PENINSULAR
ACOUSTICS

Lifesproven

PLANT SOUND ASSESSMENT

48-54 Charlotte Street, London

PLANT SOUND LIMIT ASSESSMENT
PA0104 CHARLOTTE STREET, LONDON
NOVEMBER 2023

PUBLIC

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APPENDICES

1. INTRODUCTION

Peninsular Acoustics Ltd has been commissioned by Lifesproven (hereafter referred to as 'the Client') to undertake a Plant Sound Assessment for a development at 48 Charlotte St., London W1T 2NS (hereafter referred to as 'the Site).

It is understood that an Acoustics report is required to set an external sound limit for the newly proposed plant systems to protect existing nearby sensitive receptors from any potential adverse impacts as a result of the proposed plant items.

The exact items of plant are unknown at this stage; however, the plant will be operational during the daytime only as the items are intended to serve an office space. Therefore, the assessment will be limited to the daytime period which for the purposes of BS 4142[1], is classified as 07:00 -23:00.

In order to provide the necessary detail, the following scope of work has been undertaken:

- Determine the nearest Noise Sensitive Receptors (NSR);
- Undertake an environmental sound survey to establish baseline sound levels at the Site and the nearest sensitive properties;
- Calculate the specific sound levels at the receptor; and
- Assess the impact and determine any requirements for mitigation.

The assessment considers only new plant installations. Any existing plants which already have permissions have not been included in this assessment, thereby making the assessment worst case.

For details of the acoustic terminology used throughout this report, please refer to Appendix A.

[1] BS 4142:2014 +A1:2019 *'Methods for rating and assessing industrial and commercial sound.'*

2. DESIGN CRITERIA

2.1. LOCAL POLICY

Policy 6.27-6.29 of the Camden Planning Guidance, Amenity (January 2021) states that:

Plant and other noise generating equipment

Developments proposing plant, ventilation, air extraction or conditioning equipment and flues will need to provide the system's technical specifications to the Council accompanying any acoustic report. 'BS4142 Method for rating Industrial and Commercial Sound' contains guidance and standards which should also be considered within the acoustic report.

There are however likely to be instances where the Council will consider that a BS4142 assessment alone is not sufficient to provide all the information necessary. Plant such as electrical substations for example, may meet BS4142 standards, but are also known to emit low frequency noise, which also needs to be considered.

Plant, ventilation, air extraction or conditioning equipment and flues can cause disturbance to residential properties. The Council would therefore welcome the use of long-term maintenance agreements to ensure that equipment maintains acceptable noise levels over its lifetime and the use of timers to limit any unnecessary operation of the equipment.

2.2. BS 4142: 2014+A1: 2019

BS 4142 describes methods for rating and assessing industrial and/or commercial sound and includes, but is not limited to, the assessment of:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical equipment;
- Sound from the (un)loading of goods and materials at industrial/commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes such as that from forklift trucks on or around an industrial and/or commercial site.

The methods described in BS 4142 use outdoor sound levels to assess the likely effects of sound on people who are typically outside residential premises. Although indoor effects can be indicated where the façade composition is known. A summary of the approach set out in BS 4142 is set out below:

Establish or predict the specific sound level of the source(s) by considering both the ambient (includes the source to be assessed) and residual (excludes the source to be assessed but includes all remaining sources) sound level;

- Measure the representative background sound levels, typically by measuring close to the receptor location;
- Rate the specific sound level to account for any distinguishing characteristics (see below);
- Estimate the impact by subtracting the background sound level from the rating level; and
- Consider the initial estimate of impact, as determined above, in the context of the noise and its environment.

The specific sound level is rated to account for distinguishing characteristics by using penalties for tonality, impulsivity, intermittency, and other sound characteristics.

The character corrections are flexible according to whether the acoustic character is just perceptible at the noise receptor, or is clearly perceptible or highly perceptible, and range from 0 to 6 dB for tonal noise, 3 to 9 dB for impulsive noise, and 3 dB for other non-tonal/impulsive acoustic characteristics.

An initial estimate of impact of the specific sound is obtained by subtracting the background sound level from the rating level. Typically, the greater the difference, the greater the magnitude of impact.

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context;
- At differences lower than +5 dB a low impact is likely, depending on the context. The lower the rating level is to the measured background sound level, the less likely it is that the specific sound source will have an impact.

The results of the initial assessment should then be considered in light of all pertinent contextual factors.

At this stage, the exact items of plant are unknown and therefore, the proposals are to assign appropriate limiting sound levels at the nearest noise sensitive receptor such to not exceed a ‘Low’ impact in accordance with BS 4142.

3. ENVIRONMENTAL SOUND SURVEY

3.1. METHODOLOGY

The proposed plant is located on the roof of the ground floor of the Site at the location shown in Figure 3.1. The nearest NSR is directly adjacent at 16 Scala Street, London, W1T 2HW and is identified in Figure 3.2 .

An unattended survey of the background sound levels was undertaken 5.5m above local ground level at first floor level of the Site at location LT1 shown in Figure 3.1 which is considered to be representative of conditions at the identified NSR.

Measurements of consecutive 15-minute L_{Aeq}, L_{AFmax}, L_{A10} and L_{A90} sound pressure levels were taken between 11:00 on Friday 8th until 09:30 on Tuesday 12th July 2023.

Figure 3.1: Proposed Site Plan and Location

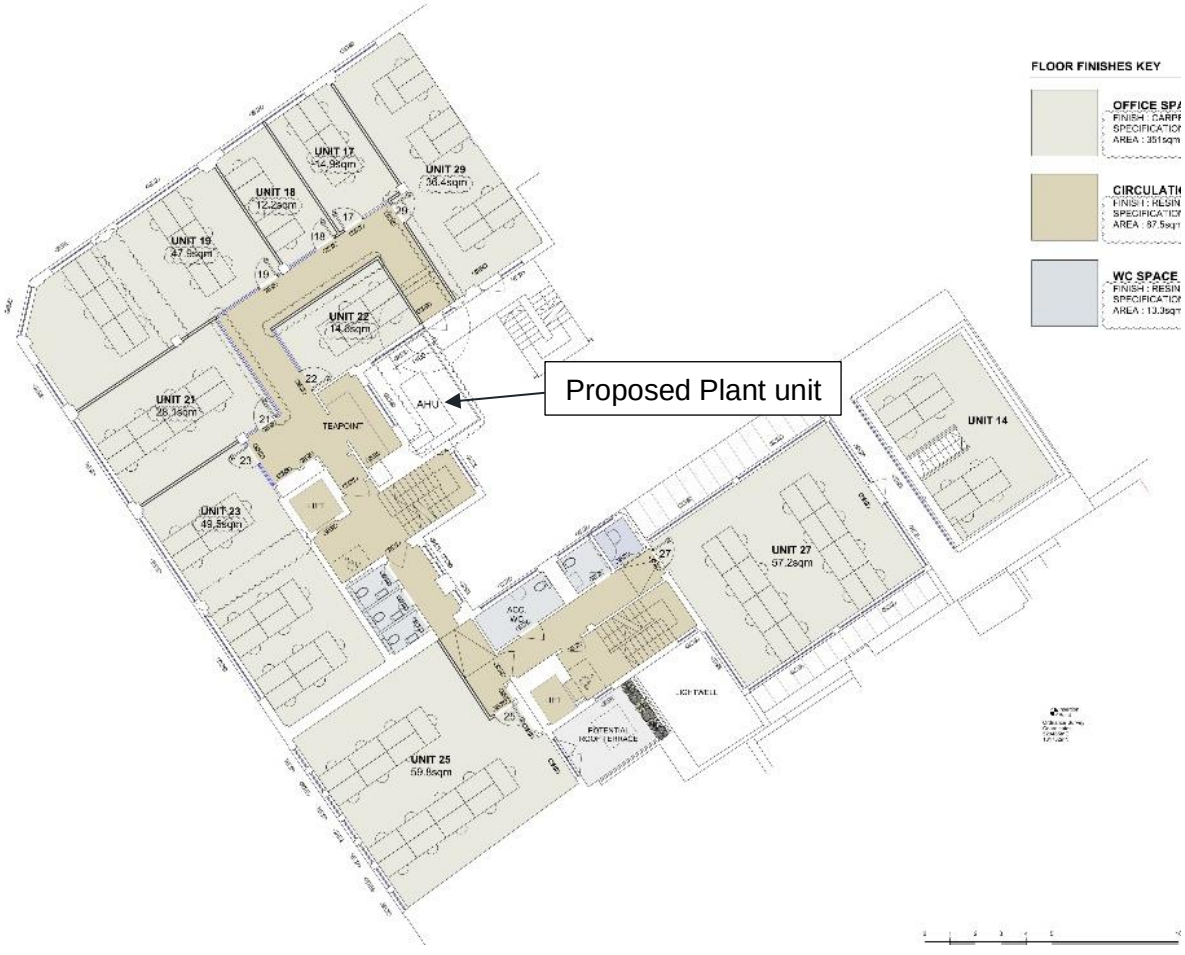
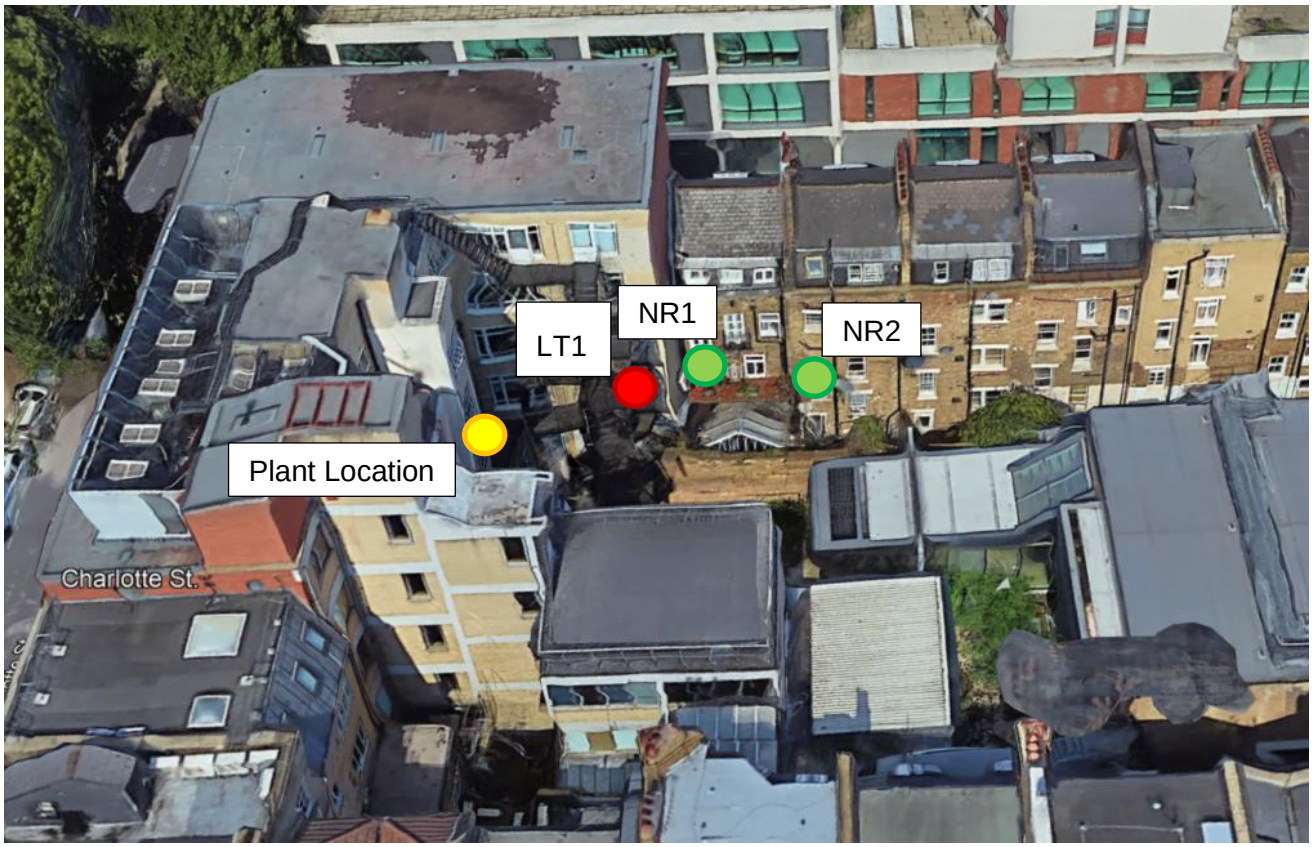


Figure 3.2: Measurement Location and Receptor Locations



3.2. EQUIPMENT

Sound levels were monitored using Class 1 integrating/averaging Sound Level Meters (SLMs), with measurement equipment housed in environmental protection apparatus. The SLM was field calibrated before and after the survey using a Class 1 calibrator, with no significant drift in calibration levels recorded (> ± 0.5dB).

Full details of the measurement equipment used in the survey are provided in Table 3.1.

Table 3.1: Environmental Survey Equipment

Position	Equipment Item	Make / Model	Serial Number	Calibration Due Date
LT1	Sound Level Meter	Norsonic 116	25511	29/03/2025
	Pre-amplifier	Norsonic 1206	30489	29/03/2025
	Microphone	GRAS 40AF	24876	29/03/2025
	Calibrator	Norsonic 1251	31664	29/03/2024

The weather during the survey was occasional spells of light showers with a gentle breeze, which made the conditions suitable for the measurement of environmental sound. Temperatures were recorded to range between 12 and 20 °C with wind speeds ranging between 1.4 and 4.2 m/s

Therefore, it can be concluded that there were no adverse meteorological impacts that could influence the outcome of the survey.

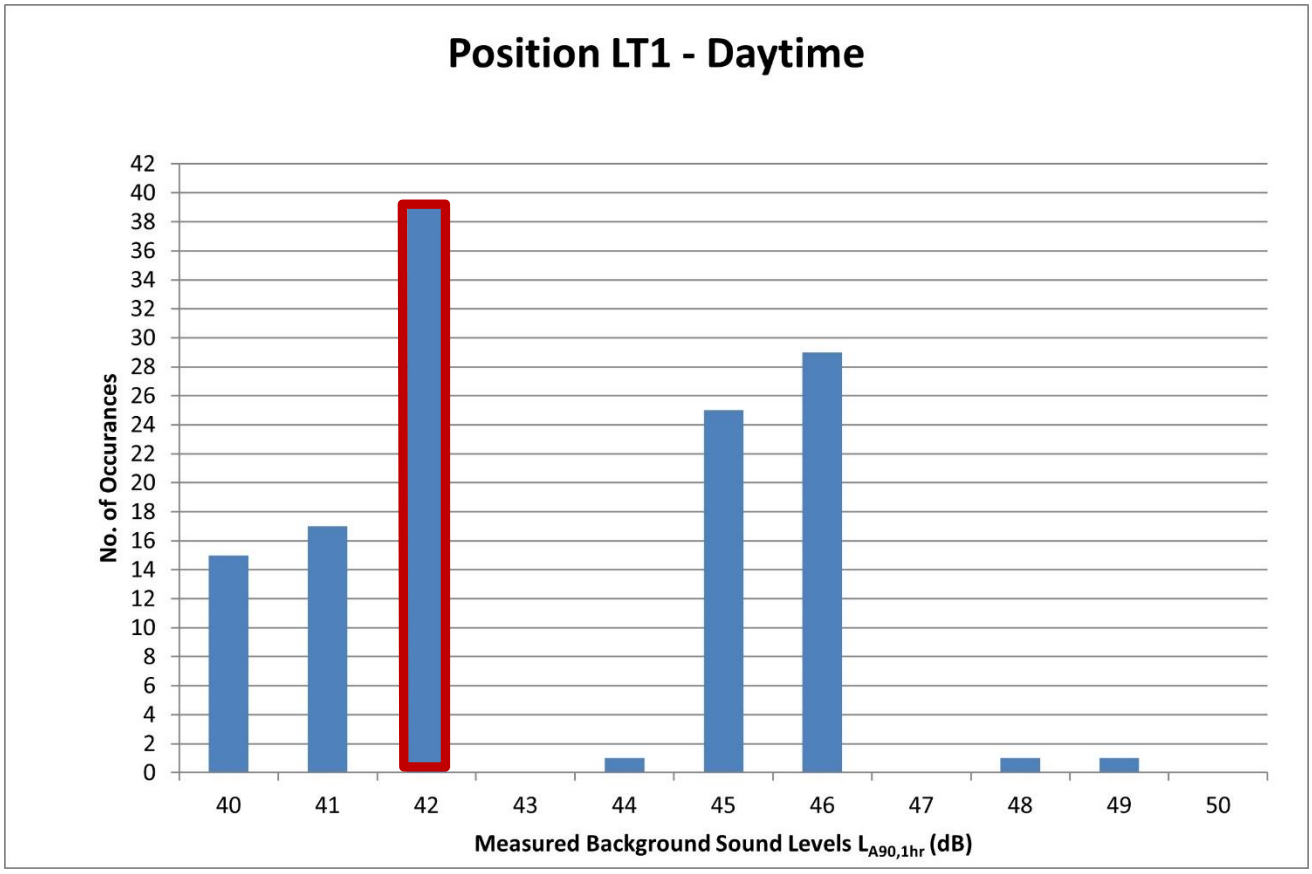
3.3. SOUND SURVEY RESULTS

Analysis of the results indicates that construction was ongoing on Friday 8th, Monday 11th and Tuesday 12th September. Therefore, this data has been omitted from analysis and the sound level limits have been derived from weekend measured background sound levels.

Figure 3.3 shows the results of all the daytime (07:00 – 23:00) measurements on Saturday 09th and Sunday 10th September 2023. Background measurements on Saturday and Sunday were taken to be representative of the background sound level due to ongoing construction work during the weekday period. According to the data a background sound level of 42 dB $L_{A90,\ 1hr}$ is representative of the most commonly occurring sound pressure level value which is exceeded 90% of the time.

A copy of the survey data is provided in Appendix B.

Figure 3.3: Statistical Analysis of Background Sound Levels, LT1.



4. ASSESSMENT

4.1. PROPOSED PLANT

The selected plant has been confirmed as 1no. Daikin D-AHU MODULAR_R (Size 4) and will be installed in the approximate location as shown in the Figure 3.1 and Figure 3.2.

Sound power level data has been taken from the manufacturer and is presented in Table 4.1.

Table 4.1: Sound Power Level Data for Daikin D-AHU Unit

Element	Sound Power Level (dB) in Octave Band Centre Frequencies (Hz)								Overall (dBA)
	63	125	250	500	1k	2k	4k	8k	
Supply	47	51	48	49	47	43	42	21	51
Return	46	50	48	49	46	42	42	21	51

N.B. For the purpose of calculations, it has been assumed that the overall sound power level from the air handling unit is the logarithmic addition of the supply and return subunits.

4.2. IMPACT ASSESSMENT

The assessment has been undertaken on the assumption of a parallelepiped propagation technique with detailed calculations provided in Appendix C. The calculations have taken into account distance and screening provided by the adjacent building (shown in Figure 3.1) in accordance with 9613-2[2].

The tables below show the predicted sound pressure levels at the nearest NSRs in accordance with the Initial Numerical Impact Assessment procedure of BS 4142.

As the specific sound levels ($L_{Aeq,\ 1hr}$) of the plant unit at the nearest receptors are significantly lower than the background sound levels ($L_{A90,\ 1hr}$), no character corrections have been applied to the specific sound levels to obtain the rating level ($L_{Ar,\ 1hr}$).

Table 4.2 BS 4142 INIA, NSR1.

Parameter	NSR1	NSR2
Specific Sound Level (At Receptor) [A]	9 $L_{Ar,\ Tr}$	19 dB $L_{Ar,\ Tr}$
Acoustic Character Corrections [B]	0 dB	0 dB
Rating level [C = A + B]	9 $L_{Ar,\ Tr}$	19 $L_{Ar,\ Tr}$
Background Sound Leve [D]**I**	42 dB $L_{A90,\ 1hr}$	42 dB $L_{A90,\ 1hr}$
Rating over Backgroudn [E = C – D]	-33 dB	-23 dB
Initial Estimate of Impact	Low Impact	Low Impact

The results of the INIA indicate that sound levels from the proposed plant items will be significant below the background sound level at the nearest NSR. Therefore, no further assessment or mitigation is required and both national and local policy is considered to be satisfied.

[2] ISO 9613-2 *'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.'*

5. CONCLUSIONS

Peninsular Acoustics Limited have been appointed by Lifesproven to undertake an environmental sound survey and derive appropriate plant sound level limits for a proposed plant installation at 48 Charlotte St., London W1T 2NS.

An environmental sound survey has been undertaken at the Site between 11:00 on Friday 08th until 09:30 on Tuesday 12th July 2023. Analysis of the survey data indicates construction was ongoing during the weekday periods and therefore, the assessment has used the weekend measured background sound levels to derive the limiting sound levels.

From discussions with the Client it is understood that the proposed plant items will be operational during the daytime (07:00 – 23:00) only and therefore, based upon a prevailing background sound level of 42 dB $L_{A90,\ 1hr}$ an assessment in accordance with BS 4142 has been undertaken using manufacturers data for the proposed plant items.

The results of the assessment show that sound levels from the proposed plant items will fall significantly below the background sound level at the nearest noise sensitive receptors and therefore, no mitigation is required and national and local policy is complied with.

Limitations to the use of this report are set out in Appendix D.

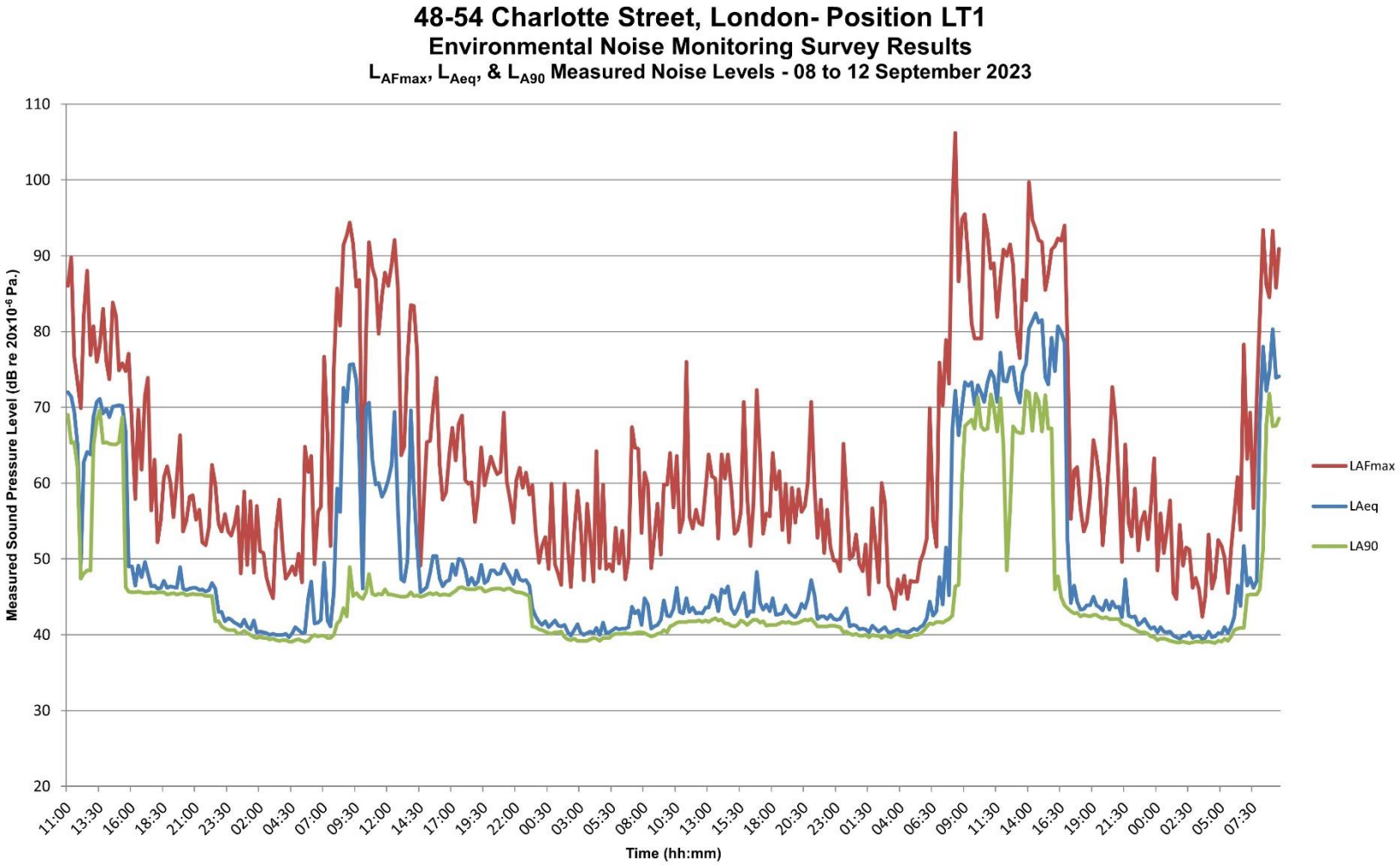
Appendix A

TECHNICAL TERMINOLOGY

Descriptor	Description
Free-Field Level	A measured sound pressure level that is independent of any contributions due to reflections from nearby surfaces and is therefore representative of the direct path only.
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level	The sound level is the sound pressure relative to a standard reference pressure of 20µPa ($20x10^{-6}$ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). 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 20µPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
$L_{eq,T}$	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.
$L_{AFmax,T}$	A noise level index defined as the maximum noise level during the period T. LMax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{Aeq,Tr}$	Specific noise level. The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.
$L_{Ar,Tr}$	Rating noise level. The specific noise level plus any adjustments for characteristic features of the noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m.

Appendix B

TIME HISTORY


48-54 Charlotte Street, London- Position LT1
Environmental Noise Monitoring Survey Results
L_{AFmax}, L_{Aeq}, & L_{A90} Measured Noise Levels - 08 to 12 September 2023
Measured Sound Pressure Level (dB re 20x10⁻⁶ Pa.)
110
100
90
80
70
60
50
40
30
20
11:00
13:30
16:00
18:30
21:00
23:30
02:00
04:30
07:00
09:30
12:00
14:30
17:00
19:30
22:00
00:30
03:00
05:30
08:00
10:30
13:00
15:30
18:00
20:30
23:00
01:30
04:00
06:30
09:00
11:30
14:00
16:30
19:00
21:30
00:00
02:30
05:00
07:30
Time (hh:mm)
LAFmax
LAeq
LA90

Appendix C

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

NR1:

Client	Lifesproven								
Job Name	PA104 48-54 Charlotte Street, London								
Parallelipiped Propagation									
Source Dimensions (m)									
Length	2.62		Width	1.2		Height	1.74		
Distance of Source (m)	0				Reference Area @ 0 m =		1.0	(X_0)	
(Enter "0" if source = SWL)									
Distance Required (m)	11		Equivalent Parallelipiped Area @ 11 m =				1790	(X_1)	
Directivity "Q"	1	*1 Surface Q=1*			*2 Surfaces Q=2*			*3 Surfaces Q=4*	
Calculation									
Frequency	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**A**
Source Sound Level	50	54	51	52	50	46	45	24	54
Distance Reduction	*= 10*Log(area X1/ref area X0) dB*								32.5
Directivity	*= 10*Log(Q) dB*								0.0
Barrier Attenuation									13
Resultant Sound Pressure Level @ 11 m =									
(1 - 2 + 3 - 4)	17.0	21.0	18.5	19.5	17.0	13.0	12.5	-8.5	**9**

NR2:

Client	Lifesproven								
Job Name	PA104 48-54 Charlotte Street, London								
Parallelipiped Propagation									
Source Dimensions (m)									
Length	2.62		Width	1.2		Height		1.74	
Distance of Source (m)	0				Reference Area @ 0 m =		1.0	(X_0)	
(Enter "0" if source = SWL)									
Distance Required (m)	16		Equivalent Parallelipiped Area @ 16 m =				3556	(X_1)	
Directivity "Q"	1	*1 Surface Q=1*			*2 Surfaces Q=2*			*3 Surfaces Q=4*	
Calculation									
Frequency	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**A**
Source Sound Level	50	54	51	52	50	46	45	24	54
Distance Reduction	*= 10*Log(area X1/ref area X0) dB*								35.5
Directivity	*= 10*Log(Q) dB*								0.0
Additional Attenuation									
Resultant Sound Pressure Level @ 16 m =									
(1 - 2 + 3 - 4)	14.0	18.0	15.5	16.5	14.0	10.0	9.5	-11.5	**19**

Appendix D

REPORT LIMITATIONS

This report has been prepared for the titled project or named part thereof and should not be used in whole or part and relied upon for any other project without the written authorisation of Peninsular Acoustics Limited. Peninsular Acoustics Limited accept no responsibility or liability for the consequences of this document if it is used for a purpose other than that for which it was commissioned. Persons wishing to use or rely upon this report for other purposes must seek written authority to do so from the owner of this report and/ or Peninsular Acoustics Limited and agree to indemnify Peninsular Acoustics Limited for any and all loss or damage resulting therefrom. Peninsular Acoustics Limited accepts no responsibility or liability for this document to any other party other than the person by whom it was commissioned.

The findings and opinions expressed are relevant to the dates of the site works and design drawings/specifications and should not be relied upon to represent conditions at substantially later dates. Opinions included therein are based on information gathered during the study and from our experience. If additional information becomes available which may affect our comments, conclusions or recommendations Peninsular Acoustics Limited reserve the right to review the information, reassess any new potential concerns and modify our opinions accordingly.

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