RBA ACOUSTICS

THE DUKE OF HAMILTON, HAMPSTEAD, LONDON NW3

Atmospheric Plant Noise Assessment

Reference: 10179.RP01.PNA.2
Prepared: 15 September 2020
Revision Number: 1

Loci Pubs

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Revision	Comment	Date	Prepared By	Approved By
0	First issue of report	3 September 2020	Pritham D'Souza	Robert Barlow
1	Incorporating comments from Client Team and minor corrections	4 September 2020	Pritham D'Souza	Robert Barlow
2	Incorporating Planning Stage drawings	15 September 2020	Pritham D'Souza	Robert Barlow

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The recommendations within this report relate to acoustics performance only and will need to be integrated within the overall design by the lead designer to incorporate all other design disciplines such as fire, structural integrity, setting-out, etc. Similarly, any sketches appended to this report illustrate acoustic principles only and again will need to be developed in to full working drawings by the lead designer to incorporate all other design disciplines.

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1.0 INTRODUCTION

It is proposed to locate new items of plant to the rear of the Duke of Hamilton, 25 New End, Hampstead, London NW3. As part of the planning application, London Borough of Camden requires consideration be given to atmospheric noise emissions from the proposed equipment at the nearest noise-sensitive property.

RBA Acoustics have been commissioned to undertake measurements of the prevailing noise conditions at the site and to determine the atmospheric noise emissions in accordance with London Borough of Camden's requirements. This report presents the results of the noise measurements, associated criteria and provides the required assessment.

2.0 ENVIRONMENTAL NOISE SURVEY

2.1 General

In accordance with the requirements of the Local Authority, monitoring of the prevailing background noise was undertaken over the following periods:

18:30 on Friday, 10th July 2020 to 17:00 on Monday, 13th July 2020

During the survey periods the weather conditions were generally appropriate for the noise measurement exercise, it being dry with light winds.

Measurements were made of the L_{A90} and L_{Aeq} noise levels over sample periods of 15 minutes duration.

2.2 Measurement Location

Measurements were undertaken with the microphone positioned on the flat roof, 1.5m above the flat roof. This measurement position was considered as being representative of the noise climate as experienced at the closest residential receptors to the proposed plant to the rear of the property. The prevailing noise climate was noted to consist of noise from existing items of plant and from noise from patron activity in the rear beer garden belonging to the pub.

Photos of the measurement position are provided in Figure 1 in Appendix D.

2.3 Instrumentation

Details of the instrumentation used to undertake the survey are provided in Appendix B.

The sound level meter was calibrated both prior to and on completion of the survey with no significant calibration drift observed.

3.0 RESULTS

The noise levels at the measurement position are shown as time-histories and histograms on the attached Graphs 1 to 3. In order to ensure a representative and worst-case assessment the typically lowest background L_{A90} noise levels measured have been used in our analyses.

Following correspondence with the management team at Loci Pubs we understand the typical operating hours for the new kitchen extract fan are between 11:00 – 22:00. In order to ensure a robust assessment and account for any variance in patron activity in the rear beer garden during these times, our assessment has been based on the noise levels measured during the regular daytime period, which runs between 07:00 – 23:00. The typically lowest L_{A90} and the period averaged L_{Aeq} noise levels measured are summarised below.

Table 1 – Measured Levels

Measurement Period	Measured Sound Pressure Levels	
	L_{90} (dBA)	L_{eq} (dBA)
Daytime (07:00 – 23:00)	38	58
Night-time (23:00 – 07:00)	31	53
Operating Hours (11:00 – 22:00) *	44	59

*typical operating hours as advised by the management team at Loci Pubs

4.0 CRITERIA

Policy A4 of Camden Local Plan 2017 provides the following information regarding the required noise levels for proposed plant items:

> *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' (BS4142) will be used. For such cases a 'Rating Level' of 10dB below background (15dB if tonal components are present) should be considered as the design criterion.*

In line with the above requirements and in order to ensure a robust assessment, accounting for any variances in patron activity in the pub's rear beer garden, we would propose items of mechanical services are designed to the following levels such that noise emissions from the plant do not exceed the following levels when assessed at the nearest noise sensitive location:

- Daytime 28 dBA
- Night-time 21 dBA

In line with BS 4142: 2014, should the proposed plant be identified as having intermittent or tonal characteristics, a further penalty should be subtracted from any of the above proposed noise emission limits.

It should be noted that the above requirements are applied at the nearest residential adjacencies and alternative criteria should be incorporated if there are also commercial properties affected by the proposed plant installations

5.0 ASSESSMENT

Our assessment has been based upon the following information:

5.1 Proposed Plant Items

Table 2 – Plant Information

Ref.	Manufacturer/Model/Duty	Plant Type
KEF	SystemAir MUB 042 500E4 Sileo Multibox	Kitchen Extract Fan

5.2 Position of Unit

Following correspondence with the administrative team at the Loci Pubs, we understand the new kitchen extract fan is to be located to replace the existing kitchen extract fan, with a new duct run which is proposed to run along the first floor flat roof and terminate at high level above the flat roof. Figure 1 in Appendix D shows photos from the site and the extent of the proposed duct layout is shown in Figures 2 and 3 of Appendix D.

5.3 Noise Levels

Information regarding the noise levels of the proposed plant has been provided by the manufacturer of the unit. The associated plant noise levels are detailed as follows:

Table 3 – Plant Noise Levels

Unit	Parameter	Sound Level (dB) at Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
KEF – Outlet	L_w	94	86	83	79	75	71	66	61
KEF – Casing Breakout	L_w	76	68	65	61	57	53	48	43

Review of the octave band data provides no indication of any tonal characteristics associated with the proposed plant.

5.4 Location of Nearest Residential Windows

Receptor 1

In terms of noise emissions from the ducted termination, the closest residential windows to the new item of plant are advised as being the residential windows belonging to 25 New End, Hampstead NW3 from the proposed atmospheric duct termination.

Receptor 2

In addition to the above, with regard to casing noise breakout, an additional assessment has also been carried out to residential windows located on 14 Elm Row, NW3.

5.5 Calculation of Noise Levels at Nearest Residential Window

Our calculation method for predicting noise levels from the proposed plant at the nearest residential windows, based on the information stated above, is summarised below.

- Source Term SWL
- 20LogR Distance Attenuation
- Directivity
- Duct Losses & End Reflections
- Attenuator Insertion Loss
- Screening and Enclosure Loss

The results of the calculations indicate the following noise levels (without any mitigation measures) at the nearest affected residential windows:

Table 4 – Predicted Noise Levels

Operating Period	Receptor 1		Receptor 2	
	Prediction (dBA)	Criterion (dBA)	Prediction (dBA)	Criterion (dBA)
Daytime (07:00 – 23:00)	48	28	40	28

Noise from the proposed units to the rear of the property is above the target criteria. We therefore recommend mitigation is included in the design and installation.

5.6 Mitigation

Following our review of the plant data, in order to achieve the required plant noise emissions targets at the nearest noise sensitive receptors, it would be required to appropriately attenuate noise emissions from the ducted termination and casing breakout of the kitchen extract fan.

Therefore, we would recommend that attenuators are added to the ducted atmospheric termination of the kitchen extract fan. The total attenuator performance required on the atmosphere-side of the fan has been detailed in the Table 5 below. This is a high-performance requirement for the attenuators and this overall performance is typically achieved by 1500mm long attenuators with 30% free area. Any attenuator specifications would need to be confirmed by suitable suppliers and implications in terms of pressure drops, etc. would need to be reviewed by the appropriate suppliers or M&E Engineers.

Table 5 – Acoustic Attenuator – Minimum Insertion Loss Values (Atmospheric Side)

Transmission Loss (dB) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
8	15	25	40	46	47	43	32

In addition to the incorporation of the attenuators along the duct-run, we would also recommend that an enclosure is built around the fan unit itself to appropriately address the casing noise breakout. This enclosure should be constructed to enclose the fan and any associated ductwork up to the first attenuator, being entirely independent of the fan itself. The enclosure should be built using solid and completely imperforate panels with absorptive linings. The minimum surface density of the panels used should be 15kg/m^2.

Our calculations indicate that the incorporation of the above recommendations would result in the predicted noise levels at the receptors to be as follows:

Table 6 – Predicted Noise Levels (following mitigation measures being incorporated)

Operating Period	Receptor 1		Receptor 2	
	Prediction (dBA)	Criterion (dBA)	Prediction (dBA)	Criterion (dBA)
Daytime (07:00 – 23:00)	27	28	23	28

Therefore, adoption of the above mitigation measures would ensure that noise levels at the nearest noise sensitive receptors are within the criteria required by the London Borough of Camden.

6.0 VIBRATION CONTROL

In addition to the control of airborne noise transfer, it is also important to consider the transfer of noise as vibration to adjacent properties (as well as to any sensitive areas of the same building).

We would typically advise that fans are isolated from the supporting structure by means of either steel spring isolators or rubber footings. For particularly sensitive locations, or when on lightweight structures the mounts should ideally be caged and be of the restrained type.

It is important the isolation is not "short-circuited" by associated pipework or conduits. To this end, any conduits should be looped and flexible connectors should be introduced between the condenser and any associated pipework. Pipework should be supported by brackets containing neoprene inserts.

7.0 CONCLUSION

Measurements of the existing background noise levels at Duke of Hamilton, 25 New End, Hampstead have been undertaken. The results of the measurements have been used in order to determine the required criteria for atmospheric noise emissions from the future plant installations.

The results of the assessment indicate atmospheric noise emissions from the plant will be within the criteria required by the London Borough of Camden providing the recommended mitigation measures are employed. As such, the proposed plant installations should be considered acceptable.

Appendix A - Acoustic Terminology

dB	Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.
dB(A)	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level. Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.
L_{eq}	L_{eq} is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (1 hour).
L_{Aeq}	The level of notional steady sound which, over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measured over that period.
L_{An} (e.g L_{A10}, L_{A90})	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during the measurement period, T. It is commonly used to measure the effect of very short duration bursts of noise, such as for example sudden bangs, shouts, car horns, emergency sirens etc. which audibly stand out from the general level of, say, traffic noise, but because of their very short duration, maybe only a very small fraction of a second, may not have any effect on the L_{eq} value.

Appendix B - Instrumentation

The following equipment was used for the measurements

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Valid Until
Norsonic Type 1 Sound Level Meter	Nor140	1406970	U32886	20 September 2021
Norsonic Pre Amplifier	1209	21205		
Norsonic ½" Microphone	1225	271055	32885	20 September 2021
Norsonic Sound Calibrator	1251	35020	U32884	20 September 2021

Appendix C – CDM Considerations

The likelihood the harm will occur can be assessed by applying an indicative score (from 1 to 5) as follows:

1 – Remote (almost never)
2 – Unlikely (occurs rarely)
3 – Possible (could occur, but uncommon)
4 – Likely (recurrent but not frequent)
5 – Very likely (occurs frequently)

The severity of harm can be assessed by applying an indicative score (from 1 to 5) as follows:

1 – Trivial (e.g. discomfort, slight bruising, self-help recovery)
2 – Minor (e.g. small cut, abrasion, basic first aid need)
3 – Moderate (e.g. strain, sprain, incapacitation > 3 days)
4 – Serious (e.g. fracture, hospitalisation > 24 hrs, incapacitation > 4 weeks)
5 – Fatal (single or multiple)

The rating value is obtained by multiply the two scores and is then used to determine the course of action.

Rating Bands (Severity x Likelihood)		
Low Risk (1 – 8)	Medium Risk (9 -12)	High Risk (15 – 25)
May be ignored but ensure controls remain effective	Continue, but implement additional reasonable practicable controls where possible	Avoidance action is required; therefore alternative design solutions must be examined. Activity must not proceed until risks are reduced to a low or medium level

The following hazards pertinent to our design input have been identified and control measures suggested:

Hazard	Risk Of	At Risk	Rating			Control Measures	Controlled		
			L	S	R		L	S	R
Attenuators/ Acoustic Lagging	Strain of neck, limbs or back.	Contractors	3	4	12	Provide sufficient manpower/ lifting gear	1	4	4
Attenuators/ Acoustic Lagging	Skin & respiratory irritation	Contractors	4	3	12	Wear gloves and mask	1	3	3

L: Likelihood S: Severity R: Rating

Appendix D – Graphs and Site Plans

Duke of Hamilton, Hampstead

L_{Aeq} Time History

Measurement Position 1

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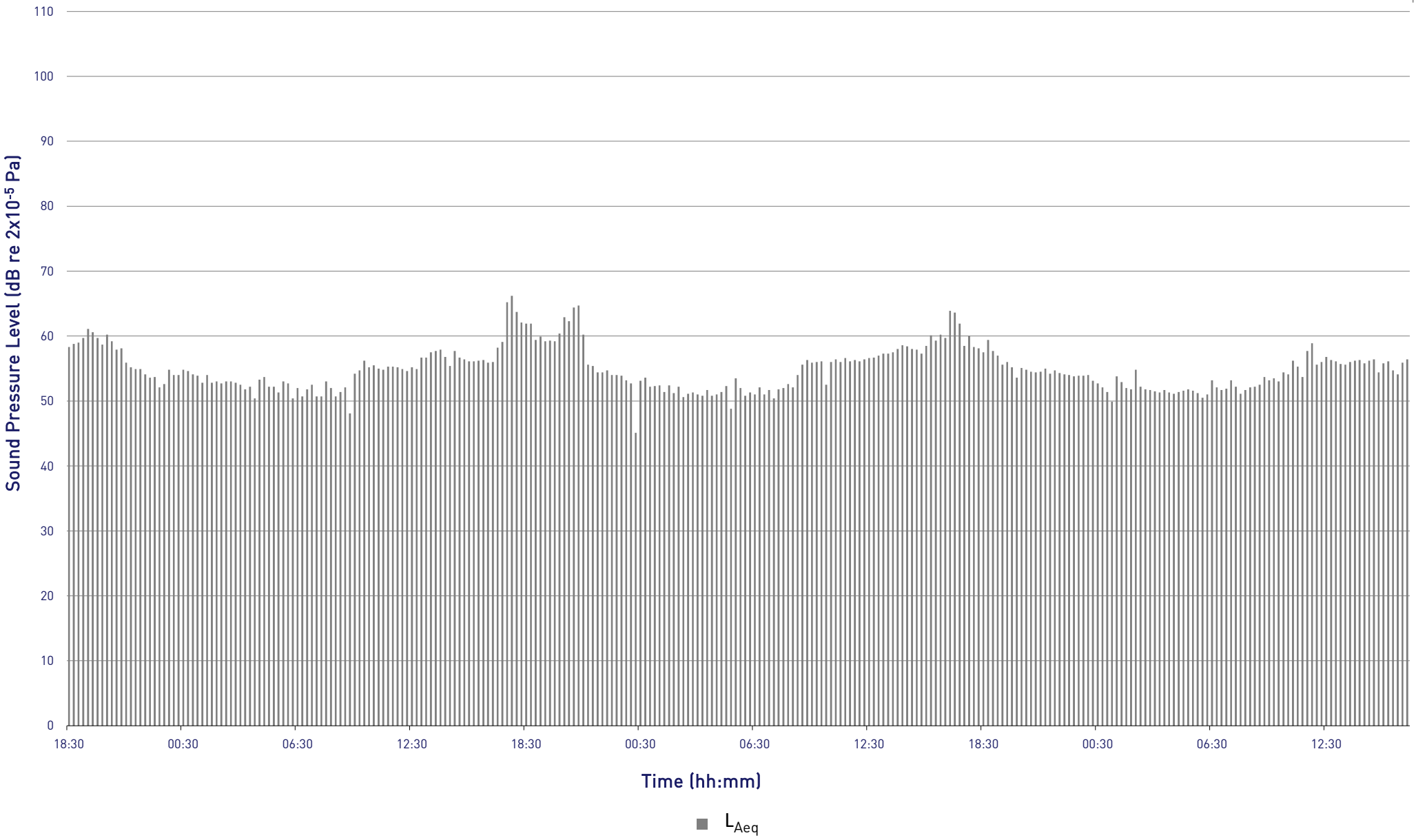
Graph 1



Duke of Hamilton, Hampstead

$L_{Amax,f}$ and L_{A90} Time History

Measurement Position 1

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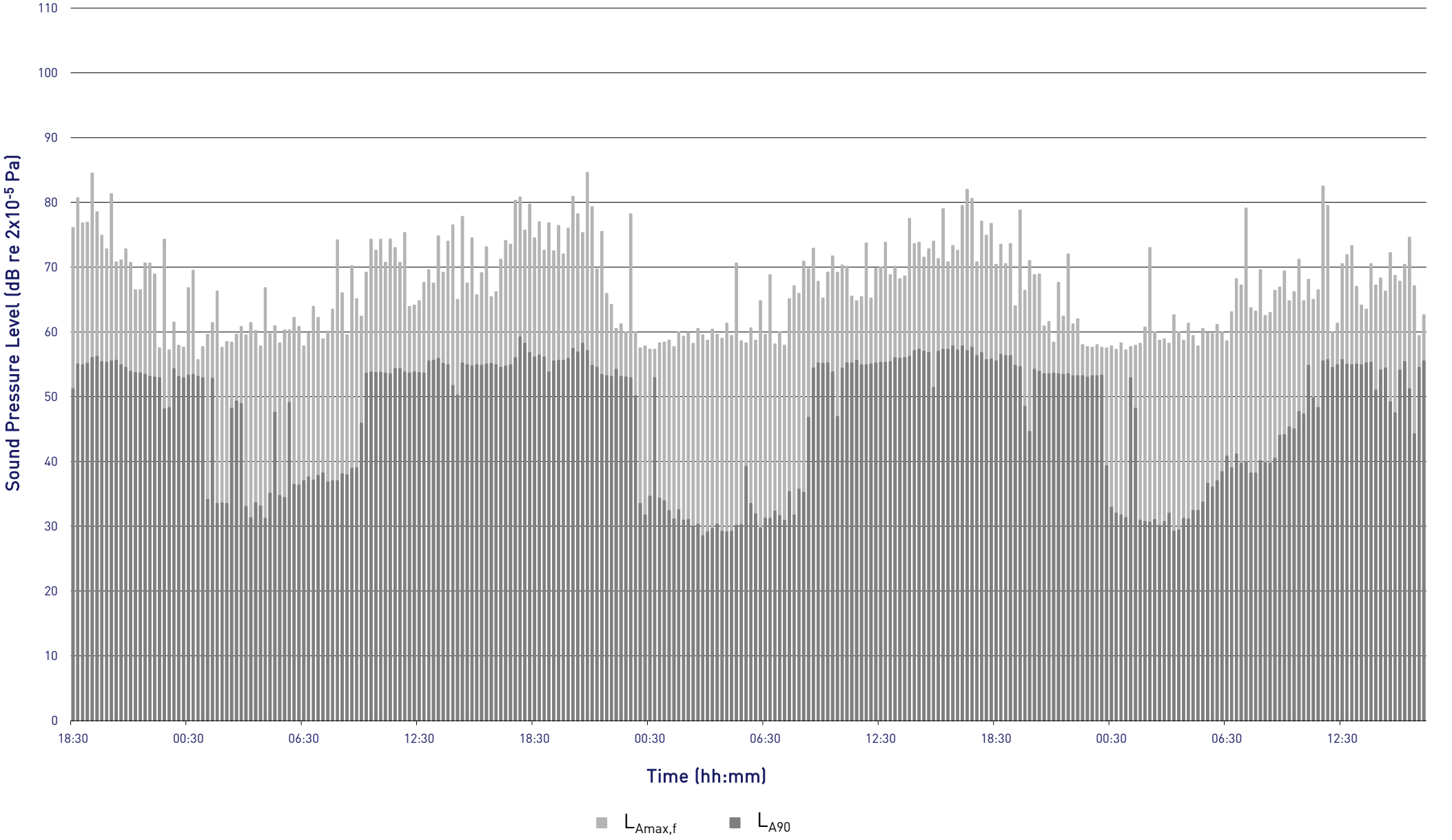
Graph 2



Duke of Hamilton, Hampstead

$L_{A90,15\ minutes}$ Histogram

Measurement Position 1

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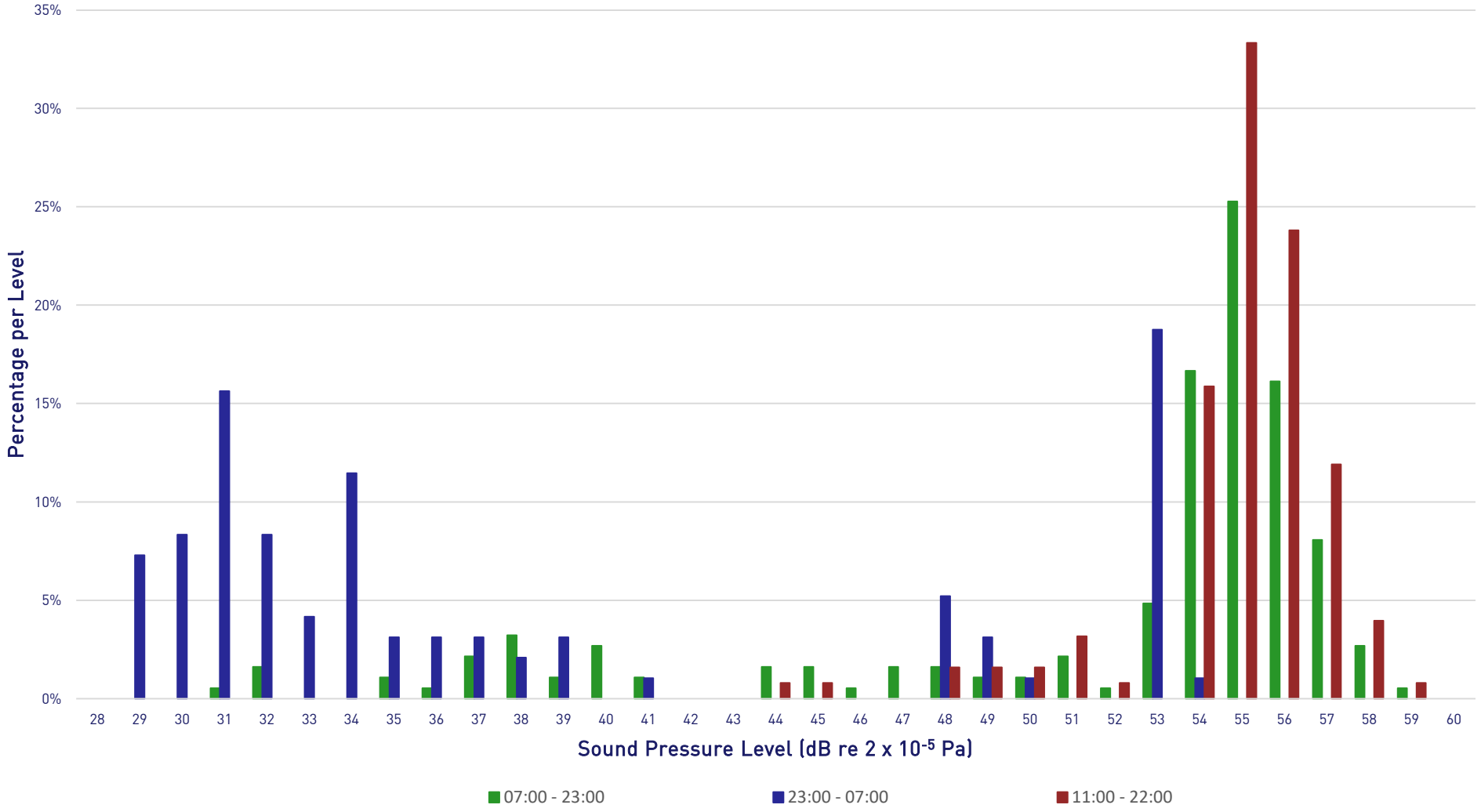
Graph 3



The Duke of Hamilton, Hampstead, London NW3
Measurement Position, Noise Receptors and Location for Ducted Termination
Project 10179

Figure 1
15 September 2020
Not to Scale

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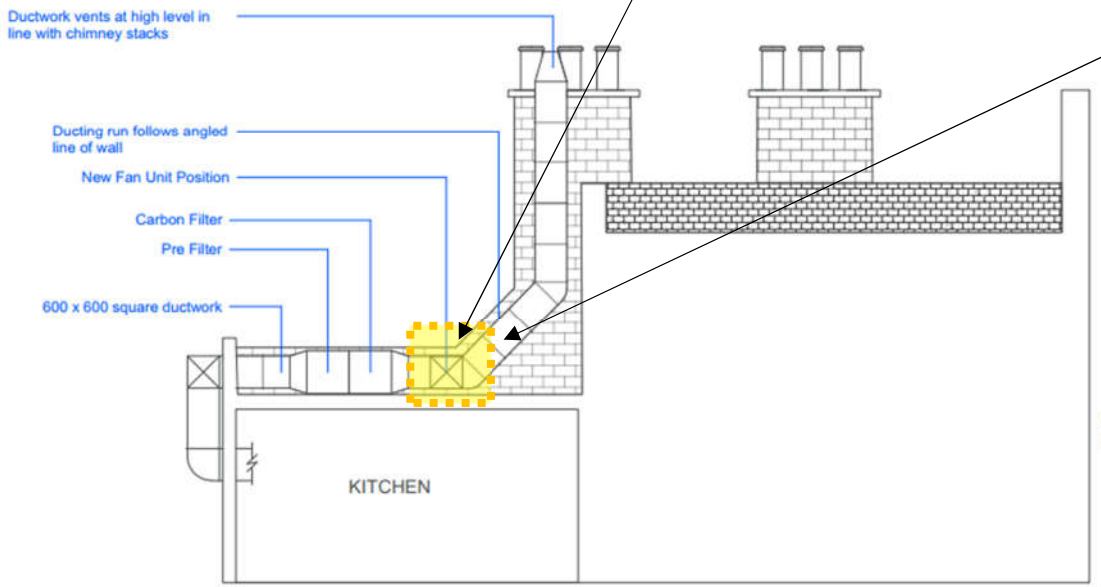
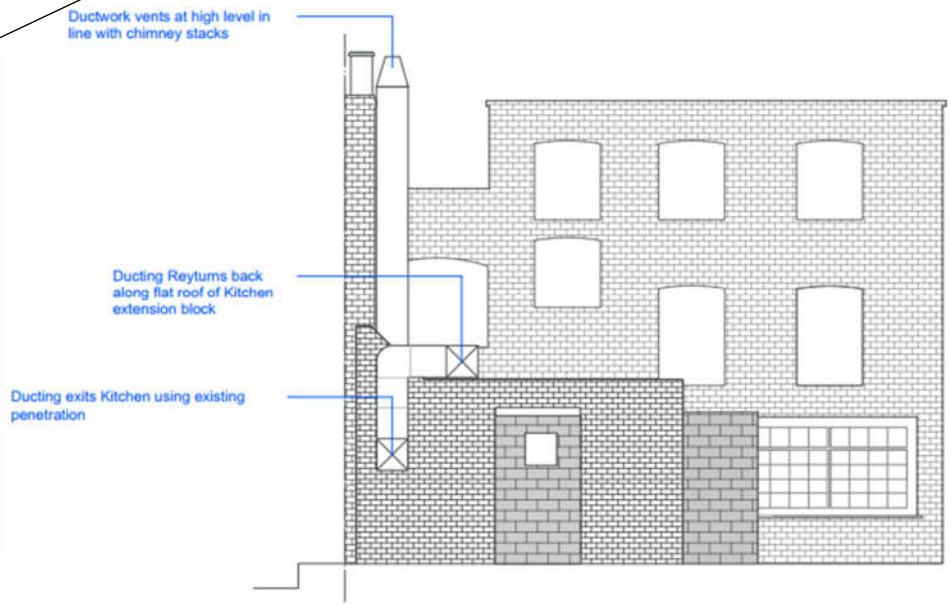
New fan unit should have an in-duct attenuator on atmosphere side of the fan. Minimum performance specifications provided in Table 5.

New fan unit and associated ductwork should be housed in an enclosure, enclosing the fan and associated ductwork up to the first attenuator. (yellow highlighted mark-up indicative only)



1 Proposed Ducting - section
Scale: 1:100



2 Proposed Duction - Rear Elevation
Scale: 1:100

The Duke of Hamilton, Hampstead, London NW3
Proposed Ducting Run – Section View
Project 10179

Figure 2
15 September 2020
Not to Scale

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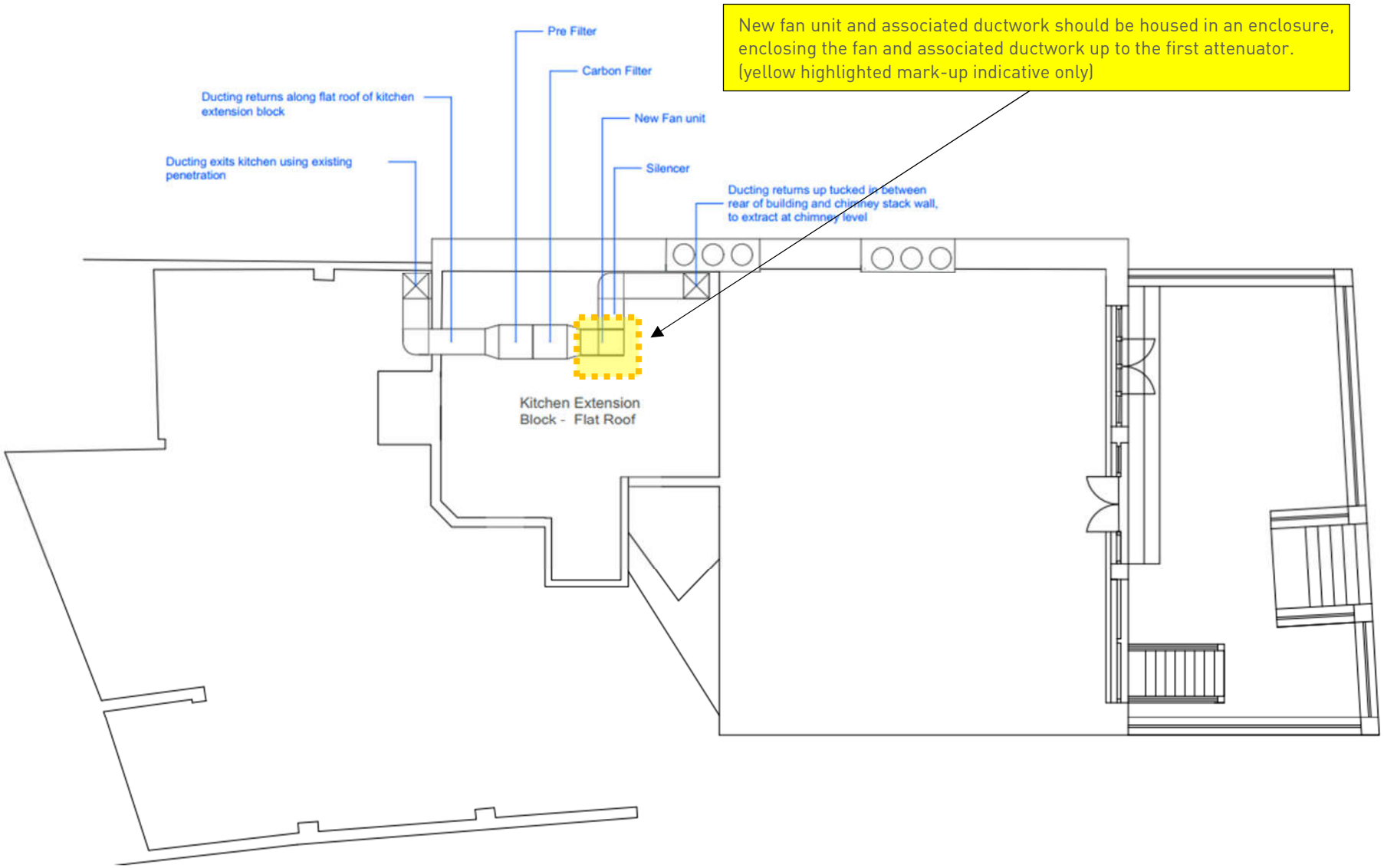

The Duke of Hamilton, Hampstead, London NW3
Proposed Ducting Run – Plan View
Project 10179

Figure 3
15 September 2020
Not to Scale

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