SANDY BROWN

Consultants in Acoustics, Noise & Vibration

Memo:	M024-A	**Date:**	30 August 2022
Project:	17132	**Pages:**	6+Appendix
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40-46 Princess Street, Manchester

Generator noise egress assessment

This report details noise egress assessment carried out in relation to the emergency generator proposed to the courtyard to the north of the site at 40-46 Princess Street, Manchester.

17132-R01-C *Environmental noise survey report and plant noise egress assessment* (dated 29 October 2019) is provided as an appendix.

Summary

- Emergency plant noise egress criteria have been set, based on MCC *Planning and Noise Technical Guidance* (dated May 2022) and on a 15 dB relaxation for emergency plant (typically allowed by MCC).
- Daytime and night-time emergency plant noise egress limits are predicted to be exceeded by 4 dB and 19 dB, respectively.
- It is understood that during a life-safety emergency and routine testing, the emergency fire alarm will likely also be sounding, which may mask noise egress from the generator.
- The generator will be tested once every 6 months. This will coincide with the testing of the fire alarm. It is understood that all neighbouring occupants will be notified in advance of the testing dates and times.
- It may be possible to agree that routing testing only be carried out during daytime hours (07:00-23:00), and subsequently agree a relaxation against the night-time limits on the basis that the generator would only operate at night during a life-safety emergency. This would need to be agreed with MCC.
- If a relaxation to the night-time limits can be agreed a sound pressure level of L_{Aeq} 71 dB at 1 m from the generator is required to be achieved (to meet the MCC daytime limits). It may be possible to undertake routine testing at a reduced duty, to help reduce the noise emissions.

Site location

The site location in relation to its surroundings is outlined in yellow in Figure 1.

The site is bound by Princess Street to the north east, a courtyard to the north west and Harter Street to the south east. There are also adjoining residential and commercial buildings.

Figure 1 Site map (courtesy of Google Earth Pro)

Adjacent premises

The site is in a mixed-use area. The following existing residential apartments are located within close proximity to the site:

- 50 Princess Street, 8 m to the south (highlighted in red in Figure 1)
- 2 Harter Street, adjacent to the site to the south (highlighted in dark blue)
- Level 1 to Level 4 of 105 to 107 Portland Street, approximately 5 m to the north-west (highlighted in dark green)
- 103 Portland Street, approximately 5 m to the north-west (highlighted in light green).

There is hotel accommodation (Townhouse Hotel) located approximately 15 m to the north-east (highlighted in light blue).

The nearest commercial premises are 109 and 113 Portland Street to the north and west respectively (highlighted in purple and brown).

Other commercial premises include 101 and 103 Princess Street approximately 15 m and 25 m respectively to the east (highlighted in pink and orange).

Environmental noise survey

An environmental noise survey has previously been carried out at the site, comprising:

- Attended sample measurements during the daytime on Tuesday 2 May 2017
- Attended sample measurements during the night-time on Wednesday 3 May 2017.

Measurements were carried out to the south of the site, the north-east of the site and to the courtyard, as indicated in Figure 2.

In each case the microphone was mounted on a tripod at approximately 1 m from a reflective and approximately 1.5 m above the ground level.

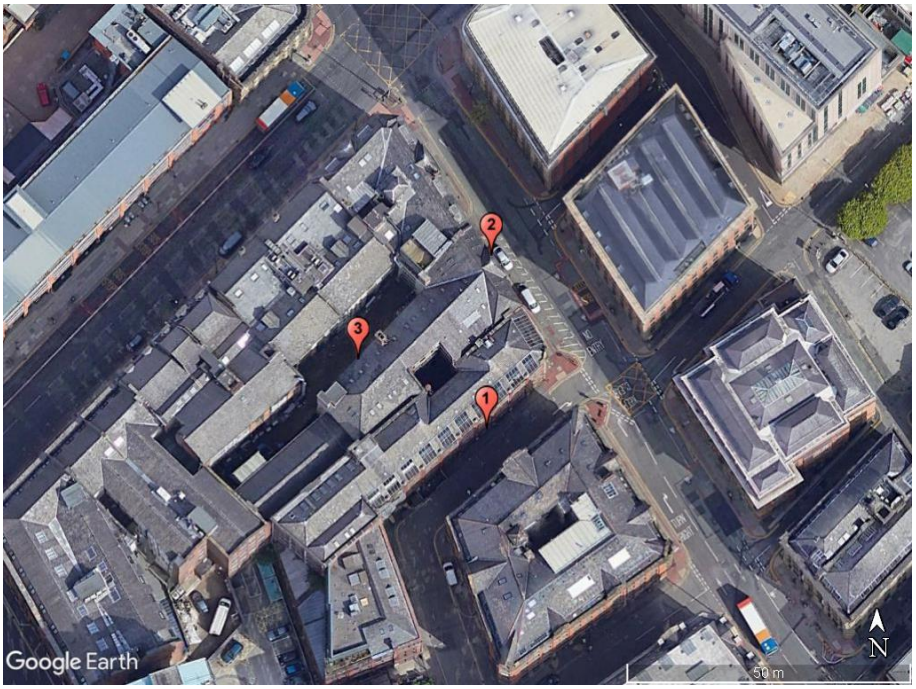

Figure 2 Environmental noise survey measurement locations (courtesy of Google Earth Pro)

The representative background sound levels measured during the environmental noise survey carried out in 2017 are summarised in Table 1. These are the minimum background sound levels measured at each location.

Further details of the environmental noise survey previously carried out are provided in 17132-R01-C *Environmental noise survey report and plant noise egress assessment* (dated 29 October 2019), provided as an appendix at the end of this report.

Table 1 Representative measured background levels measured

Location	Time of day	Representative background noise level, $L_{A90,15min}$ (dB)
South	Daytime (07:00-23:00)	56
	Night-time (23:00-07:00)	57
North-east	Daytime (07:00-23:00)	60
	Night-time (23:00-07:00)	59
North (Courtyard)	Daytime (07:00-23:00)	62
	Night-time (23:00-07:00)	47

Plant noise limits

Local Authority criteria

Manchester City Council (MCC) provides guidance in relation to plant noise emissions in *Planning and Noise Technical Guidance*, dated May 2022.

MCC stipulates the following criteria regarding plant noise emissions:

> *'Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5 dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location'*.

MCC typically allows a 15 dB relaxation for emergency plant. As such, the cumulative noise level resulting from the operation of all new emergency plant at 1 m from the most affected windows of the nearest noise sensitive premises should not exceed a rating level of 10 dB above the typical background level.

Emergency plant noise limits

Based on the above criteria and the results of the environmental noise survey, the cumulative noise level resulting from the operation of all new plant at 1 m from the worst affected windows of the nearest noise sensitive premises should not exceed the limits set out in Table 2.

Table 2 Plant noise limits at 1 m from the nearest noise sensitive premises

Location	Time of day	Maximum sound pressure level at 1 m from noise sensitive premises ($L_{Aeq,15min}$ dB)
South	Daytime (07:00-23:00)	66
	Night-time (23:00-07:00)	67
North-east	Daytime (07:00-23:00)	70
	Night-time (23:00-07:00)	69
North (Courtyard)	Daytime (07:00-23:00)	72
	Night-time (23:00-07:00)	57

Proposed generator

The generator is proposed within the courtyard to the north of the site. The generator is required to provide emergency backup power to the fire-fighting lift in the event of a fire.

The generator will be located within a fenced enclosure. This will provide little/no acoustic screening. It is understood the front of the generator compound will extend 2 m from the north-west facade of the existing 40-46 Princess Street building.

Operating conditions

It is understood that the proposed generator will only operate during a life-safety emergency and during routine testing.

Life safety emergency

During a life-safety emergency, the emergency fire alarm will likely also be sounding, which may mask noise egress from the generator.

Routine testing

The generator will be tested once every 6 months. This will coincide with the testing of the fire alarm, which as above may mask noise egress from the generator.

It is understood that all neighbouring occupants will be notified in advance of the testing dates and times.

Generator noise data

It is understood that the proposed generator has a free-field sound pressure level of L_{Aeq} 75 dB at 1 m, based on email correspondence received on 5 July 2022. This noise level is based on the generator being housed within an acoustic enclosure, with a secondary silencer fitted.

Assessment

Calculations have been performed to predict plant noise egress levels associated with the proposed emergency generator to the nearby noise sensitive premises.

The predicted plant noise egress level at the worst affected noise sensitive receptors facing the courtyard is L_{Aeq} 76 dB. This exceeds the daytime and night-time emergency plant noise egress limits for receptors within the courtyard by 4 dB and 19 dB, respectively.

Potential relaxation to limits

It may be possible to agree that routing testing only be carried out during daytime hours (07:00-23:00), and subsequently agree a relaxation against the night-time limits on the basis that the generator would only operate at night during a life-safety emergency. This would need to be agreed with MCC. In this case, 4 dB attenuation would need to be achieved to the generator. The routine testing could also potentially be carried out at a reduced duty to help reduce the noise emissions from the generator. This approach would need to be agreed with MCC.

Otherwise, if night-time emergency plant noise egress limits are required to be achieved during a life-safety emergency, 19 dB attenuation would need to be achieved.

Potential mitigation measures

If a relaxation to the night-time limits can be agreed (as discussed above) a sound pressure level of L_{Aeq} 71 dB at 1 m from the generator is required to be achieved, to allow the MCC limits to be met.

Otherwise, a level of L_{Aeq} 56 dB at 1 m from the generator is required to be achieved to allow the MCC limits to be met.

Potential mitigation measures to be considered to allow the plant noise egress criteria to be achieved include:

- Reselection of generator unit
- Enhanced acoustic enclosure
- Enhanced/additional in-duct attenuation to the generator exhaust
- Localised screening
- Relocation of the generator to allow for more distance attenuation and/or screening to the nearby receptors (eg, to the rooftop).

Other emergency plant items

It is understood that the generator is the only item of emergency plant proposed for the scheme. The emergency plant noise egress limits are cumulative, and therefore additional attenuation may be required if other emergency plant items are proposed.

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Consultants in Acoustics, Noise & Vibration

17132-R01-C

29 October 2019

40-46 Princess Street, Manchester

Environmental noise survey and plant assessment report

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Version	Date	Comments	Author	Reviewer
A	17 May 17		Jose Maria Gonzalez	James Atha
B	24 Jun 17	Plant assessment updated	Jose Maria Gonzalez	James Atha
C	29 Oct 19	Updated plant noise egress assessment and amplified sound egress	Jose Maria Gonzalez	James Atha

Summary

Sandy Brown has been commissioned by Wittington Investments (Properties) Ltd to provide acoustic advice in relation to the proposed development at 40 -46 Princess Street, Manchester.

An environmental noise survey has been carried out to determine the existing background sound levels in the area and to set appropriate plant noise limits in line with the requirements of the Manchester City Council. The noise survey was performed between 13:28 on 2 May 2017 and 01:36 on 3 May 2017.

To the north-east, the representative background sound levels measured during the survey were $L_{A90,15min}$ 60 dB during the daytime and $L_{A90,15min}$ 59 dB at night. To the south, the representative background sound levels measured during the survey were $L_{A90,15min}$ 56 dB during the daytime and $L_{A90,15min}$ 57 dB at night. To the north (courtyard), the representative background sound levels measured during the survey were $L_{A90,15min}$ 62 dB during the daytime and $L_{A90,15min}$ 47 dB at night.

Based on the requirements of Manchester City Council and on the results of the noise survey, all plant must be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises is to be at least 5 dB below the typical background noise levels measured. These limits are cumulative, and apply with all plant operation under normal conditions. If plant items contain tonal or attention catching features, a penalty based on the type and impact of those features will be applied, and the limits will be more stringent than those set.

An assessment of the proposed plant items associated with the development has been carried out. The assessment indicates that provided the future tenant plant limits set out are met, the overall plant noise egress levels are expected to comply with the required limits. No further mitigation measures are required. Therefore, it is considered that planning condition 10 for application number 116550/FO/2017 can be discharged.

The tenants will need to provide assessments once tenant plant selections are made to satisfy the landlord and/or Local Authority that the relevant limits are met.

The proposed development includes Gym area basement level with offices across the upper floor levels. An assessment of noise transfer between the Basement level and upper floors has been carried out along with advice on the floor and guidance on maximum limits within leisure/Gym unit.

An assessment of amplified sound break out from the ground floor and basement level has been carried out based on achieving limits that have been set in line with the requirements of Manchester City Council. Guidance on maximum internal amplified sound limits to control this has been provided along with in advice on the facade to the Gym unit at Basement level.

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1 Introduction

Sandy Brown has been commissioned by Wittington Investments (Properties) Ltd to provide acoustic advice in relation to the proposed development at 40-46 Princess Street, Manchester.

As part of this, an environmental noise survey is required, the purpose of which is to establish the existing background sound levels in the vicinity of nearby noise sensitive premises. The results of the survey measurements have been used to set appropriated limits for noise egress from building services plant associated with the development and to set appropriate limits for noise egress from building services plant in line with the requirements of Manchester City Council.

This report presents the survey method, results of the environmental noise survey, and determines limits for noise emission from new building services plant to be installed. An assessment of the noise levels from the proposed items of plant has also been carried out and the required mitigation measures determined.

This report also presents a discussion of acceptable amplified sound associated with the leisure/gym unit amplified sound and comments on noise ingress to office spaces.

2 Site description

The proposed redevelopment at 40-46 Princess Street, Manchester include a leisure /gym unit at basement level and speculative offices on the upper floors. A rooftop plant area is also proposed.

2.1 The site and its surrounding

The site location in relation to its surroundings is outlined in yellow in Figure 1. The site is bounded by Princess Street north to east, a courtyard and office building to the north-west, 2 Harper Street to the southwest and Harter Street to the south.

Figure 1 Site map (courtesy of Google Earth Pro)

2.2 Adjacent premises

The site is located in a mixed use area, with the immediate surrounding comprising of residential accommodation, hotel, office, retail units (including restaurants) and 'The Spot' night club which is located in the basement of 40 Princess Street. The nearest existing residential accommodation is located approximately 8 m to the south-west. This is highlighted in red in Figure 1.

The 2 Harter Street building which is adjacent to the site to the south-west is currently being converted into apartments. Additionally, there is a conversion of first floor offices into apartments at 103 Portland Street which approximately 5 m to the north-west, these future apartments are also considered to be noise sensitive premises. These are highlighted in blue and green respectively in Figure 1 There is hotel accommodation (Townhouse Hotel) located approximately 15 m to the north-east, this is also considered a noise sensitive premise and highlighted in light blue in Figure 1.

The nearest existing daytime noise sensitive premises are the rear facade of 109 and 113 Portland Street to the north and west respectively. These are highlighted in purple and brown respectively in Figure 1. Other day time noise sensitive premises include 101 and 103 Princess Street approximately 15 m and 25 m respectively to the east. These are highlighted in pink and orange respectively in Figure 1.

3 Method

Details of the equipment used, the noise indices and the weather conditions during the survey are provided in Appendix A. Further information on the specific survey method is provided in this section.

3.1 Attended measurements

3.1.1 Daytime attended measurements

Attended sample measurements were performed by Jose M. Gonzalez at 4 locations around the proposed site. These are indicated in Figure 1 as positions 1 to 3. The attended measurements were carried out on 2 May 2017, over 15 minute periods, with the purpose of determining the existing noise levels from road traffic, pedestrians and other significant noise sources in the area.

The locations of the measurements are indicated in Figure 1. In each case the microphone was mounted on a tripod at approximately 1 m from a reflective and approximately 1.5 m above the ground level.

3.1.2 Night time attended measurements

Attended sample measurements were performed by Jose M. Gonzalez at 3 of locations around the proposed site. These are indicated in Figure 1 as positions 1 to 3. The attended measurements were carried out between 23:51 on 2 May 2017 and 01:36 on 6 May 2017, over 15 minute periods, with the purpose of determining the existing noise levels from road traffic, pedestrians and other significant noise sources in the area.

The locations of the measurements are indicated in Figure 1. In each case the microphone was mounted on a tripod at approximately 1 m from a reflective and approximately 1.5 m above the ground level.

4 Measurement results

4.1 Observations

The dominant noise sources observed at the site during the survey consisted of road traffic on Princess Street and Harter Street.

Less significant noise sources included road traffic on Portland Street, distant plant and pedestrians passing by.

4.2 Attended measurement results

4.2.1 Daytime attended measurements results

The sound pressure levels recorded during the attended measurements are summarised in Table 1, along with the dominant noise sources noted during the measurements All the attended measurements were performed over 15 minute periods.

Table 1 Sound pressure levels from attended measurements (Daytime)

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,15min}$	$L_{AFmax,15min}$	$L_{A90,15min}$	
1	13:28	63	78	58	Distant road traffic on Princess Street, pedestrians passing by talking, constant distant plant, truck reverse beeping and slamming door.
	14:17	68	91	59	Distant road traffic on Princess Street, cars passing by pedestrians passing by talking, constant distant plant, distant scaffolding and building works.
	19:00	62	84	56	Distant road traffic on Princess Street, pedestrians passing by talking, distant constant plant.
	19:48	62	76	57	
2	13:44	68	83	60	Road traffic on Princess Street, distant road traffic along Portland Street, pedestrians passing by talking.
	14:32	67	83	60	
	19:16	70	89	62	Road traffic on Princess Street, distant road traffic along Portland Street, pedestrians passing by talking, roller shutter, distant car slamming door.
	20:04	68	85	60	
3	14:01	67	77	66	Distant road traffic along Princess Street, constant plant along courtyard (condenser, extract units), building works, drops in rubbish bin
	14:48	67	80	66	
	19:32	63	74	63	Distant road traffic along Princess Street, constant plant along courtyard (as above).
	20:22	63	75	62	

4.2.2 Night-time attended measurements

The sound pressure levels recorded during the attended measurements are summarised in Table 2, along with the dominant noise sources noted during the measurements All the attended measurements were performed over 15 minute periods.

Table 2 Sound pressure levels from attended measurements (Night-time)

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,15min}$	$L_{AFmax,15min}$	$L_{A90,15min}$	
1	23:51	61	76	58	Distant road traffic on Princess Street, cars passing by, constant distant plant, distant siren
	00:48	61	76	57	
2	00:16	68	91	59	Road traffic on Princess Street, distant road traffic along Portland Street, pedestrians passing by talking, siren (L_{AFmax} 91 dB).
	01:04	65	79	59	
3	00:31	51	66	47	Distant road traffic on Princess Street, distant constant plant
	01:21	52	66	47	

As attended measurements have been carried out rather than unattended noise logging over a period of a number of days there are a limited number of background sound measurements.

As such it would not be appropriate to carry out statistical analysis to determine the representative background noise level. The minimum background sound levels measured has been therefore been used as the representative background sound level.

The representative background noise levels measured during the survey are given in Table 3

Table 3 Representative measured background levels measured

Location	Time of day	Representative background noise level ($L_{A90,15min}$ dB)
South	Daytime (07:00-23:00)	56
	Night-time (23:00-07:00)	57
North-east	Daytime (07:00-23:00)	60
	Night-time (23:00-07:00)	59
North (Courtyard)	Daytime (07:00-23:00)	62
	Night-time (23:00-07:00)	47

5 Building services noise egress

5.1 Standard guidance

Guidance for noise emission from proposed new items of building services plant is given in BS 4142: 2014 '*Methods for rating and assessing industrial and commercial sound*'.

BS 4142 provides a method for assessing noise from items such as building services plant against the existing background sound levels at the nearest noise sensitive.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background level, it is an indication of having a low impact.

If the noise contains 'attention catching features' such as tones, bangs etc, a penalty, based on the type and impact of those features, is applied.

5.2 Local Authority criteria

5.2.1 Plant noise egress

Manchester City Council (MCC) provides guidance in relation to plant noise emissions in *Planning and Noise Technical Guidance* document dated December 2015 states the following in relation to plant noise egress:

'The development should be designed so as to achieve a rating level of 5 dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.'

Corrections for tonal or attention catching characteristics would need to be applied to the rating level in accordance with BS4142: 2014.

Planning condition 10 for application number 11 6550/FO/2017 states the following:

> '*Before first occupation of the development the building, together with all externally mounted ancillary equipment, shall be acoustically insulated in accordance with a scheme submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the equipment. The scheme shall be implemented in full before first occupation of the building.*
>
> *Reason- To safeguard the amenities of the occupier of nearby residential accommodation, pursuant to policies SP1 and DM1 of the Core Strategy and saved policy DC26 of the Unitary Development Plan*.'

5.2.2 Amplified sound egress via building envelope

Planning condition 9 states the following:

> *'Before the A3, A4 and D2 uses hereby approved commence, the premises shall be acoustically insulated and treated to limit the breakout of noise in accordance with a noise study of the premises and a scheme of acoustic treatment that has been submitted to and approved in writing by the City Council as local planning Authority. The scheme shall be implemented in full before the uses commence.'*

'Reason – To safeguard the amenities of the occupiers of the building and occupiers of nearby properties, pursuant to policies SP1 and DM1 of the Core Strategy and saved policy DC26 of Unitary Development Plan.

MCC *Planning and Noise Technical Guidance* document dated December 2015 stipulates the following in relation to amplified music associated with a new development:

> '*Entertainment noise (L_{Aeq}) should be controlled to 10 dB below the background noise level (L_{A90}) without the entertainment noise present, in each octave band at the nearest noise sensitive location.'*

There are no A3, A4 and D2 uses proposed within this development.

5.2.3 Amplified sound transfer from gym to office

MCC requires an assessment of noise transfer through the building. If the upper levels of the development are to be offices (and not residential) there are no specific criteria. However, in relation to amplified sound transfer to residential premises MCC states the following:

> *'Music noise levels in the 63Hz and 125Hz octave centre frequency bands (L_{eq}) should be controlled so as not to exceed (in habitable rooms) 47 dB and 41 dB (L_{eq}), respectively'.*

6 Plant noise egress

6.1 Basic limits

Based on the above criteria and the measurement results, the cumulative noise level resulting from the operation of all new plant at 1 m from the worst affected windows of the nearest noise sensitive premises should not exceed the limits set out in Table 4.

Table 4 Plant noise limits at 1 m from the nearest noise sensitive premises

Location	Time of day	Maximum sound pressure level at 1 m from noise sensitive premises ($L_{Aeq,15min}$ dB)
South	Daytime (07:00-23:00)	51
	Night-time (23:00-07:00)	52
North-east	Daytime (07:00-23:00)	55
	Night-time (23:00-07:00)	54
North (Courtyard)	Daytime (07:00-23:00)	57
	Night-time (23:00-07:00)	42

The limits set out in Table 4 do not include any attention catching features. The penalties for attention catching features may be significant, and will need to be considered as the building services design progresses. This is discussed further in Section 6.1.1.

The corresponding octave band levels are provided in Table 5.

Table 5 Representative measured background sound levels in octave bands

		Representative measured background noise levels (dB) at each octave band centre frequency (Hz)						
Location	Time of day	63	125	250	500	1k	2k	4k
South	Daytime (07:00-23:00)	65	63	59	54	53	48	39
	Night-time (23:00-07:00)	64	65	59	54	51	47	38
North-east	Daytime (07:00-23:00)	69	67	60	56	54	49	42
	Night-time (23:00-07:00)	66	67	58	56	54	48	39
North Courtyard	Daytime (07:00-23:00)	67	67	60	60	57	52	42
	Night-time (23:00-07:00	55	52	46	44	41	37	29

6.1.1 Attention catching features

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), the plant should be designed to achieve a limit below those set out above, based on the type and impact of the features.

If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible

Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor:

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible

For noise which is equally both impulsive and tonal, then both features can be taken into account by linearly summing the corrections for both characteristics.

If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

If a subjective assessment is not appropriate then an objective assessment can be made. A noise source is deemed to be tonal if the time averaged sound pressure level in a one-third octave band exceeds the level in adjacent one-third octave bands by the level differences given below:

- 15 dB in the low frequency one-third octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency one-third octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency one-third octave bands (500 Hz to 10000 Hz)

If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.

6.2 Plant noise assessment

6.2.1 Proposed plant

The proposed development consists of a mixed use building with a basement gym and office accommodation on all other floors. As part of the works, new building services plant is proposed to be installed at roof level and in the rear courtyard of the building

The proposed landlord plant selections have been provided which are given below:

- Four Samsung AM080JXVHGR/ET, highlighted in red in Figure 2
- Four Samsung AM0100JXVHGR/ET, highlighted in blue in Figure 2
- Five Samsung AM0120JXVHGR/ET, highlighted in green in Figure 2
- Five Samsung AM0180JXVHGR/ET, highlighted in light blue in Figure 2
- One Nuaire EST20H toilet extract fan highlighted in yellow in Figure 2
- One FlaktGroup Air Handling Unit eQ (ACON-02447752), highlighted in purple in Figure 2.

It is understood that spatial allowances tenant plant items have also been allowed for in the fifth-floor plant room, these are given below:

- Four outdoor condenser units, highlighted in orange in Figure 2.
- One generator unit, highlighted in dark green in Figure 2.

A tenant boiler flue termination is also proposed at rooftop level. The location of the proposed flue atmosphere termination at roof top level is highlighted in pink in Figure 2

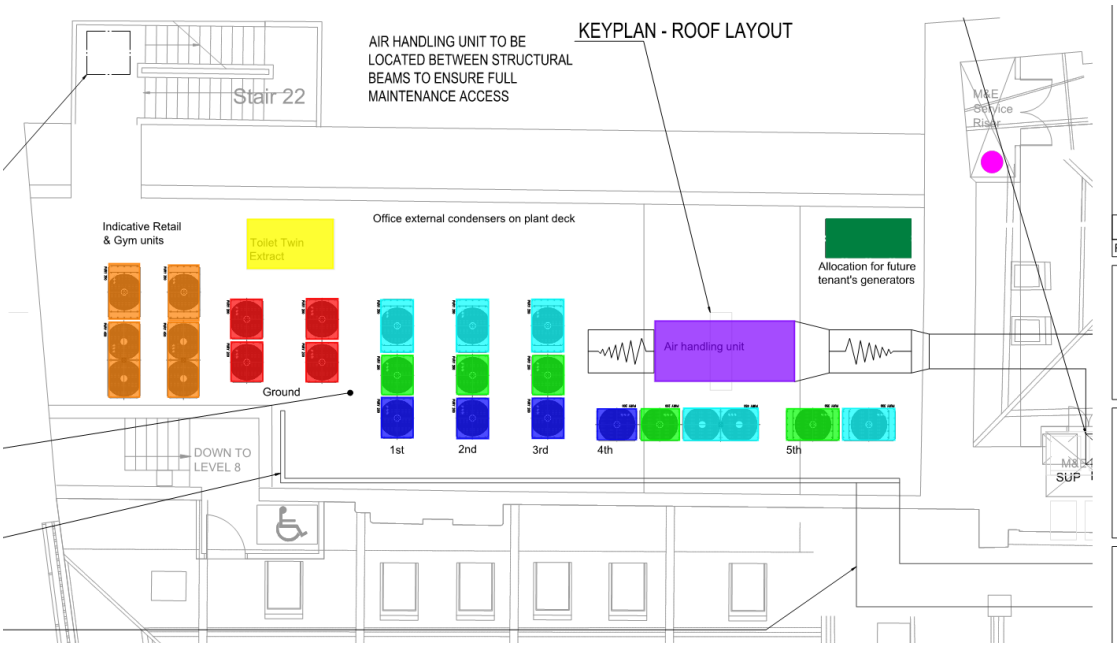

Figure 2 Proposed ground level plant item locations

The plant units are proposed to be installed within a semi-enclosed room. To the west, the plantroom is proposed to be fully screened from the nearby noise sensitive premises by a pitched slate roof. The slate roof cladding is assumed to be well-sealed with a minimum surface mass of 15 kg/m^2. To the east, a louvre is proposed to the plant area. The proposed arrangement is shown in Figure 3.

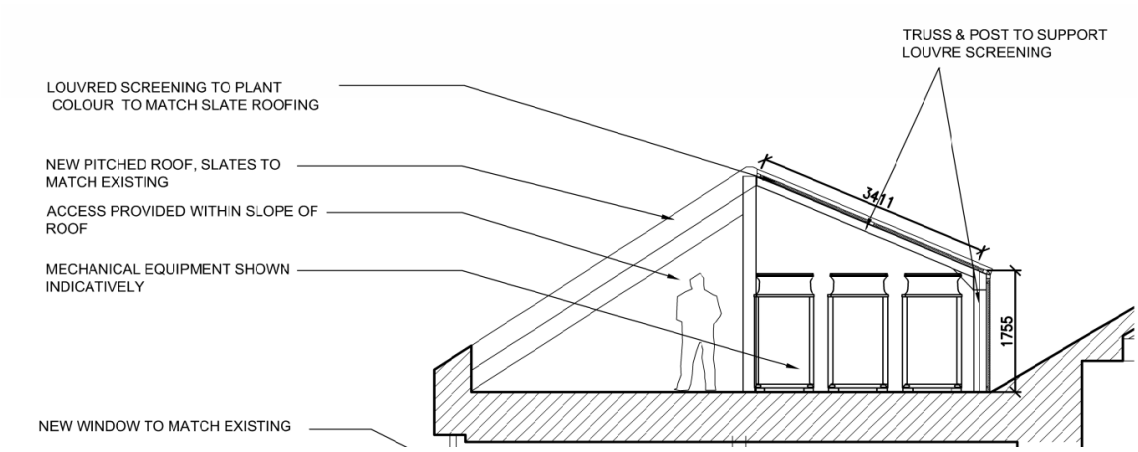

Figure 3 Proposed rooftop plant area - section

Table 6 and Table 7 present the noise data received for the condenser units listed above.

Table 6 Manufacturer's sound power levels for the proposed outdoor condenser units

	Sound pressure levels, at 1m (dB) Octave band centre frequency (Hz)						
Plant item	63	125	250	500	1k	2k	4k
AM080JXVHGR/ET	68	61	60	55	46	44	42
AM0100JXVHGR/ET	73	63	60	57	48	45	40
AM0120JXVHGR/ET	73	67	64	62	53	48	41
AM0180JXVHGR/ET	87	80	77	74	70	66	60

The noise data received for the proposed AHU units are provided Table 7.

Table 7 Manufacturer sound power levels for the proposed AHU and toilet extract fan

	Sound power levels, L_w(dB) Octave band centre frequency (Hz)						
Plant item	63	125	250	500	1k	2k	4k
AHU							
In-duct intake	67	68	79	70	64	63	59
In-duct extract	67	68	81	72	63	62	58
Break-out	64	62	70	55	51	51	47
Toilet Extract							
In-duct outlet	87	80	77	74	70	66	60

At this stage there is no detailed information in relation to the proposed items of plants proposed for the tenant, therefore overall limits have been set for this plant outside each of the nearby noise sensitive receptors.

6.2.2 Predicted plant noise rating levels

Calculations have been carried out to determine the noise rating levels from the proposed plant items outside the nearby noise sensitive premises, taking into account the following:

- Attenuation due to distance and screening
- Plant units operate continuously
- The noise egress level outside the receptor does not contain any perceivable tonal or impulsive characteristics
- Reverberant noise build-up in the courtyard
- The location of the plant items and directivity due to reflections from nearby surfaces

- The future tenant plant is designed to achieve overall noise levels at the nearest noise sensitive premises indicated in Table 8.

Table 8 Maximum overall sound pressure level limits for tenant's plant items

Location	Maximum sound pressure level, L_{Aeq} (dB) from tenant plant (limits)	
	Day time (07:00-23:00)	Night time (23:00-07:00)
109 to 113 Portland Street (courtyard)	52	-
103 Portland Street-First floor level (courtyard)	57	32
48 Princess Street	51	51
2 Harter Street	50	50
Townhall hotel (level 6 windows)	54	53

The noise egress levels resulting from the operation of the proposed landlord items of plant have been predicted at the nearest noise sensitive premises, the results are given in Table 9.

Table 9 Predicted noise level from the operation of the proposed items of plant at nearest noise sensitive premises

Location	Predicted sound pressure level, L_{Aeq} (dB)
109 to 113 Portland Street (courtyard)	53
103 Portland Street-First floor level (courtyard)	42
48 Princess Street	38
2 Harter Street	45
Townhall hotel (level 6 windows)	43

On the basis that the plant noise at the receptor contains no attention catching characteristics, the predicted noise egress levels comply with the relevant noise limits during the day time and at night, without further mitigation measures. Taking into account contributions from the proposed tenant plant limits in Table 8, the overall criteria are still expected to be met.

On this basis, it is considered that planning condition 10 can be discharged.

The tenants will need to provide assessments once tenant plant selections are made to satisfy the landlord and/or Local Authority that the relevant limits are met.

7 Amplified sound

7.1 Limits for amplified sound egress

The cumulative noise level resulting from any amplified sound egress from Leisure/gym at 1 m from the most affected windows of the nearest noise sensitive premises should not exceed 10 dB below the existing representative background sound level in octave bands. These limits are set out in Table 10.

Table 10 Octave band amplified sound limits at 1m from the nearest noise sensitive premises

		Maximum sound pressure level at 1m from noise sensitive premises, L_{eq} (dB) octave band centre frequency (Hz)						
Location	Time of day	63	125	250	500	1k	2k	4k
South	Daytime (07:00-23:00)	55	53	49	44	43	38	29
	Night-time (23:00-07:00)	54	55	49	44	41	37	28
North-east	Daytime (07:00-23:00)	59	57	50	46	44	39	32
	Night-time (23:00-07:00)	56	57	48	46	44	38	29
North Courtyard	Daytime (07:00-23:00)	57	57	50	50	47	42	32
	Night-time (23:00-07:00	45	42	36	34	31	27	19

7.2 Guidance on amplified sound limits within leisure/gym

The existing windows within the development are single glazed within timber frames. Basement windows along Princess Street and Harter Street are to be replaced with 6.8/12/6 laminate glazing as a minimum. This glazing configuration typically has a sound insulation performance of at least R_w +C_{tr} 33 dB. All other basement windows are to be retained.

The ground floor Gym entrance (Princess Street) consists of standard thermal double glazing. The corner entrance to the office space (unit 2) is also to be replaced and will also consists of standard thermal double glazing (eg 6 mm glass/12 mm airgap/6 mm glass). This glazing configuration typically has a sound insulation performance of at least R_w +C_{tr} 28 dB. Some ground floors windows which were previously blocked up are to be reinstated.

The non-glazed elements of the facade consist of solid masonry which is at least 200 mm thick. This is capable of providing a sound insulation performance of at least R_w +C_{tr} 50 dB.

Any un-lobbied door entrance doors to units with amplified sound should provide a minimum sound insulation performance of R_w+C_{tr} 28 dB. However, Manchester City Council may require lobbied doors to be installed to these locations if amplified sound is proposed. These could be provided as part of the tenant fit-out.

Based on the above and the criteria given in Section 5.2.3 and the limits for amplified sound egress, initial guidance on internal amplified sound limits are provided below in Table 11.

Table 11 Maximum internal amplified sound limits for Leisure/Gym

	Maximum sound pressure level, L_{eq} (dB) per octave-band centre frequency (Hz)						
Location	63	125	250	500	1000	2000	4000
Gym (Courtyard- Princess Street side)	74	80	90	90	90	88	84
Gym studio basement (Harter Street side)	79	85	88	85	87	78	74

It should be noted that depending on the internal sound insulation strategy, the internal limits provided also need to be adapted to control internal noise transfer, to ensure the limits given in Section 7.1also met.

It should be noted that if higher levels of amplified sound were to be proposed by a future tenant, enhancements to the facade would be needed in order to adhere to the limits set. Examples of such enhancements include:

- Acoustic door lobbies be provided
- Increasing the sound insulation performance of the glazing
- Increasing the sound insulation performance of the entrance doorways.

In addition, this may require additional enhancements to control internal transfer to the offices above. Such works would include:

- Installation of sound insulating ceiling
- Acoustically rated door lobbies
- Enhancements to the façade such as enhanced/ secondary glazing and dry lining
- Installation of independent lining to any common structural elements such as columns and/or flanking walls.

For the gym, vibration transfer in the building will also need to be controlled to ensure that appropriate criteria are met in the office areas.

These will need to be considered as the design progresses based on the sound insulation performance of the internal floors and partitions.

8 Conclusion

A noise survey has been carried out to determine the existing background sound levels in the vicinity of the site and surrounding noise sensitive premises.

To the north-east, the representative background sound levels measured during the survey were $L_{A90,15min}$ 60 dB during the daytime and $L_{A90,15min}$ 59 dB at night. To the north-west, the representative background sound levels measured during the survey were $L_{A90,15min}$ 56 dB during the daytime and $L_{A90,15min}$ 57 dB at night. To the south, the representative background sound levels measured during the survey were $L_{A90,15min}$ 62 dB during the daytime and $L_{A90,15min}$ 47 dB at night.

Based on the requirements of Manchester City Council and on the results of the noise survey, all plant must be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises is to be at least 5 dB below the typical background noise levels measured.

These limits are cumulative, and apply with all plant operating under normal conditions. If plant items contain tonal or attention catching features, the limits will be more stringent than those set out above. If plant items contain tonal or attention catching features, a penalty based on the type and impact of those features indicated in Section 6.1.1 will be applied, and the limits will be more stringent than those set out above.

An assessment of the proposed plant items associated with the development has been carried out. The predicted noise egress levels are expected to comply with the relevant noise limits during the day time and at night at the nearest noise sensitive premises without further mitigation measures. On this basis, it is considered that planning condition 10 can be discharged.

The tenants will need to provide assessments once tenant plant selections are made to satisfy the landlord and/or Local Authority that the relevant limits are met.

Initial guidance on amplified sound egress from Gym units at basement level has been provided based on achieving limits in line with the requirements of Manchester city council.

Appendix A

Survey details

Equipment

A Rion NL-52 sound level meter was used to undertake the attended measurements. The calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	NL-52/01143564	Rion	21 Dec 18	1612654
Microphone	UC-59/10153	Rion	21 Dec 18	1612654
Pre-amp	NH-25/43581	Rion	21 Dec 18	1612654
Calibrator	NC-74/34257023	Rion	19 Dec 18	1612649

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

The sound level meters and microphones were calibrated at the beginning and end of the measurements using their respective sound level calibrators. No significant deviation in calibration occurred.

Noise indices

The equipment was set to record a continuous series of broadband sound pressure levels. Noise indices recorded included the following:

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

The L_{A90} is considered most representative of the background sound level for the purposes of complying with any local authority requirements.

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

A more detailed explanation of these quantities can be found in BS7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures.*

Weather conditions

During the attended measurements carried out between 2 May 2017 and 3 May 2017, the weather was clear and dry and no rain occurred. Wind speeds varied between approximately 0 m/s and 3 m/s.

These weather conditions are considered suitable for obtaining representative measurements.