Acoustic assessment of proposed new mechanical services equipment

102 Market Street, Manchester M1 1PB

Client: Spiritus Technical Services

Report Reference: 251205-R001A

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-	19/12/2025	Rob Cant MIOA MIEnvSc	Tommy Burn BSc (Hons) MIOA
A	03/03/2025	Rob Cant MIOA MIEnvSc	Tommy Burn BSc (Hons) MIOA

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0. SUMMARY

0.1. ACA Acoustics Limited has been commissioned to assess the acoustic impact of proposed new mechanical services equipment associated with a new Wasabi store to be installed at 102 Market Street, Manchester.

0.2. The assessment is required to provide evidence that noise emissions from the equipment will not be detrimental to the amenity of nearby noise-sensitive properties and complies with the Local Authority's requirements.

0.3. A survey has been carried out in the vicinity to establish existing background sound levels. Based on Manchester City Council's requirements, noise from the new plant should be assessed in accordance with BS 4142:2014+A1:2019. Manchester City Council require the rating level of the new plant to be at least 5dB below the background levels at the most noise-sensitive receptor.

0.4. Table 1 below summarises the assessment details of the plant to the most noise-sensitive receptor (NSR).

Ref	Description	Background Level, LA90	Calculated Rating Level, LAr	Excess of Rating Level Over Background Sound Level
NSR1	Top floor windows of The Shakespeare public house, around 23m from the louvre location.	49dB	41dB	-8dB

Table 1: Summary of Assessment

0.5. With the implementation of the recommended mitigation scheme outlined in this report, noise from the proposed equipment will not be disturbing or detrimental to the amenity of the most sensitive noise-sensitive receptor and complies with the planning requirements of Manchester City Council.

1. INTRODUCTION

New mechanical services equipment associated with a new Wasabi store is to be installed at 102 Market Street, Manchester.

ACA Acoustics Limited has been commissioned by Spiritus Technical Services to carry out an assessment of noise emissions from the proposed mechanical plant and, where necessary, to make recommendations for a mitigation scheme to ensure that the amenity of nearby noise-sensitive properties is not compromised.

This report presents results of the sound level survey, computer modelling, and assessment.

2. ACOUSTIC CRITERIA

BS 4142:2014+A1:2019 is commonly used to assess the potential for loss of amenity due to noise from mechanical services equipment and is considered appropriate for this application.

The scope of BS 4142:2014+A1:2019 advises that "*this British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature … to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident*".

The assessment method of BS 4142:2014+A1:2019 corrects the specific sound level from the source under investigation to account for characteristics that could make the sound more obtrusive to obtain a rating level. This rating level is compared against the prevailing background noise outside the noise-sensitive property. Section 11 provides a commentary of the assessment result and advises that:

a) Typically the greater this difference [between the rating level and background sound level]*, the greater the magnitude of the impact;*
b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context;
d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

Based on previous development within the city, it is understood that Manchester City Council's requirement is that noise from the new equipment shall be assessed in accordance with

BS 4142:2014+A1:2019, with the rating level to be at least 5dB below the prevailing background level at 1m outside windows of the nearest affected noise-sensitive properties.

Manchester City Council's criteria is more stringent than required by the Standard and will ensure there is no adverse impacts on nearby occupants.

3. REVIEW OF SITE LOCATION

The site is located in Manchester city centre, at the junction of Market Street and Fountain Street. The immediate vicinity of the site is primarily to commercial properties, however it appears that the top floor of The Shakespeare public house is residential use and The Brewdog Doghouse hotel is just beyond that on Fountain Street.

New supply and extract fans are to be installed internally within the building, ducted to louvres on the Fountain Street façade, as detailed on Spiritus drawing STS-1378M01.

The most affected noise sensitive receptor (NSR) is discussed in Table 2 below.

Receptor	Description
NSR1	Top floor windows of The Shakespeare public house, around 23m from the louvre location.

Table 2: Noise sensitive receptor details

Other receptor locations in the vicinity have also been considered and may be affected by the proposed plant, however the receptor location used in the assessment is the most sensitive – sound levels at other positions will be lower.

A marked-up aerial image is included in Figure 1, identifying the location of the proposed equipment and sound level survey measurement positions.

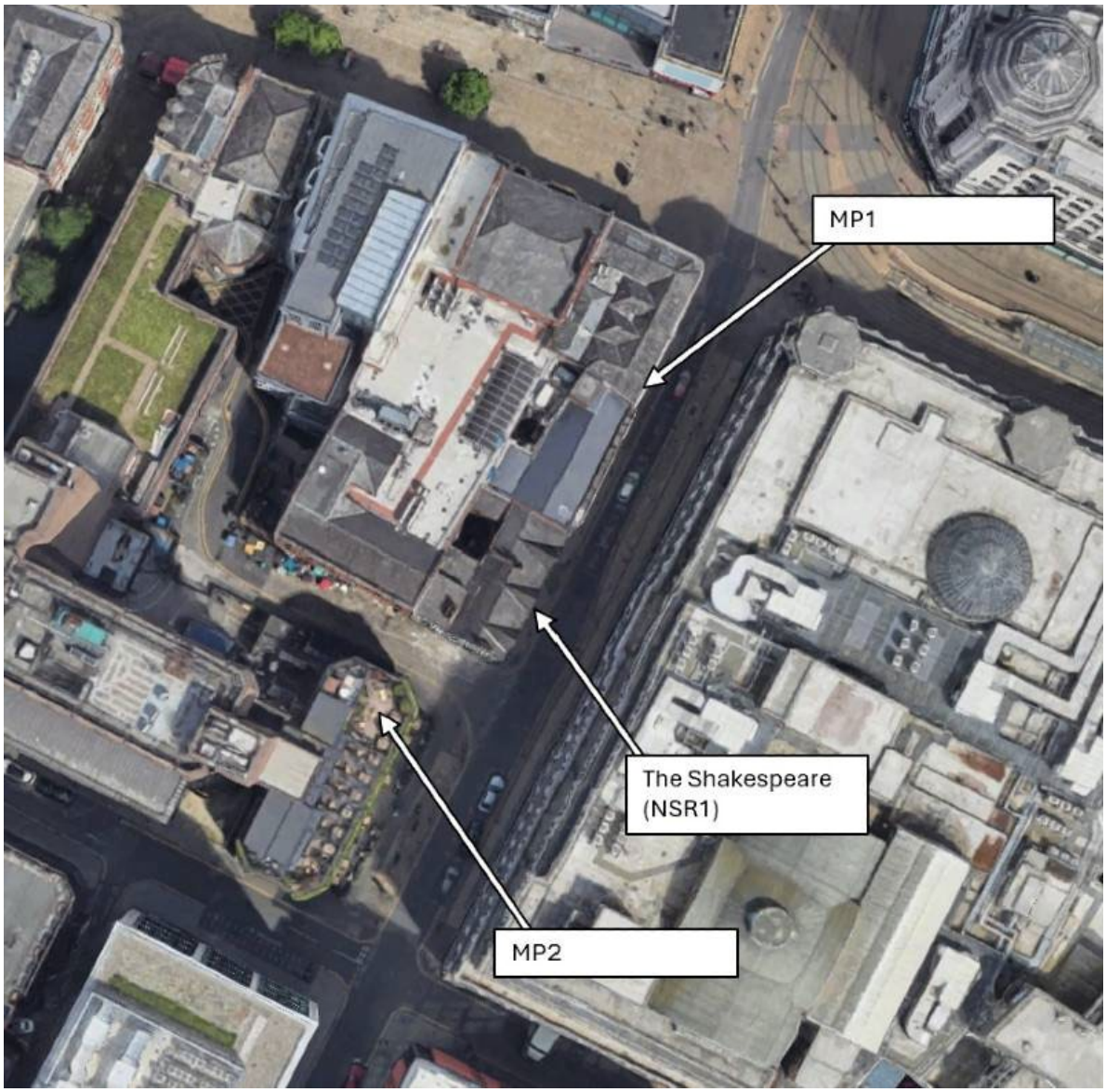


Figure 1: Equipment location, measurement position, and closest receptor (available at google.com/maps)

The client would like the capacity for the plant to operate at any time over a full 24-hour period.

4. SOUND LEVEL SURVEY

To assess sound levels from the new mechanical equipment, it is necessary to establish representative background sound levels in the vicinity during the proposed plant operating times.

A background sound level survey was carried out via an unattended survey at the MP1 position indicated in Figure 1.

The survey was set up by Rob Cant of ACA Acoustics and conducted between the 10/12/2025 and 11/12/2025.

During the survey, the soundscape in the vicinity was influenced predominantly by high volume traffic and pedestrian activity, trams on Fountain Street, and existing third-party mechanical plant.

Following analysis of the survey results, it was identified that this existing third-party mechanical plant operated continuously overnight.

A background sound level survey had previously been conducted by ACA Acoustics for another development, with the sound levels measured on the roof of The Brewdog Doghouse hotel, close to the nearest receptors. This survey was conducted between 13th and 14th February 2020. Although the previous survey was conducted a number of years ago, the shape of the measurement results is very similar to that recently measured, but just with a lower level overnight. This indicates that the dominant source of noise in the vicinity remains the same – third party mechanical plant – but that the position at MP2 is further removed from the plant. As such, results of that previous survey have been used to determine the representative background sound level at the nearest receptors for use in this assessment.

The following equipment was used during the surveys. An on-site calibration check was conducted on the sound level meters prior to the survey and repeated after with no deviation noted.

Equipment	**Serial Number**
MP1 NTi Audio Class 1 sound level meter type XL2 complete with weatherproof and lockable outdoor environmental kit	A2A-06294-E0
Svantek calibrator type SV33B. Compliant to IEC 60942:2003	83826
MP2 Svantek Class 1 sound level meter type SVAN971A, complete with MOLES weatherproof and lockable outdoor environmental kit	121131
Svantek calibrator type SV33B. Compliant to IEC 60942:2003	122245

Table 3: Equipment used for the sound level survey

Weather conditions at the time of setting up the 2025 survey consisted of 100% cloud cover, 14km/h northerly breeze, a temperature of around 10°C and light drizzle.

At the start of the survey there was light drizzle. The damp ground conditions may have increased tyre noise slightly at this time, however the rain ceased around an hour after the survey was set up and background sound levels measured through the remainder of the survey, including the most

important late evening and early morning periods will not have been affected. Meteorological conditions are not considered to have adversely impacted the outcome of the assessment.

Results of the survey at the MP1 position are shown in graphical form in Figure 2 below.

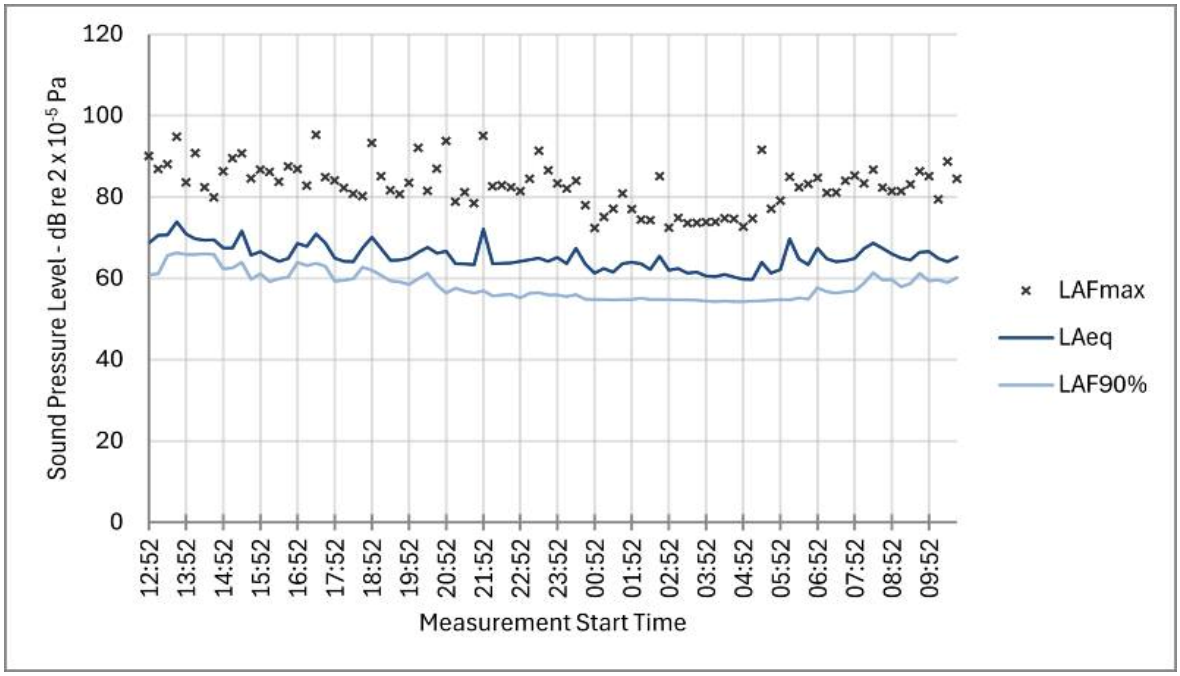


Figure 2: Sound level survey results MP1 – 10/12/2025 to 11/12/2025

In accordance with the methodology set out in BS 4142:2014+A1:2019, the background sound level is not necessarily the lowest recorded value. Instead, the background sound level should be a level which is representative of the underlying soundscape at the receptor location.

A statistical analysis of the measured LA90 results during the most sensitive night-time period is shown below, following guidance set out in the Standard.

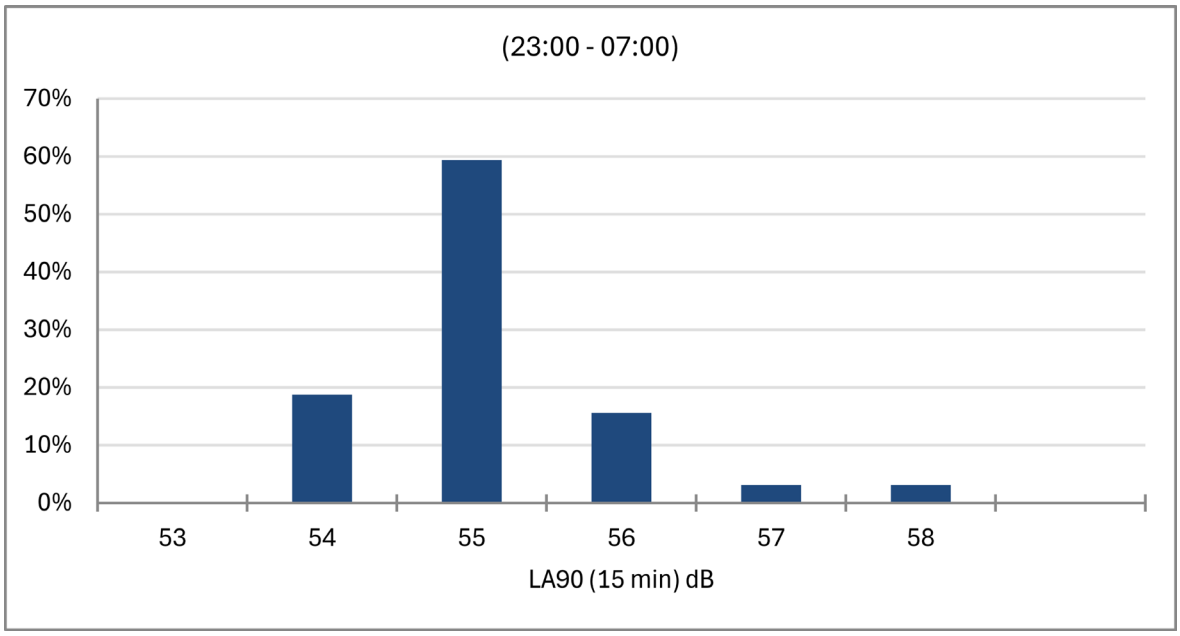


Figure 3: Statistical analysis of measured LA90 sound levels – MP1

Results of the survey at the MP2 position in 2020 are shown in graphical form in Figure 4 below.

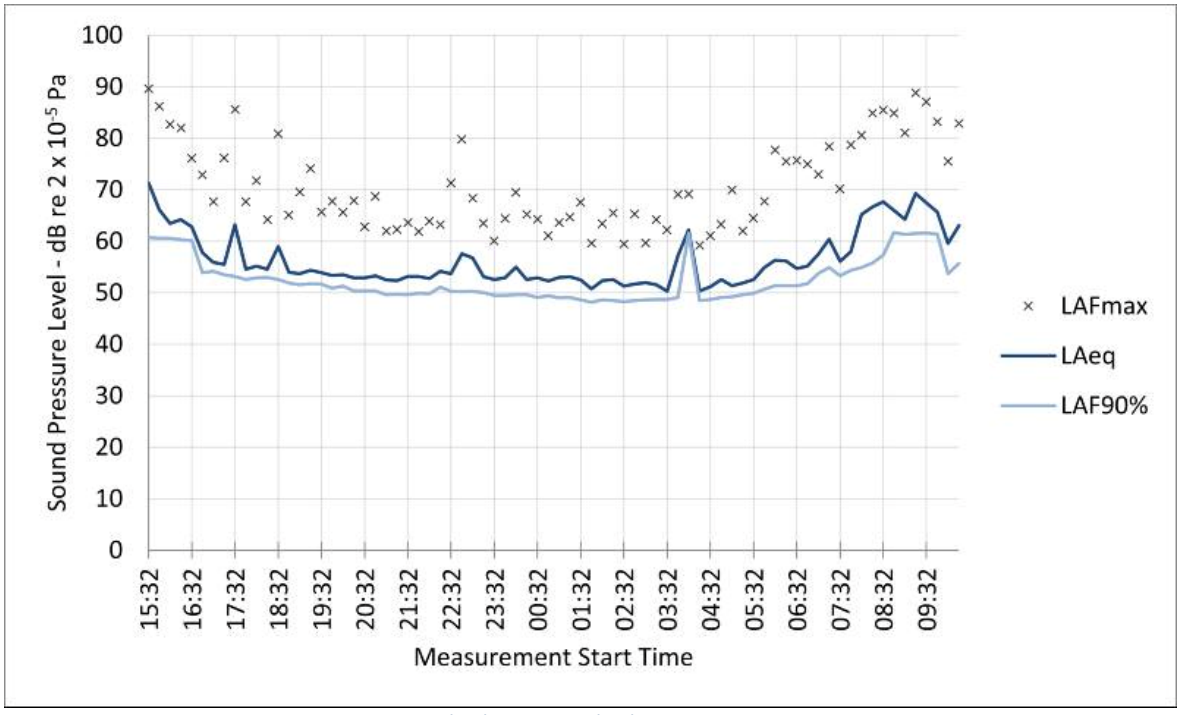


Figure 4: Sound level survey results MP2 – 13/02/2020 to 14/02/2020

A statistical analysis of the measured LA90 results at MP2 during the night-time period is shown below, following guidance set out in the Standard.

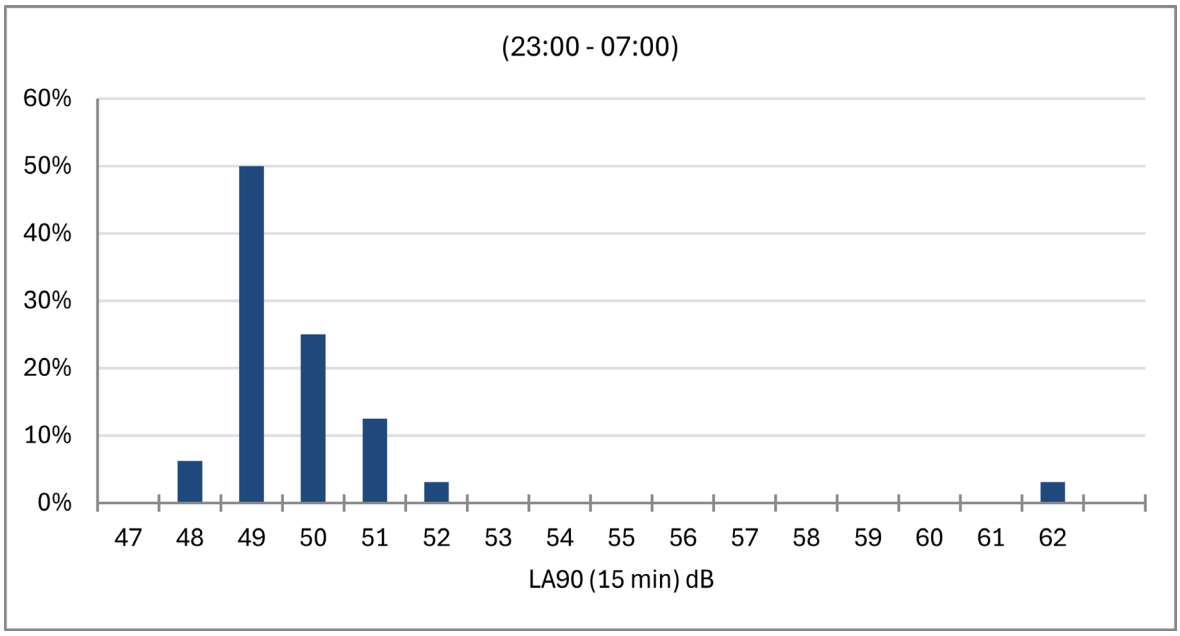


Figure 5: Statistical analysis of measured LA90 sound levels – MP2

Comparison of the survey results identifies a similar shape of the results graphs, but that measurements at position MP2 are around 6dB lower.

Summary results of the survey are provided in Table 4 below.

Receptor	Period	Background Sound Level During Operating Period LA90
NSR1	06:00 to 00:00	49dB

Table 4: Summary sound level survey results

5. ACOUSTIC ASSESSMENT

Confirmation of the equipment models used in the assessment is provided in Table 5 below.

Description	Equipment Model	Airflow (m3/s)	Sound Level (LwA)	Quantity
EF1 Exhaust	Systemair MUB 062 500EC	1.31	75dB	1
SF1 Inlet	Systemair MUB 042 500EC	0.96	76dB	1
HE1 Inlet	Daikin RDXYQ8T	1.20	81dB	1
HE2 Inlet	Daikin RDXY5QT	0.91	76dB	1
TF1 Exhaust	Systemair PRIO S 100	0.02	54dB	1

Table 5: Proposed new mechanical equipment used in the assessment

A computer model has been used to calculate the noise contribution from the proposed plant to outside nearest noise-sensitive windows, using manufacturer's published sound data for the proposed new plant. Ductwork system losses have been calculated in accordance with CIBSE Guide B4 *Noise and vibration control for HVAC*. Environmental corrections have been calculated in accordance with ISO 9613-2.

The assessment has been undertaken using drawing reference "*STS-1378M01",* as provided by the client.

Mitigation recommendations outlined in Section 6 of this report are included in the computer model.

The cumulative calculated specific sound level to outside the most sensitive receptor with all equipment operating is shown in Table 6 below. Summary printouts from the calculation models are included in Appendix A.

Receptor Location	Calculated Specific Sound Level
NSR1	41dBA

Table 6: Calculated cumulative equipment sound levels at 1m outside noise-sensitive windows

Assessment of the calculated rating level to NSR1 for the cumulative impact of all equipment, in accordance with BS 4142:2014+A1:2019, is provided in Table 7 below.

Description	NSR1 Receptor	Relevant Clause	Commentary
Calculated specific sound level to receptor	LAeq 41dB	7.1 7.3.6	New equipment operating. Refer to calculation sheets in Appendix A.
Background sound level	LA90 49dB	8.1.3 8.3	Measured representative background sound level.
Acoustic feature correction	0dB	9.2	The calculated specific sound levels do not indicate any distinctive component and the equipment will be significantly below the background and residual sound levels. The existing background sound level overnight is dominated by existing mechanical plant and therefore the new equipment will not be noticeable against the existing soundscape.
Rating level	LAr 41dB	9.2	
Excess of rating level over background sound level	**-8dB**	**11**	**Assessment indicates a low likelihood of adverse impact**

Table 7: Assessment of results in accordance with BS 4142:2014+A1:2019 for all equipment operating

The table above shows the rating level of the proposed new equipment will be at least 5dB below the background LA90 sound level to outside the closest noise-sensitive properties and is therefore compliant with the requirements of Manchester City Council.

BS 4142:2014+A1:2019 requires an assessment to consider the context of the development, rather than simply adhering to numerical values. Considering the calculated numerical value of the specific sound, allowing a reduction through partially open windows of 15dBA, as recommended in BS 8233:2014, the sound levels inside the neighbouring dwellings due to the proposed new equipment will be below the guideline levels for sleeping in bedrooms of LAeq 30dB, set out in BS 8233:2014 and is further confirmation that sound levels from the new mechanical equipment should not be detrimental to the amenity of any noise-sensitive receptors in the vicinity.

Finally, the proposals involve new items of mechanical equipment being introduced to an area with other commercial and retail uses in the vicinity. In this scenario, the change in acoustic character,

and subsequent potential for loss of amenity, is lower than if, say, there were no other similar businesses in the area.

The author considers that the context of the assessment does not alter the initial estimate of the impact, and that sound levels from the new mechanical equipment should not be detrimental to the amenity of any residential occupiers in the vicinity.

6. ACOUSTIC MITIGATION TREATMENTS

As discussed in Section 5, noise control treatments have been included in the calculation model. Acoustic specification for the mitigation scheme is provided below. These have been incorporated into the HVAC design, as detailed on the Spiritus drawing.

6.1. Duct Mounted Attenuators

The calculation model includes benefit of duct-mounted attenuators to the atmospheric side of the kitchen extract fan (EF1) and larger of the heat recovery units (HE1). Schedule of minimum insertion loss performance for the attenuators along with description of typical silencer to comply with the specified performance is provided in a schedule in Appendix B. Dynamic insertion losses are shown in the relevant calculation sheet.

Note that the dimensions and free area shown are nominal and the successful supplier should confirm their own selections to meet the minimum required insertion loss performance.

It is important airflow generated noise from the atmospheric terminal does not increase the cumulative sound level at nearby noise-sensitive properties. Suitable airflow velocity is dependent on the profile of the terminal used and should be verified with the manufacturer accordingly.

6.2. Vibration Isolators

As standard good practice, to control the potential for structure-borne noise and vibration from the mechanical equipment affecting adjoining commercial occupants, it is recommended that the plant is installed on suitable vibration isolators.

7. CONCLUSION

A planning application is to be submitted for the installation of new mechanical plant and equipment associated with a new Wasabi store at 102 Market Street, Manchester.

ACA Acoustics have undertaken an assessment of noise from the proposed equipment using manufacturer's published acoustic data. Calculated rating levels for the plant will be at least 5dB below the background sound level during proposed operating times of the equipment when assessed at 1m from the closest noise-sensitive receptor.

The author considers that allowing for the proposed mitigation scheme in this report, the proposed equipment achieves the Local Authority's planning requirements for this development and will not be detrimental to the amenity of nearby noise-sensitive occupants.

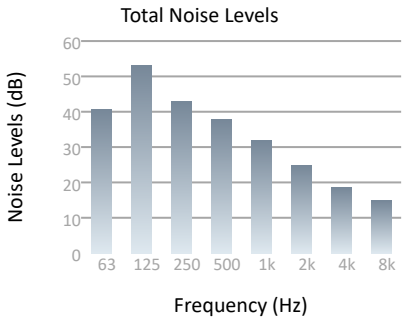
Appendix A

Acoustic Calculations

ACA acoustics

Wasabi, Market Street, Manchester

Project Name	Wasabi, Market Street, Manchester
Project Reference	251205
Reference	The Shakespeare
Description	
Noise Limit	43
dBA	41



Calculated Lp at Receptor

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
EF1 - Exhaust	1	29	32	14	3	-6	-3	-2	-2
SF1 - Inlet	1	39	53	37	33	28	20	16	9
HE1 - Inlet	1	33	33	36	26	13	13	5	4
HE2 - Inlet	1	27	41	40	36	29	22	15	13
TF1 - Exhaust	1	17	22	21	11	3	-1	-9	-15

ACA Acoustics Limited
Head Office: 12 Sheep Street, Highworth, Wiltshire, SN6 7AA Tel: 01793 766 324
London Office: 3 Shortlands, Hammersmith, London, W6 8DA Tel: 0203 609 8733
Manchester Office: Colony, 5 Piccadilly Place, Manchester, M1 3BR Tel: 0161 327 1681
w: www.aca-acoustics.co.uk

Calculation Sheet

EF1 - Exhaust to The Shakespeare

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - EF1 - Exhaust								
Sound Power Levels	**74.0**	**82.0**	**71.0**	**72.0**	**71.0**	**66.0**	**61.0**	**57.0**
Silencer								
	-9.0	*-15.0*	*-20.0*	*-28.7*	*-33.9*	*-24.7*	*-17.8*	*-12.0*
End Reflection & Directional Directivity	*-6.5*	*-6.0*	*-7.8*	*-10.7*	*-14.0*	*-15.0*	*-15.0*	*-15.0*
Dc - Reflections & Directivity								
	6.0	*6.0*	*6.0*	*6.0*	*6.0*	*6.0*	*6.0*	*6.0*
Adiv - Geometrical Divergance								
	-38.4	*-38.4*	*-38.4*	*-38.4*	*-38.4*	*-38.4*	*-38.4*	*-38.4*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	*-0.8*	*-2.7*
Agr - Ground Attenuation								
	3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Abar - Barrier Attenuation								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
External Receiver								
External Receiver - The Shakespeare								
Sound Pressure, Lp:	**29.1**	**31.6**	**13.8**	**3.2**	**-6.4**	**-3.3**	**-2.0**	**-2.1**

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Head Office: 12 Sheep Street, Highworth, Wiltshire, SN6 7AA Tel: 01793 766 324
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Manchester Office: Colony, 5 Piccadilly Place, Manchester, M1 3BR Tel: 0161 327 1681
w: www.aca-acoustics.co.uk

Calculation Sheet

SF1 - Inlet to The Shakespeare

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - SF1 - Inlet								
Sound Power Levels	**76.0**	**88.0**	**73.0**	**72.0**	**70.0**	**65.0**	**61.0**	**56.0**
Silencer								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
End Reflection & Directional Directivity	*-7.4*	*-5.9*	*-6.9*	*-9.5*	*-12.7*	*-15.0*	*-15.0*	*-15.0*
Dc - Reflections & Directivity								
	6.0	*6.0*	*6.0*	*6.0*	*6.0*	*6.0*	*6.0*	*6.0*
Adiv - Geometrical Divergance								
	-38.4	*-38.4*	*-38.4*	*-38.4*	*-38.4*	*-38.4*	*-38.4*	*-38.4*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	*-0.8*	*-2.7*
Agr - Ground Attenuation								
	3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Abar - Barrier Attenuation								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
External Receiver								
External Receiver - The Shakespeare								
Sound Pressure, Lp:	**39.2**	**52.7**	**36.7**	**33.0**	**27.8**	**20.4**	**15.9**	**8.9**

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Calculation Sheet

HE1 - Inlet to The Shakespeare

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - HE1 - Inlet								
Sound Power Levels	**73.0**	**73.0**	**82.0**	**79.0**	**74.0**	**73.0**	**63.0**	**59.0**
Silencer								
	-3.0	*-5.0*	*-10.0*	*-15.0*	*-19.8*	*-14.9*	*-12.7*	*-8.0*
End Reflection & Directional Directivity	*-8.1*	*-6.0*	*-6.6*	*-9.0*	*-12.1*	*-15.0*	*-15.0*	*-15.0*
Dc - Reflections & Directivity								
	6.0	*6.0*	*6.0*	*6.0*	*6.0*	*6.0*	*6.0*	*6.0*
Adiv - Geometrical Divergance								
	-38.4	*-38.4*	*-38.4*	*-38.4*	*-38.4*	*-38.4*	*-38.4*	*-38.4*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	*-0.8*	*-2.7*
Agr - Ground Attenuation								
	3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Abar - Barrier Attenuation								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
External Receiver								
External Receiver - The Shakespeare								
Sound Pressure, Lp:	**32.6**	**32.7**	**36.0**	**25.7**	**12.7**	**13.5**	**5.2**	**3.9**

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Head Office: 12 Sheep Street, Highworth, Wiltshire, SN6 7AA Tel: 01793 766 324
London Office: 3 Shortlands, Hammersmith, London, W6 8DA Tel: 0203 609 8733
Manchester Office: Colony, 5 Piccadilly Place, Manchester, M1 3BR Tel: 0161 327 1681
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Calculation Sheet

HE2 - Inlet to The Shakespeare

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - HE2 - Inlet								
Sound Power Levels	**64.0**	**76.0**	**76.0**	**74.0**	**71.0**	**67.0**	**60.0**	**60.0**
Silencer								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
End Reflection & Directional Directivity	*-8.1*	*-6.0*	*-6.6*	*-9.0*	*-12.1*	*-15.0*	*-15.0*	*-15.0*
Dc - Reflections & Directivity								
	6.0	*6.0*	*6.0*	*6.0*	*6.0*	*6.0*	*6.0*	*6.0*
Adiv - Geometrical Divergance								
	-38.4	*-38.4*	*-38.4*	*-38.4*	*-38.4*	*-38.4*	*-38.4*	*-38.4*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	*-0.8*	*-2.7*
Agr - Ground Attenuation								
	3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Abar - Barrier Attenuation								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
External Receiver								
External Receiver - The Shakespeare								
Sound Pressure, Lp:	**26.6**	**40.6**	**40.0**	**35.6**	**29.5**	**22.4**	**14.9**	**12.9**

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London Office: 3 Shortlands, Hammersmith, London, W6 8DA Tel: 0203 609 8733
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Calculation Sheet

TF1 - Exhaust to The Shakespeare

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - TF1 - Exhaust								
Sound Power Levels	**64.0**	**64.0**	**61.0**	**47.0**	**38.0**	**36.0**	**31.0**	**31.0**
Silencer								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
End Reflection & Directional Directivity	*-18.0*	*-12.5*	*-10.4*	*-6.9*	*-5.9*	*-7.4*	*-10.2*	*-13.5*
Dc - Reflections & Directivity								
	6.0	*6.0*	*6.0*	*6.0*	*6.0*	*6.0*	*6.0*	*6.0*
Adiv - Geometrical Divergance								
	-38.4	*-38.4*	*-38.4*	*-38.4*	*-38.4*	*-38.4*	*-38.4*	*-38.4*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	*-0.8*	*-2.7*
Agr - Ground Attenuation								
	3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Abar - Barrier Attenuation								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
External Receiver								
External Receiver - The Shakespeare								
Sound Pressure, Lp:	**16.7**	**22.1**	**21.2**	**10.7**	**2.6**	**-1.0**	**-9.3**	**-14.5**

ACA Acoustics Limited
Head Office: 12 Sheep Street, Highworth, Wiltshire, SN6 7AA Tel: 01793 766 324
London Office: 3 Shortlands, Hammersmith, London, W6 8DA Tel: 0203 609 8733
Manchester Office: Colony, 5 Piccadilly Place, Manchester, M1 3BR Tel: 0161 327 1681
w: www.aca-acoustics.co.uk

Appendix B

Noise Control Treatment

ACA acoustics

Wasabi, Market Street, Manchester

Attenuator Schedule

Reference	Location	Description	Insertion Losses (dB)							
			63	125	250	500	1k	2k	4k	8k
ATT1-EF1	EF1 Exhaust	1200L 40% Free Area c/w Melinex	9	15	20	29	35	25	18	12
ATT2-HE1	HE1 Inlet	600L 50% Free Area	3	5	10	15	20	15	13	8

Notes:
1. All dimensions in mm
2. Performance shown as static insertion loss. Dynamic insertion loss performance allowing for airflow generated noise is shown on the relevant calculation sheet.
3. Selections are nominal and the successful supplier should ensure their proposal achieves the minimum required static and dynamic insertion loss performance.

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