16A Neal's Yard

London
WC2H 9DP

Plant Noise Impact Assessment

On behalf of

ZLNY Limited

Project Reference: 90298 | Revision: 1 | Date: 18th October 2021
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Document Information

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	Name	Qualifications	Initials	Date
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For and on behalf of Noise Solutions Ltd				

Revision	Date	Description	Prepared	Reviewed/ Approved
1	20/10/2021	Minor text alterations and design update	AQ	DMB

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Appendices

1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned to provide a noise impact assessment for a new kitchen extract system serving the coffee shop at 16A Neal's Yard, London.

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. Noise levels from the proposed plant have been predicted at the nearest noise-sensitive receptors and assessed against London Borough of Camden'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. New plant is proposed to serve the existing commercial food and drink premises, Jacob The Angel. The remainder of the building is occupied by other separate commercial units.

2.2. The new extract fan is to be located internally with ducting running up the north east elevation and discharging at roof height. The system is to be fitted with a suitable atmospheric-side attenuator. In addition, the fan and ductwork will be fitted with suitably rated spring mounts and flexible connections to ensure structure-borne sound transmission to adjoining premises is minimised.

2.3. The coffee shop is expected to operate between the hours of 08:00-23:30, Monday through Sunday.

2.4. A site plan showing the site and surrounding area and the noise monitoring location used in this assessment is presented in **Appendix B**. The proposed plant layouts are shown in **Appendix D**. Plant noise data is given in **Appendix E**.

3.0 Nearest noise-sensitive receptors

3.1. The area surrounding the site is predominantly commercial in nature with some residential premises located above the local shops and restaurants.

3.2. The closest residential property is assumed to be approximately 3m from the extract discharge. This property is situated within the adjoined north-western premises. There are additional noise

sensitive properties immediately to the north east, assumed to be offices, or used for other commercial purposes, approximately 2.5m from the extract discharge.

4.0 Existing noise climate

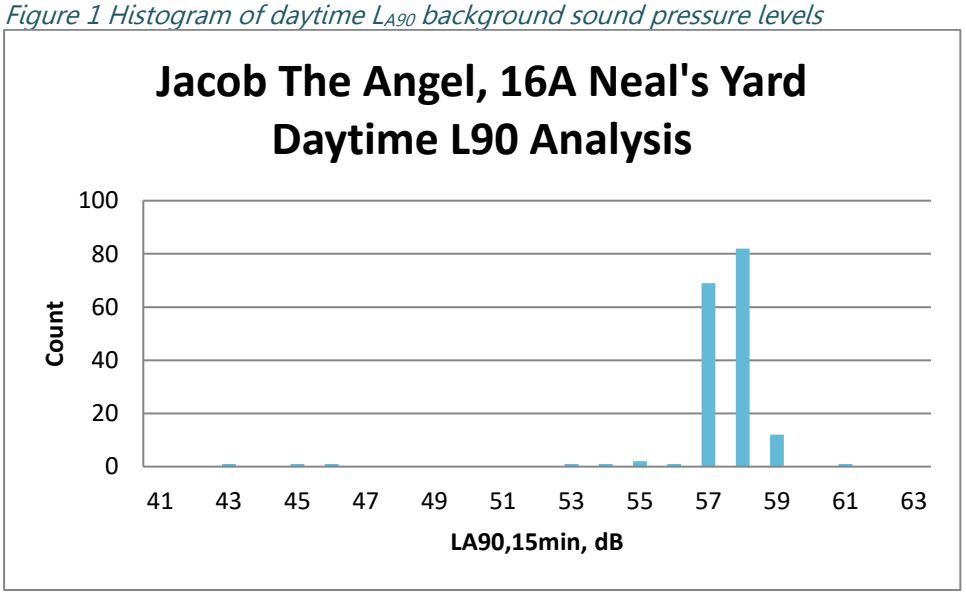
4.1. An environmental noise survey has been undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant area during the quietest times at which the plant will operate.

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)			
	$L_{Aeq(15mins)}$	$L_{AFmax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
Daytime (07.00 – 23.00 hours)	48-63	60-78	51-67	43-61
Night-time (23.00 – 07.00 hours)	43-59	54-68	45-61	40-58

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



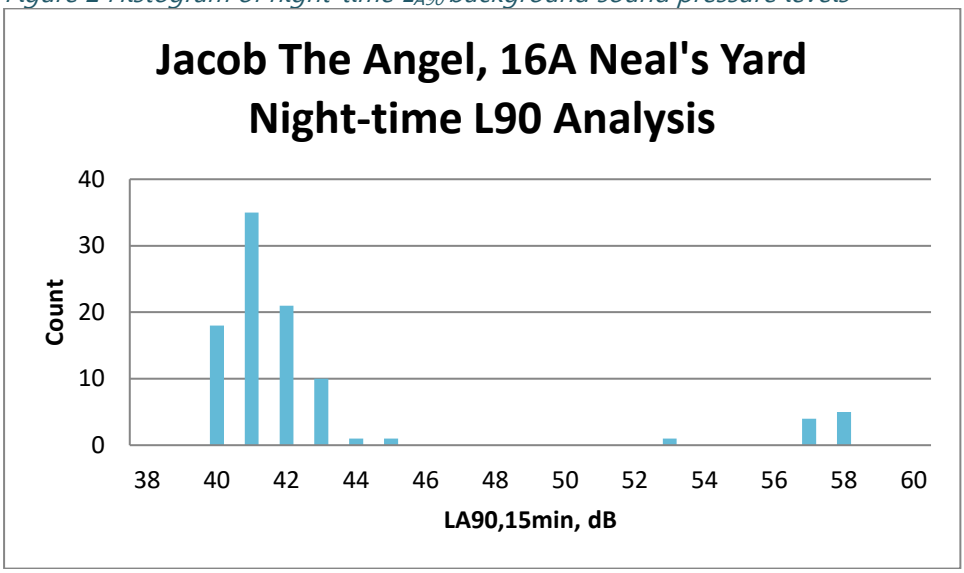
4.3. Further statistical analysis has been carried out on the data, and the mean and median values are shown in Table 2.

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

dB, L_{A90} daytime period	
Mean	57
Modal	58
Median	58

4.4. From the histogram analysis, 57dB(A) has been selected to be a robust representation of the background noise level during the daytime period.

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



4.5. Further statistical analysis has been carried out on the data and the mean 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	43
Modal	41
Median	41

4.6. From the histogram analysis, 41dB(A) has been chosen to be representative of the background sound level during the night-time period.

4.7. Therefore, the following values are considered representative of the existing background sound pressure levels at nearby noise sensitive premises:

- 57dB L_{A90} during the daytime period; and
- 41dB L_{A90} during the night-time period.

5.0 Plant noise design criteria

5.1. Section 6 of the Camden Planning Guidance Amenity, published March 2018, gives guidance on noise and vibration.

5.2. Clause 6.8 refers noise thresholds within Appendix 3 of the Local Plan and to refers to the principles of No observed effect level (NOEL), Lowest observable adverse effect level (LOAEL) and Significant observed adverse effect level (SOAEL) and defines their meanings. Specifically, in the context of this report, LOAEL is defined as:

> *The level above which changes in behaviour (e.g. closing windows for periods of the day) and adverse effects on health (e.g. sleep disturbance) and quality of life can be detected.*

5.3. SOEAL is defined as:

> *The level above which adverse effects on health and quality of life occur. This could include psychological stress, regular sleep deprivation and loss of appetite.*

5.4. Clause 6.27 states that:

> *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.*

5.5. Appendix 3 within the Camden Local Plan published 2017 states:

> *"A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion)."*

5.6. Table C of the appendix states the criteria at which development related noise levels will be acceptable:

Table C: Noise levels applicable to proposed industrial and commercial development (including plant and machinery)

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dBL_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dBL_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dBL_{Amax}

**10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.*

***levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.*

5.7. The plant noise data available indicates that the noise from the extraction fan is not tonal. It is therefore considered appropriate to exclude the 5dB additional penalty described in the notes to Table C.

Criterion at offices

5.8. Typically local authorities do not consider commercial premises to be as sensitive to noise as residential properties and, therefore, emissions criteria are generally relaxed at these locations.

5.9. However, it is considered appropriate to control plant noise levels within offices to meet the recommended internal noise levels provided in BS 8233:2014 *'Guidance on sound insulation and noise reduction for buildings'*. The standard states a range of noise levels for various spaces used for 'study and work requiring concentration' between 35 and 50dB L_{Aeq}.

5.10. In addition, BS 8233:2014 provides general guidance on the expected sound insulation performance of a given building façade, with details of how various elements can affect the overall performance. Concerning windows, it states that:

> *If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15dB.*

5.11. This implies that should windows on a noise affected façade be openable, a sound insulation value of 15dB should be applied to the whole façade to an internal room being assessed. It should be noted that a sound insulation performance of much greater than 15dB is expected for non-openable standard double-glazed windows. However in order to assess the worst case scenario, this report assumes that windows may be opened if desired.

5.12. Based on the above and assuming an internal criterion of 40dB L_{Aeq}, (typical for a standard office environment) - cumulative plant noise levels at the façade of the nearest commercial premises should not exceed 55dB L_{Aeq}.

BS 4142:2014 Methods for rating and assessing industrial and commercial sound

5.13. BS 4142:2014 is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142:2014 includes *"sound from fixed plant installations which comprise mechanical and electrical plant and equipment"*.

5.14. The procedure contained in BS 4142:2014 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.

5.15. 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.

5.16. The penalty for tonal elements is between 0 dB and 6 dB, 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."*

5.17. The penalty for impulsive elements is between 0 dB and 9 dB, 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."*

5.18. 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.*
- *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;*
- *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.*

5.19. The standard does state that *"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."*

5.20. 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."*

5.21. 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."*

5.22. BS 4142:2014 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.

Summary of proposed criteria

5.10. From a review of the proposed plant, the proposed extractor fan unit is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained. As a result, cumulative noise emissions have been assessed against a level 10dB below the lowest background noise level at the nearest residences.

5.11. Table 4 below presents the proposed cumulative plant noise limits at the nearest receptors.

Table 4 Proposed plant noise emissions level limits at nearest receptors

Receptor	Period	Plant noise level, dB
Residential premises	Daytime (07:00 – 23:00 hours)	47
	Night-time (23:00 – 07:00 hours)	31
Commercial premises	Daytime (07:00 – 23:00 hours)	55
	Night-time (23:00 – 07:00 hours)	--

6.0 Plant noise assessment

6.1. Noise levels for the proposed fan have been predicted taking into account ductwork system losses, aperture size, directivity of sound propagation and distance attenuation. Predictions are inclusive of the following atmospheric-side attenuation fitted to the ventilation system.

Table 5 Proposed atmospheric side attenuator to extract system

Attenuator	Insertion losses dB, at octave band centre frequencies (Hz)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Extract attenuator	6	11	21	30	36	32	26	18

6.2. The predictions have robustly assumed that there will be no acoustic screening between the plant and receptors.

6.3. A summary of the assessment of predicted noise levels is given in Table 6. Full calculations are given in **Appendix F**.

Table 6 Assessment of predicted noise levels

Receptor	Period	Plant rating level at receptor, dB $L_{Ar,Tr}$	Proposed criterion, dB $L_{Ar,Tr}$	Excess, dBA
R1 (residential)	Daytime (07.00 – 23.00 hours)	26	47	-21
	Night-time (23.00 – 07.00 hours)	26	31	-5
R2 (commercial)	Daytime (07.00 – 23.00 hours)	28	55	-27
	Night-time (23.00 – 07.00 hours)	28	N/A	N/A

6.4. The assessment shows that noise from the proposed plant will be below the recommended criteria and should therefore be acceptable to London Borough of Camden.

6.5. The following must, therefore, also be taken into consideration when determining the potential impact that may be experienced:

- The assessment is undertaken at the nearest residential/office windows. The impact on all other nearby residential/office windows will be lower due to screening and distance attenuation.
- The assessment has been made with all plant operating at maximum capacity, as this is not always the case, the assessment is an absolute worst-case scenario.

Assessment of uncertainties

6.6. 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 to provide a noise impact assessment for a new kitchen extract system serving the coffee shop at 16A Neal's Yard, London.

7.2. 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.

7.3. Noise levels from the proposed plant have been predicted at the nearest noise-sensitive receptors and assessed against the local authority's usual requirements. The predictions are inclusive of a suitable atmospheric-side attenuator being fitted to the extract system. In addition, the fan and ductwork will be fitted with suitably rated spring mounts and flexible connections to ensure structure-borne sound transmission to adjoining premises is minimised.

7.4. The assessment shows that noise from the plant will comply with London Borough of Camden's usual requirements and should therefore be acceptable to them.

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 s1 and s2 is given by 20 $\log_{10}$ (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. 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 Aerial photograph showing site and surrounding area

Appendix C Environmental sound survey

Details of environmental sound survey

C.1 Measurements of the existing background sound levels were undertaken between 13.10 hours on Thursday 30 September and 11.30 hours on Friday 1 October 2021.

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 5-minute sample periods for the duration of the noise survey.

Measurement position

C.3 The sound level meter was positioned in the 'yard' area to the rear of the property. 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

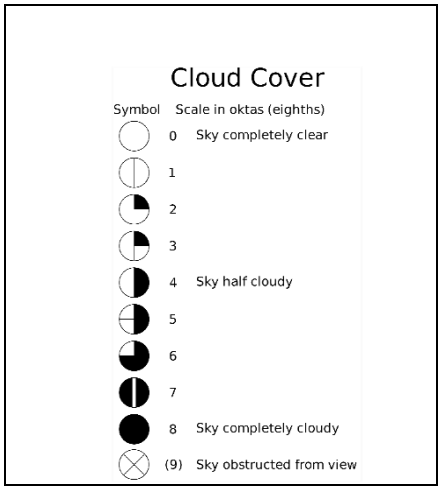
C.5 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

Environmental noise survey

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Rion NL-52 / 00654035	07/06/2021	1500431
Condenser microphone	Rion UC-59 /08290		
Preamplifier	Rion NH-25 / 54080		
Calibrator	Rion NC-74 / 35094453	13/08/2021	1500814-1

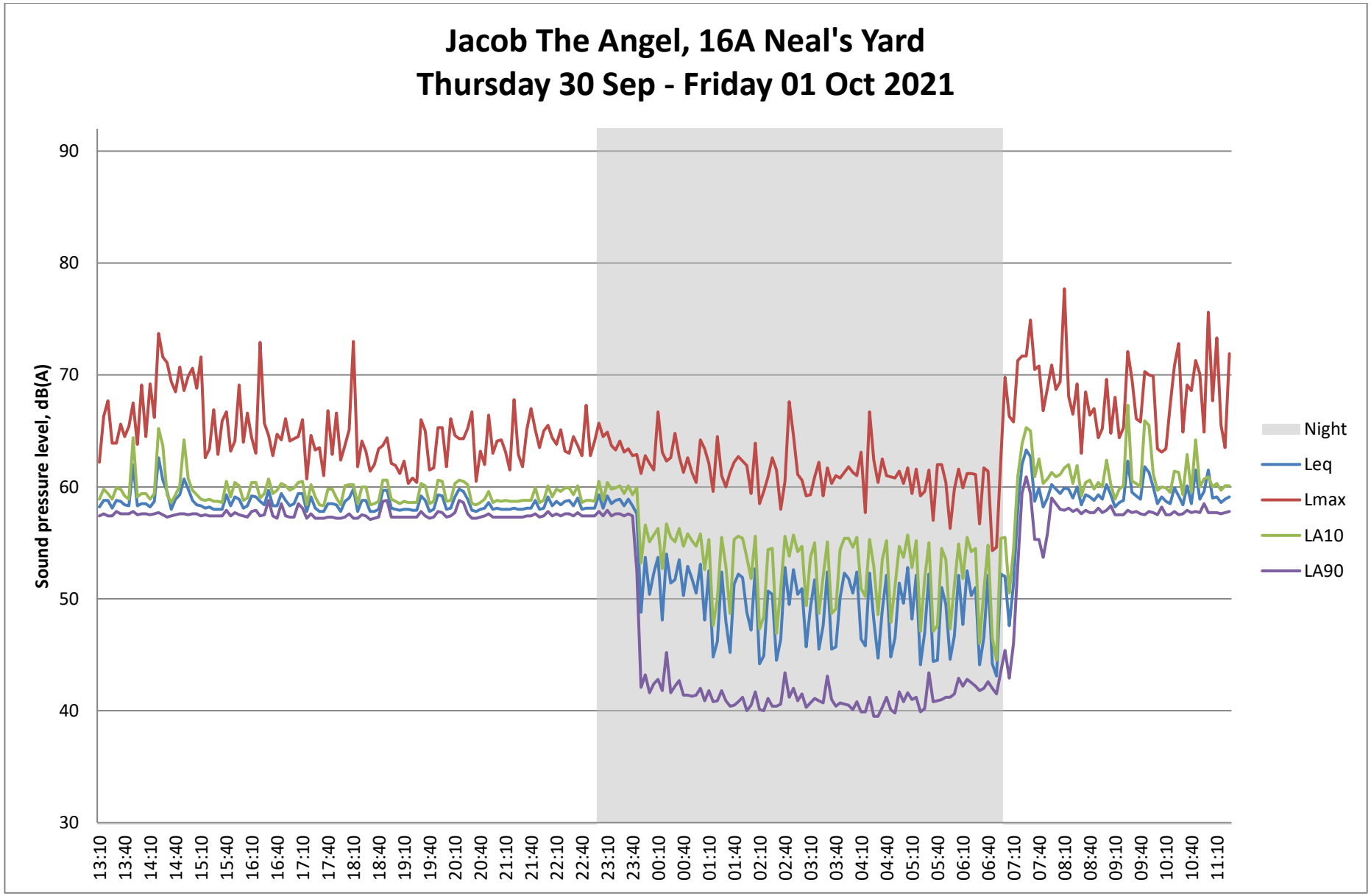
Weather conditions

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	13.10 30th Sep - 11.30 1st Oct 2021	Temperature (°C)	17	16
		Precipitation:	No	No
		Cloud cover (oktas - see guide)	8	7
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	Wet
		Wind Speed (m/s)	1	1
		Wind Direction	From south east	From south east
		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 background sound pressure levels at the façades of the nearest noise sensitive receptors during the quietest times at which the plant will operate. The predominant noise source affecting the area was plant noise with occasional noise from aircraft, power tools and voices. The results of the survey are presented in a time history graph overleaf.


Jacob The Angel, 16A Neal's Yard
Thursday 30 Sep - Friday 01 Oct 2021
Sound pressure level, dB(A)
90
80
70
60
50
40
30
13:10
13:40
14:10
14:40
15:10
15:40
16:10
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07:40
08:10
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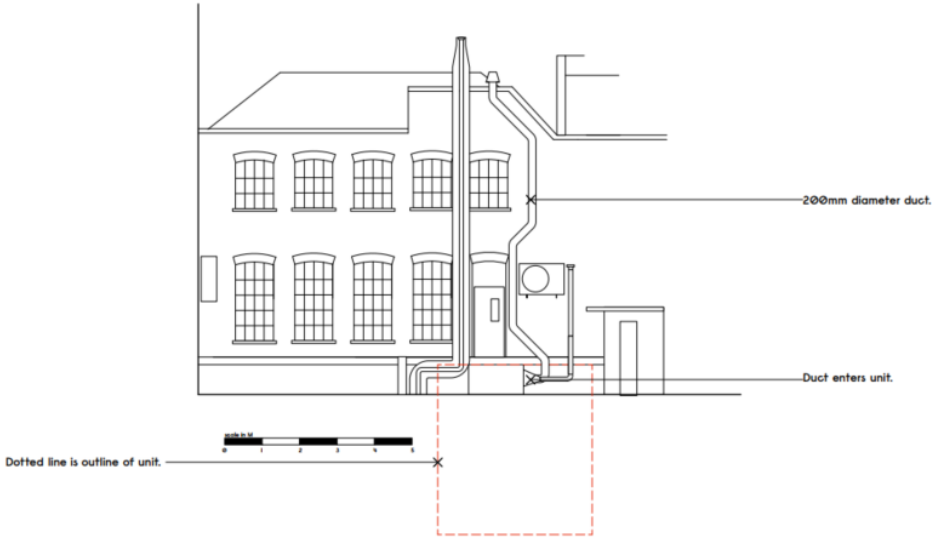
11:10
Night
Leq
Lmax
LA10
LA90

Appendix D Proposed plant layout drawings



Notes
-

Revision	Date	Description
/	/	/

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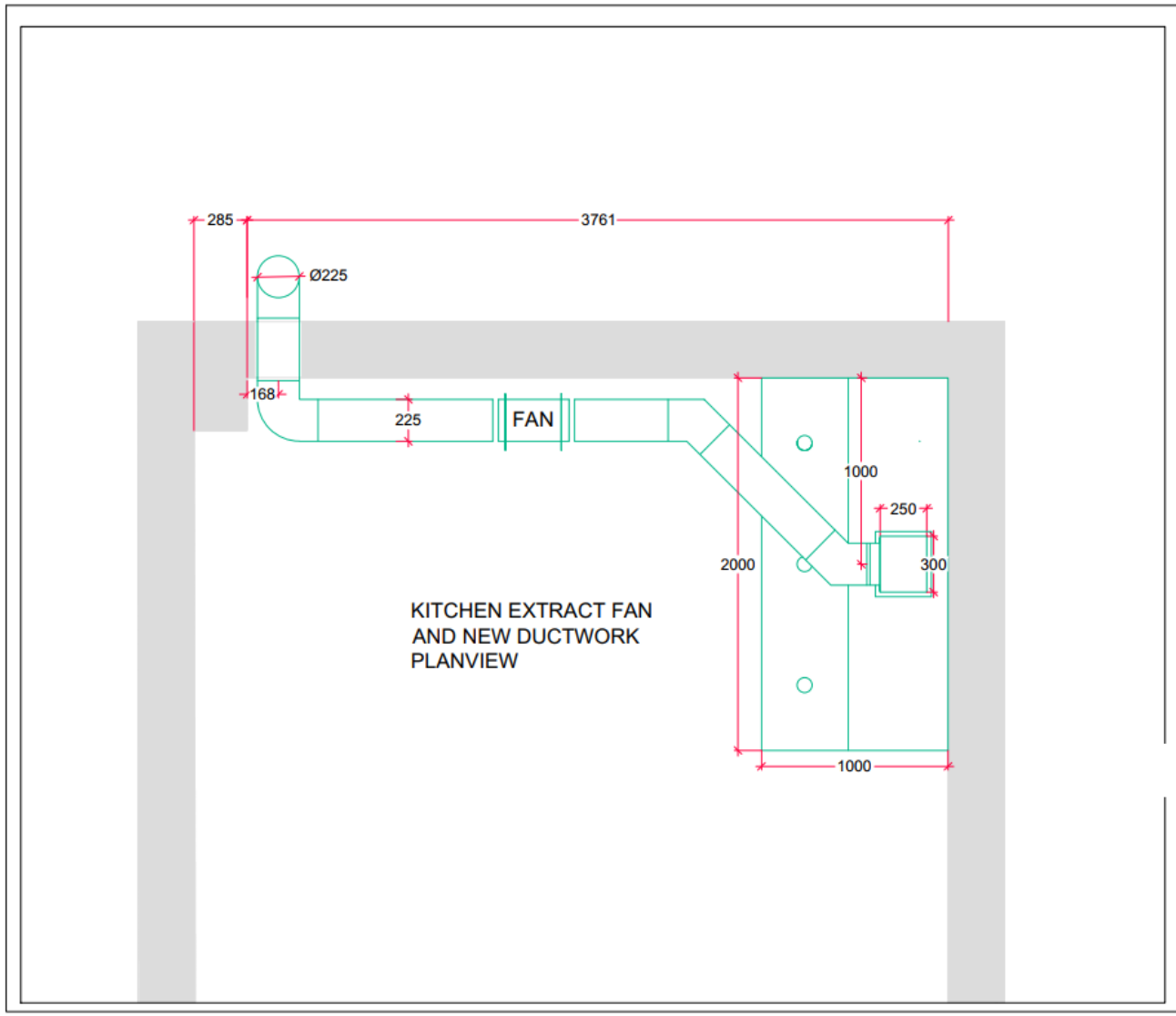
Project Barbary Next Door.
Drawing title As Proposed : Courtyard Elevation.
Scale 1:100@A3 Dwg. No. Rev
Date Oct 2021 490_PL-04 /
Status as built



CLEAN AIR SYSTEMS & INSTALLATIONS C.A.S.I

REV	DATE	AMENDMENTS
-	--/--/--	---------- ----------

CLIENT
TAG CATERING LTD

PROJECT
JACOB THE ANGEL
NEILS YARD

TITLE
EXTRACTION SYSTEM
PLAN VEIW

C.A.S.I LTD
16-18 SPRINGWOOD DRIVE
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SCALE:	DATE:	DRAWN BY:
1: 20 @A3	15-09-21	MB

DRAWING REF:	REVISION:
06179-01-03	-

Appendix E Plant noise data

Reference	Make / Model	No. units	Notes	Sound levels, dB, at octave band frequencies (Hz)							
				63	125	250	500	1K	2K	4K	8K
Kitchen extract fan	Helios 6661 VARW 225/2 TK	1	Discharge L_w	--*	67.1	70.6	77.2	76.0	74.8	71.0	64.1

**data unavailable from unit manufacturer*

Appendix F Plant noise calculations

Kitchen Extract – EF-01

		Octave band centre frequency (Hz)								
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dB(A)
Kitchen Extract										
Source noise level (Fan)	In duct L_w	0	67.1	70.6	77.2	76	74.8	71	64.1	81
System losses		-14	-10	-6	-3	-2	-4	-6	-6	
Atmospheric-side attenuator		-6	-11	-21	-30	-36	-32	-26	-18	
Total at discharge	L_w of discharge	**-20**	**46.1**	**43.6**	**44.2**	**38**	**38.8**	**39**	**40.1**	**47**
To R1 (Residential)										
Directivity correction (discharge)	225 x 225 (90,0)	0	0	0	0	-4	-7	-7	-7	
Distance correction	3 m	-18	-18	-18	-18	-18	-18	-18	-18	
Resultant at R1		**-38**	**28.1**	**25.6**	**26.2**	**16**	**13.8**	**14**	**15.1**	**26**
To R2 (Commercial)										
Directivity correction (discharge)	225 x 225 (90,0)	0	0	0	0	-4	-7	-7	-7	
Distance correction	2.5 m	-16	-16	-16	-16	-16	-16	-16	-16	
Resultant at R2		**-36**	**30.1**	**27.6**	**28.2**	**18**	**15.8**	**16**	**17.1**	**28**