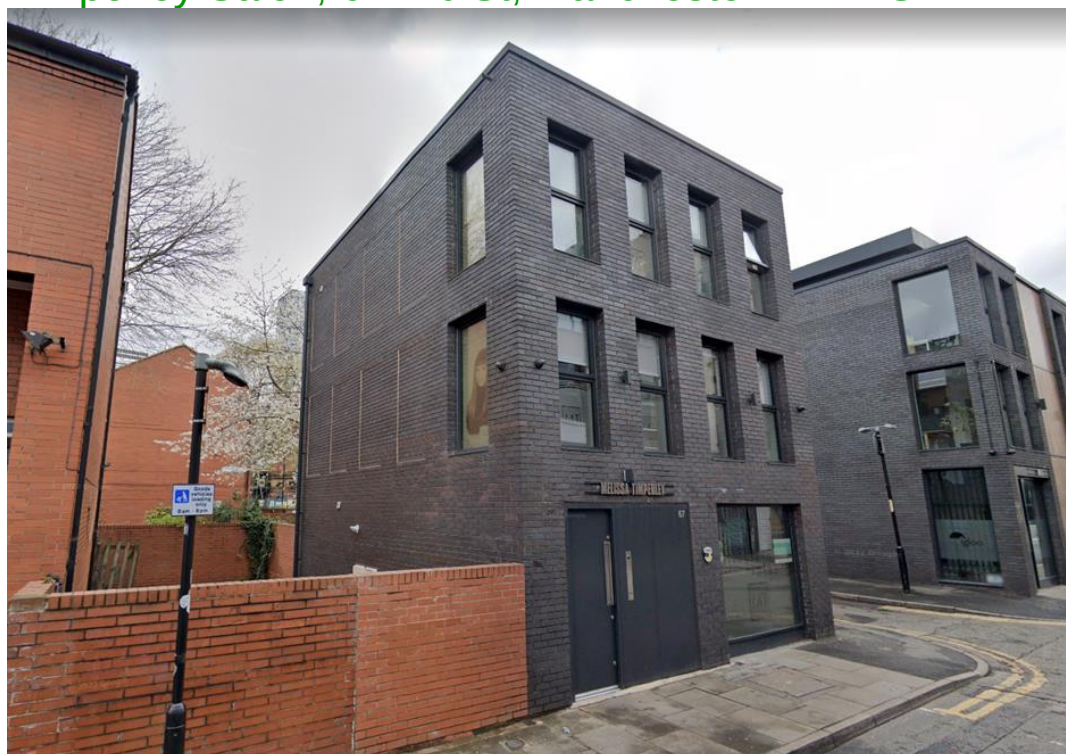


Melissa Timperley Hair Salon
67 Tib Street
Manchester
M4 1LS

Acoustic Screening Assessment

Timperley Salon, 67 Tib St, Manchester M4 1LS.



18 December 2022

Report Reference: 338/MPD(TimperleySaloon)



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Contents

1	Introduction	3
1.1	Statement of qualifications	3
1.2	Site Description	3
1.2.1	Elevation A	4
1.3	Proposed Plant specification.....	5
2	Legislation and Guidance	7
2.1	Guidance.....	7
2.1.1	National Planning Policy Framework (NPPF).....	7
2.1.2	Local Planning Policy.....	8
3	Assessment Strategy	9
3.1	Methodology	9
3.2	Noise Modelling	9
3.2.1	Model Assumptions.....	10
3.3	Limitations & Uncertainty	10
4	Impact Assessment Results.....	11
4.1	Modelled output Plant noise only.....	11
4.2	Plant Noise BS4142.....	12
4.2.1	BS4142:2014 assessment for Plant Noise.....	12
4.3	Cumulative impact	13
5	Conclusions & Recommendations	16

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1 Introduction

Melissa Timperley Hair Salon has commissioned Enviroconsult Limited to provide an assessment of the potential impact of noise in respect of the proposed installation of 3 small condenser fans at Melissa Timperley Salon, 67 Tib St, Manchester M4 1LS. The proposed plant is intended to provide comfort cooling for the building and for the benefit of staff and clients.

Manchester City Council (MCC) Planning and Noise Technical Guidance was issued in October 2022. The guidance recommends that, in accordance with paragraph 3.7.1.5 of MCC planning policy DM1 – Development Management that:

“The development should be designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location.”

The purpose of this report is to assess the potential impact of the new plant.

Enviroconsult has produced the report based on the following:

1. Drawings and intended layouts provided by the client.
2. Review of the Hann Tucker Associates 2019 report for 134-141 Oldham Road Manchester, ref: which provides background sound levels.
3. Reference noise data for the proposed plant.
4. Modelling of the potential impacts based use of dBMap Noise model.
5. Summarise results of impact assessments as a screening assessment using, BS4142:2014 and WHO criteria.

Enviroconsult considers that the impact of the plant is likely to be negligible. The plant is operational only during the day when ambient noise in the area will be high. Condenser plant is very common in urban locations and is inherently designed to be quiet.

Enviroconsult has not conducted a site survey to measure existing levels as the combined predicted impact of the plant is negligible. This screening assessment report provides suitable confirmation.

1.1 Statement of qualifications

Tony Higgins has over 30 years of regulatory and consultancy experience dealing with noise and nuisance issues, and holds a Post Graduate Diploma in Acoustics and Noise Control. He is a Member of the Institute of Acoustics and also an elected member of the IOA Measurement & Instrumentation Group. He has spoken at (and organised) many IOA training events considering the implementation of BS4142:2014 and the use of noise measurements in both planning and licensing appeals. Tony managed the Public Protection service at Telford and Wrekin Council, including the Licensing Service, noise and statutory nuisance service and the consultation responses to the planning service.

Tony has also prepared and delivered training materials for the EMAQ training package advising local authorities on the implementation of BS4142:2014. Tony has significant experience carrying out and evaluating data in determination of acoustic impact for complaints, licensing and planning work, in formal and informal hearings as well as court.

1.2 Site Description

The site is located within the city centre area of Manchester, approximately 0.9 km east of main centre in the North Quarter part of the city.

67 Tibb Street is a modern detached three storey property situated on the corner of Tib Street and Foundry Lane. The building operates as modern hair salon offering premier hair dressing and treatment services to clients. The site provides a relaxed and comfortable atmosphere for its clients.

The building is constructed of grey brickwork and has a flat roof. To the south and west of the building is the Smithfield Estate which consists of three storey residential housing characterised by red brick walls and grey concrete tile roofs.

Opposite the site facing the front elevation are a range of commercial activities, including restaurants, takeaways, and other commercial activities. Across Foundry Lane is a large commercial development with a rear courtyard or principally office developments.

Fig.1.2 below provides a basic layout of the site and identifies relevant sensitive receptors. Those in Blue are existing receptors, those highlighted in yellow are existing commercial premises.

Fig.1.2 Schematic showing existing location plan.



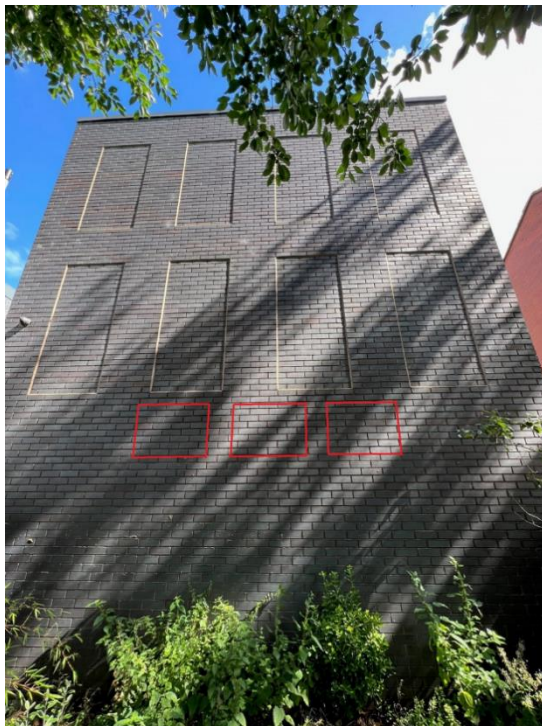
Courtesy of Google Earth Image (2021).

- Site (proposed plant location marked A)
- Existing commercial
- Existing residential receptors

1.2.1 Elevation A

The proposed plant is to be located at point A on the above plan Fig.1.2. The image below shows the proposed location of the plant.

Fig.1.2.1 Proposed location of plant Elevation A



Google image



Location of Condenser

1.3 Proposed Plant specification

The proposal is to install 3 condenser fan units with the following acoustic specification:

Mitsubishi MUZ-AP50VG [\[link\]](#)

The relevant extract from the document is reproduced below:

Parameter	MUZ-AP50VG
SOUND PRESSURE LEVEL (dBA)	52 / 52
SOUND POWER LEVEL (dBA)	64
WEIGHT (kg)	40
DIMENSIONS (mm)	800 x 285 x 714
ELECTRICAL SUPPLY	220-240v, 50Hz
PHASE	Single
SYSTEM POWER INPUT (kW)	1.60 / 1.55
	1.44 / 1.29
STARTING CURRENT (A)	7
SYSTEM RUNNING CURRENT (A)	7.0 / 6.9 [13.6]
FUSE RATING (BS88) - HRC (A)	16
MAINS CABLE No. CORES	3
MAX PIPE LENGTH (m)	20
MAX HEIGHT DIFFERENCE (m)	12
CHARGE REFRIGERANT (kg) / CO2 EQUIVALENT (t) - R32 (GWP 675) - 7m	1.00 / 0.68
MAX ADDITIONAL REFRIGERANT (kg) / CO2 EQUIVALENT (t) - R32 (GWP 675)	0.26 / 0.18



MUZ-AP - OUTDOOR UNITS	MULTI-SPLIT ONLY	MUZ-AP20VG	MUZ-AP25VG	MUZ-AP35VG	MUZ-AP42VG	MUZ-AP50VG	MUZ-AP60VG	MUZ-AP71VG
SOUND PRESSURE LEVEL (dBA) Heating/Cooling	-	48 / 47	48 / 47	50 / 49	51 / 50	52 / 52	57 / 56	55 / 55
SOUND POWER LEVEL (dBA) Cooling	-	59	59	61	61	64	65	65
WEIGHT (kg)	-	31	31	31	35	40	40	55
DIMENSIONS (mm) Width x Depth x Height	-	800 x 285 x 550	800 x 285 x 550	800 x 285 x 550	800 x 285 x 550	800 x 285 x 714	800 x 285 x 714	840 x 330 x 880
ELECTRICAL SUPPLY	-	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz
PHASE	-	Single	Single	Single	Single	Single	Single	Single
SYSTEM POWER INPUT (kW) Heating/Cooling (nominal)	-	0.60 / 0.46	0.78 / 0.60	1.03 / 0.99	1.49 / 1.30	1.60 / 1.55	1.67 / 1.59	2.12 / 2.01
Heating/Cooling (UK)	-	0.52 / 0.38	0.70 / 0.50	0.93 / 0.83	1.34 / 1.09	1.44 / 1.29	1.51 / 1.33	1.91 / 1.68
STARTING CURRENT (A)	-	3.2	3.6	4.7	6.6	7.0	7.4	9.3
SYSTEM RUNNING CURRENT (A) Heating/Cooling [MAX]	-	3.2 / 2.6 [7.0]	3.6 / 2.9 [7.06]	4.7 / 4.5 [8.46]	6.6 / 5.8 [9.6]	7.0 / 6.9 [13.6]	7.4 / 7.1 [14.0]	9.3 / 8.8 [16.4]
FUSE RATING (BS88) - HRC (A)	-	10	10	10	10	16	16	20
MAINS CABLE No. CORES	-	3	3	3	3	3	3	3
MAX PIPE LENGTH (m)	-	20	20	20	20	20	30	30
MAX HEIGHT DIFFERENCE (m)	-	12	12	12	12	12	15	15
CHARGE REFRIGERANT (kg) / CO ₂ EQUIVALENT (t) - R32 (GWP 675) - 7m	-	0.55 / 0.38	0.55 / 0.37	0.55 / 0.37	0.70 / 0.47	1.00 / 0.68	1.05 / 0.71	1.50 / 1.02
MAX ADDITIONAL REFRIGERANT (kg) / CO ₂ EQUIVALENT (t) - R32 (GWP 675)	-	0.26 / 0.18	0.26 / 0.18	0.26 / 0.18	0.26 / 0.18	0.26 / 0.18	0.30 / 0.21	0.30 / 0.21

Extract from Mitsubishi Promotional material.

The sound power 64 dB L_w, has been used within modelling to estimate potential acoustic impact.

2 Legislation and Guidance

2.1 Guidance

2.1.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework sets out Governmental planning policies for England and how these are expected to be applied. It provides a framework within which local people can influence planning policy using distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities. The NPPF requires that Local Planning Authorities develop their own specific planning policies, however, all local plans are required to have regard to the principle enshrined in the NPPF and in particular sustainable development.

Paragraph 174 outlines general requirements in terms of noise:

174. Planning policies and decisions should contribute to and enhance the natural and local environment by:

- e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and..." [emphasis added]*

Paragraph 185 provides additional detail:

185. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life⁶⁵;*
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation." [my emphasis]*

65. See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010).

The NPPF makes specific reference to the Noise Policy Statement for England (NPSE). The noise policy vision is to 'Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development'.

The NPSE refers to the World Health Organisation guidance and deals with noise in the context of health. Health is defined as 'physical and mental well-being' and is quoted in terms of standards with 'observed' health impacts. Additionally, quality of life is also mentioned which is a subjective measure and can be considered to promote of amenity standards and in all cases, equate to prevention of nuisance. The NPSE makes reference is made to two concepts documented by the WHO, namely:

- No Observed Effect Level (NOEL): the level below which no effect can be detected
- Lowest Observed Adverse Effect Level (LOAEL): the level above which adverse effects on health and quality of life can be detected.

And (by extrapolation from WHO criteria), a further level,

- ✧ Significant Observed Adverse Effect Level (SOAEL): the level above which significant adverse effects on health and quality of life occur.

There is no specific definition of how these levels are to be calculated, however it is noted that methodologies comparing results (either measured or calculated) to background and ambient levels are considered appropriate.

The determination as to how these impacts are to be demonstrated will depend on the nature of the noise, acoustic properties of the noise, and the site-specific circumstance of design and construction of development locations in which the noise is present. In most cases the local council within whose area the application site exists provides additional guidance on what is required to determine impact in accordance with local policy that will, by definition, have regard to local conditions and circumstances.

2.1.2 Local Planning Policy

Manchester City Council Core Strategy Development Plan Document 2012 -2027 (the Core Strategy) policy **DM1 – Development Management states:**

“Policy DM 1 - Development Management

All development should have regard to the following specific issues for which more detailed guidance may be given within a supplementary planning document:

...

- Effects on amenity, including privacy, light, noise, vibration, air quality, odours, litter, vermin, birds, road safety and traffic generation. This could also include proposals which would be sensitive to existing environmental conditions, such as noise;

...” [emphasis added]

Manchester City Council helpfully provide guidance on noise in their document “*Planning and Noise Technical Guidance*” (October 2022).

Paragraph 3.7.1.5 of that document states:

“3.7.1.5 Industrial / commercial developments

BS 4142 should be used to assess the likely impact of noise from industrial and commercial sources at noise sensitive premises (section 3.5). One of the indications of the impact of a BS 4142 assessment is 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.

The Council consider that new developments should contribute and enhance the area in which they are located and where possible i.e. prevent ‘noise creep’, contribute to the improvement of people’s health and quality of life as per the NPSE. With this in mind, the design objective should be:

‘The development should be designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location.’

Where this criterion cannot be achieved, the various noise control measures considered as part of the assessment should be fully explained (i.e. relocation of noise sources, use of quieter equipment, enclosures, screening, restriction of the hours of operation) and the achievable noise level should be identified. This information will allow a judgement to be made concerning the application and its likely impact on the surrounding area.

In addition to the above, maximum noise levels should also be adequately controlled. Where particular uses generate high noise levels of a short duration (e.g. loud bangs) on a regular basis, these should aim to be controlled so as not to exceed 60 dB (LAmax) at the façade of noise sensitive premises nearby in accordance with the recommendations of the WHO (section 3.6).”

3 Assessment Strategy

3.1 Methodology

The installation of condenser plant in city centre locations is not normally significant. The levels of noise generated from small plant (such as the proposed Mitsubishi units) are normally not noticeable.

Where an assessment is required for this type of plant, it would be normal to screen the data to assess the likelihood of significant noise arising.

Three Mitsubishi MUZ-AP50VG condenser units all operating simultaneously at maximum power would generate a total sound power of approximately 69 dB L_w.

The nearest sensitive receptor is 9m away, using the equation:

$$L_p = L_w - 20\log(r) - 8 \quad \text{where } r \text{ is distance}$$

$$L_p = 69 - 20 \log(9) - 8$$

$$L_p = 69 - 20 * 0.95 - 8$$

$$L_p = 42 \text{ dB}$$

The assessed screening level is likely to be well below the existing urban background level for daytime noise.

To evaluate the noise level from the proposed plant and demonstrate that there is unlikely to be a creeping background, the following procedure has been undertaken.

1. Attended surveys were undertaken in the local area by Hann Tucker Associates report reference 25636/NIA1 dated 28th February 2019 [\[link\]](#) supporting the current planning application ref: 122808/FO/2019.

These surveys established the minimum daytime background levels to be 47 dB L_{A90,1hour}. (see paragraph 6.5 and a mean daytime average level between 64 L_{Evening} and 69 dB L_{day}. (It should be noted that this data was monitored in 2019 prior to the onset of COVID 19.

2. Assuming the lowest L_{Evening} level measured by Hann Tucker as a benchmark are road traffic related, the existing residual levels at the receptor locations can be predicted using modelling of road traffic both with and without the 67 Tib St building.
3. The predicted impact of plant installation and operation can be added to the 'with' model to demonstrate no significant increase.
4. The plant can be evaluated using BS4142 as requested within MCC Planning and Noise Technical Guidance.

The absolute level of noise has also been used assessed to provide context.

3.2 Noise Modelling

The dBMap software (produced by MAS Environmental) is 3D noise modelling software designed specifically to provide visual representations of noise level predictions. The model requires a natural topographical digital map to be overlaid with generic man made feature data such as building heights and widths, roads, local barriers etc. The model is then updated to ensure that model 'surfaces' behave appropriately in respect of absorption and reflection of noise. Lastly noise sources are added, with known sound power or sound pressure levels and frequency spectra data as noted in [Appendix 1](#). The model then calculates the resulting transit of sound from the source(s) to receptor(s) taking into account

the various obstacles, reflections and absorption characteristics that would impede the propagation of sound through the environment.

dBMap is a model that is capable of using multiple different modelling techniques. This assessment (common to most assessments in the UK) utilises the calculation methods for ISO 9613 part 2. This is an internationally recognised standard for the modelling of noise and is accepted as suitable for assessment of industrial noise sources.

dBMap as an acoustic model using ISO9613, would be expected to provide an accuracy of ± 3 dB for the modelling aspect, but overall uncertainty is heavily dependent on the quality of the data input. Uncertainty has been minimised by applying a worst case approach, the results are therefore considered to be higher than may actually be the case, as the source data is conservative.

3.2.1 Model Assumptions

The results for modelling are based on the plans submitted and visual structural surveys identifying key features. And are based on the following assumptions:

- All modelling is considered to be Hard Ground (Ground Factor = 0)
- Modelled @ 20.0°C Temperature
- Modelled @ 70% Humidity
- Results are A-weighted
- Results are rounded to 0 decimal places
- Second order reflections are included
- ISO9613-2 barrier attenuation limit is limited to 20/25dB
- Vertical edges (lateral paths) are not included
- Ground reflections are not screened (as recommended in ISO17534-3 5.3)
- Input data for plant is 64 dB Lw, @ 2.5m from ground level
- Building heights are estimated from Google Earth.
- The local topography is essentially flat.

3.3 Limitations & Uncertainty

Impact assessments have been prepared in accordance with source data and drawn from manufacturer data for new plant. The calculations using dBMap conform to ISO9613 that has an uncertainty reported as ± 3 dB uncertainty. ISO9613 assumes a *downwind* model output that will tend to over estimate actual noise transmission from source to receptor locations. The calculated levels are therefore based on worst case data. Estimates assume the continuous operation of all plant except where specifically noted, in reality some plant will idle or not operate.

Results obtained from modelling can be up to 3 dB lower or higher than predicted assuming the data collected is representative. However, the model produced includes the façade reflection which added 3 dB to the displayed results.

The predicted results are based on **conservative estimates** and **worst case scenarios**, and it would be expected that the modelled results presented **are higher** than the likely actual levels and therefore the predictions are already considered worst case making it more likely that the actual observed values will be lower than expected.

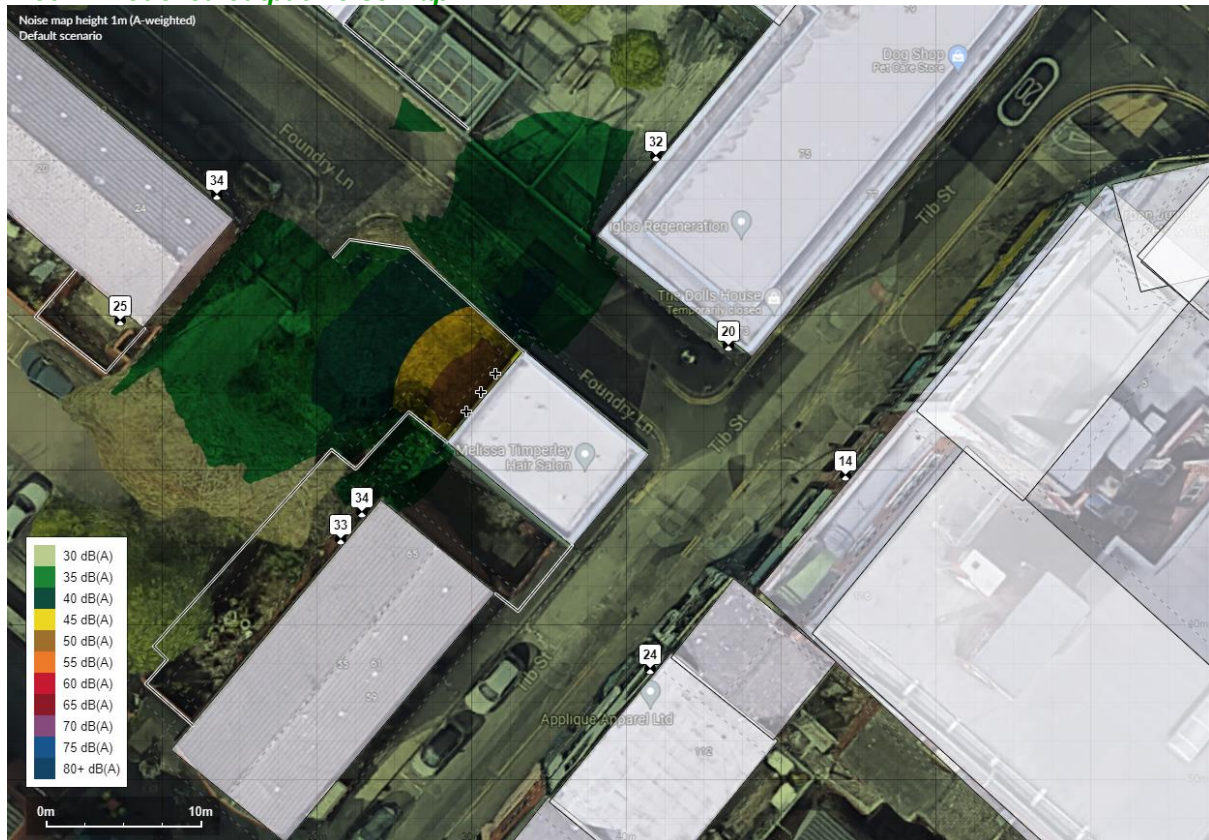
4 Impact Assessment Results

The impact assessments have been conducted as outlined in the methodology above. The screening assessment results for music noise, plant noise and behavioural noise are summarised in the paragraphs below. The detailed assessments are to be found in Appendices 1.

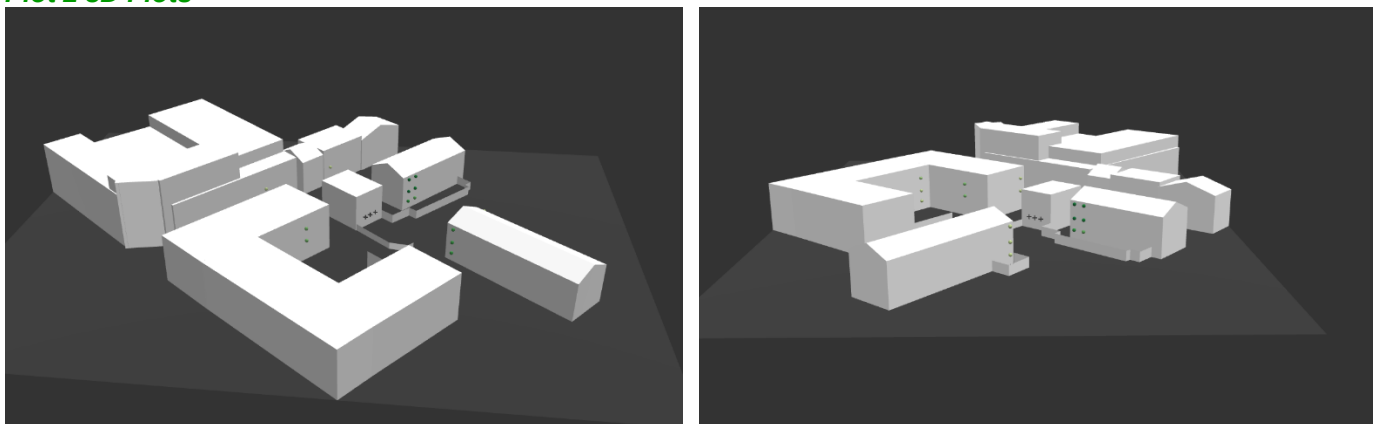
4.1 Modelled output Plant noise only

The modelled outputs are summarised below:

Plot 1 - Modelled output Noise Map



Plot 2 3D Plots



The results for the 3D plots are summarised in the table below.

Receiver Name	Height (m)	Total dB(A)
24 Foundry Lane NE	2.1	34
24 Foundry Lane NE	4.5	34
24 Foundry Lane NE	7.4	34
65 Tib Street	2.1	34
65 Tib Street	4.5	37
65 Tib Street	7.4	37
65 Tib Street 2	2.1	33
65 Tib Street 2	4.5	36
65 Tib Street 2	7.4	36
73 Tib St Igloo S X	4.5	20
73 Tib St Igloo S X	7.4	20
73 Tib St Igloo W X	4.5	32
73 Tib St Igloo W X	7.2	32
Ringley S	2.1	29
Ringley S	4.5	29
Ringley S	7.4	31
Work Screen Print	4.5	24
116 Tib St	4.5	14

The highest modelled levels are predictably for the building immediately adjacent to the site, 65 Tib Street. The 2nd and 3rd floors both receiving a predicted level of 37 dB. This data is used in the BS4142 assessment below.

4.2 Plant Noise BS4142

The plant noise from the proposed installation may comprise a contribution from up to 3 condenser chiller units. This assessment considers a worst case, where all fixed plant units are operating.

4.2.1 BS4142:2014 assessment for Plant Noise

Results	Daytime	Relevant BS4142 Clause	Comments
Calculated Specific Level	37	7.3	Based on the operation of 3 plants
Acoustic feature correction	+5	9.2	Daytime Barely audible tone (+2 dB), intermittency (+3 dB)
Rating level	42	9.2	
Background sound level	47	8.1.1 8.1.3 8.3	Based on Hann Tucker report
Excess of rating over background sound level	-5 dB	11	LOW impact (worst case operation)

The predicted levels of noise at the receptor location are based on worst case with all plant operating 100% which is unlikely.

No adverse impacts may be noted at the receptor locations it is likely that, even at worst case, plant would be inaudible.

The assessment is based on the lowest background measurement that may not reflect true normal modal background sound levels in a busy city centre.

It is considered that plant noise emitted e “*not noticeable*” in planning terms as a worst case.

4.3 Cumulative impact

The cumulative impact of the proposed plant installation has been assessed by modelling the Hann Tucker measured levels for road traffic noise and predicting the impact at the existing receptors.

This is a two stage process as 63 Tib St was not constructed until after the Hann Tucker monitoring took place.

The modelling therefore validates the noise data for the environment without this building and to establish the sound level required to generate 64 dB L_{evening} at Hanner Tucker monitoring point 2. The sound power level required is 78 dB L_w as a line source.

The modelled level of noise at existing receptors based on that source sound level is then compared with the 63 Tib St building present. This then predicts the existing ambient noise level for the area without the plant operating.

The modelled impact of the proposed condenser plants can then be added and show the cumulative impact.

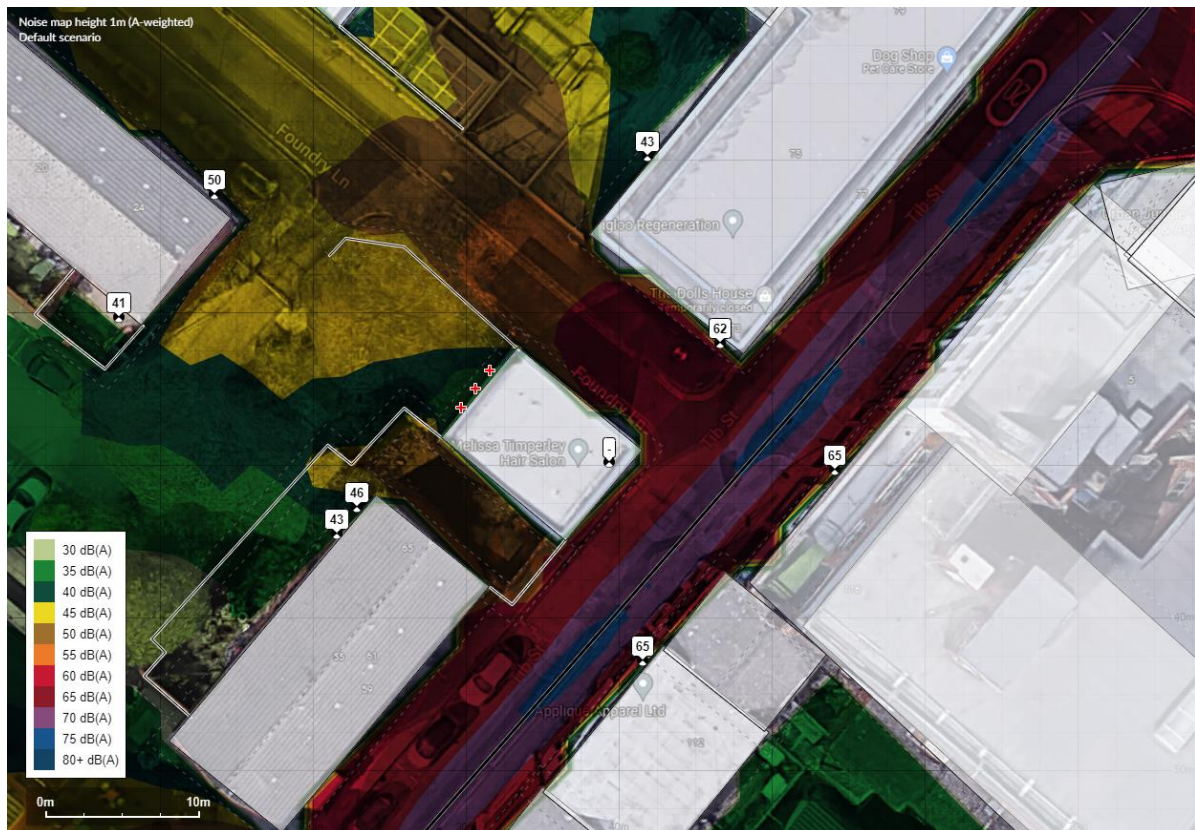
The model outputs are provided below:

Plot 1 – Modelled road traffic noise levels



‘Pre-Existing’ ambient levels indicate residential receptors exposed to levels of traffic and city noise 45 – 51 dB.

Plot 2 – Modelled road traffic noise levels after construction of 63 Tib St.



Existing predicted levels of noise including the new building show that residential receptors are exposed to levels of traffic and city noise 41 - 50 dB, a slight reduction in levels due to the barrier effect of the new building.

lot 3 – Cumulative impact with plant operating.



The cumulative impact model shows that the use of the three condenser plants does not increase predicted levels.

5 Conclusions & Recommendations

The site is located with a busy city centre area that is subject to significant existing ambient noise.

The impact assessment has been carried out and assessed the impact on existing sensitive receptors.

The closest *existing* receptors are those immediately adjacent to the application site. The receptors are 3 storey buildings with an elevated position overlooking the area where plant is to be installed.

Adverse impacts of operation of the plant has been demonstrably screened out due to the very low sound levels of the proposed plant. The maximum predicted level of noise from the plant at the nearest receptor is 37 dB significantly below the existing predicted ambient levels.

The results of the assessments carried out indicate that plant will likely be of low impact according to BS4142:2014+A1(2019), and the cumulative impact assessment demonstrates that operation of plant is unlikely to raise the existing observed levels.

In the unlikely event that the plant is audible, this will only be during very quiet periods and is likely to be heavily masked by other plant of a similar type and existing road traffic.

It is recommended that the installation of the proposed plant is acceptable in planning terms, compliant with MCC Planning Policy and compliant with the Planning and Noise Technical Guidance.

Prepared by:



Tony Higgins MSc BSc (Hons) PGDip MIOA CMCIEH
Director

Glossary of terms

Sound – an acoustic effect perceived by an individual. Sound is perceived differently by individuals and is highly subjective. Acoustically for sound to be perceived it has to be above the threshold of hearing (typically taken to be 0dB) but this threshold varies between individuals.

Noise – noise is defined as unwanted sound. The level at which noise is present will indicate the potential impact. In order for a sound to become noise, it has to be perceivable by the individual. Technically noise can be described in terms of its acoustic profile, typically though noise at or below the ambient levels is rarely loud enough to be considered significant.

Acoustic environment sound from all sound sources as modified by the environment [BS ISO 12913-1:2013]

‘A’ Weighting – This function modifies the linear frequency response of the meter sound profile to attempts to simulate the characteristics of human hearing. Hence a dB(A) reading is a subjective evaluation of what we actually hear whereas dB(LIN) (now written dBZ), is an objective reading of what is actually present. A weightings are normally used in environmental and occupational measurements

Ambient – This is the general level of sound in an area. It is usually composed of sound from many sources near and far, that together make the ‘average’ noise for an area. Ambient noise is normally described using a long term average sound level (typically LAeq).

Ambient sound – totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far. *NOTE The ambient sound comprises the residual sound and the specific sound when present.*

ambient sound level, LAeq,T – equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, *T*. *NOTE The ambient sound level is a measure of the residual sound and the specific sound when present.*

Attenuation – The loss in energy level of the sound usually used in relation to the loss due to sound passing through a structure or enclosure.

Background Noise Level – The underlying level of sound in the absence of the source is normally measured as an LA90, the level which is exceeded by 90% of sound present. This measurement effectively screens out transient noises. Occasionally LA99 is used which is the level which is exceeded by 99% of the sound present.

Background sound level, LA90,T – A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, *T*, measured using time weighting F and quoted to the nearest whole number of decibels

Decibel (dB) – a unit or level, derived from the logarithm of the ratio between the sound pressure measured and a reference value. For sound pressure level the reference quantity is 20μPa, the threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only barely perceptible whilst a change of 10dB is considered significant. Sound pressure levels are noted as SPL, sound power can also be measured as a ratio of energy values, and is normally noted as SWL.

dB(A) (See A weighting above) – decibels measured on a sound level meter weighted by a scale which is designed to reflect the perception by the human ear. A noise meter incorporates a frequency weighting device to create this differentiation. Measurements in dB(A) broadly agree with people’s assessment of loudness for broadband noise. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; a busy factory may have a level around 85dB(A); the level near a pneumatic drill about 100 dB(A).

Equivalent continuous A-weighted sound pressure level, LAeq,T – value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time. *NOTE The equivalent continuous A-weighted sound pressure level is normally quoted to the nearest whole number of decibels.*

Frequency – This is the number wavelengths passing a given point per second. The unit is the hertz (Hz). Frequency is the normal variation in pitch that most sounds have over time. Sound is normally made up of many different frequencies, and they behave differently within the environment. For example, moderate and high frequencies are damped out easily by barriers, screens or enclosures while low frequencies are more difficult to attenuate, which explains why loud music from a neighbour perceived through a wall often only sounds like a dull base thumping noise.

Impulse Noise – Single or repeated sound of short duration such as a bang or crash.

LA90 – The A weighted noise level exceeded for 90% of the specified measurement period. It is a statistical measurement. Used in BS 4142:2014 as the baseline for impact assessment and more generally it is used to define background noise level. Example, if a sound measurement carried out each second over 100 seconds the LA90 result would be the level representing the quietest 10% of the readings i.e. 10seconds.

LAeq – The equivalent continuous sound level - the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period. LAeq is used to describe many types of noise and can be measured directly with an integrating sound level meter. It is obtained by continuously integrating ('adding up the energy of') a fluctuating sound signal and dividing by the elapsed time, to give the true mathematical average of any time varying signal. An Leq reading must always be related to a time period, it should not be read as an instantaneous value of sound pressure.

LAmx – The highest A weighted noise level recorded during a noise event. The time weighting used (F or S) should be stated. Almost all environmental measurements are 'Fast' weighted.

Logarithmic – A scale where the exponent indicating the power to which a fixed number, the base, must be raised to produce a given number. The base used in acoustics is 10. Thus, the logarithm of 10 = 1, the logarithm of 100 = 2 and the logarithm of 1000 = 3. Logarithms are used to convert very spans of pressure or energy measurements into usable scales.

Loudness – An observer's auditory impression of the strength of a sound. It is a subjective effect which is a function of the way we hear, and psychoacoustic response as well as the amplitude and frequency of the sound.

Masking – The process by which the threshold of hearing of one sound is reduced due to the presence of another which 'masks' the first.

Measurement Periods (T) – is the period over which the measurement is taken, normally varies between 5mins to an hour. More commonly 'real time' analysis and new data storage capabilities has allowed measurement times to be reduced to 1 second

Measurement time interval, Tm – total time over which measurements are taken.
NOTE This may consist of the sum of a number of non-contiguous, short-term measurement time intervals.

Meter response and time weightings – Sound Level Meters are provided with a sampling reference time weightings dependent on the sounds to be assessed. The variable time response control with settings are:- 'S' Slow; 'F' Fast; 'I' Impulse; 'P' Peak.

'S' Slow – meter response is over damped with a time constant of approximately 1000ms. The setting tends to average out variations in sound levels in the readings.

'F' Fast – meter responses sample over a response of 125ms. i.e. the measurement for variable sound will respond each 1/8th of a second showing a value.

'I' Impulse – uses a special electrical circuit with a time constant of about 35ms (of the same order as the response time of the human ear) to permit a very rapid response for investigating very sudden, short duration - impulsive - sounds. This setting incorporates a detector which in effect stores the signal for sufficient time to allow it to be displayed. Also a slow decay rate is incorporated with time response of approx. 1500ms to allow more easy reading of the maximum value as the indicator moves back relatively slowly.

Peak – Sound Level Meters often incorporate this setting which enables the **absolute peak** (as opposed to the rms) value of an impulsive waveform to be measured. A time constant of the order of 20 - 50 micro seconds is now involved to permit the following of very sharp impulsive events. Evidently electrical signal storage is also required to permit the meter to register the peak of such very fast events.

Rating Level – The specific noise level of a source when measured at receiver location (usually averaged over a time interval) plus any adjustment (penalty or weighting) for the characteristic features of the noise. It is used in BS4142 to rate the likelihood of complaints.

Reference time interval, T_r – specified interval over which the specific sound level is determined. *NOTE This is 1 h during the day from 07:00 h to 23:00 h and a shorter period of 15 min at night from 23:00 h to 07:00 h.*

Residual sound – ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound

Residual sound level, $L_r = LA_{eq,T}$ – equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T

Specific sound level, $L_s = LA_{eq,T_r}$ – equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r

Specific sound source – sound source being assessed

WHO – World Health Organisation

References

1. BS 4142:2014+A1(2019) Method for rating and assessing industrial and commercial sound
2. BS 8233:2014 Guidance on sound insulation and noise reduction for buildings
3. WHO Guidelines on Community Noise 1999
<http://www.who.int/docstore/peh/noise/guidelines2.html>
4. Planning and Noise Technical Guidance (October 2022), Manchester City Council

