

Synergy House Manchester

Environmental Noise Survey and Plant Noise Assessment Report

30646/PNA1

6 April 2023

For:
W Sutherland Construction Ltd
Central Working
The Future Works
2 Brunel Way
Slough
SL1 1FQ



Hann Tucker Associates
Consultants in Acoustics Noise & Vibration

Head Office: Duke House, 1-2 Duke Street, Woking, Surrey, GU21 5BA [\(t\) +44 \(0\) 1483 770 595"> \(t\) +44 \(0\) 1483 770 595](tel:+441483770595)
Manchester Office: First Floor, 346 Deansgate, Manchester, M3 4LY [\(t\) +44 \(0\) 161 832 7041"> \(t\) +44 \(0\) 161 832 7041](tel:+441618327041)
 [\(w\) hanntucker.co.uk](http://www.hanntucker.co.uk) [\(e\) enquiries@hanntucker.co.uk](mailto:enquiries@hanntucker.co.uk)



Environmental Noise Survey and Plant Noise Assessment Report Report 30646/PNA1

Document Control

Rev	Date	Comment	Prepared by	Authorised by
0	06/04/2023	-	 James Hardacre Consultant BEng (Hons), AMIOA	 Tom Bonnert Senior Associate BEng (Hons), MIOA



Environmental Noise Survey and Plant Noise Assessment Report Report 30646/PNA1

Contents	Page
1.0 Introduction	1
2.0 Objectives	1
3.0 Acoustic Terminology	1
4.0 Site Description	2
5.0 Project Proposals	3
6.0 Acoustic Standards and Guidelines	3
7.0 Environmental Noise Survey	5
8.0 Plant Noise Emission Criteria	9
9.0 Plant Noise Impact Assessment	9
10.0 Conclusions	12

Attachments

Appendix A – Acoustic Terminology

Appendix B – Time History Graph 30646/TH1



1.0 Introduction

Hann Tucker Associates Limited (Hann Tucker) has been commissioned to provide supporting evidence for a planning application for the installation of new building services plant at Manchester Science Parks in Manchester.

Hann Tucker have therefore been commissioned to conduct an environmental noise survey to inform an assessment of plant noise egress from the proposed building services plant installation to surrounding noise sensitive receptors.

The new condenser units have been installed at the existing Equinix data centre in Synergy House, Manchester, therefore in-situ noise measurements have also been undertaken during our time on site.

This report presents the plant noise assessment and our advice on further mitigation measures, where/if necessary.

2.0 Objectives

To establish, by means of an unmanned survey over a minimum 24 hour period, the prevailing environmental noise levels at secure and accessible on-site positions using fully computerised noise monitoring equipment.

To carry out specific isolated noise measurements the newly installed condenser units.

Based on the results of the survey, to recommend daytime and night-time plant noise emission limits following liaison with the Local Authority.

To assess the airborne plant noise emissions from the proposed plant and advise on noise control measures to achieve the plant noise limits, if required.

3.0 Acoustic Terminology

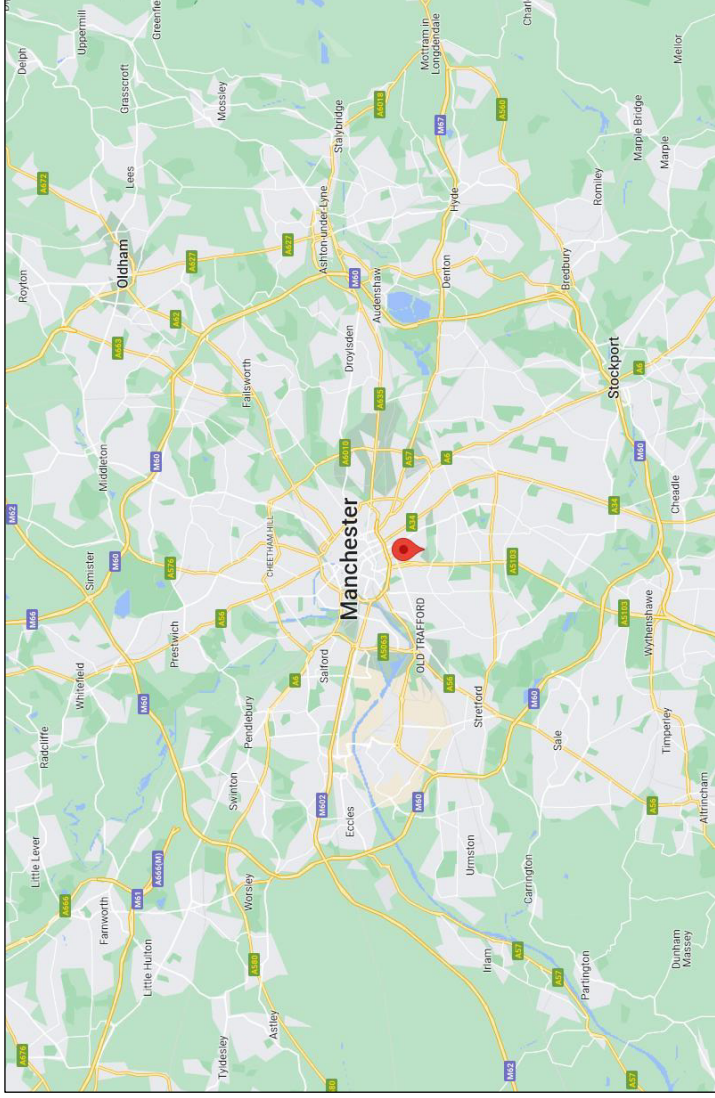
For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.



4.0 Site Description

4.1 Location

The site is located in Manchester Science Parks in Manchester. The site falls within the jurisdiction of Manchester City Council (MCC) and the site location is shown in the Location Map overleaf.



Location Map (Map Data © 2023 Google)

4.2 Description

The site is located in Synergy House, in Manchester Science Parks. There are other office buildings to the north and east of site, a Darul Aman Mosque to the west, and Holy Name Primary School to the south. The nearest residential properties are approximately 120m to the north west and south west of site.

The site is shown in the Site Plan below.



Site Plan (Imagery © 2023 Infoterra Ltd & Bluesky, Maxar Technologies, the GeoInformation Group, Map data © 2023 Google)

5.0 Project Proposals

We understand the proposed plant comprises 6No. new condenser units to be located within the existing external plant area to the south of the data centre. Reference has been made to the following mechanical services drawing as part of this assessment.

Reference	Title	Date
221006-XX-00-DR-M-51-101	Mechanical Services External Plant Layout, Unit 3, Ground Floor	14/03/2023

6.0 Acoustic Standards and Guidelines

6.1 National Planning Policies

In order to provide a suitable assessment a number of national planning policies have been considered, including:

- The National Planning Policy Framework (NPPF), 2021
- The Noise Policy Statement for England (NPSE), 2010
- Planning Practice Guidance – Noise (PPGN), 2019



The above documents highlight the importance of considering the potential noise effects on any new development and provide a qualitative approach to assessment. However, each of the above does not provide any quantitative guidance. As such, all quantitative guidance used to form a noise impact assessment is taken from various other standards and guidance s as detailed in the following sections.

6.2 BS 4142:2014 + A1:2019

BS 4142: 2014 describes methods for rating and assessing the effects of outdoor sound levels, of an industrial and/or a commercial nature, “*on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident*”.

The impact of a specific sound is indicated by subtracting the existing background noise level from the rating level (i.e. noise level from the proposed items of plant/machinery/etc plus any acoustic feature corrections). The standard states that:

- “a difference of around +10dB or more is likely to be an indication of a significant adverse impact”;
- “a difference of around +5dB is of marginal significance is likely to be an indication of an 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”.

The noise from the new development is expressed in terms of a rating level and given as a $L_{Aeq, T}$ noise level. The existing background noise level is expressed in terms of a $L_{A90, T}$ noise level. T is the assessment time interval, which is 1-hour for operations during daytime hours (07:00 to 23:00) and 15-minutes for operations during night-time hours (23:00 to 07:00).

BS 4142:2014 states that if a noise source contains an ‘acoustic feature’, such as tonality, intermittency or impulsiveness, an appropriate penalty should be applied.

6.3 Local Authority Requirements

The site lies within the jurisdiction of Manchester City Council. Manchester City Councils Planning and Noise Technical Guidance (June 2022) notes the following with regards to control of new fixed building services plant.

“Noise from fixed plant, equipment or machinery can be very annoying and disruptive to people living nearby particularly where that item involved emits a noise with impulsive or tonal characteristics.



Many of the complaints Environmental Health receive about noise from plant, equipment and machinery specifically concern the character of the noise emitted. Any noise assessment needs to consider not only the overall level of noise emitted, but also its particular characteristics. The noise assessment should be based on BS 4142, and any application for fixed plant, equipment or machinery must demonstrate that:

‘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’.

By designing the sound pressure level of any plant items to generate a noise impact of at least 5dB below the existing background level, any plant noise impact should be of a negligible level which should not give rise to complaints from users or occupiers of existing noise-sensitive usages. See Appendix A with regards to the expectation of how to calculate a ‘typical’ background level.

7.0 Environmental Noise Survey

7.1 Procedure

Fully automated environmental noise monitoring was undertaken J.W. Hardacre B.Eng (Hons) AMIOA from approximately 13:00 hours on Thursday 23 March 2023 to 16:00 hours on Monday 27 March 2023.

Additional manned measurements were performed between 13:00 hours and 13:30 hours on Monday 27 March 2023 with the purpose of establishing specific noise levels associated with the operation of existing and newly installed items of plant.

Unattended measurements were taken continuously of the A-weighted (dBA) L_{90} , L_{eq} and L_{max} sound pressure levels over 15 minute periods.

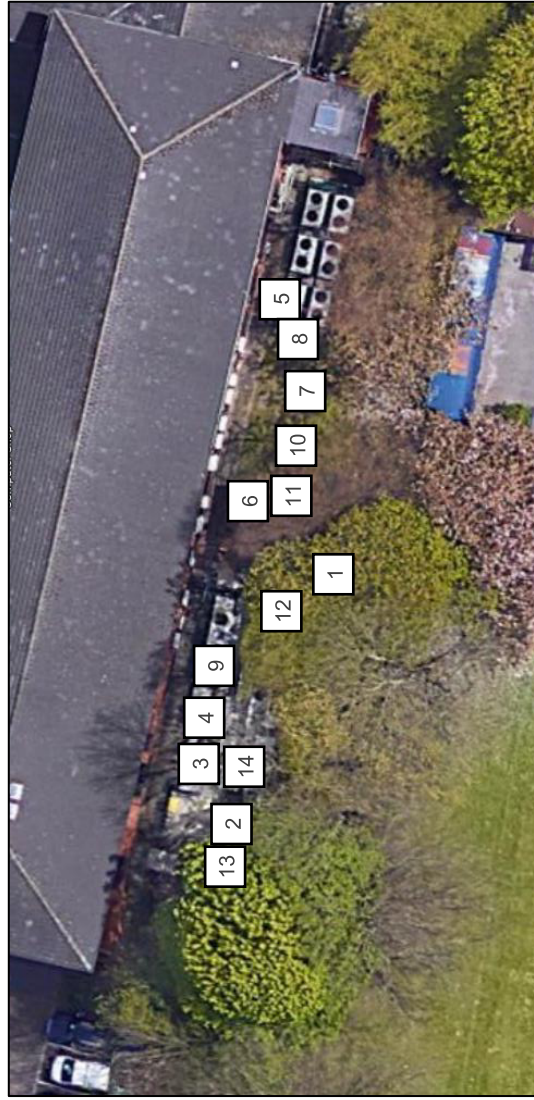
Attended measurements were obtained over shorter time periods, in close proximity to the selected item of plant being measured. Measurements were 60 seconds in duration.



7.2 Measurement Positions

The measurement positions were as described and illustrated below.

Position	Type	Description
1	Unattended	The microphone was attached to a pole approximately 2m above ground level as to overlook the Primary school and residential properties to the south of site.
2	Attended	1m from existing Mitsubishi unit
3	Attended	1m from existing Microox unit with low fan speed
4	Attended	1m from existing Microox unit with high fan speed
5	Attended	1m from existing Airedale units with 2No. fans running
6	Attended	1m from new unit 1No. fan running
7	Attended	1m from new unit
8	Attended	1m from existing Airedale units with 2No. high speed fans and 2No. low speed fans
9	Attended	1m from existing Microox unit with high fan speed
10	Attended	1m from new units with 2No. fans cycling up and down
11	Attended	1m from new units with 2No. fans running
12	Attended	1m from unknown unit
13	Attended	1m from existing Mitsubishi unit
14	Attended	1m from existing Microox unit cycling down from high fan speed



Plan Showing Measurement Positions (Imagery © 2023 Getmapping plc, Maxar Technologies, Map data © 2023 Google)



7.3 Instrumentation

The instrumentation used during the survey is presented in the Table below:

Description	Manufacturer	Type	Serial Number	Calibration
Position 1 Type 1 Data Logging Sound Level Meter	Larson Davis	824	3838	05/09/2022
Position 2 - 14 Type 1 Data Logging Sound Level Meter	B&K	2250	2600445	05/12/2022

The sound level meter, including the extension cable, was calibrated prior to and on completion of the surveys. No significant change was found to have occurred (no more than 0.3 dB).

The sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable.

The microphone was fitted with a windshield.

7.4 Weather Conditions

For the unattended survey between Thursday 23 March 2023 and Monday 27 March 2023, local weather reports indicated no notable periods of prolonged and heavy rainfall, with temperatures ranging from 2°C (night) to 14°C (day) and wind speeds less than 5. m/s. During our time on site, skies were largely clear with patchy cloud cover, wind conditions were light and from a north westerly direction and road surfaces were dry.

7.5 Results

7.5.1 Unattended Survey

The results have been plotted on Time History Graph 30646/TH1 enclosed, presenting the 15 minute A-weighted (dBA) L_{90} and L_{eq} noise levels at each measurement position throughout the duration of the survey, presented as free field sound pressure levels.

A summary of the results, as used to inform subsequent assessments against current guidelines, is presented in the table below. The L_{A90} values presented are the 'representative lowest' levels determined through statistical analysis of the 15-minute readings, in line with BS 4142. All results are free-field levels.



Position	Typical Measured $L_{A90(15min)}$ Background Noise Level (dB re 2×10^{-5} Pa)	
	Daytime (07:00 – 23:00) Hours	Night-Time (23:00 – 07:00) Hours
1	44	43

7.5.2 Attended Survey

The following table summarises noise levels recorded at each of the attended measurement positions

Position	Unit	Description	Sound Pressure Level (dB)		
			$L_{Aeq,T}$	$L_{A90,T}$	$L_{Amax,T}$
2	Mitsubishi Condenser	1m from fan running at constant duty	56	55	57
3	Microox Condenser	1No. fan running at constant duty	48	47	52
4	Microox Condenser	1No. fan running at constant duty	64	63	67
5	Airedale Condenser	2No. fans running at constant duty	61	60	62
6	Stulz Condenser	1No. fan running at constant duty	59	58	63
7	Stulz Condenser	1No. fan running at constant duty	57	50	67
8	Airedale Condenser	4No. fans running at constant duty	57	56	65
9	Microox Condenser	1No. fan running at constant duty	64	62	75
10	Stulz Condenser	2No. fans cycling up and down	56	47	61
11	Stulz Condenser	2No. fans running at constant duty	57	48	66
12	Unknown Condenser	1No. fan running at constant duty	49	47	54
13	Mitsubishi Condenser	1No. fan running at constant duty	55	53	56
14	Microox Condenser	1No. fan cycling up and down	59	53	64

7.6 Discussion Of Noise Climate

During the periods we were on site the dominant noise sources were noted to be distant road noise from the local road network, children playing in the playground and field of Holy Name Primary School and mild plant noise from local existing units.



8.0 Plant Noise Emission Criteria

Building services plant external noise emission levels will need to comply with local planning/environmental authority requirements and statutory noise nuisance legislation.

On the basis of the requirements of the local planning authority (see Section 6.3), and the results of the environmental noise survey, we propose that the following plant noise emission criteria be achieved at 1 metre from the nearest noise sensitive window.

Receptor	Noise Emission Limit, $L_{A_{Tr}}$ (dB)	
	Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 00:00 hours)
Holy Name Primary School	42	41

Note 1: The emission limits contain a +3dB correction for free field to façade level

The above criteria are to be achieved with all of the proposed plant operating simultaneously. Noise shall be assessed in accordance with BS 4142:2014 with corrections applied for any plant emitting noise of a tonal or irregular quality.

It should be noted that the above are subject to the final approval of the Local Authority.

9.0 Plant Noise Impact Assessment

9.1 Plant Noise Data

The proposed plant comprises 6No. Stulz Condenser units and the manufacturer's noise data for the equipment to be as follows:

Plant Description	Sound Pressure Level (dB re 2×10^{-5} Pa) at 5 metres								dBA
	63	125	250	500	1000	2000	4000	8000	
KSV075A42p	71	59	52	47	43	38	28	16	51

The following table presents the measured octave band levels at 1m of the new condensers.

Position	Sound Pressure Level (dB re 2×10^{-5} Pa) at 1m								dBA
	63	125	250	500	1000	2000	4000	8000	
7	63	62	62	55	49	44	41	39	58
10	59	60	63	52	46	43	38	34	56
11	61	59	63	53	48	44	37	32	57



It is worth noting that the manufacturer data is measured at 5m while our measurements were taken at 1m. We would expect a change in level of approximately 8dB over this distance. This indicates that the manufacturer supplied noise data likely presents a more worst-case situation if used in calculations.

9.2 Location of Plant

The condensers are installed within the existing plant compound to the south of site. The nearest noise sensitive receptor is Holy Name Primary School approximately 30m south of the proposed location.

9.3 Plant Noise Impact Assessment

We understand that the plant is operational as part of the cooling system for the data centre as so it is expected that the units can be operational at any time of day or night.

It should be noted that the proposed plant is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained. All proposed external plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems. In order to be robust, however, a +3dB feature correction as advised in BS 4142:2014 has been applied for the presence of intermittency due to the purpose of the plant.

The following table summarises our predictions of atmospheric noise emissions from the plant enclosure to the nearest noise sensitive window.

	Sound Pressure Level (dB re 2x10 ⁻⁵ Pa) at Octave Band Centre Frequency (Hz)							dBA
	63	125	250	500	1k	2k	4k	8k
Measured Sound Pressure Level at 1m	61	59	63	53	48	44	37	32
Correction for 6No.	+8	+8	+8	+8	+8	+8	+8	+8
Distance Correction 1m to 30m	-30	-30	-30	-30	-30	-30	-30	-30
BS4142 Penalty	+3	+3	+3	+3	+3	+3	+3	+3
Façade Reflection	+3	+3	+3	+3	+3	+3	+3	+3
Calculated Noise Level at Receptor	45	43	47	37	32	28	21	16
								41

Our calculations indicate that the newly installed plant should be capable of achieving the requirements of Manchester City Council outlined in Section 8.0.



Whilst the above table indicates that the proposed plant falls within the suggested plant noise limits at the receptor, additional analysis has been undertaken to assess the likely change in noise level in close proximity to the plant compound from the introduction of the new condensers. The following tables present the calculations of total plant noise emissions from the plant enclosure both without (ie existing and operational) and with the new condenser units.

	Sound Pressure Level (dB re 2x10 ⁻⁵ Pa) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Mitsubishi Condenser	63	34	53	55	51	45	38	32	56
Correction for 3No.	+5	+5	+5	+5	+5	+5	+5	+5	
Calculated Noise Level at 1m from Units	68	39	58	60	56	50	43	37	61
Microox Condenser	75	76	63	60	56	53	46	36	64
Correction for 7No.	+8	+8	+8	+8	+8	+8	+8	+8	
Calculated Noise Level at 1m from Units	83	84	71	68	64	61	54	44	72
Airedale Condenser	60	64	63	58	55	52	49	45	61
Correction for 7No.	+8	+8	+8	+8	+8	+8	+8	+8	+8
Calculated Noise Level at 1m from Units	68	72	71	66	63	60	57	53	69
Calculated Total Noise Level at 1m from Plant Enclosure	83	84	74	71	67	64	59	54	74.0

	Sound Pressure Level (dB re 2x10 ⁻⁵ Pa) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
New Stulz Condenser	61	59	63	53	48	44	37	32	57
Correction for 6No.	+8	+8	+8	+8	+8	+8	+8	+8	
Calculated Noise Level at 1m from Units	69	67	71	61	56	52	45	40	65
Calculated Total Noise Level at 1m from Plant Enclosure Inclusive of New Units	83	84	76	71	67	64	59	54	74.5

From the above tables it can be determined that even in a worst-case situation the total emissions from the plant enclosure is only increased by 0.5dB. This change is a negligible increase in noise level and as such would not be considered noticeable. As such, it further supports the new condenser units' compliance with the requirements of the Manchester City Council.



10.0 Conclusions

An environmental noise survey has been undertaken in order to establish the currently prevailing noise levels.

Plant noise emission criteria have been recommended based on the results of the noise survey and with reference to the Local Authority's advice.

An assessment has been carried out to determine the plant noise emissions at the nearest noise sensitive window.

The assessment indicates that the proposed plant should be capable of achieving the proposed environmental noise criteria at the nearest noise sensitive residential window.

Appendix A

The acoustic terms used in this report are defined as follows:

dB Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. $30\text{dB} + 30\text{dB} = 33\text{dB}$, not 60dB).

dB_A The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The _A subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted

It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.

L_{90,T} L₉₀ is the noise level exceeded for 90% of the period *T* (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.

L_{eq,T} L_{eq,T} is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, *T*.

L_{max} L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

Sound Pressure Level (L_p) is the sound pressure relative to a standard reference pressure of 2×10^{-5} Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).

Sound Power Level (SWL or L_w) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).

Synergy House

Position 1

L_{eq} , L_{max} and L_{90} Noise Levels

Thursday 23 March 2023 to Monday 27 March 2023

■ L_{Amax}

■ L_{Aeq}

■ L_{A90}

