

CSG

acoustics

201 DEANSGATE

PLANT NOISE IMPACT ASSESSMENT
CSGA-C2098-T1

6th March 2023

PREFACE

Project	201 Deansgate
Reference	CSGA-2098-T1
Report Type	Plant Noise Impact Assessment
Recipient	Dynamic FM
Date	06/03/2023
Issue	Final
Revision	0
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Table P1: Revision Details

Revision Number	Date	Details
-	-	-
-	-	-
-	-	-

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1 INTRODUCTION

CSG Acoustics Ltd has been appointed by Dynamic FM Ltd to undertake an external plant noise assessment to support a planning application for external fixed plant equipment. Air handling units (AHUs), are being replaced on the roof-top of the office building at 201 Deansgate, Manchester.

In light of the above a noise assessment is required in accordance with the Manchester City Council planning policy.

The assessment includes:

- Results of a noise survey conducted at the site over a five-day period;
- Results of measurements of the existing AHUs;
- Proposed plant noise limits based on the results of the noise survey and the Local Authority’s planning policy; and
- Prediction and assessment of the AHU noise levels.

This report is technical in nature therefore, to assist the reader, explanations of the relevant terminology are presented in Appendix A.

2 EXISTING / PROPOSED SITE

201 Deansgate is an existing office Building (with existing roof top plant), and it is proposed that 2No. Air Handling Units are to be replaced.

The following new plant is proposed:

Table 2.1: Proposed Plant Details

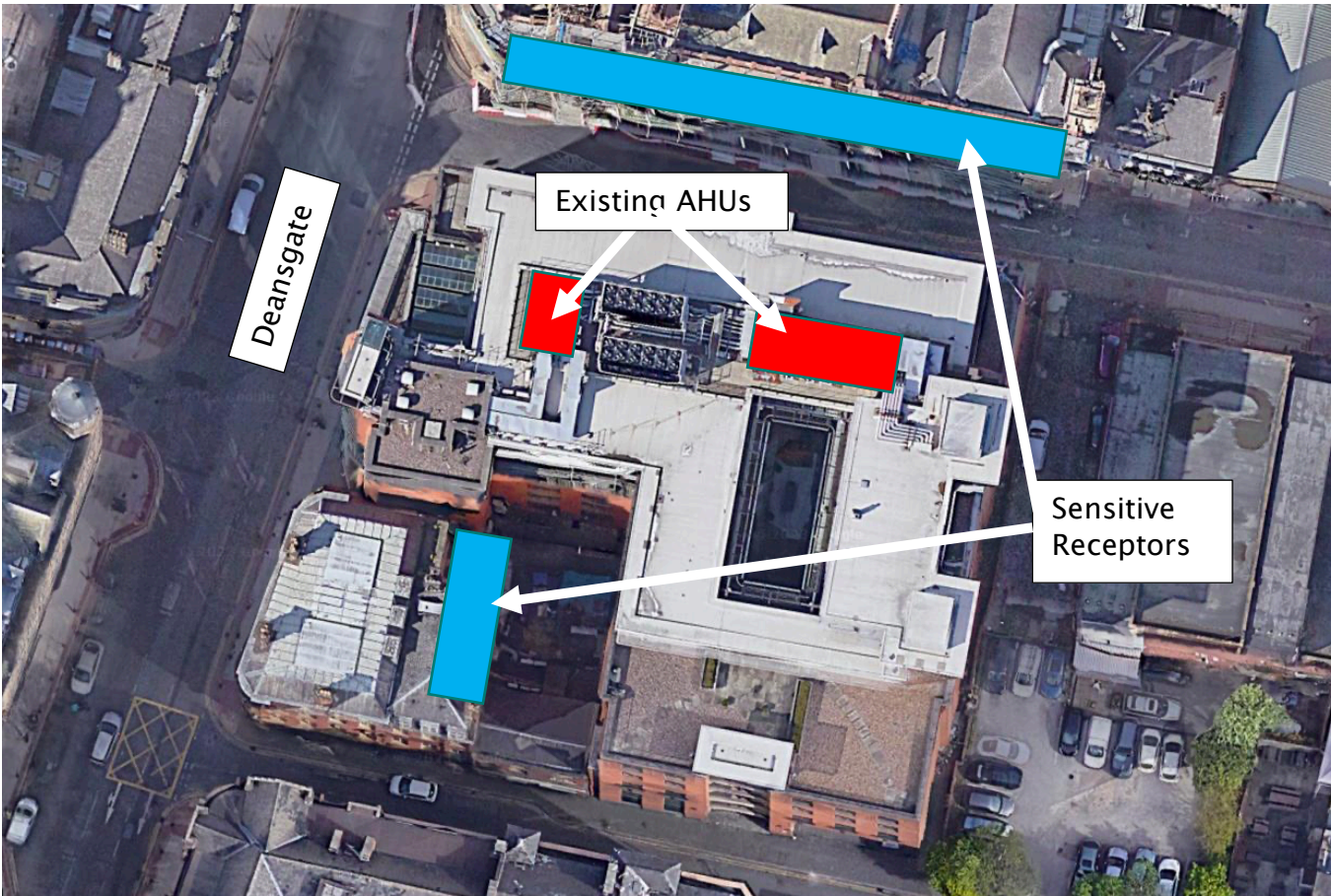
Reference Number	Unit type	Quantity	Model	Sound Power Level dB (A) (Casing Breakout)
AHU01	Air Handling Unit	1	ATC Comfort Line 5	88.5 dB
AHU02	Air Handling Unit	1	ATC Comfort Line 5	84.5 dB

The above equipment is proposed to be located on the rooftop of the existing building as shown in Figure 2.1 below and will operate during the daytime (07:00–23:00) only.

Full noise data in octave bands can be found in Appendix B.

Both AHUs will be fitted with in-duct attenuation on the exhaust to achieve no more than 70 dBA at 1m from each termination.

Figure 2.1: 201 Deansgate – Existing Roof Top Layout and Sensitive Receptors

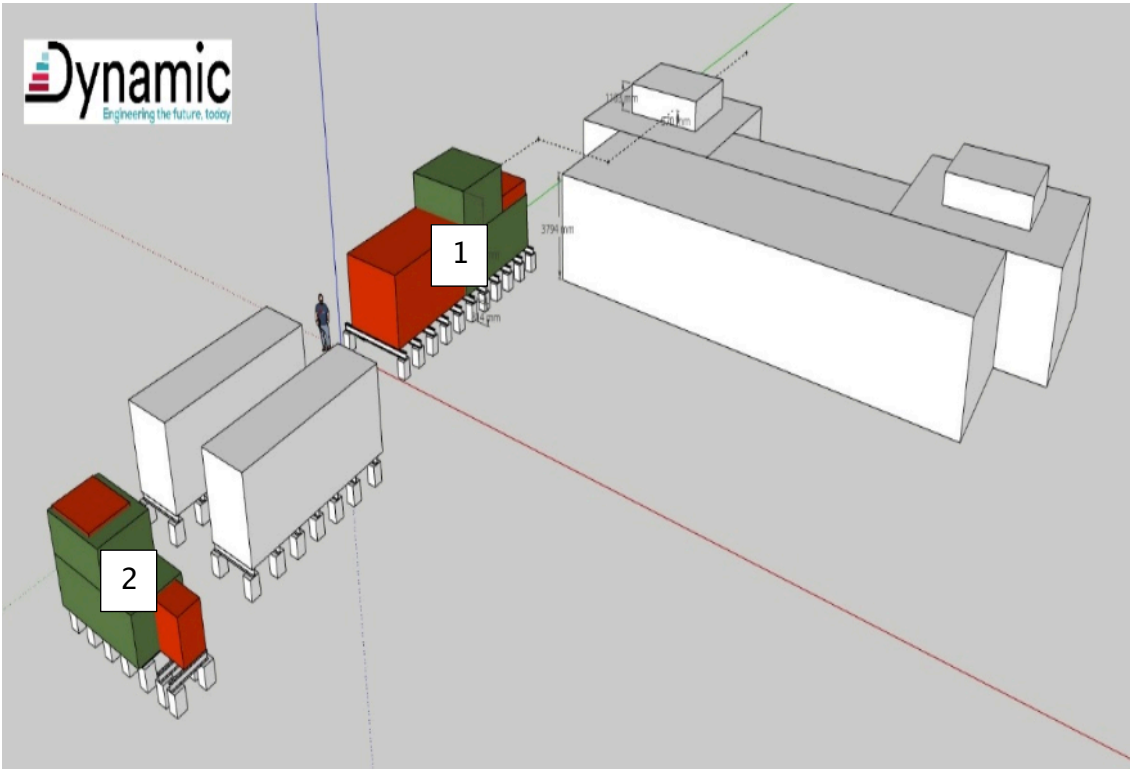


As shown in Figure 2.2 the new AHUs will be in same location as the existing AHUs which will be removed.

The exact location of the nearest residential property is unknown, as it is unclear whether any of the buildings in the vicinity are residential. They appear to be only commercial buildings and the closest worst-affected windows to the proposed external plant equipment is offices on Bootle Street and Jacksons Row. The facades of these buildings are approximately 20m from the rooftop AHUs

All other noise sensitive locations are either further away from the identified location, or the intervening architecture provides more acoustic screening.

Figure 2.2: Proposed AHUs (Green), Existing AHUs (Red)



3 GUIDANCE AND CONSULTATION

This assessment has been undertaken in accordance with National and Local planning policy for the Manchester City Council and relevant British Standards.

National Planning Policy is presented in Appendix B of this document.

3.1 LOCAL PLANNING POLICY

Manchester City Council Core Strategy

The Core Strategy Development Plan Document 2012 –2027 (the Core Strategy) was adopted by the City Council in July 2012. It is the key document in Manchester's Local Development Framework and sets out the core development principles relating to noise.

The Core Strategy refers to British Standard BS4142:2014 as a suitable assessment method. The assessment method is based on the difference between the measured background sound level without the influence of any industrial noise source and the 'rating level' of the industrial source, at the receiver location.

The background sound level ($L_{A90,T}$) is the sound level existing in the absence of the 'specific sound level' at the receiver location. The specific sound level ($L_{Aeq,Tr}$) from the industrial source can be subject to a certain weighting (penalty) where it displays an identifiable character (such as tonality, impulsivity, intermittency or otherwise distinctive features) to provide a 'rating level' ($L_{Ar,Tr}$).

Criteria

The Manchester City Council Policy states the following for noise from fixed plant equipment:

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 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location.

This assessment has assumed the nearest noise sensitive location to be the Bootle Street and Jackson Row façades.

4 NOISE SURVEY

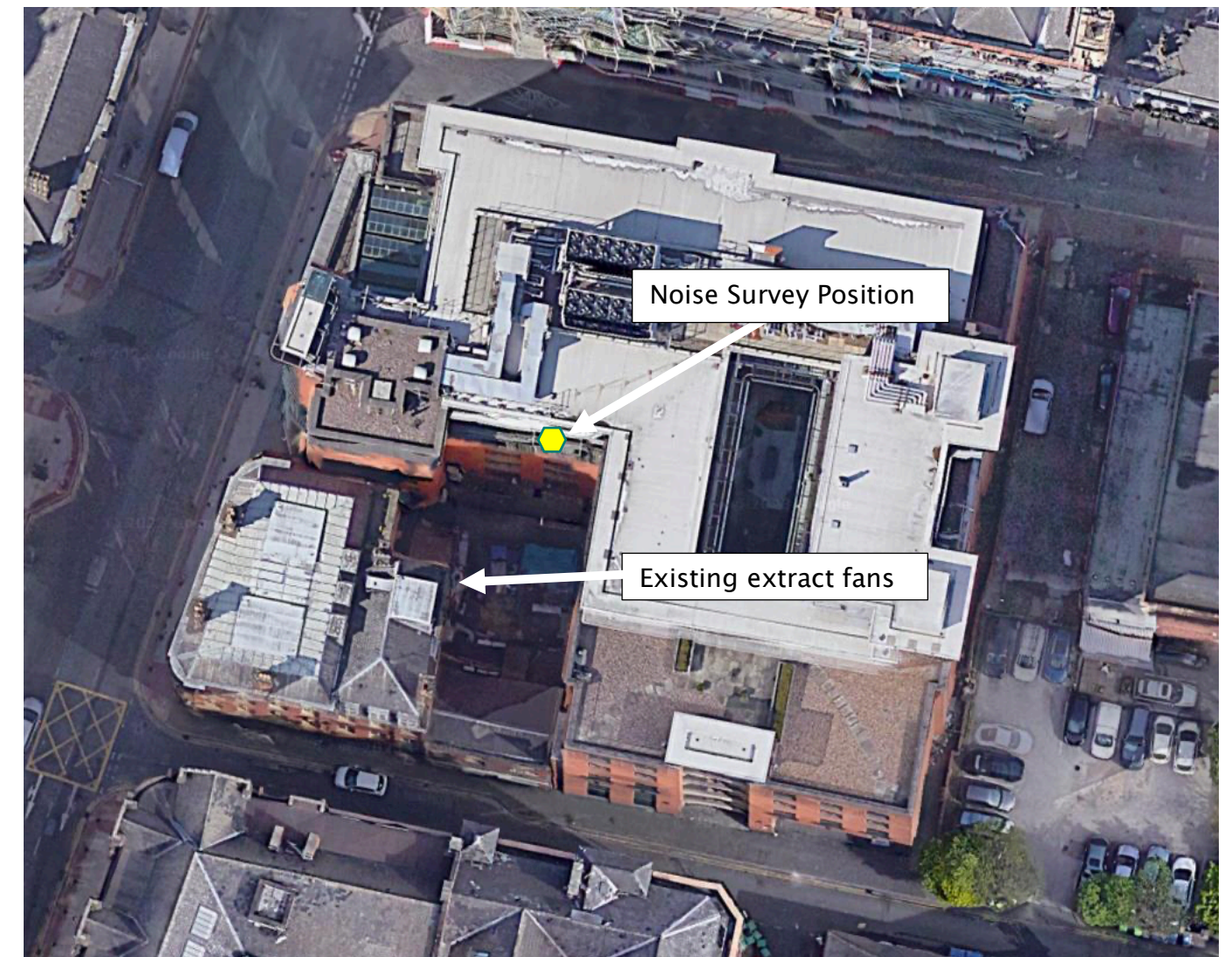
Attended measurements of the existing AHUs were carried on the 24th February to establish the source levels of the existing AHUs, this will allow direct comparison with the newly proposed AHUs.

A long-term noise survey was also carried out of the existing background noise environment between Friday 24th February to 1st March. Measurements were undertaken to try to establish the background noise levels representative of the nearest sensitive property. The survey methodology and results are set out below.

Noise measurements have been taken at a height of 1.5m above the rooftop level at the position shown in Figure 4.1.

The noise survey position was influenced by the existing plant noise on the rooftop but other noise sources were noticeable. Traffic noise and noise from extract plant located at the rear of the commercial premises on Bootle Street was audible and also contributed to the noise climate.

Figure 4.1 Noise Survey Measurement Location



The equipment used for the survey was as follows:

Table 4.1: Equipment

Equipment	Model	Serial No.	Certificate No.	Calibration date
Class 1 SLM	01dB SOLO	60672	05231/2	22/04/2021
Microphone	01dB - MCE212	80836		
Preamplifier	01dB - PRE21S	13541		
Calibrator	Cirrus - 511E	33927	05872/1	10/08/2022

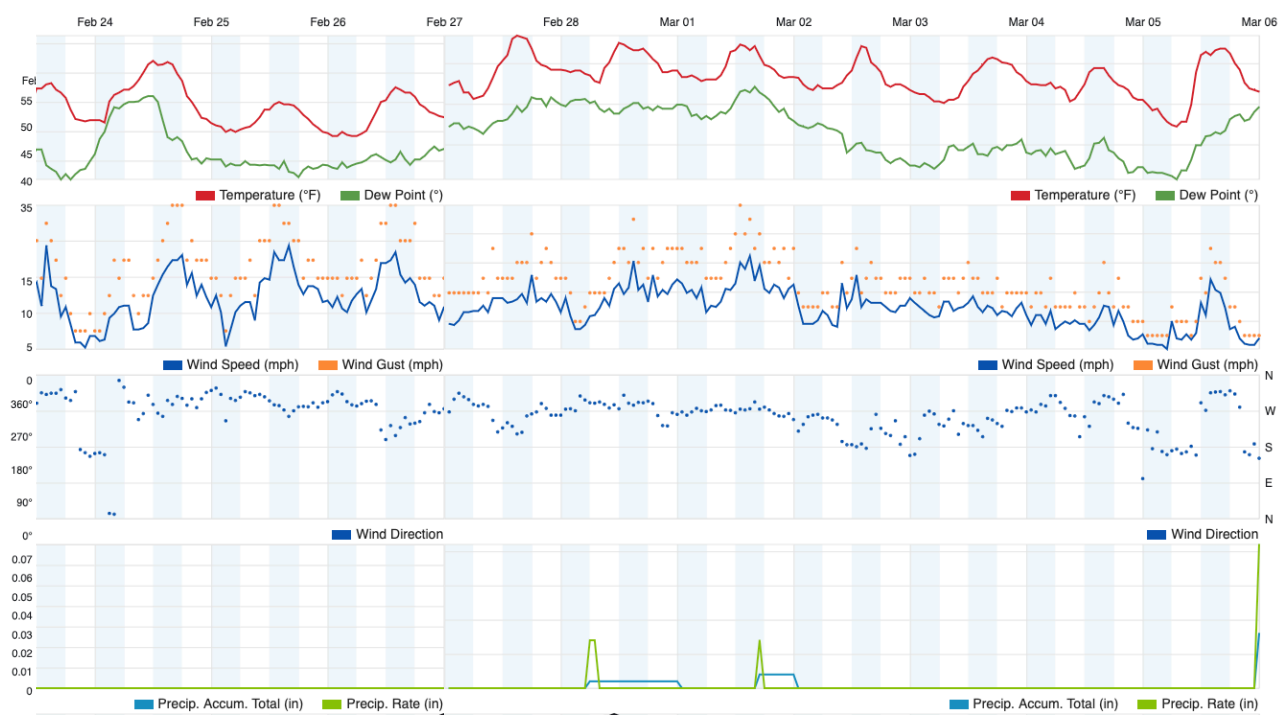
4.1 RESULTS

The noise survey was mostly unattended, with observations taken by the surveyor at the start and end of the measurements.

The weather for the duration of the survey was suitable for noise measurement, being mostly dry throughout with only light winds.

A graphical summary of the weather for the period is given below. The data is from the closest weather station with available data (IMANCH115).

Figure 4.1: Weather Profile at Local Station



Noise sources at the site include traffic on local roads, existing plant noise and distant traffic noise. There were no other sources of noise considered abnormal for this location.

A summary of the time averaged ambient levels and the typical measured background levels over the measurement periods are shown in Table 4.2. It should be noted that the presented

typical lowest L_{A90} levels are based on a 15-minute measurement period in line with BS4142:2014.

A summary of the measured noise levels during the full measurement period is represented graphically in Appendix C.

Table 4.2: Measured Ambient and Lowest Background Noise Levels

Period	Average $L_{Aeq,T}$ - dB	Typical L_{A90} - dB
Day time (07:00–23:00)	59	58
Night-time (23:00–07:00)	61	52

5 PLANT NOISE ASSESSMENT

This report is to support a planning application at 201 Deansgate, Manchester, which includes proposals for external fixed plant to be located on the roof of the building.

5.1 PLANT NOISE LIMITS

The existing AHU plant noise levels have been measured at source and then used to compare against the noise levels of the proposed AHUs which will be replacing them.

An assessment of noise levels at the nearest sensitive noise receptors has then also been undertaken to demonstrate the change in noise levels predicted.

Based on the above and the requirements set out in Section 3 of this report, Table 5.1 presents the proposed plant noise limit in accordance with BS4142:2014 and Manchester City Council Planning Policy.

Table 5.1: Suggested Plant Noise Emission Limits Based on Measured LA90, (Free-field) dB

Location	Period	Proposed Noise Limit LAr
Nearest Façade on Bootle Street and Jacksons Row	Day (07:00–23:00)	53dB
	Night (23:00–0700)	47dB

Note that the limits suggested above are rating levels (LAr) and as such any design should consider the acoustic characteristics of the plant items in line with BS4142:2014.

It should be noted that the proposed units do not display characteristics whereby the acoustic corrections should be applied and as such no correction will be applied in this assessment.

Should any other items of plant be installed as part of the development, the cumulative noise from all items should not exceed the limits stated in Table 5.1.

The plant proposed for this building will only be operational during daytime hours (07:00–23:00). Therefore, only the daytime noise limits are considered in the assessment.

5.2 EXTERNAL PLANT NOISE IMPACT ASSESSMENT

Noise data of the proposed plant used in this assessment can be found in Appendix B.

Calculations based on the manufacturer noise data of the new proposed units and the measured noise levels of the existing units have been used to compare noise levels of the existing and proposed and also predict noise levels at the nearest noise sensitive property.

Table 5.2 presents the noise data and predicted noise levels at the closest worst-affected property, based on geometric divergence, radiating surface adjustment and building edge screening.

Also, in duct attenuators are added to outlets of both the AHUs to achieve 70dBA at 1m.

Table 5.2: Plant Noise Planning Demonstration

Plant Assessment		dBA
Existing AHU 01	Measured Noise Level*	90.5
Existing AHU 02	Measured Noise Level*	89.5
Proposed AHU 01	Manufacturers Noise Level Data	88.5
Proposed AHU 02	Manufacturers Noise Level Data	84.5
Existing	Total L _w	93.1
Proposed		90.0
Prediction at Nearest Sensitive Property		
Distance Loss (20m)		–26 dB
Power to Pressure Adjustment		–11 dB
Mounting Adjustment		+3dB
Screening (Building Edge and Rooftop Architecture)		–5 dB
Predicted Plant Noise Level at Nearest Sensitive Property	Existing AHU Plant Noise level	54.1 dBA
	Proposed AHU Plant Noise Level	51.0 dBA

*Estimated sound power based on measured sound pressure levels

As seen in Table 5.2 the predicted rating level of the new two new AHU plant items is **51dBA** at the nearest sensitive property. This level is 7dB below the existing typical measured background noise level and therefore is predicted to meet the requirement of the Local Authority.

The assessment also shows that the new proposed plant will reduce noise levels compared to the existing roof top AHUs, which are being replaced.

6 CONCLUSION

CSG Acoustics Ltd has been appointed by Dynamic FM Ltd to undertake an external plant noise assessment to support a planning application for replacement fixed plant equipment at 201 Deansgate, Manchester.

AHUs will be fitted with in duct noise attenuation on the intake and exhaust to achieve no more than 70 dBA at 1m from each termination. This attenuation has been included in the predicted noise levels.

The assessment has been carried out in accordance with national planning guidance and the requirements of the Manchester City Council planning policy, and is based on a noise survey conducted over five days.

A prediction of the noise at the worst affected noise sensitive property has been undertaken in line with BS4142 and the operation of the plant would be considered to have a low impact on the noise climate surrounding the site.

Two AHUs are being removed and two new AHUs are replacing them. The assessment shows that the new AHUs have lower noise levels than the existing and therefore demonstrating the new AHUs will not increase noise in the local environment.

Rating levels are predicted to be 7dB below the measured background noise levels and as such meet the requirements of the Local Planning Authority.

Assuming the noise limits are met and with respect to the principles of the National Planning Policy Framework, the predicted noise levels will be at the LOAEL (Lowest Observed Adverse Effect Level).



APPENDICES

APPENDIX A: GLOSSARY OF TERMS

Decibel (dB) – The unit used to describe sound. A logarithmic scale is used to describe sound pressure levels and sound power levels. The logarithms used are to base 10; hence, an increase of 10dB in sound pressure level corresponds to a doubling in perceived loudness of the sound.

Sound Power Level (SWL) – This is a product of the source alone and is independent of its surroundings. It is a measure of the amount of sound power output measured in decibels.

Sound Pressure Level (SPL) – This is a function of the source and its surroundings and is a measure of the sound pressure at a point in space. The sound pressure measured or reported can be influenced by room/mounting conditions and the distance that the measurement is taken.

Octave Bands – The human ear is sensitive to sound over a range of approximately 20 Hz to 20 KHz and is generally more sensitive to medium and high frequencies than to low frequencies. In order to define the frequency content of a noise, the spectrum is divided into frequency bands and the sound pressure level is measured in each band. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it.

"A" Weighting – A number of frequency weightings have been developed to imitate the ear's varying sensitivity to sound of different frequencies. The most commonly used weighting is the "A" weighting. The "A" weighted SPL can be measured directly or derived from octave or one-third octave band SPLs. The result is a single figure index which gives some idea of the subjective loudness of the sound, but which contains no information as to its frequency content.

Intermittency and Time-Weighting – The degree of annoyance caused by a noise also depends on its duration and intermittency of a noise. Intermittent, impulsive or repetitive noises tend to be more annoying than continuous noises. Various time-weightings have been derived to measure sounds of differing intermittences and these can be measured directly on modern equipment. The most common time-weightings in use are as follows:–

L_{90} This is the sound pressure level exceeded for 90% of the measurement period. It is widely used to measure background noise levels.

L_{eq} The equivalent continuous noise level is often used to measure intermittent noise. It is defined as the notional steady noise level that would contain the same acoustic energy as the varying noise. Because the averaging process used is logarithmic, the L_{eq} level tends to be dominated by the higher noise levels measured.

APPENDIX B: MANUFACTURERS NOISE DATA

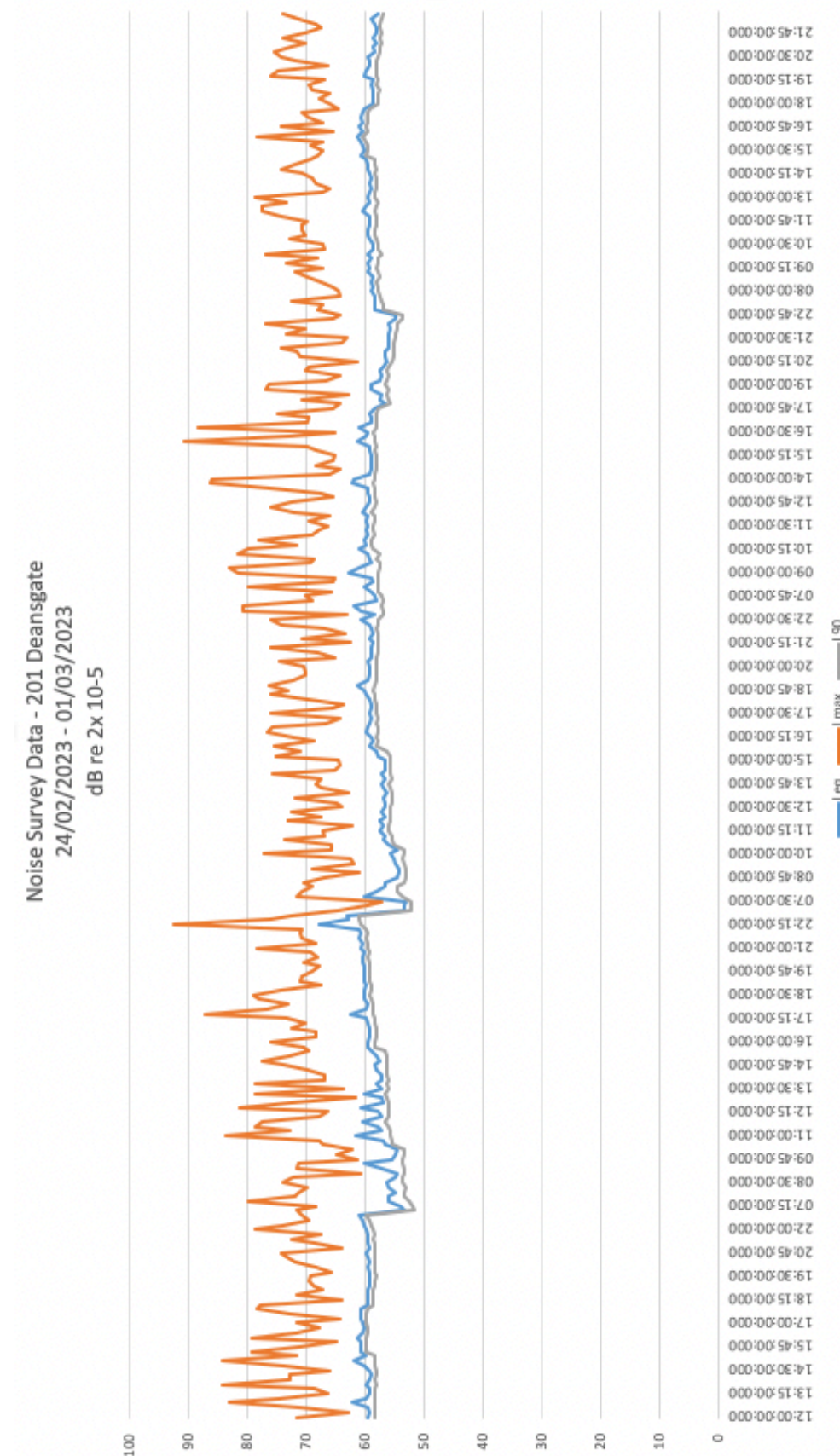
AHU #01

SOUND POWER LEVEL (dB)									
Frequency Hz		125	250	500	1000	2000	4000	8000	LwA-tot
Airborne Sound Power Level		80.6	85.6	73.8	83.6	67.0	73.7	87.5	88.5 dBA
Air Outlet Induct Sound Power Level		73.1	84.1	88.6	99.1	87.9	88.3	87.5	99.1 dBA
Air Inlet Induct Sound Power Level		67.2	67.5	58.8	59.8	41.6	16.4	22.8	63.3 dBA
Return Air Outlet Induct Sound Power Level		74.7	88.1	90.1	91.6	92.0	87.9	88.9	96.5 dBA
Return Air Inlet Induct Sound Power Level		74.8	77.1	71.6	67.4	44.6	16.8	25.4	73.1 dBA

AHU#02

SOUND POWER LEVEL (dB)									
Frequency Hz		125	250	500	1000	2000	4000	8000	LwA-tot
Airborne Sound Power Level		74.4	79.8	70.4	68.3	62.2	65.3	85.5	84.5 dBA
Air Outlet Induct Sound Power Level		68.3	79.6	85.9	86.3	83.9	82.5	85.5	91.3 dBA
Air Inlet Induct Sound Power Level		62.3	65.2	59.0	55.6	39.4	14.9	22.9	60.7 dBA
Return Air Outlet Induct Sound Power Level		66.2	72.5	75.8	78.0	75.5	75.7	68.2	82.0 dBA
Return Air Inlet Induct Sound Power Level		65.4	62.0	54.4	56.6	37.9	14.9	18.0	59.6 dBA

APPENDIX C: NOISE MEASUREMENT DATA



APPENDIX D: PLANNING POLICY AND GUIDANCE

National Planning Policy

National Planning Policy Framework and the Noise Policy Statement for England

The Department for Communities and Local Government published the National Planning Policy Framework (NPPF) on 27th March 2012 and upon its publication, the majority of planning policy statements and guidance notes were withdrawn, including Planning Policy Guidance 24 Planning and Noise, which previously presented the government's overarching planning policy on noise.

The NPPF contains four aims, which are set out at paragraph 123 in Section 11 of the document, titled *Conserving and enhancing the natural environment*:

"Planning policies and decisions should aim to:

Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;

Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;

Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them cause of changes in nearby land uses since they were established; and

Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."

The Department for Environment Food and Rural Affairs published the Noise Policy Statement for England (NPSE) in March 2010. The explanatory note of NPSE defines the following terms used in the NPPF:

"NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

2.21 Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur."

The NPSE does not define any of the above effect levels numerically.

The NPSE presents the Noise Policy Aims as:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy and sustainable development:

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life."*

It can be seen that the first two bullet points are similar to Section 11 of the NPPF, with a third aim that seeks to improve health and quality of life. The NPSE later expands on the Noise Policy Aims, stating:

“2.23 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development (paragraph 1.8).

2.24 The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.

2.25 This aim (the third aim), seeks where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development (paragraph 1.8), recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.”

It is clear that noise described in the NPSE as SOAEL that would lead to significant adverse effects should be avoided, although there is no definition as to what constitutes a significant adverse effect. Similarly, noise should be mitigated where it is high enough to lead to adverse effects, termed the LOAEL, but not so high that it leads to significant adverse effects.

Local Planning Policy

British Standard 4142

British Standard (BS) 4142: 2014 *Methods for rating and assessing industrial and commercial sound* is intended to be used to assess whether noise from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises is likely to give rise to complaints from people residing in nearby dwellings.

The procedure contained in BS4142 for assessing the likelihood of complaints is to compare the “*specific sound level*”, which is the measured or predicted sound level from the source in question immediately outside the dwelling, with the background sound level.

NOTE 1 of paragraph 8.1.4 states that when determining the background sound level for the assessment;

“A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value”

BS4142 provides various corrective methods depending on if the sound source is tonal (0 to +6dB), impulsive (0 to +9dB) or distinctive (0 to 3dB), which can be applied.

“The likelihood of noise provoking complaints is assessed by subtracting the background noise level from the rating noise level. BS4142 states:

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB 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.

NOTE 2 Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.”

In the context of the NPPF, it is considered that a situation between where BS4142 suggests a low impact (specific sound levels below the measured background noise level) and an indication of significant adverse impact (specific sound levels exceed +10dB above the measured background noise level) would equate to the Lowest Observed Adverse Effect Level (LOAEL).

Noise levels that are more than 10dB below the measured background would equate to the No Observed Effect Level (NOEL).

Setting plant noise limits in accordance with the requirements of the LA will result in noise levels between the LOAEL and the NOEL.

This assessment is carried out over a one-hour period for the daytime and a fifteen-minute period for the night-time. Day or night are not defined in the standard but it states that night should cover the times when the general adult population are preparing for sleep or are actually sleeping. For the purposes of this assessment, it is assumed that daytime and night-time are 07:00 to 23:00 hours and 23:00 to 07:00 hours respectively.

BS4142 has been referenced in setting noise limits for any fixed plant proposed as part of the proposed development.