

340 Deansgate
Manchester

Plant Noise Impact Assessment

On behalf of



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1.0 Introduction

- 1.1. Noise Solutions Ltd (NSL) has been commissioned by Mace Group to provide a noise impact assessment of the proposed internal plant to serve 340 Deansgate, Manchester.
- 1.2. An environmental sound survey has been undertaken to establish the prevailing background sound pressure levels at a location representative of the sound levels outside the nearest noise sensitive receptors to the site.
- 1.3. Plant noise levels have been predicted at the nearest noise sensitive receptors and assessed against the local authority's usual requirements.
- 1.4. To assist with the understanding of this report a glossary of acoustic terms can be found in **Appendix A**. An in-depth glossary of acoustic terms can be viewed online at www.acoustic-glossary.co.uk.

2.0 Details of development proposals

- 2.1. 340 Deansgate is a commercial unit. The proposed plant room louvres are located at the rear of the store on Southern Street in the place of four existing windows.
- 2.2. The AC plant will operate only when the store is open; the refrigeration plant will operate at all times but will typically run at reduced duty at night.
- 2.3. A site plan showing the site, surrounding area and the noise monitoring location used in this assessment is presented in **Appendix B**. The proposed store layout is shown in **Appendix E**. The Southern Street elevation is shown in **Appendix F**.

3.0 Nearest noise-sensitive receptors

- 3.1. The area surrounding the site has mixed use. Southern Street to the rear of the store is predominately residential in nature. The properties on Deansgate neighbouring the store are commercial.
- 3.2. The most potentially affected noise sensitive receptors will be the residential properties on Southern Street. Receptor R1 covers 6-12 Southern Street directly across the street from the plantroom louvres approximately 6m away. Receptor R2 covers 11-13 Southern Street, the property directly adjoining the proposed store. Here the closest louvre is approximately 3m away.

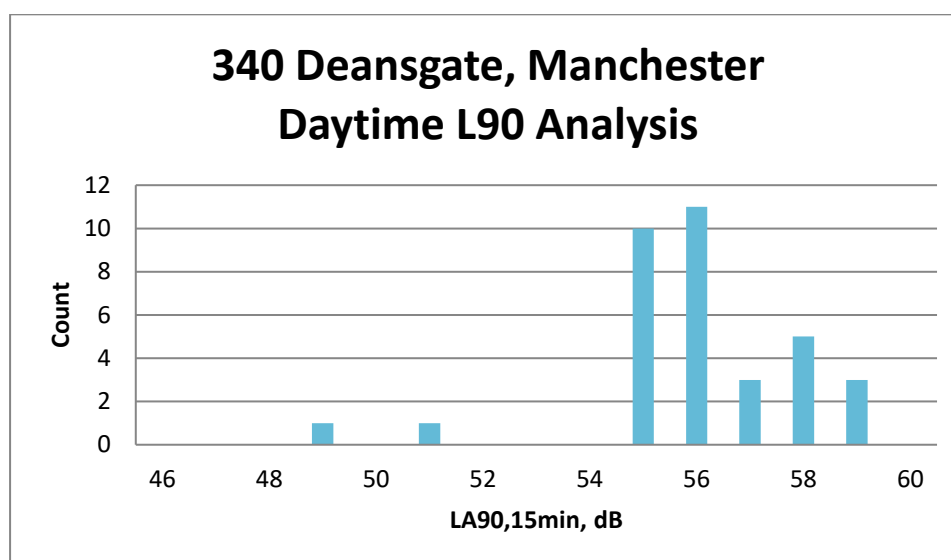
4.0 Existing noise climate

- 4.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant area during the quietest times at which the plant will operate.
- 4.2. The results of the environmental sound survey are summarised in Table 1 below. The full set of measurement results and details of the survey methodology are presented in [Appendix C](#).

Table 1 Summary of survey results

Measurement period	Range of recorded sound pressure levels (dB)			
	L _{Aeq} (15mins)	L _{Amax} (15mins)	L _{A10} (15mins)	L _{A90} (15mins)
Daytime (07.00 – 23.00 hours)	58-64	69-88	61-66	49-59
Night-time (23.00 – 07.00 hours)	54-68	66-95	58-64	47-57

Figure 1 Histogram of daytime L_{A90} background sound pressure levels

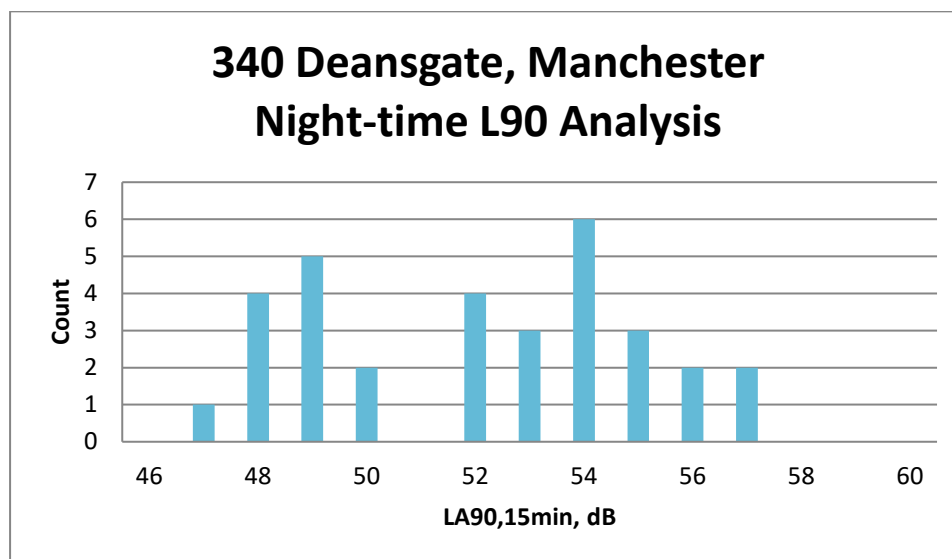


- 4.3. Further statistical analysis has been carried out on the data, and the mean, mode and median values are shown in Table 2 below.

Table 2 Statistical analysis of L_{A90,15min} levels during the daytime period

dB, L _{A90} daytime period	
mean	56
modal	56
median	56

Figure 2 Histogram of night-time L_{A90} background sound pressure levels



- 4.4. Further statistical analysis has been carried out on the data; the mean, mode and median values are shown in Table 3 below.

Table 3 Statistical analysis of $L_{A90,15min}$ levels during the night-time period

dB, L_{A90} night-time period	
mean	52
modal	54
median	52

- 4.5. The following values are considered robustly representative of the existing background sound pressure levels at nearby noise sensitive premises:
- 55dB L_{A90} during the daytime period; and
 - 48dB L_{A90} during the night-time period.

5.0 Plant noise design criteria

Manchester City Council

- 5.1. The Planning and Noise Technical Guidance document for Manchester City Council¹ provides the following guidance with regards to noise and vibration from fixed plant/equipment.

The noise assessment should be based on BS 4142, and any application for fixed plant, equipment or machinery must demonstrate that:

¹ Planning and Noise, Technical Guidance, Manchester City Council, October 2022

'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'.

BS 4142:2014+A1:2019 Methods for Rating and Measuring Industrial and Commercial Sound

- 5.2. British Standard (BS) 4142:2014+A1:2019 describes a method for rating and assessing sound of an industrial or commercial nature, which includes sound from fixed installations which comprise mechanical and electrical plant and equipment.
- 5.3. The industrial or commercial sound is assessed outside a dwelling or premises used for residential purposes, upon which sound is incident.
- 5.4. The procedure contained in BS 4142:2014+A1:2019 is to quantify the "specific sound level", which is the measured or predicted level of sound from the source in question over a one-hour period for the daytime and a 15-minute period for the night-time. Daytime is defined in the standard as 07:00 to 23:00 hours, and night-time as 23:00 to 07:00 hours.
- 5.5. The specific sound level is converted to a rating level by adding penalties on a sliding scale to account for either potentially tonal or impulsive elements. The standard sets out objective methods for determining the presence of tones or impulsive elements, but notes that it is acceptable to subjectively determine these effects.
- 5.6. The penalty for tonal elements is between 0dB and 6dB, and the standard notes: "Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible."
- 5.7. The penalty for impulsive elements is between 0dB and 9dB, and the standard notes: "Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."
- 5.8. The background sound level should be established in terms of the L_{A90} noise index. The standard states that the background sound level should be measured over a period of sufficient length to obtain a representative value. This should not normally be less than 15-minute intervals. The standard states that: *"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."*
- 5.9. The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:

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.

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."

5.10. The standard goes on to note that: "Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."

5.11. In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:

"An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context."

5.12. BS 4142:2014+A1:2019 requires uncertainties in the assessment to be considered, and where the uncertainty is likely to affect the outcome of the assessment, steps should be taken to reduce the uncertainty.

National Planning Policy Framework

5.13. A new edition of NPPF was published in December 2023 and came into effect immediately. The original National Planning Policy Framework (NPPF²) was published in March 2012, with subsequent revisions made periodically - this document replaced the existing Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." The December 2023 revised edition contains

² National Planning Policy Framework, DCLG, March 2012

no new directions or guidance with respect to noise. The paragraph references quoted below relate to the December 2023 edition.

- 5.14. Paragraph 180 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by, (amongst others) *"preventing new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, water or noise pollution or land instability."*
- 5.15. The NPPF goes on to state in Paragraph 191:
- "planning policies and decisions 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 quality of life;*
 - 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 ...*
- 5.16. The NPPF document does not refer to any other documents or British Standards regarding noise other than the Noise Policy Statement for England (NPSE³).
- 5.17. Paragraph 2 of the NPPF states that *"planning law requires that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise."*
- 5.18. Paragraph 12 of the NPPF states that *"The presumption in favour of sustainable development does not change the statutory status of the development plan as the starting point for decision making. Where a planning application conflicts with an up-to-date development plan (including any neighbourhood plans that form part of the development plan), permission should not usually be granted. Local planning authorities may take decisions that depart from an up-to-date development plan, but only if material considerations in a particular case indicate that the plan should not be followed"*.
- 5.19. Paragraph 123 states that *"Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land"*.

³ Noise Policy Statement for England, DEFRA, March 2010

Summary of criteria

- 5.20. Manchester City Council requires that the rating level of new plant, must be 5dB below the existing background sound level with the upper limit capped at 45dBA in order that daytime sound levels in the nearest residences are not excessive.
- 5.21. The proposed plant limits are therefore as shown in Table 4.

Table 4 Proposed plant noise emissions level limits at nearest residential receptors

Receptor	Period	Plant rating level (dB L _{Ar,Tr})
Residential	Daytime (07.00 – 23.00 hours)	45
	Night-time (23.00 – 07.00 hours)	43

- 5.22. The above limits have not been approved by the local authority at this stage.

6.0 Louvre noise impact assessment

- 6.1. Plant rating levels have been predicted at the nearest noise sensitive receptor. The assessment has taken account of the distance between the plant and the nearest receptor, orientations, screening, reflections and other propagation effects. Calculations also include the following attenuation.

Table 5 Proposed atmospheric side attenuator specifications

Attenuator	Insertion losses dB, at octave band centre frequencies (Hz)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Intake	6	13	26	41	45	45	43	36
Condenser Discharge Louvre	9	19	34	45	45	45	45	44
VRV Discharge Louvre	9	19	34	45	45	45	45	44

- 6.2. 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 plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems. The plant is also not expected to contain any significant low frequency tones, as stated in BS 4142:2014.
- 6.3. Table 6 summaries the results of the assessment outside the nearest noise sensitive premises. Full calculations are shown in [Appendix F](#).

Table 5 Plant room louvre noise assessment

Receptor	Period	Plant noise level at receptor	Plant noise limit at receptor	Excess, dB
R1	Daytime (07.00 – 23.00 hours)	45	45	0
	Night-time (23.00 – 07.00 hours)	41	43	-2
R2	Daytime (07.00 – 23.00 hours)	44	45	-1
	Night-time (23.00 – 07.00 hours)	42	43	-2

Assessment of uncertainties

6.4. Where possible uncertainty in this assessment has been minimised by taking the following steps:

- The measurement of the background sound levels was undertaken over a period including the quietest times of the day and night.
- The sound level meter and calibrator used have a traceable laboratory calibration and the meter was field calibrated before and after the measurements.
- Uncertainty in the calculated impact has been reduced by the use of a well-established calculation method.
- Care was taken to ensure that the measurement position was representative of the noise climate outside the nearby residential dwellings and not at a position where higher noise levels are present.

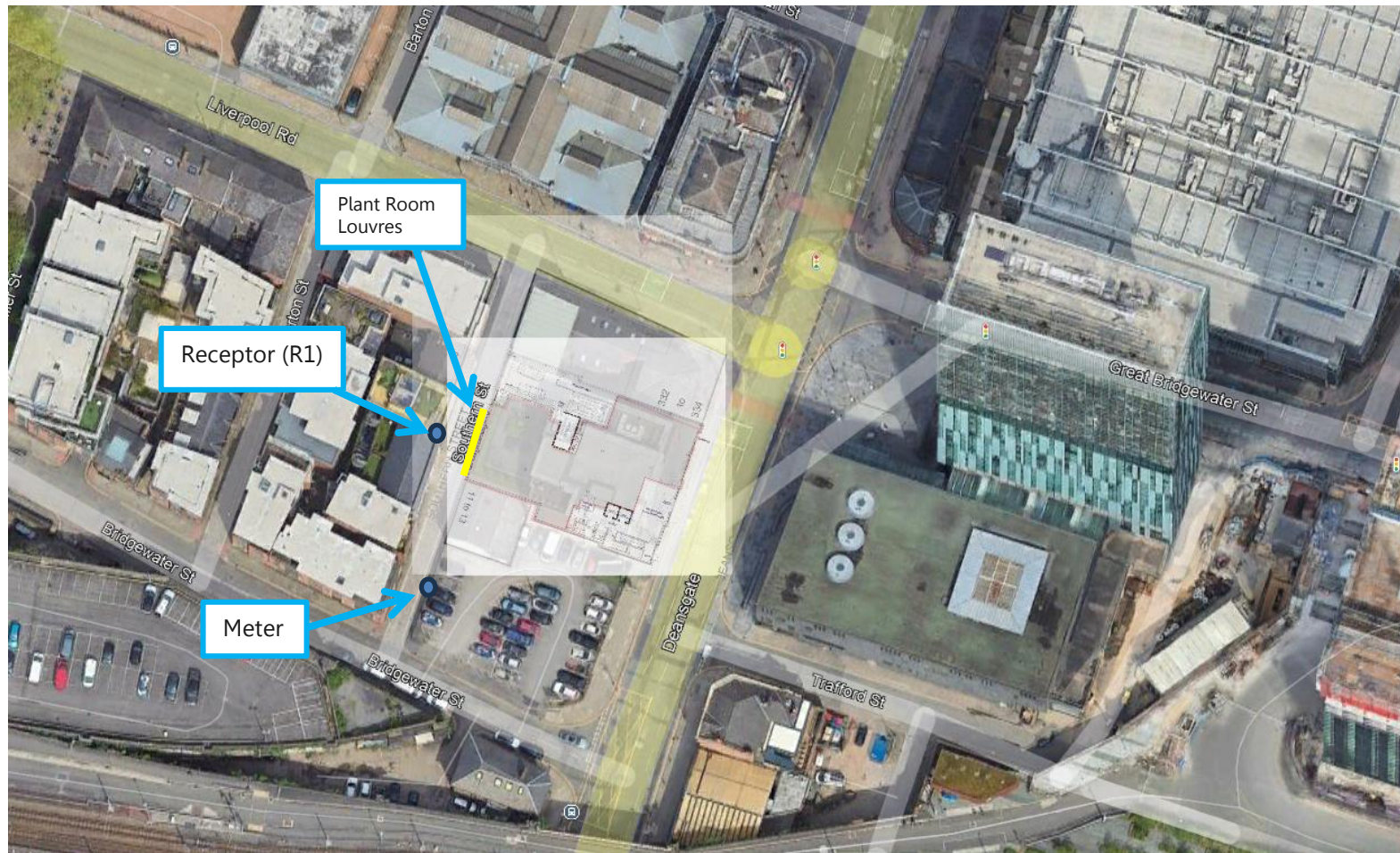
7.0 Summary

- 7.1. Noise Solutions Ltd (NSL) has been commissioned by Mace Group to provide a noise impact assessment of the proposed internal plant to serve 340 Deansgate, Manchester.
- 7.2. An environmental noise survey has been undertaken to establish the existing prevailing noise levels at a location representative of the noise climate outside the nearest noise sensitive receptors to the proposed site.
- 7.3. Plant noise levels have been predicted at the nearest noise-sensitive premises. When attenuated as described in this report, noise from the proposed plant will comply with Manchester City Council's usual requirements and should therefore be acceptable.

Appendix A Acoustic terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu\text{Pa}$. 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 perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. 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 in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A-weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. Generally used to describe background noise level.

Appendix B Photograph of site showing areas of interest



Appendix C Environmental sound survey

Details of environmental sound survey

- C.1 Measurements of the existing background sound levels were undertaken between 15.00 hours on Friday 18th October and 07.30 hours on Saturday 19th October 2024.
- C.2 The sound level meter was programmed to record the A-weighted L_{eq} , L_{90} , L_{10} and L_{max} noise indices for consecutive fifteen-minute sample periods for the duration of the survey.

Measurement position

- C.3 The sound level meter was positioned on a lamppost along Southern Street. The approximate location of the microphone is indicated on the plan in [Appendix B](#).
- C.4 In accordance with BS 7445-2:1991 '*Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use*', the measurements were undertaken under free-field conditions.

Equipment

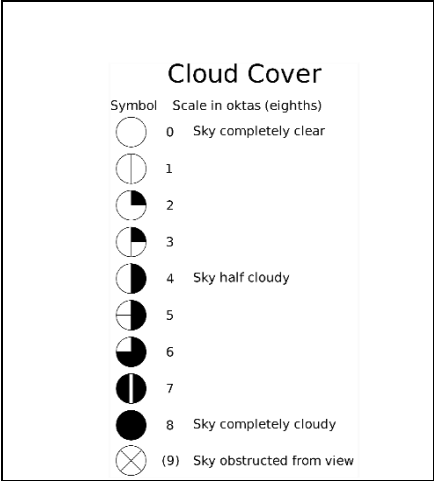
- C.5 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (± 0.2 dB) in the calibration level was noted.

Environmental noise survey

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977D / 99070	11/05/2023	Factory conformation certificate
Condenser microphone	Microtech MK255 / 25429		
Preamplifier	Svantek SV12L / 126981		
Calibrator	Rion NC-74 / 35094453	03/09/2024	1509491-1

Weather conditions

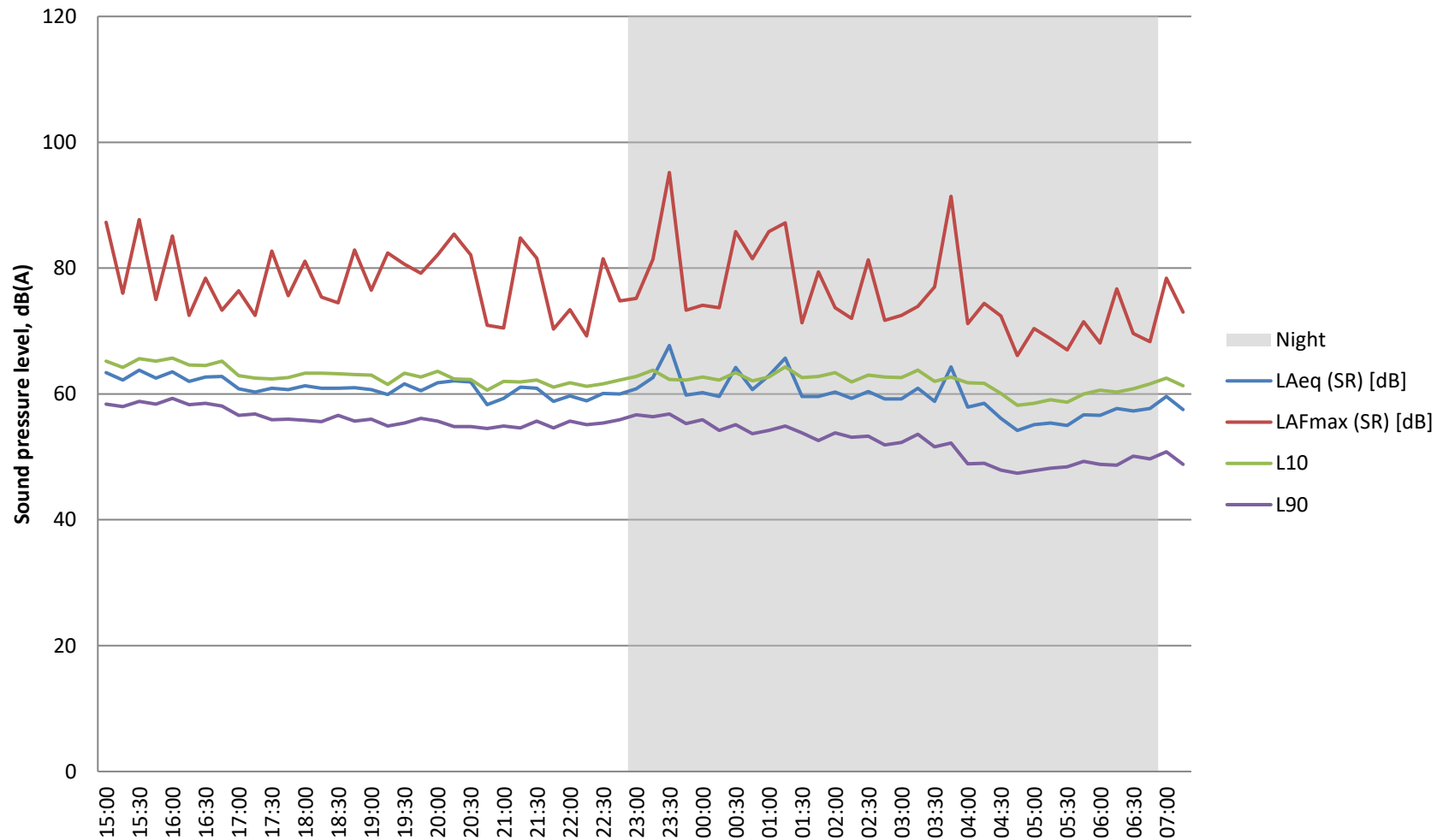
- C.6 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

Weather Conditions				
Measurement Location	Date/Time	Description	Beginning of Survey	End of Survey
As indicated on Appendix B	13.30 4 Jan - 09.45 5 Jan 2022	Temperature (°C)	15	11
 Cloud Cover Symbol Scale in oktas (eighths) 0 Sky completely clear 1 2 3 4 Sky half cloudy 5 6 7 8 Sky completely cloudy (9) Sky obstructed from view		Precipitation:	No	No
		Cloud cover (oktas - see guide)	4	8
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	No
		Wind Speed (m/s)	0.9	1.1
		Wind Direction	S	SW
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results

- C.7 The results of the environmental survey are considered to be representative of the sound pressure levels at the façades of the nearest noise sensitive receptors during the quietest times at which the plant will operate.
- C.8 The predominant noise sources affecting the area were construction and distant traffic noise. Some pedestrian noise was also present. The results of the survey are presented in a time history graph overleaf.

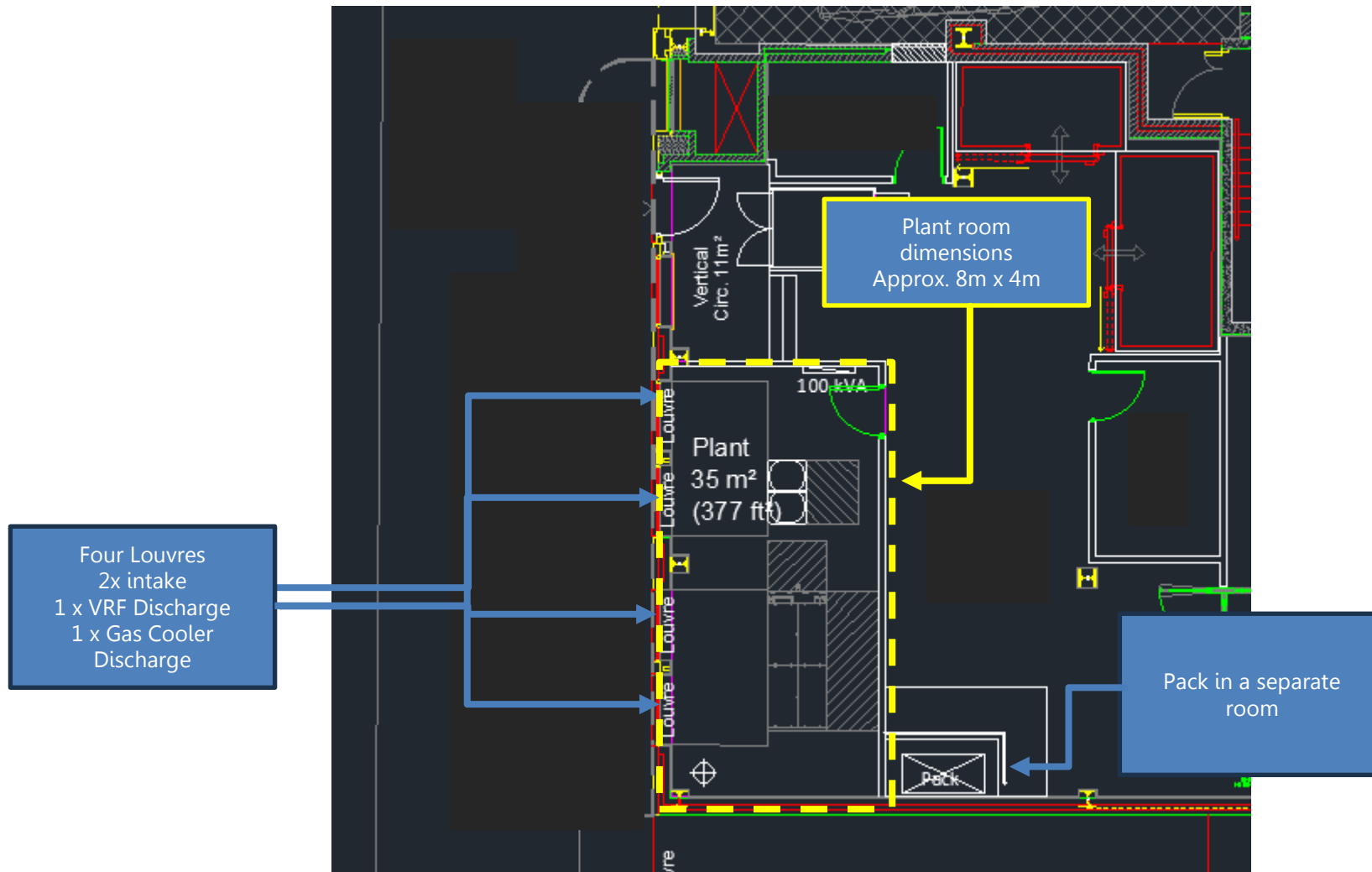
340 Deansgate, Manchester Friday 18 - Saturday 19 Oct 2024



Appendix D Plant noise data

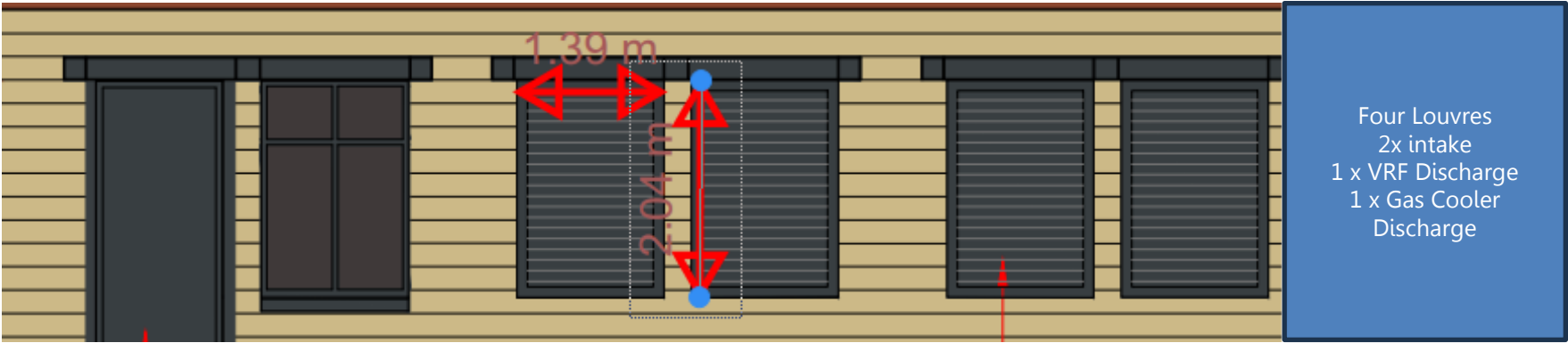
Plant	Model	Comment		Sound level (dB) at 1m at octave band centre frequencies (Hz)							
				63	125	250	500	1k	2k	4k	8k
Gas cooler	Proposed Internal Plant Spec	Sound power level each fan (2 operate) Estimated $L_p=55\text{dBA}$ @10m	Intake	75	80	76	69	69	67	63	59
			Discharge	81	86	82	75	75	73	69	65
Pack											
VRV	Proposed Internal Plant Spec	Sound Power level 84dB	Intake	88	81	78	76	70	67	63	60
			Discharge	94	87	84	82	76	73	69	66

Appendix E Proposed Plant Room Layout



Appendix F

Louvre Elevations



Appendix G Calculations

Daytime

Description	Notes	Sound level (dB) at octave band centre frequency								LAeq (dB)
		63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	
Plant room										
Intake										
Reverberant level in plant room	Rev Lp	85	82	77	72	69	66	62	58	75
All plant running										
Opening area (m2)	5.60	7	7	7	7	7	7	7	7	
SRI of opening	I.L	-6	-13	-26	-41	-45	-45	-43	-36	
Inside-outside correction		-6	-6	-6	-6	-6	-6	-6	-6	
Lw of opening	Lw	81	71	52	33	26	22	20	23	58
R1										
Distance correction (m)	6	-24	-24	-24	-24	-24	-24	-24	-24	
Screening (d = /m)	-	0	0	0	0	0	0	0	0	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		3	3	3	3	3	3	3	3	
Resultant at receptor R1	Lp @ R1	64	55	37	18	11	7	5	9	41
R2										
Distance correction (m)	4.3	-21	-21	-21	-21	-21	-21	-21	-21	
Screening (d = /m)	-	0	0	0	0	0	0	0	0	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		3	3	3	3	3	3	3	3	
Resultant at receptor R2	Lp @ R2	64	54	31	8	1	-3	-5	-1	41
Discharge										
Condenser Discharge										
Sound power	Lw	84	89	85	78	78	76	72	68	84
End reflection	2.1	-1	0	0	0	0	0	0	0	
SRI of opening	I.L	-9	-19	-34	-45	-45	-45	-45	-44	
Lw of opening		74	70	51	33	33	31	27	24	55
R1										
Distance correction (m)	6	-24	-24	-24	-24	-24	-24	-24	-24	
Screening (d = /m)	-	0	0	0	0	0	0	0	0	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		3	3	3	3	3	3	3	3	
Resultant at receptor R1	Lp @ R1	56	53	35	18	18	16	12	9	38
R2										
Distance correction (m)	2.7	-17	-17	-17	-17	-17	-17	-17	-17	
Screening (d = /m)	-	0	0	0	0	0	0	0	0	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		3	3	3	3	3	3	3	3	
Resultant at receptor R2	Lp @ R2	60	56	33	12	12	10	6	3	41
VRV Unit Discharge										
Sound power	Lw	94	87	84	82	76	73	69	66	83
End reflection	2.8	-3	-1	0	0	0	0	0	0	
SRI of opening	I.L	-9	-19	-34	-45	-45	-45	-45	-44	
Lw of opening		82	67	50	37	31	28	24	22	57
R1										
Distance correction (m)	6	-24	-24	-24	-24	-24	-24	-24	-24	
Screening (d = /m)	-	0	0	0	0	0	0	0	0	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		3	3	3	3	3	3	3	3	
Resultant at receptor R1	Lp @ R1	64	50	34	22	17	13	9	7	39
R2										
Distance correction (m)	6.8	-25	-25	-25	-25	-25	-25	-25	-25	
Screening (d = /m)	-	0	0	0	0	0	0	0	0	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		3	3	3	3	3	3	3	3	
Resultant at receptor R2	Lp @ R2	60	45	24	7	2	-1	-5	-7	35

SUMMARY

Receptor R1

Intake
Condenser Discharge
VRV Discharge
Cumulative

63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	
64	55	37	18	11	7	5	9	41
56	53	35	18	18	16	12	9	38
64	50	34	22	17	13	9	7	39
67	58	40	24	21	18	15	13	45

Receptor R2

Intake
Condenser Discharge
VRV Discharge
Cumulative

64	54	31	8	1	-3	-5	-1	41
60	56	33	12	12	10	6	3	41
60	45	24	7	2	-1	-5	-7	35
66	58	35	14	13	11	7	5	44

Night-time

Description	Notes	Sound level (dB) at octave band centre frequency								LAeq (dB)
		63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	
Plant room										
Intake										
Reverberant level in plant room	Rev Lp	75	80	74	67	67	64	60	56	73
All plant running										
Opening area (m2)	5.6	7	7	7	7	7	7	7	7	
SRI of opening	I.L	-6	-13	-26	-41	-45	-45	-43	-36	
Inside-outside correction		-6	-6	-6	-6	-6	-6	-6	-6	
Lw of opening	Lw	71	69	49	27	23	20	18	21	53
R1										
Distance correction (m)	6.0	-24	-24	-24	-24	-24	-24	-24	-24	
Screening (d = /m)	-	0	0	0	0	0	0	0	0	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		3	3	3	3	3	3	3	3	
Resultant at receptor R1	Lp @ R1	54	53	34	13	9	6	4	7	37
R2										
Distance correction (m)	4.3	-21	-21	-21	-21	-21	-21	-21	-21	
Screening (d = /m)	-	0	0	0	0	0	0	0	0	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		3	3	3	3	3	3	3	3	
Resultant at receptor R2	Lp @ R2	54	51	28	3	-1	-4	-6	-3	36
Condenser Discharge										
Sound power	Lw	84	89	85	78	78	76	72	68	84
End reflection	2.1	-1	0	0	0	0	0	0	0	
SRI of opening	I.L	-9	-19	-34	-45	-45	-45	-45	-44	
Lw of opening		74	70	51	33	33	31	27	24	55
R1										
Distance correction (m)	6.0	-24	-24	-24	-24	-24	-24	-24	-24	
Screening (d = /m)	-	0	0	0	0	0	0	0	0	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		3	3	3	3	3	3	3	3	
Resultant at receptor R1	Lp @ R1	56	53	35	18	18	16	12	9	38
R2										
Distance correction (m)	2.7	-17	-17	-17	-17	-17	-17	-17	-17	
Screening (d = /m)	-	0	0	0	0	0	0	0	0	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		3	3	3	3	3	3	3	3	
Resultant at receptor R2	Lp @ R2	60	56	33	12	12	10	6	3	41

SUMMARY

Receptor R1

Intake

Condenser Discharge

Cumulative

Receptor R2

Intake

Condenser Discharge

Cumulative

	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	
Receptor R1 Intake	54	53	34	13	9	6	4	7	37
Receptor R1 Condenser Discharge	56	53	35	18	18	16	12	9	38
Receptor R1 Cumulative	58	56	38	19	19	17	13	11	41
Receptor R2 Intake	54	51	28	3	-1	-4	-6	-3	36
Receptor R2 Condenser Discharge	60	56	33	12	12	10	6	3	41
Receptor R2 Cumulative	61	57	34	12	13	11	7	4	42