level, guideline penalties that can be applied to noise emissions to account for tonality, impulsivity and intermittency as provided by BS 4142. Where a sound source is neither tonal nor impulsive, but is still distinctive against the residual acoustic environment, a penalty may still be applied.

The available penalties for different characteristics are summarised in Table 5.2.

Characteristic	Comments	Maximum Penalty
Tonality	Can be converted to 2 dB for a tone which is just perceptible, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible	+6 dB
Impulsivity	Can be converted to 3 dB for impulsivity which is just perceptible, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible	+9 dB
Intermittency	When the sound has identifiable on/off conditions	+3 dB
Distinctiveness	Intended for sources that are neither tonal nor impulsive, but distinctive against background noise sources	+3 dB

Table 5.2 Available penalties according to BS 4142

5.1.1 Consideration of Tonality

As the above planning condition refers to the assessment of plant noise against existing background noise levels in each octave frequency band, the tonality of plant is not expected to be audible.

5.1.2 Consideration of Impulsivity

The proposed plant would not be considered an impulsive source of noise, provided the units are maintained in good working order.

5.1.3 Consideration of Intermittency

In terms of the potential intermittency, the following guidance taken from Section 9.2 of BS 4142 is noted:

“Intermittency

When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.”

For the assessed worst-case periods, the plant is assumed to be in constant operation, in line with the above guidance. It can therefore be determined that there will be no intermittency within that period.

5.1.4 Consideration of Distinctiveness

As the target is to achieve a noise rating level that is below the existing background noise level, the resulting plant noise level will inherently be indistinct from the existing noise environment.

5.2 Restaurant Operations

It is understood that the following planning condition has been imposed by Manchester City Council regarding entertainment noise:

“The ground floor and basement of the building shall be acoustically insulated and treated to limit the breakout of noise in accordance with the Noise Impact Assessment referenced 19373-NIA-02-AA-R0 prepared Clement Acoustics received by the City Council as local planning authority on 28 August 2025 and all recommended mitigation measures within this document shall be implemented within 3 months of the date of approval of this planning permission. Where entertainment noise is proposed the LAeq (entertainment noise) shall be controlled to 10dB below the LA90 (without entertainment noise) in each octave band at the facade of the nearest noise sensitive location, and internal noise levels at structurally adjoined residential properties in the 63Hz and 125Hz octave frequency bands shall be controlled so as not to exceed (in habitable rooms) 47dB and 41dB, respectively..”

A new assessment and will be conducted due to the change in operating hours and criteria applied by Manchester City Council. Based on the above requirements and the measured spectral background sound levels, Table 5.3 shows the noise limits to be achieved at the identified receivers; the proposed mitigation will be designed to comply with these new limits.

Period	Location	Limiting Noise Level, dB in each Frequency Band, Hz for restaurant entertainment								dB(A)
		63	125	250	500	1k	2k	4k	8k	
Daytime (07:00 – 23:00)	The facade of the nearest noise sensitive location	47	45	44	43	43	38	32	31	47
	Inside the nearest noise sensitive location	47	41	-	-	-	-	-	-	-

Table 5.3 Typical background noise level by frequency

6.0 PLANT NOISE IMPACT ASSESSMENT

6.1 Proposed Installation

The proposed plant installation comprises the following:

- 1 No. NFAN CBF560-43 – 450 PA Fresh Air Fan
- 1 No. NFAN CBF560-43 – 500 PA Fresh Air Fan
- 1 No. NFAN CBF630/120C-43 – 850 PA Kitchen Extract Fan
- 1 No. Helios 710/4T 120 Kitchen Extract Fan
- 2 No. GREE KF-120TW Condenser Units

Noise emissions for the proposed plant units, as provided by the manufacturer, are shown in Table 6.1. As the fans will be located internally within the building envelope and ducted to external termination points, the atmospheric ducted noise levels must be considered. Loudest modes of operation have been used in order to present a robust worst-case assessment.

Unit	Sound power Level (dB) in each Frequency Band, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
NFAN CBF560-43 – 450 PA <i>Fresh Air System 1 Fan</i>	73	87	85	81	74	71	64	62	82
NFAN CBF560-43 – 500 PA <i>Fresh Air System 2 Fan</i>	75	94	88	78	76	73	66	62	81
NFAN CBF630/120C-43 – 850 PA <i>Kitchen Extract System 1 Fan</i>	86	95	90	89	86	81	76	69	91
Helios 710/4T 120 <i>Kitchen Extract System 2 Fan</i>	77	77	78	80	81	81	77	70	87
Sound pressure Level (at 1 m, dB) in each Frequency Band, Hz									
GREE KF-120TW ^[1]	64	64	57	58	55	56	56	47	63 ^[1]

Table 6.1 Manufacturer provided noise emissions levels

Note [1]: Manufacturer data states “> 63 dB(A)”, so frequency data from a similar unit (Daikin REYA18A) has been used to inform source noise levels

Supply fans are to be ducted to roof level, while extract fans are ducted to James Street at ground floor level, adjacent to proposed condenser locations. This is shown on indicative site plan 19373-SP1.

6.2 Noise Impact Assessment

The closest receivers have been identified as 46 George Street to the west of the front façade of the site and Faulkner Court directly south of the site.

Screening of the extract fan duct ends and condensers to 46 George Street is provided by the building envelope.

Taking into account all necessary acoustic corrections, the resulting noise level at the identified residential windows would be as shown in Table 6.2. Detailed calculations are shown in Appendix B.

Receiver	Limiting Noise Level, dB in each Frequency Band, Hz for restaurant entertainment								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Design Criterion	52	50	49	48	48	43	37	36	52
1: 46 George Street	28	42	40	32	23	24	21	18	35
2: Faulkner Court	36	44	38	33	27	28	27	20	36

Table 6.2 Noise levels and project criterion at noise sensitive receivers

As presented in Table 6.2 and Appendix B, the proposed plant installation would be expected to meet the requirements of the proposed criteria.

6.3 British Standard Requirements

Further calculations have been undertaken to assess whether the noise emissions from the proposed plant unit would be expected to meet recognised British Standard recommendations, in order to further ensure the amenity of nearby noise sensitive receivers.

British Standard 8233: 2014 ‘*Guidance on sound insulation and noise reduction for buildings*’ gives recommendations for acceptable internal noise levels in residential properties. Assuming worst case conditions, of the closest window being for a bedroom, BS 8233: 2014 recommends 35/30 dB(A) as being acceptable internal sleeping conditions during night-time.

With loudest external levels of 36 dB(A), acceptable internal conditions would be met by taking the attenuation of the window itself into consideration. According to BS 8233: 2014, a typical building facade with a partially open window offers 15 dB attenuation.

It can therefore be predicted that, in addition to meeting the requirements of the set criteria, the emissions from the proposed plant would be expected to meet the most stringent recommendations of the relevant British Standard, with neighbouring windows partially open. Predicted levels are shown in Table 6.3.

Receiver	Recommended Target – For sleeping conditions in a bedroom, in BS 8233: 2014	Noise Level at Receiver (due to plant installation)
Inside Residential Window	30 dB(A)	21 dB(A)

Table 6.3 Noise levels and BS 8233: 2014 criteria inside nearest residential space

6.4 Duct-Borne Noise Breakout

It is understood that fresh air ducts to roof level will pass by restaurant spaces at first and second floor level. In order to mitigate any duct-borne noise breakout from fresh-air ducts running through the building, is recommended that an attenuator is installed between the fresh air fans and the vertical riser duct.

Based on the information provided, attenuators meeting the sound reduction indices as stated in Table 6.4 should be suitable.

Mitigation	Required Attenuation (dB) in each Frequency Band, Hz							
	63	125	250	500	1k	2k	4k	8k
Fresh Air System 1 and System 2 In-Duct Attenuator	5	11	21	33	37	36	27	18

Table 6.4 Required attenuation from mitigation

In addition to the use of attenuators, the following should be followed:

- Ducts and pipework that run vertically through should be lagged with 25 mm mineral wool and boxed in with at least two layers of 15 mm dense plasterboard.
- Ducts and pipework that run horizontally should be lagged with 25 mm mineral wool with a min. 5 kg/m² mass barrier and concealed behind the ceiling line.
- Ensure a minimum 10 mm gap between pipes and enclosures/studs.
- Pipe brackets with neoprene inserts should be selected.

7.0 RESTAURANT OPERATION NOISE IMPACT ASSESSMENT

7.1 Proposed Internal Operations

As the building is not currently in use as a restaurant, attended measurements were taken of similar sized venue, with patrons present and music played back at a level considered to be an entertainment level; as this is higher than the proposed operation of the site this would be considered a worst-case assessment.

The measured noise levels that will be used in calculations are as shown in in Table 7.1

Source	Sound Pressure Level (at 1 m, dB) in each Frequency Band, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Busy bar with music at entertainment level	91	92	90	90	85	77	69	64	90

Table 7.1 Measured noise emissions levels

7.2 External Building Fabric

Based on available drawings, the noise breakout path from the restaurant will be via the front door and windows at the front of the site. We have been informed that a door will also be placed at the foot of the stairwell into the dining area, thereby creating a lobby area across the stairwell area.

For the proposed main entrance and lobby doors, we would recommend selecting doors with a stated sound reduction performance of at least R_w 35 dB. It should be ensured that the doors are well sealed with high performing acoustic seals around the entire perimeter including the threshold.

7.3 Noise Impact Calculations

In order to calculate the predicted level of noise at residential receivers, the equation shown in Equation 7.1 was used to calculate the breakout of internal noise.

$$SPL_{outdoor} = SPL_{indoor} - SRI_{Composite} + 10 \log_{10} S - 20 \log_{10} r - 14$$

Equation 7.1 Noise Breakout Calculations

The source noise discussed in Section 7.1 is assumed to be constant across the entire basement area. Calculations assume that only one entrance door could be closed.

All dimensions and distances have been taken from available drawings.

7.4 Proposed Mitigation

To control noise emissions, it is recommended a noise limiter is fitted and set such that the music from the proposed operations meets the recommended limits described in Section 5.2. This is expected to be

achievable with the noise limits shown below in Table 7.2, in addition to the recommended facade upgrade works discussed in Section 7.2.

Noise Source	Low Frequency Limits		Overall Limit
	63 Hz	125 Hz	
Music / Entertainment	82 dB	78 dB	81 dB(A)

Table 7.2 Proposed noise limits

Note: It must be noted that these noise limits are a prediction only, based on the expected performance of the external façades, and acoustic formulae. A final commissioning exercise should be undertaken to determine the appropriate limits in practice, which could be lower.

7.5 Noise Impact Assessment

The closest receiver has been identified as the window on the southern facade of a residential property across the access road which is a minimum of 11 m from the closet façade of the site.

Taking into account all necessary acoustic corrections, including the proposed mitigation in Section 7.4, the resulting noise level at the identified residential windows would be as shown in Table 6.2. Detailed calculations are shown in Appendix B2.

Receiver	Location	Limiting Noise Level, dB in each Frequency Band, Hz for restaurant entertainment								dB(A)
		63	125	250	500	1k	2k	4k	8k	
Façade of 46 George Street	<i>Design Criterion</i>	47	45	44	43	43	38	32	31	47
	Calculated Level	47	45	44	36	27	20	11	6	38
Inside 46 George Street	<i>Design Criterion</i>	47	41	-	-	-	-	-	-	-
	Calculated Level	32	30	29	21	12	5	0	0	23

Table 7.3 Noise levels and project criterion at noise sensitive receivers

As presented in Table 6.2 and Appendix B2, the proposed operations with the proposed mitigation in place would be expected to meet the criteria.

7.6 Proposed Noise Management Plan

In addition to limiting music noise, the following additional measures are proposed to limit the noise impact of the site:

- During evening hours, it should be ensured that entrance doors are closed when not in use.
 - The lobby area should be used to ensure that at least one door is closed at all times.
- Windows should be kept closed at all times.

- Patrons should also be reminded of the nature of surrounding premises and behaviour outside the premises should be monitored accordingly.
- No deliveries or waste collection should be undertaken outside daytime hours.
- It is understood that there will be no onsite parking for guests. If proposals in this regard change, additional assessment of noise should be considered.
- Arrival and dispersal of guests should be carefully managed, to ensure noise due to outdoor sources is minimised.

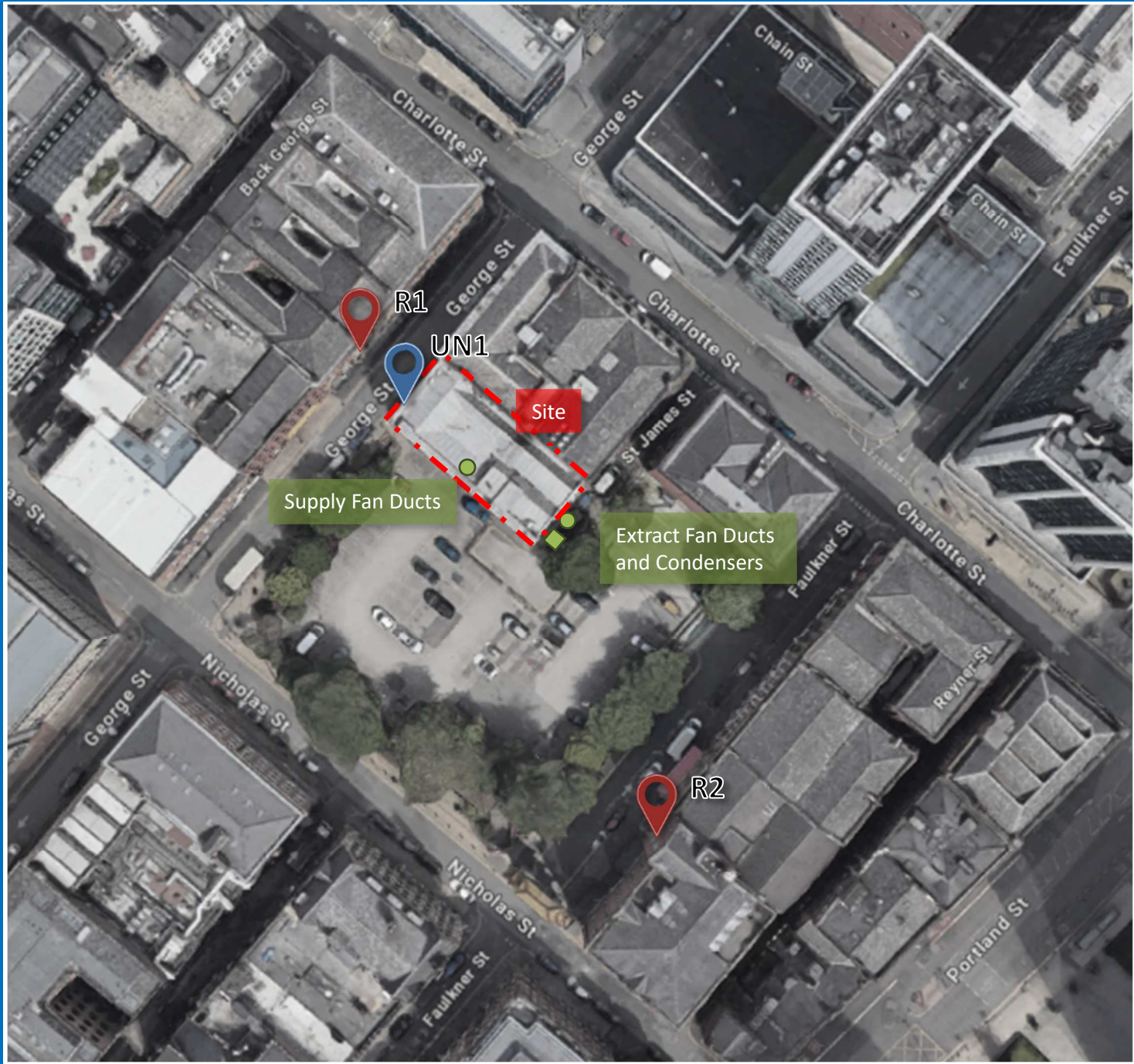
8.0 CONCLUSION

An environmental noise survey has been undertaken at 19-21 George Street, Manchester. The results of the survey have enabled criteria to be set for noise emissions from the proposed plant and operation of the restaurant in accordance with the requirements of the Manchester City Council, including stricter criteria set out to specifically limit low frequency entertainment noise.

A noise impact assessment has then been undertaken using manufacturer noise data to predict the noise levels, due to the proposed plant, at the nearby noise sensitive receivers.

Calculations show that noise emissions from the proposed units should meet the requirements of the Manchester City Council. Although not required for compliance with the stated criterion, mitigation measures have been recommended in the form of in line attenuators to fresh air ducts, in order to protect the amenity of upper floor commercial users of the building.

A further assessment of noise breakout due to internal activities has been undertaken, with suitable noise limits predicted to ensure no adverse effects on the amenity of nearby residents.



Not to scale

Description:

Indicative site plan showing noise monitoring position and nearest sensitive receiver

Date	10 March 2026
Reference	19373-SP1
Project Name	Basement, 19-21 George Street
Image ©	Google Earth

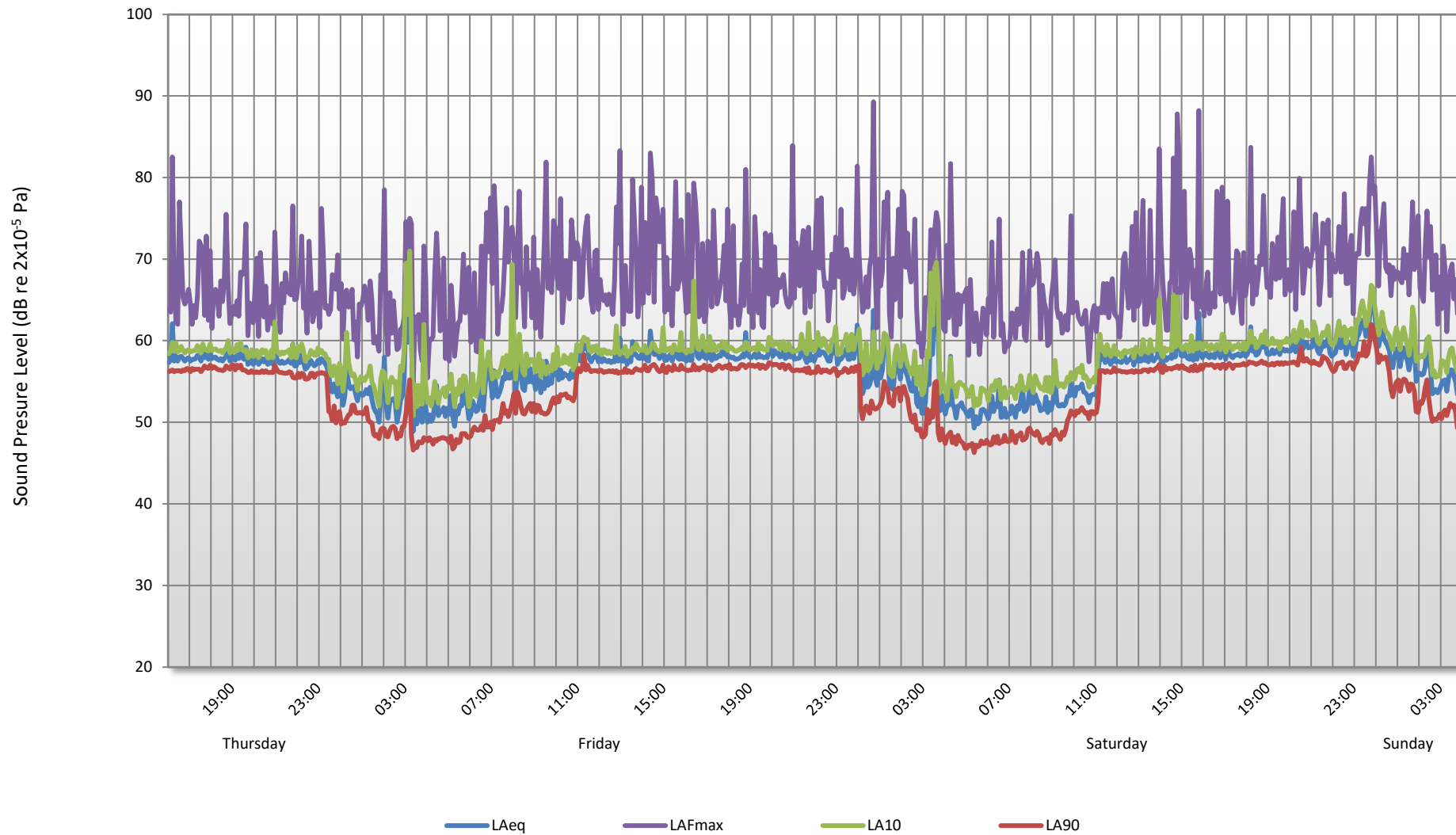
Key:

Unattended Noise Survey Position
Noise Sensitive Receiver
Plant Locations

Basement 19-21 George Street Manchester

Position 1

Environmental Noise Time History
19 September 2024 to 22 September 2024



GLOSSARY OF ACOUSTIC TERMINOLOGY

Absorption Coefficient α	The absorption coefficient of a material, usually measured for each octave or third-octave band and ranging between zero and one. For example, a value of 0.85 for an octave band means that 85% of the sound energy within that octave band is absorbed on coming into contact with the material. Conversely, a low value below about 0.1 means the material is acoustically reflective.
Acceleration	The rate of change of velocity, often measured in ms^{-2} . Commonly used to assess human response to vibration and for machine condition monitoring.
Accelerometer	A vibration transducer sensor that is used to measure acceleration.
Airborne noise	Noise which is fundamentally transmitted by way of the air and can be attenuated by the use of barriers and walls placed physically between the noise source and receiver.
Ambient Vibration	The all-encompassing vibration occurring at a given location, at a given time, composed of all vibration sources near and far.
Audible Range	The limits of frequency which are audible or heard as sound. The normal hearing in a typical young adult detects ranges from 20 Hz to 20 kHz, although some people can detect sound with frequencies outside these limits. Typically, as a person ages their audible hearing range decreases.
A-Weighting	A filter applied to the sound recording made by a microphone to approximate the response of the human ear.
Axis	A fixed reference line for the measurement of vibration in a particular direction. Vibration is commonly measured in transverse (T), longitudinal (L) and vertical (V) axes (or X, Y and Z).
Background Noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation. The L_{90} parameter, i.e. the level exceeded for not more than 90% of the time is often used as a descriptor of "background noise" for environmental impact studies.
Background Vibration	The underlying level of vibration in the ambient environment, measured in the absence of the vibration sources of interest.
Continuous Vibration	Vibration that continues uninterrupted over a defined period.
dB(A)	The human ear is less sensitive to low (below 125 Hz) and high (above 16 kHz) frequency sounds. A sound level meter duplicates the ear's variable sensitivity to sound of different frequencies. This is achieved by building a filter into the instrument with a similar frequency response to that of the ear. This is called an A-weighting filter. Measurements of sound made with this filter are called A-weighted sound level measurements and the unit is dB(A).
Decibel [dB]	The unit that sound is measured in. Decibels are a logarithmic scale hence two equally intense sound sources operating together produce a sound level which is 3 dB higher than one alone and 10 identical, uncorrelated sources produce a 10 dB higher sound level.
Distance Attenuation	Sound which propagates from a point source in free air attenuates by 6 dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3 dB for each doubling of distance.
$D_{nT,w}$	Weighted Standardised Field Level Difference A measure of sound insulation performance of a building element. It is characterised by the difference in noise level on each side of a wall or floor. It is measured in-situ. It is a field measurement that relates to the R_w laboratory measured value but is not equal to it because an in-situ space is not of the same quality as a laboratory space. The value is indicative of the level of speech privacy between spaces. The higher its value the better the insulation performance.
Flanking	Flanking is the transfer of sound through paths around a building element rather than through the building element material directly. For example, sound travelling through a gap underneath a door or a gap at the top of a wall.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch, and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz. In the case of vibration, frequency is the number of oscillations that occurs per second. Frequency is measured in units of Hertz (Hz).
Ground-Borne Noise	Vibration propagated through the ground and then radiated as noise by vibrating building elements such as wall and floor surfaces. This noise is more noticeable in rooms that are well insulated from other airborne noise. An example would be vibration transmitted from an underground rail line radiating as sound in a bedroom of a building located above.
Impact Noise	Impact noise / structure-borne noise is generated when an object impacts with a separating element, causing that element to vibrate and re-radiate as noise in the receiving room. Common domestic examples of impact noise include footsteps and dropping objects.
Impulsive Noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.

Impulsive Vibration	Vibration that rapidly builds up to a peak followed by a damped decay. May consist of multiple impulsive events, typically less than two seconds in duration.
Intermittent Noise	The level suddenly drops to that of the background noise several times during the period of observation.
Intermittent Vibration	Either interrupted periods of continuous vibration or repeated periods of impulsive vibration.
L_{10}	This is the level exceeded for not more than 10% of the time. This parameter is often used as a “not to exceed” criterion for noise
L_{90}	This is the level exceeded for not more than 90% of the time. This parameter is often used as a descriptor of “background noise” for environmental impact studies.
L_{eq}	The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq} . The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.
L_{max}	This is the maximum sound pressure level that has been measured over a period.
$L_{nT,w}$	Weighted Standardised Field Impact Sound Pressure Level As for $L_{n,w}$ but measured in-situ and therefore subject to the inherent accuracies involved in such a measurement. The equivalent measurement in a laboratory is the $L_{n,w}$. A lower value indicates a better performing floor.
Noise	Unwanted sound.
Octave	An octave represents a doubling or halving in frequency. Noise or vibration levels across a frequency spectrum are commonly given in octave or one-third octave frequency bands.
PPV	Peak Particle Velocity. The absolute maximum value of the vibration velocity signal measured in any axis during a given time interval.
Reflection	Sound wave reflected from a solid object obscuring its path.
R_w	Weighted Sound Reduction Index A measure of the sound insulation performance of a building element. It is measured in very controlled conditions in a laboratory. The related field measurement is the $D_{nT,w}$. The higher the value the better the acoustic performance of the building element.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound Absorption	The ability of a material to absorb sound energy by conversion to thermal energy.
Sound Insulation	Sound insulation refers to the ability of a construction or building element to limit noise transmission through the building element. The sound insulation of a material can be described by the R_w and the sound insulation between two rooms can be described by the $D_{nT,w}$.
Sound Level Meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound Power Level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 pico watt.
Sound Pressure Level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone referenced to 20 micro Pascal.
Structure-borne Noise	Audible noise generated by vibration induced in the ground and/or a structure. Vibration can be generated by impact or by solid contact with a vibrating machine. Examples of structure-borne noise include the noise of trains in underground tunnels heard to a listener above the ground, the sound of footsteps on the floor above a listener and the sound of a lift car passing in a shaft.
Tonal Noise	Sound containing a prominent frequency and characterised by a definite pitch.
Transmission Loss	The sound level difference between one room or area and another, usually of sound transmitted through an intervening partition or wall. Also the vibration level difference between one point and another. For example, if the sound level on one side of a wall is 100 dB and 65 dB on the other side, it is said that the transmission loss of the wall is 35 dB. If the transmission loss is normalised or standardised, it then becomes the R_w or R'_w or $D_{nT,w}$.
VDV	Vibration Dose Value. A measure of tactile vibration levels used to assess intermittent vibration.
Velocity	The rate of change of vibration displacement, usually measured in mms^{-1} .
Vibration	A mechanical phenomenon whereby oscillations occur about an equilibrium point; a periodic back-and-forth motion of an elastic body or medium, commonly resulting when almost any physical system is displaced from its equilibrium condition.

Plant Noise Acoustic Calculations

19373

Basement 19-21 George Street Manchester

Receiver 1: 46 George Street

External Plant Noise Emissions Calculation

Description	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Manufacturer provided sound power level									
Kitchen Extract System 1 Fan - NFAN CBF630/120C-43 – 850 PA	86	95	90	89	86	81	76	69	91
System Effects	-14	-11	-15	-20	-27	-24	-21	-19	
Radiating correction, dB	-8	-8	-8	-8	-8	-8	-8	-8	
Distance correction to receiver, dB (41 m) ^[1]	-32	-32	-32	-32	-32	-32	-32	-32	
Barrier Attenuation	-14	-19	-23	-25	-25	-25	-25	-25	
Sound pressure level at receiver	18	25	13	3	-7	-9	-11	-16	11
Manufacturer provided sound power level									
Kitchen Extract System 2 Fan - Helios 710/4T 120	77	77	78	80	81	81	77	70	86
System Effects	-10	-8	-10	-14	-20	-17	-14	-12	
Radiating correction, dB	-8	-8	-8	-8	-8	-8	-8	-8	
Distance correction to receiver, dB (41 m) ^[1]	-32	-32	-32	-32	-32	-32	-32	-32	
Barrier Attenuation	-14	-19	-23	-25	-25	-25	-25	-25	
Sound pressure level at receiver	13	10	5	0	-5	-2	-3	-8	5
Manufacturer provided sound power level									
Fresh Air System 1 Fan - NFAN CBF560-43 – 450 PA	73	87	85	81	74	71	64	62	82
System Effects	-21	-15	-12	-14	-19	-16	-13	-11	
Radiating correction, dB	-8	-8	-8	-8	-8	-8	-8	-8	
Distance correction to receiver, dB (30 m) ^[1]	-30	-30	-30	-30	-30	-30	-30	-30	
Sound pressure level at receiver	15	34	35	30	18	18	14	14	31
Manufacturer provided sound power level									
Fresh Air System 2 Fan - NFAN CBF560-43 – 500 PA	75	94	88	78	76	73	66	62	84
System Effects	-21	-15	-12	-14	-19	-16	-13	-11	
Radiating correction, dB	-8	-8	-8	-8	-8	-8	-8	-8	
Distance correction to receiver, dB (30 m) ^[1]	-30	-30	-30	-30	-30	-30	-30	-30	
Sound pressure level at receiver	17	41	38	27	20	20	16	14	33
Indicative sound pressure level									
GREE KF-120TW	63	63	56	57	55	56	56	47	62
Correction for Multiple Units (2 Units)	3	3	3	3	3	3	3	3	
Distance correction to receiver, dB (41 m) ^[1]	-32	-32	-32	-32	-32	-32	-32	-32	
Barrier Attenuation	-8	-8	-8	-8	-8	-8	-8	-8	
Sound pressure level at receiver	26	26	19	20	18	19	19	10	25
Combined Sound Pressure Level at Receiver	27	42	40	32	23	24	21	18	35
Design Criterion	52	50	49	48	48	43	37	36	52

[1] Distance loss calculated assuming Point Source attenuation (typically used where distance is more than 3x the largest source dimension)

BS 8233 Assessment Calculation

Description	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Sound pressure level outside window	27	42	40	32	23	24	21	18	35
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	12	27	25	17	8	9	6	3	20

Design Criterion

30

Receiver 2: Faulkner Court

External Plant Noise Emissions Calculation

Description	63	125	250	Frequency, Hz				8k	dB(A)
	500	1k	2k	4k					
Manufacturer provided sound power level									
Kitchen Extract System 1 Fan - NFAN CBF630/120C-43 – 850 PA	86	95	90	89	86	81	76	69	91
System Effects	-14	-11	-15	-20	-27	-24	-21	-19	
Radiating correction, dB	-8	-8	-8	-8	-8	-8	-8	-8	
Distance correction to receiver, dB (47 m) ^[1]	-33	-33	-33	-33	-33	-33	-33	-33	
Sound pressure level at receiver	31	42	34	27	17	15	13	8	31
Manufacturer provided sound power level									
Kitchen Extract System 2 Fan - Helios 710/4T 120	77	77	78	80	81	81	77	70	86
System Effects	-10	-8	-10	-14	-20	-17	-14	-12	
Radiating correction, dB	-8	-8	-8	-8	-8	-8	-8	-8	
Distance correction to receiver, dB (47 m) ^[1]	-33	-33	-33	-33	-33	-33	-33	-33	
Sound pressure level at receiver	26	27	26	24	19	22	21	16	28
Manufacturer provided sound power level									
Fresh Air System 1 Fan - NFAN CBF560-43 – 450 PA	73	87	85	81	74	71	64	62	82
System Effects	-21	-15	-12	-14	-19	-16	-13	-11	
Radiating correction, dB	-8	-8	-8	-8	-8	-8	-8	-8	
Distance correction to receiver, dB (56 m) ^[1]	-35	-35	-35	-35	-35	-35	-35	-35	
Sound pressure level at receiver	9	29	30	25	13	13	9	9	25
Manufacturer provided sound power level									
Fresh Air System 2 Fan - NFAN CBF560-43 – 500 PA	75	94	88	78	76	73	66	62	84
System Effects	-21	-15	-12	-14	-19	-16	-13	-11	
Radiating correction, dB	-8	-8	-8	-8	-8	-8	-8	-8	
Distance correction to receiver, dB (56 m) ^[1]	-35	-35	-35	-35	-35	-35	-35	-35	
Sound pressure level at receiver	11	36	33	22	15	15	11	9	27
Indicative sound pressure level									
GREE KF-120TW	64	64	56	57	55	56	56	47	62
Correction for Multiple Units (2 Units)	3	3	3	3	3	3	3	3	
Distance correction to receiver, dB (47 m) ^[1]	-33	-33	-33	-33	-33	-33	-33	-33	
Sound pressure level at receiver	34	34	26	27	25	26	26	17	32
Combined Sound Pressure Level at Receiver	36	44	38	32	27	28	27	20	36
Design Criterion	52	50	49	48	48	43	37	36	52

BS 8233 Assessment Calculation

Description	63	125	250	Frequency, Hz				8k	dB(A)
	500	1k	2k	4k					
Sound pressure level outside window	36	44	38	32	27	28	27	20	36
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	21	29	23	17	12	13	12	5	21
Design Criterion									30

Restaurant Operations Acoustic Calculations

19373

Receiver 1: 46 George Street

$$SPL_{outdoor} = SPL_{indoor} - SRI_{composite} + 10\log_{10}S - 20\log_{10}r - 14$$

Basement Noise Emissions Calculation

Description	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Measured operation sound levels									
Limited Internal Noise Level	82	78	81	81	76	68	60	55	81
SRI Composite - Front Façade	-29	-27	-31	-39	-43	-42	-42	-42	
Correction for Surface Area of Breakout Point (27 m ²)	29	29	29	29	29	29	29	29	
Distance correction to receiver, dB (11 m)	-21	-21	-21	-21	-21	-21	-21	-21	
Correction for indoor to outdoor conditions	-14	-14	-14	-14	-14	-14	-14	-14	
Sound Pressure Level at Reciever	47	45	44	36	27	20	11	6	38
Design Criterion	47	45	44	43	43	38	32	31	47

Internal Assessment

Description	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Sound pressure level outside window	47	45	44	36	27	20	11	6	38
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	32	30	29	21	12	5	-4	-9	23
Design Criterion	47	41	-	-	-	-	-	-	-