
Subject Camden Town Hall – Supplementary environmental noise assessment
Date 22 November 2019 **Job No/Ref** D03

1 Introduction

Further to the issue of *261250-00/R02 Noise and Vibration Assessment (8 March 2019)*, Arup has conducted a supplementary environmental noise assessment, specifically associated with the air source heat pumps (proposed to be installed on the west side of the roof) in relation to the apartments on the other side of Bidborough Street.

The original environmental noise measurements were conducted on the south east corner of the roof with the microphone installed on a tripod rather than on a pole extended over the edge of the building at the request of Camden Council, who were controlling the building at the time. These measurements were used to define the environmental noise limits for new roof mounted mechanical equipment at the façade of the Crosstree Hotel and the apartments on the other side of Bidborough Street.

Recent changes to the design of the air source heat pumps have proved challenging in terms of achieving compliance with the environmental noise limits identified in the original planning report whilst also balancing the height of the proposed attenuators.

It is considered likely that at this location, the originally established environment noise criteria were conservative at the nearest apartments to the Air Source Heat Pumps due to the measurement microphone position being:

1. significantly further away from Judd Street than are the apartments which are closest to the new air source heat pumps and;
2. shielded from the road due to the microphone being on a tripod rather than on a pole extending over the edge of the building.

With the goal of reducing the required height of the ASHP attenuators, further environmental noise measurements were conducted on the roof terrace on the southwest corner of the Camden Town Hall to establish a more representative estimate of the existing background noise.

New measurements were taken near the junction of Bidborough St and Judd St, by employing a measurement position more comparable in terms of noise exposure to the apartments closest to the new air source heat pumps. This document sets out the method and results of the measurements, establishes specific noise emission criteria for this noise sensitive receiver with reference to the Camden Council requirements and assesses the noise emission from the proposed rooftop air source heat pumps.

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2 Method and measurement location

The measurements were conducted by Delphis Migliori, who is an Associate Member of the Institute of Acoustics, in the location shown below.

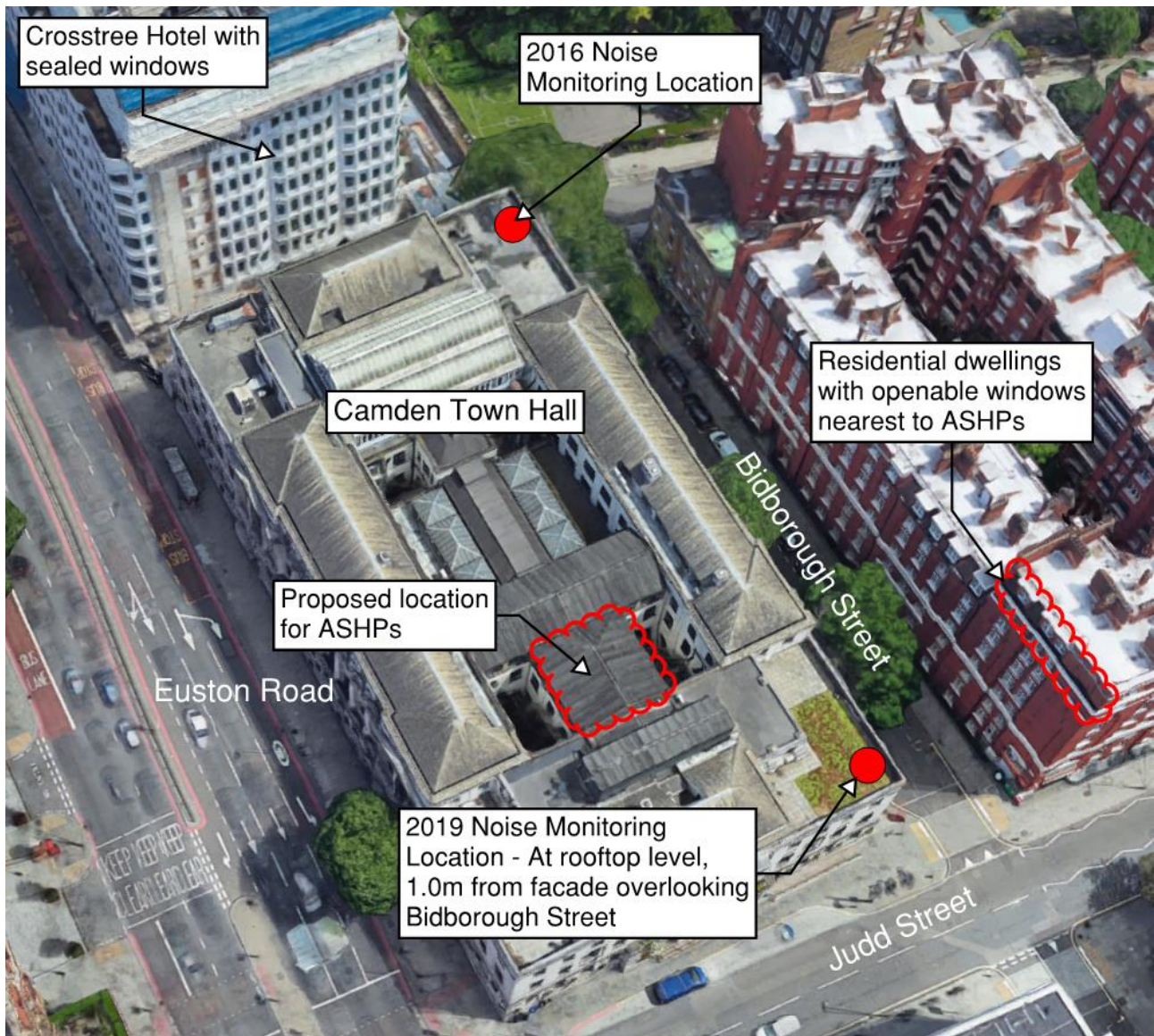


Figure 1: Location of noise logger

The selected noise logger location is considered to have an equivalent noise climate to that outside the nearest noise sensitive receptor to the building, namely the upper bedroom windows on the opposite side of Bidborough Street.

The measurements were made using a RION NL-52 Sound Level Analyser. The sound level meter and microphone are Type 1 conforming to BS EN 61672-1:2013 *Electroacoustics. Sound level meters. Specifications*. The sound level meter and microphone were calibrated before and after use, to confirm that there was no significant drift in meter response at the calibrator frequency and level.

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This verification indicated that there were no more than 0.1dB variation between checks. The meter is annually calibrated and this calibration is traceable to international standards. All measurements were made with A-weighting and fast (0.125s) time constant.

The microphone of the noise logger was mounted on a pole which was extended from the edge of the roof to be at 1m from the façade as shown in figure below. During the unattended measurement period, the weather was mostly dry and with moderate wind speeds (e.g. 5m/s) except for some heavy rain on Thursday 24 and Saturday 26 October and Friday 1 November.



Figure 2: Noise logger set-up, overlooking Bidborough St

Noise levels were measured continuously, except for a 1hr interruption to allow for battery change of measurement equipment, between Thursday 24th October and Friday 1st November 2019.

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3 Measurement Results

Table 1 sets out the lowest background noise levels from measurements for each of the day in the measurement period. Results are presented for daytime (07:00 – 18:00) and evening (18:00 – 23:00) as L_{A90} figures measured over a sample period of 1 hour, whilst night-time results (23:00 – 07:00) are presented as L_{A90} figures measured over a sample of 15 minutes. The levels presented in the table below are free-field values i.e. 3dB contribution due to façade reflection has been removed.

	Day (0700-1800)	Evening (1800-2300)	Night (2300-0700)
Date:	$L_{A90,1hr}$	$L_{A90,1hr}$	$L_{A90,15min}$
Thu 24/10/2019	53	50	47
Fri 25/10/2019	52	52	48
Sat 26/10/2019	49	50	45
Sun 27/10/2019	47	48	42
Mon 28/10/2019	52	49	42
Tue 29/10/2019	51	48	43
Wed 30/10/2019	51	50	44
Thu 31/10/2019	50	50	47
Fri 01/11/2019	52	Not measured	Not measured

Table 1: Summary of unattended noise survey, free-field noise levels

Figure 3 shows the time history of free-field background levels during the quietest weekday period (28th and 30th October 2019). The lowest free-field background levels during the weekday periods are:

- $L_{A90,1hr}$ 50 dB for daytime
- $L_{A90,1hr}$ 48 dB for evening
- $L_{A90,15min}$ 42dB for night-time

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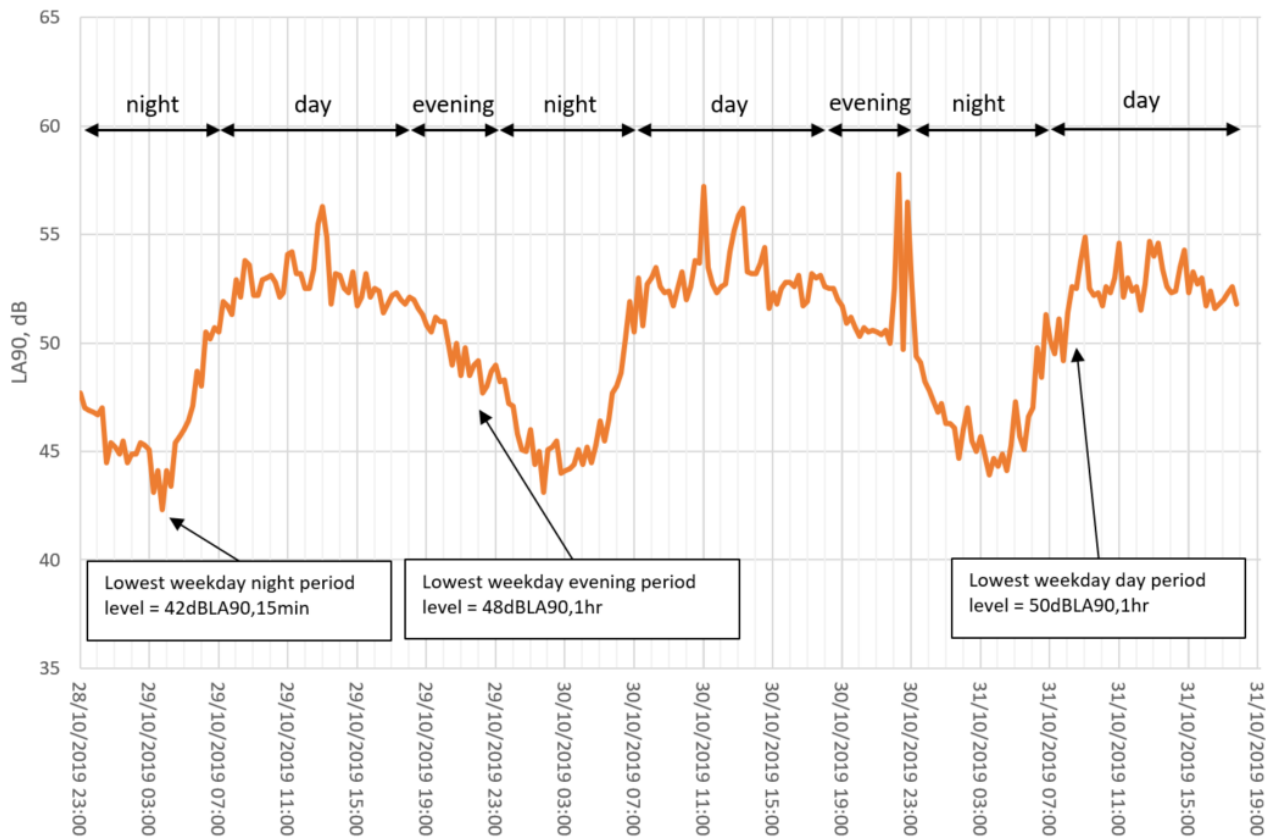


Figure 3: Time history of free-field background noise levels from the quietest weekday periods of the unattended noise survey

Table 2 sets out the lowest background noise levels for each of the weekday in typical office hours (08:00 – 18:00) measured during the unattended survey. Results are presented as free-field values and as LA90 figures measured over a sample period of 1 hour.

	Weekday, office hours (0800-1800)
Date:	LA90,1hr
Thu 24/10/2019	53
Fri 25/10/2019	52
Mon 28/10/2019	52
Tue 29/10/2019	52
Wed 30/10/2019	52
Thu 31/10/2019	52
Fri 01/11/2019	53

Table 2: Free-field background levels during office hours

In light of this, the lowest free-field background levels during office hours is LA90,1hr 52.

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4 Plant Noise Emission Criteria

For noise emission from plant, Camden Council planning policy refers to BS4142:2014 *Methods for rating and assessing industrial and commercial sound*. This document states that noise emission levels from the newly proposed plant (*rating level*) needs to be no greater than 10dB below the background noise outside the nearest residential window at all times.

Because the proposed development is a commercial building, it is expected that its plant noise emission levels will be low during weekends. Therefore, the rating levels herein proposed are based on background noise levels measured during weekday periods. Additionally, for the daytime rating level it is proposed to adopt the 08:00-18:00 period instead of 07:00-18:00 period as the former better represent typical office hours, during which plant noise emission levels from development are higher. It is proposed for the rating level for the 07:00-08:00 period to be the same as for the rating level during the night-time period.

In light of the above, the plant noise criteria at noise sensitive receptor (i.e. residential units at Bidborough St) are as follow:

Maximum total building services noise level incident on the nearest noise sensitive receptor during weekdays		
Day (0800-1800 i.e. office hours) rating level, $dBL_{Ar,Tr}$	Evening (1800-2300) rating level, $dBL_{Ar,Tr}$	Night (2300-0800) rating level, $dBL_{Ar,Tr}$
42	38	32

Table 3: Building services noise emission limits outside the nearest noise-sensitive receptor during weekdays

As defined in BS4142:2014 *Methods for rating and assessing industrial and commercial sound*, the rating level $L_{Ar,Tr}$ is the A-weighted sound pressure level of the combined building services noise terms of L_{eq} plus any adjustment for the characteristic features of the sound, such as tonality.

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5 Assessment

Since the issue of *261250-00/R02 Noise and Vibration Assessment (8 March 2019)*, the number and the type of ASHPs changed. These now consist of two small units and one larger unit, each fitted with an Allway Acoustics AA206 acoustic package. Noise data for when the units are at operating at 100% duty were provided by the manufacturer and are shown below.

ASHP	A-weighted Sound Power Level, dB re 10 ⁻¹² W
Large ASHP - Climaveneta ERACS2-Q-G05/XL-CA 2222	78
Small ASHP #1 - Climaveneta NX-N /LN-K /0802P	77
Small ASHP #2 - Climaveneta NX-N /LN-K /0802P	77

Table 4: ASHP manufacturer data incorporating acoustic package at 100% duty

The newly proposed ASHPs will be located on the rooftop of the development as shown in Figure 1. The larger unit will be at approximately 37m away from the nearest residential receptor in Bidborough St, whilst the smaller units will be approximately 30m away from receptor.

In addition to the acoustic package, it is proposed to install a 150mm-deep acoustic louvre at the same height as the ASHP units to the south and east side of the ASHP area. This additional control measure will further mitigate the noise emissions from the bottom of the ASHP, which is understood to be primary source of noise from the equipment. The acoustic performance of the acoustic louvre is shown in the table below.

Minimum Dynamic Insertion Loss, dB							
Octave Band Centre Frequency, Hz							
63	125	250	500	1k	2k	4k	8k
4	4	5	8	12	16	15	13

Table 5: Performance of acoustic louvre

It is understood that the ASHPs will only be running at 100% duty in the height of summer during weekday office hours (08:00-18:00). In the evenings and nights, the ASHPs are expected to be running at significantly reduced levels (respectively at 40% and 30% duty). At these lower duties, the plant is expected to generate noise levels significantly lower than those in Table 4.

For the case of the ASHPs running all at 100% duty, the calculated noise levels due to the proposed Landlord plant are presented in the table below for the nearest residential receptors in Bidborough St. Please refer to the *261250-00/R02 Noise and Vibration Assessment (8 March 2019)* issue for details on the other Landlord plant items.

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Proposed Landlord plant	Sound pressure level at receptor, dBA
x3 ASPHs (x1 large unit, x2 small units)	38
x2 Commercial office AHUs (04/01 and 04/02), Intake	21
x2 Commercial office AHUs (04/01 and 04/02), Exhaust	14
Council Chamber AHU (04/03), Intake	16
Council Chamber AHU (04/03), Exhaust	23
Toilet MVHRs (04-01 and 04-02), Intake	22
Toilet MVHRs (04-01 and 04-02), Discharge	28
Affordable SME workspace AHU (B0/01), Intake	22
Affordable SME workspace AHU (B0/01), Exhaust	< 5
Main Council Areas AHU (B0/02), Intake	13
Main Council Areas AHU (B0/02), Exhaust	< 5
Council BOH AHU (B0/03), Intake	10
Council BOH AHU (B0/03), Exhaust	20
<u>Cumulative noise level at receptor due to proposed plant:</u>	<u>39</u>

Table 6: Calculated noise levels incident (free field) on the windows of the residential flats in Bidborough St due to proposed Landlord plant

Based on the calculated cumulative noise levels (39dBA), the daytime requirements of Camden Council (42dBA, see Table 3) can be achieved outside the residential flats in Bidborough when the above mentioned mitigation measures are installed, as long as the items of equipment do not exhibit any tonal or attention catching qualities which would increase the overall rating level.

Octave band sound power levels provided by manufacturer for the newly proposed ASHPs are reasonably even in adjacent bands. However, there is still a risk that the large unit (screw compressor) and the small units (scroll compressor) may have tonal components. However, there is a margin of 3dB between calculated noise level and daytime limit which can act as a penalty to the rating level criteria in case of tonality in plant noise.

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For evening and night-time noise limit, it is expected that these can also be achieved on the basis that plant noise emission levels at low running duty tend to significantly decrease.