RBA ACOUSTICS

79 CAMDEN ROAD

LONDON NW1

PLANT NOISE ASSESSMENT

REPORT 5366/PNA
Prepared: 11 March 2016
Revision Number: 1

Barratt West London
Wallis House
Great West Road
Brentford
Middlesex
TW8 9BS

Plant Noise Assessment

79 CAMDEN ROAD, LONDON NW1

REPORT 5366/PNA
Prepared: 11 March 2016

Revision	Comment	Date	Prepared By	Approved By
0	First issue of report.	27 January 2016	Gareth Davies	Ignacio Alonso Martínez
1	Correction regarding CHP cooling fan	11 March 2016	Gareth Davies	Ignacio Alonso Martínez

RBA ACOUSTICS
44 Borough Road
London SE1 0AJ
T. +44 (0) 20 7620 1950
W. www.rba-acoustics.co.uk

Contents

1.0 INTRODUCTION

The design of 79 Camden Road, London is currently being developed. This report is concerned with plant serving the development. Plant is currently proposed at the following locations:

- Lower ground floor Energy Centre
- Lower ground floor water tank room
- Ground floor bin stores
- Flue terminations at roof level

This report relates to noise and vibration control of items of plant. Reference to the London Borough of Camden Local Development Framework (LDF) and Planning Conditions 19 and 20 has been made.

2.0 ATMOSPHERIC NOISE EMISSIONS CRITERIA

2.1 London Borough of Camden – Local Development Framework

The requirements of Camden Council are set out in their Local Development Framework (LDF) in Table E of DP28. Noise levels from new plant and machinery are confirmed as follows.

Table 5366/T1 – Camden Council Noise Thresholds

Noise description and Location of measurement	Period	Time	Noise Level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <L_{A90}
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	10dB(A) <L_{A90}
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	10dB(A) <L_{A90}
Noise at 1 metre external to sensitive façade where L_{A90} >60dB	Day, evening and night	0000-2400	55dB L_{Aeq}

2.2 Planning Conditions

The London Borough of Camden has set out the following Planning Conditions for the development which are addressed in this report:

Planning Condition 19 states;

> *"Prior to the occupation of the development hereby permitted, full details of all machinery, plant or equipment (including CHP) to be installed shall be submitted to and approved by the Local Authority in writing. The details shall include manufacturer's specifications, location, attenuation measures and a noise report demonstrating compliance with Camden's noise standards. The approved measures shall be installed prior to occupation of any of the residential units, and retained and maintained thereafter."*

Planning Condition 20 states:

> *"Before the relevant part of the development commences details of a vibration mitigation scheme to protect the residential units against vibration (including transportation sources and building services and CHP plant) shall be submitted and approved in writing by the Local Authority. The approved scheme shall be implemented and remain in place for the lifetime of the development."*

2.3 Emergency Plant

As directed by London Borough of Camden (email correspondence from Edward Davis, Noise Officer, London Borough of Camden dated 2 November 2015) daytime limits at the nearest neighbouring noise-sensitive façade for emergency plant operation are determined as follows:

> *"Noise emitted by standby or emergency generators during power outages or testing are not to exceed the lowest daytime $L_{Aeq(15min)}$ as measured or calculated according to BS4142:2014."*

2.4 Atmospheric Plant Noise Limits

Noise levels monitored at the site are detailed in RBA Acoustics Report 5366/AAP dated 5 December 2012. Furthermore, long term noise monitoring has been ongoing since December 2014 of which noise levels are representative of Rochester Place. The lowest representative $L_{A90(15min)}$ at this location is 54, 53 and 47dB for office, daytime and night-time hours respectively (see relevant periods in Table 5366/T2 below). Long-term noise measurements have also been used to derive emergency plant criteria as detailed in Section 2.3 (i.e the lowest representative daytime $L_{Aeq(15min)}$ is 58dB).

In line with such requirements we would propose that items of mechanical services be designed so that noise emissions from the cumulative plant do not exceed the following levels when assessed at the nearest noise sensitive locations:

Table 5366/T2 – Plant Noise Emission Criteria

Measurement Position	L_{Aeq} Noise Level of all operating plant (dB re $2x10^{-5}$ Pa) at 1m from the nearest noise sensitive façade		
	12h Office Hours (08:00-20:00 hours)	16h Daytime (07:00-23:00 hours)	8h Night time (23:00-07:00 hours)
Camden Road	58	53	42
St Pancras Way	52	47	38
Rochester Place	49	48	42
Emergency Plant	58	-	-

A further reduction of 5dBA should be applied to the stated criteria in the case of tonal and/or impulsive items of plant.

3.0 INTERNAL NOISE CRITERIA

Noise transferred from plant to internal areas via ducts or due to the operation of FCU / extract fans / ventilation systems, etc. should not exceed the following internal noise levels (as extracted from CIBSE Guide).

Table 5366/T3 – Maximum internal noise levels due to plant noise

Area	Internal Noise Criterion (NR)
Living Rooms	30
Bedrooms	25
Bathrooms	35-40
Reception	35-40
Bin Stores	55
Bike Stores	55

It is important that Whitecode incorporate these limits in to any relevant sub-contractor packages.

4.0 ROOM TO ROOM TRANSMISSION CRITERIA

We would propose noise level transfer from plant rooms to internal areas do not exceed the following levels.

Table 5366/T4 – Maximum noise levels

Area	Internal Noise Criteria (NR)
Bedrooms	15
Living Rooms	20
Bin Stores	45
Bike Stores	45

5.0 NOISE CONTROL

5.1 General

Plant Items and Noise Break-out / Discharge Locations

The relevant plant items and associated noise levels are detailed in Plant Noise Schedule 5366/PNS.

Key noise break-out / discharge locations are indicated on Site Plans 5366/SP1-3.

Nearest Noise Sensitive Receptors

The closest existing residential noise sensitive receptors on Rochester Place are approximately 6m away from plant noise break out locations at lower ground level (Energy Centre louvres and Generator Room ventilation outlet/inlet) and ground floor level (bin store ventilation outlets).

The closest existing residential noise sensitive receptors on Saint Pancras Way are approximately 16m away from bin store ventilation outlets at ground floor level.

The nearest noise sensitive receptors to the rooftop plant termination are those at 3rd floor level on Rochester Place approximately 25m away.

Key noise sensitive receptor approximate locations are detailed on Site Plan 5366/SP2.

5.2 Energy Centre

Atmospheric Noise Emissions

We understand that the Energy Centre is to be naturally ventilated (i.e. no ducted fans). The Energy Centre is understood to ventilate via two louvres in a lightwell at lower ground floor level on the Rochester Place façade and a louvred door at ground floor level on the courtyard façade (see Site Plan 5366/SP1).

Our calculations indicate that the Energy Centre noise levels will be approximately 75-80dBA. In order to meet plant noise emission criteria at the nearest residential receptor we recommend the mitigation measure below is implemented:

- An acoustic louvre achieving the specification provided in the attached Louvre Schedule 5366/LS is installed. We typically expect this performance to be met by a 305mm deep acoustic louvre.

Room to Room Transmission to Ground Floor Areas (Floor)

We understand that the floor slab between the Energy Centre and areas at ground floor level will comprise 250mm concrete in addition to a floating screed on the top.

Our calculations indicate that the internal noise criteria detailed in Table 5366/T4 will be achieved in ground floor areas.

Room to Room Transmission to Lower Ground Floor Areas (Wall)

The wall between the Energy Centre and the adjacent lower ground floor level apartment is to comprise 215mm dense blockwork with 75mm thermal insulation and 2No. layers of 15mm dense plasterboard (min. density 12.6kg/m^2) on an independent wall lining. We would recommend the insulation type is changed to a mineral wool type insulation if possible as this would have better acoustic properties.

Our calculations indicate that the internal noise criteria detailed in Table 5366/T4 will be achieved in lower ground floor level areas.

5.3 Generator Room

Atmospheric Noise Emissions

We understand that the generator room will be naturally ventilated via two ducts at low and high level as per Site Plan 5366/SP1. Noise levels to be achieved 1m from the outlet/inlet should not exceed 61dBA. It is important that the generator manufacturer is made aware of this requirement. Ultimately in-line attenuators may be required.

Room to Room Transmission to Lower Ground Floor Areas (Wall)

The wall between the lower ground floor level apartment and the generator room is to comprise 140mm dense blockwork with 75mm thermal insulation and 2No. layers of 15mm dense plasterboard (min. density 12.6kg/m^2) on an independent wall lining. We would recommend the insulation type is changed to a mineral wool type insulation if possible as this would have better acoustic properties.

Noise levels within the generator room should not exceed 65dBA at 1m as measured in free field conditions. It is important this limit is considered for any sub-contractor package in terms of defining the generator enclosure performance.

5.4 Water Tank Room

We understand that the water tank room will be located at lower ground floor level at the northern most corner of the development as detailed in Site Plan 5366/SP1.

Atmospheric Noise Emissions

We understand that the water tank room does not require either natural or mechanical ventilation and therefore is not a concern from an atmospheric noise emissions point of view.

Room to Room Transmission to Ground Floor Areas (Floor)

We understand that the floor slab between the Water Tank Room and areas at ground floor level will comprise 250mm concrete.

Our calculations indicate that the internal noise criteria detailed in Table 5366/T4 will be achieved in ground floor areas.

5.5 Bin Store Extract

We understand that one extract fan will be located in each bin store (five in total) at ground floor level. Ducted terminations are located on the Rochester Place, St. Pancras Way, western and courtyard façades as detailed in Site Plan 5366/SP2.

Atmospheric Noise Emissions

In order to meet the criteria at the nearest noise sensitive location an attenuator is required to be installed within the outlet ductwork. The attenuator is required to meet the minimum insertion loss specification detailed in the attached attenuator schedule 5366/AS. It is expected that an attenuator with a free area of 40% and 1200mm in length will meet this specification.

Room to Room Transmission to First Floor Areas (Floor)

We understand that the floor slab between the Bin Store and areas at first floor level will comprise 250mm concrete.

Our calculations indicate that the internal noise criteria detailed in Table 5366/T4 will be achieved in first floor areas.

5.6 Rooftop Terminations

CHP and Boiler Flues

The flues terminate above roof level (level 8). The flues should be attenuated to achieve a level of 67dBA @ 1m on axis individually providing the low frequency content criteria detailed in Table 5366/T6 are achieved. This should also reduce any noise breakout to the flats adjacent to the flue riser to a suitable level providing the attenuators are fitted within the Energy Centre before the flues vertically rise through the building to roof level.

We further recommend the CHP and boiler flue systems do not exceed the following levels at 1m on-axis from the discharge:

Table 5366/T6 – Low Frequency Flue Noise Criteria at 1m on axis

Noise Emissions Criterion (dB) 1m On-Axis at Octave Band Centre Frequency (Hz)		
63	125	250
69	66	65

The overall frequency content should also be considered non-tonal.

In addition, the cumulative noise emissions criterion and the above levels should be achieved during all phases of plant operation (including start-up and modulation phases).

5.7 Other Noise Sources

CHP Unit Cooling Fan

We understand that the CHP unit can normally be provided with an attenuator to its ventilation air outlet ductwork.

Based on the CHP fan noise emission data and the current attenuator selection as provided by ENER-G (2D podded (EP) for a 315-560mm diameter fan – see attached Attenuator Schedule 5366/AS for insertion losses), noise emissions from the CHP cooling fan are in line with the requirements detailed herein and no further attenuation measures are therefore required.

Please note that the CHP cooling fan ductwork should not terminate at the back of the Energy Centre acoustic louvre, as this could apply additional back-pressure to the extract fan resulting in higher noise levels. Additionally, the potential high face velocities within the ventilation ductwork across the acoustic louvres could increase the risk of regenerated noise. Therefore a standard weather louvre should be utilised at the termination of the CHP extract ductwork and care should be taken to ensure that there are no gaps between the ductwork and louvre – all unused areas of the weather louvre should be appropriately blanked off to minimise noise leakage.

Acoustic Lagging

We would recommend the section of ductwork between the CHP cooling fan and the louvre is lagged with an acoustic lagging material of minimum mass per unit area 10kg/m^2, e.g. Muftilag P (MP2510) or similar.

MVHRs

Typically no internal noise issues arise providing the ductwork runs are planned and coordinated (not torturous), such that bends are minimised so as to reduce back pressure on the fan unit and regenerated noise in the ductwork.

Consideration should be made to locate the fan units in cupboards that are ideally not adjacent to bedrooms in order to minimise any potential future issues with noise transfer.

The fan units are usually isolated internally and therefore no other resilient fixings are usually required, noting the ductwork run design comments made above.

The MVHR systems should be designed by the M&E Consultant and M&E Sub-Contractor / Supplier to achieve the internal noise levels in Table 5366/T3 during operation. Manufacturer's installation guidelines should always be followed and the manufacturer should confirm no vibration transfer will occur through the stud walls so as to create re-radiated structure-borne noise issues.

6.0 VIBRATION ISOLATION

Each item of mechanical services plant will require appropriate treatment in order to ensure vibration transfer to the building structure (which may then cause a re-radiated noise issue) is controlled to acceptable levels. The Anti-Vibration Mount Schedule 5366/AVM attached details our recommended vibration control measures for each item of building services plant serving the development.

We also present the following general advice.

6.1 Pipework Isolation

The use of flexible connectors as an interface between plant and associated pipework cannot be considered as adequate vibration isolation. Their use as thermal and shock compensators is well known, but even under nominal line pressures the connectors become acoustically rigid. It is, therefore, recommended that all active pipework should be isolated on resilient mountings/hangers up to the Energy Centre structural penetration. Thereafter oversized brackets having neoprene inserts would be advisable, generally for larger "live" pipework, but also for smaller "live" pipework where friction losses exceed 280Pa/m.

If flexible connectors are also required they should be located in the horizontal plane and be of the double bellows type.

6.2 Ductwork Flexible Connections

All ductwork connections to fans and air handling units should be flexible and at least 75mm long. These should be constructed from sound barrier mat having a minimum superficial density of at least 5kg/m^2. These connections should be straight but not rigid, with no offset, in order to prevent turbulence.

6.3 Electrical Connections

It is important that isolated equipment is not mechanically shorted by the installation of conduit or cable trays, etc., which are rigidly connected to the structure. Electrical connections to plant should, therefore, be made via a looped flexible conduit. The loop should form a diameter of 300mm or more.

6.4 MVHRs

Consideration should be made to locate the fan units in cupboards that are ideally not adjacent to bedrooms in order to minimise any potential future issues with noise transfer.

The fan units are usually isolated internally and therefore no other resilient fixings are usually required when fixed to concrete slabs. When fixed to lightweight structures like stud walls additional anti vibration measures should be considered in the mounting. This may comprise a 10-15mm resilient material (i.e. TVS Sylomer SR18 or similar) with resilient washed fixings.

7.0 CONCLUSIONS

RBA Acoustics have reviewed the noise issues relating the mechanical services plant of the development at 79 Camden Road, London.

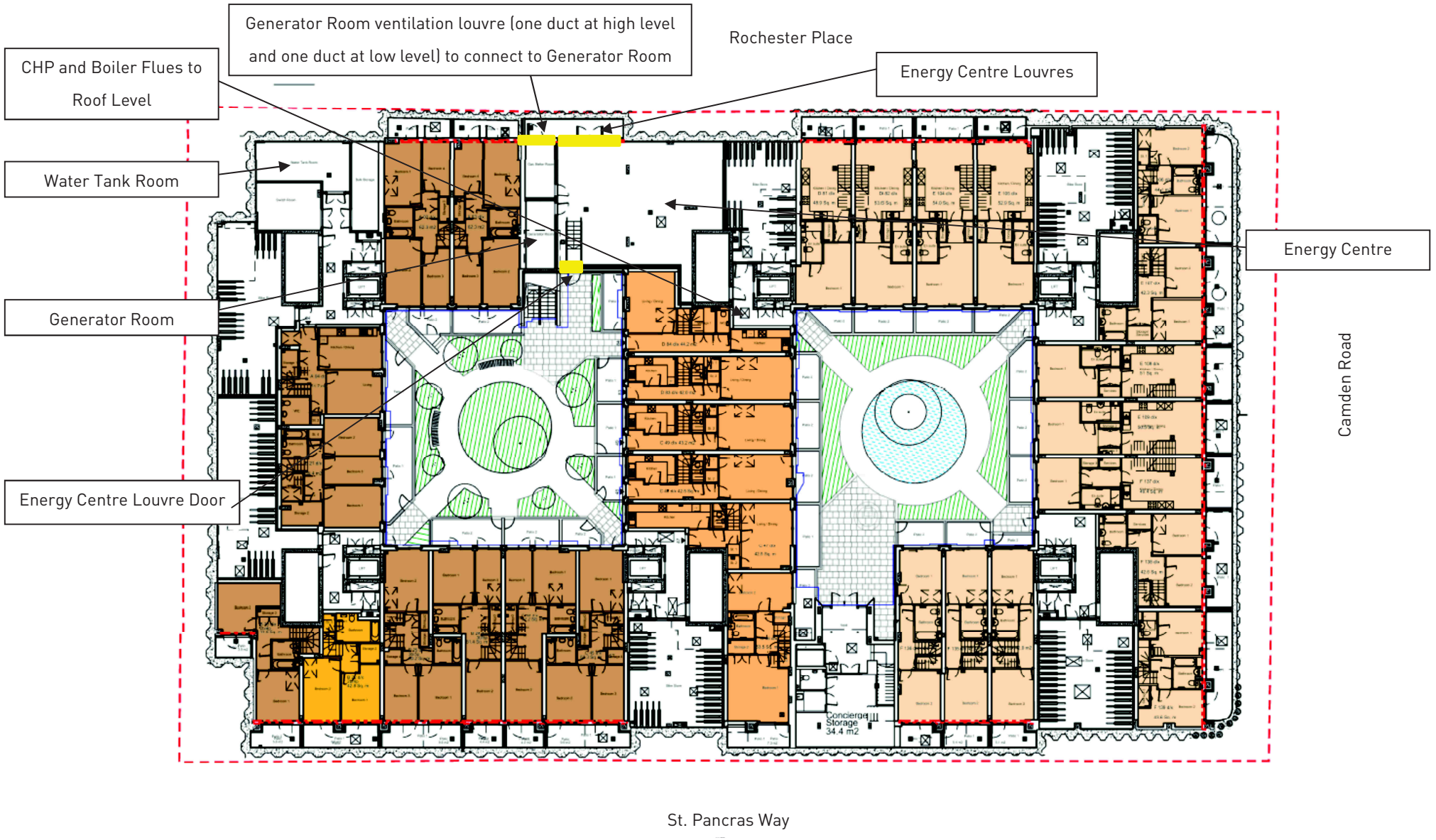
Acoustic louvres have been proposed for the Energy Centre discharge location with the corresponding acoustic performance specification being provided in order to achieve acceptable noise levels to the environment in line with Planning Condition 19 at existing noise sensitive locations.

Noise limits have been proposed for extract ventilation systems at ground floor level and for flue terminations for the boiler units and CHP engines at roof level.

Vibration control measures have been outlined as well as an anti-vibration schedule provided in line with Planning Condition 20.

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.



79 Camden Road, London

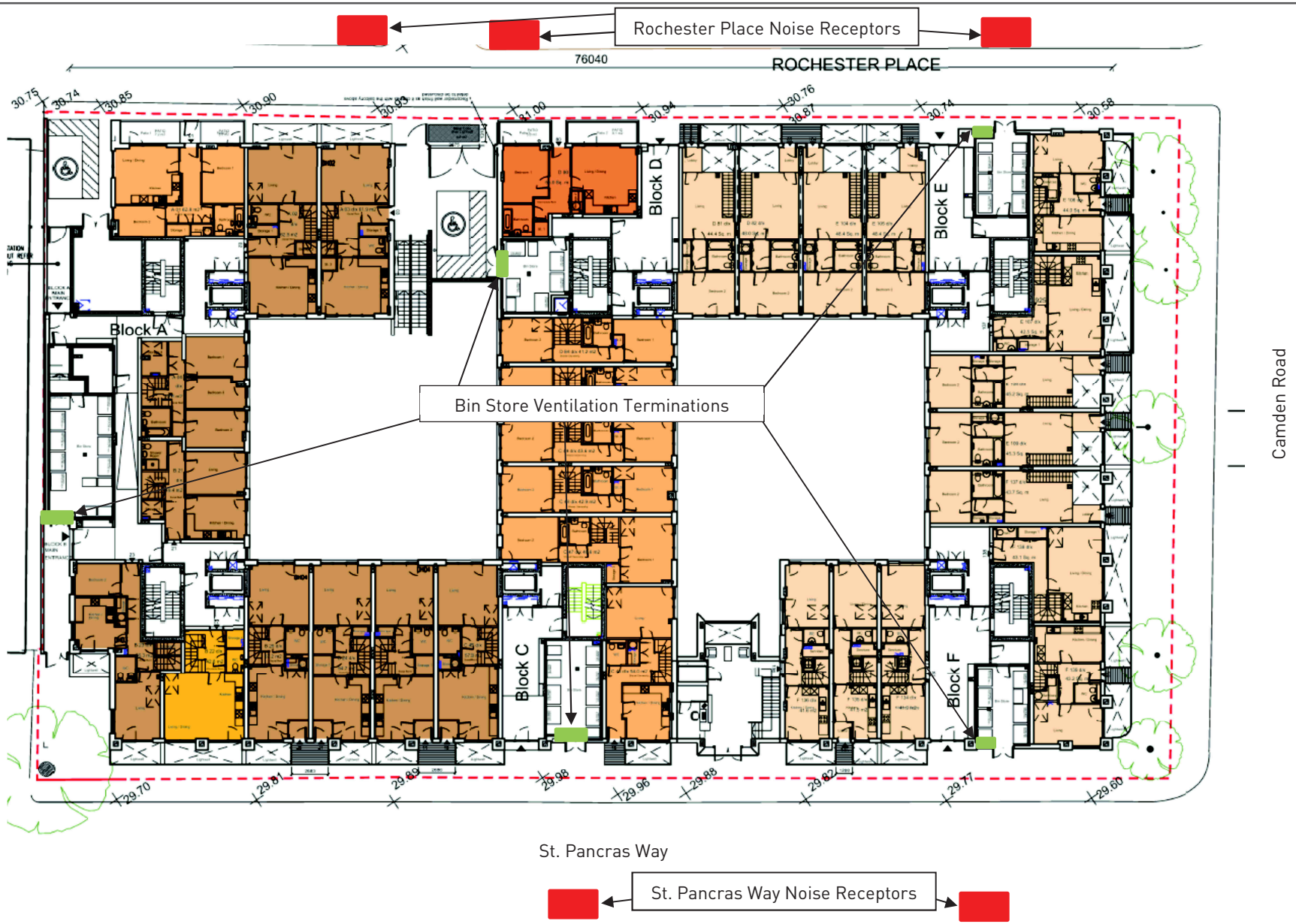
Lower Ground Floor Plan Showing Location of Energy Centre, Water Tank Room and Key Noise Break-Out / Discharge Locations

Site Plan 5366/SP1

11 March 2016

Not to Scale

RBA ACOUSTICS



79 Camden Road, London

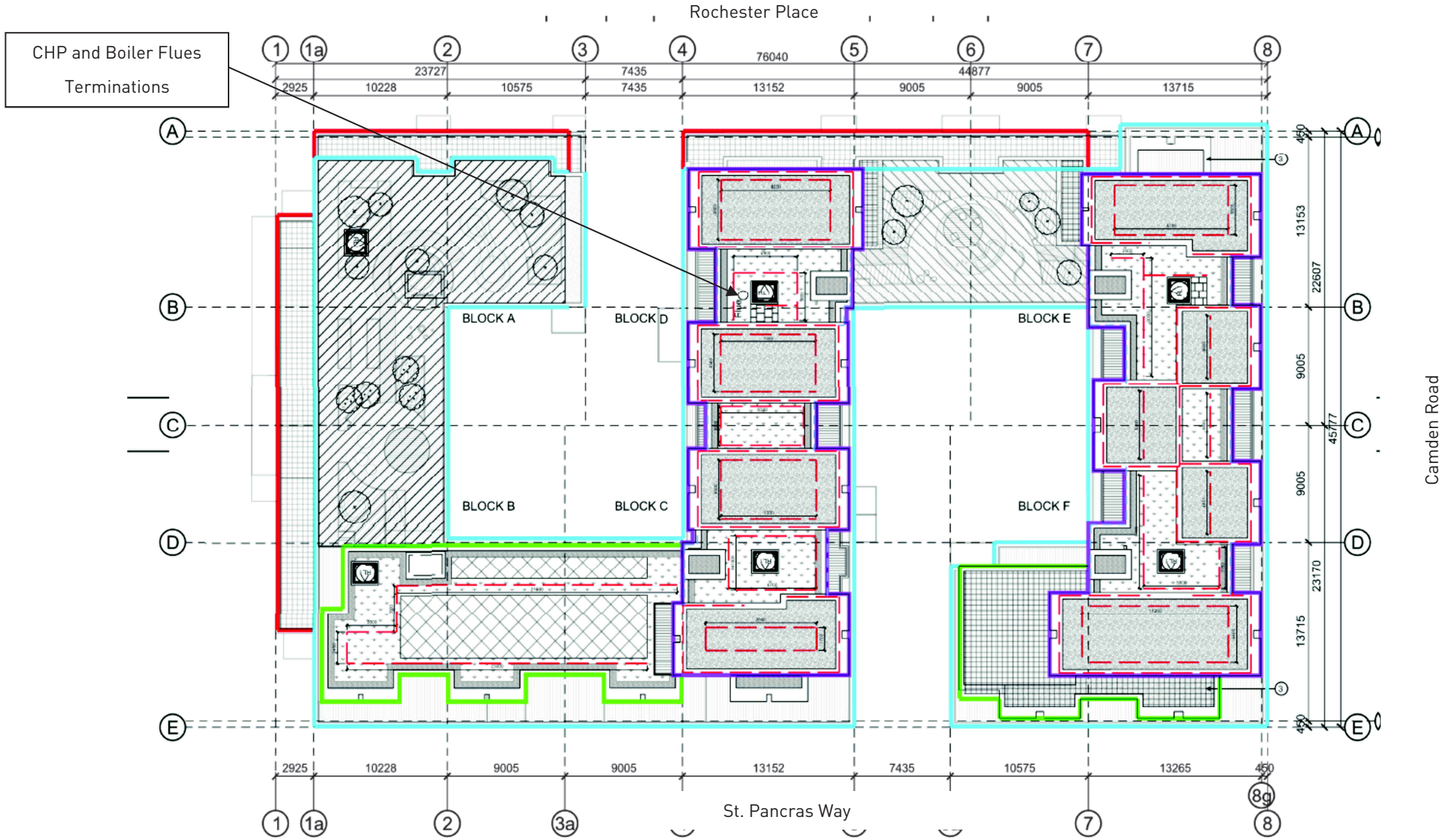
Ground Floor Plan Showing Location of Bin Store Ventilation Terminations and Noise Sensitive Receptors

Site Plan 5366/SP2

11 March 2016

Not to Scale

RBA ACOUSTICS



79 Camden Road, London

Roof Plan Showing Noise Break-Out / Discharge Locations

Site Plan 5366/SP3

11 March 2016

Not to Scale

RBA ACOUSTICS

RBA ACOUSTICS
44 Borough Road
London SE1 0AJ
T. +44 (0) 20 7620 1950
W. www.rba-acoustics.co.uk
E. info@rba-acoustics.co.uk

79 CAMDEN ROAD

PLANT NOISE SCHEDULE

5366/PNS

Plant Description / number of	Location	Plant Type	Data from Manufacturers L_w/L_p	Sound Level (dB) @ Octave Band Centre Frequency (Hz)							
				63	125	250	500	1k	2k	4k	8k
Boilers (x2)	Energy Centre	Hoval Ultragas 850 boiler	L_w (breakout)	84	83	74	71	72	68	64	57
CHP Engine		Ener-G gas fired CHP 70kWe	L_w (breakout)	84	77	81	69	67	66	61	64
CHP Cooling fan		ELTA SC050K4-A10/20	In-duct L_w (outlet)	75	77	81	80	79	77	73	63
			In-duct L_w (inlet)	75	77	79	80	81	77	73	59
Heating circulation pumps (x2)		Grundfos MGE100LC2-D1 3kW	L_p @ 1m	65dBA							
Cooling circulation pump		Grundfos TPE 65-210/2 A-F-A-BAQE	L_p @ 1m	59dBA							
Generator	Generator Room	Unknown	-	-							
Booster Pump	Water tank room	Grundfos Hydro MPC-E 3 CRIE10-6	L_p @ 1m	62dBA							
Extract Fan	Bin Stores	Nuaire Aire-Volve Extract AVS2	In-duct L_w (inlet)	79	75	69	69	66	62	58	56
			In-duct L_w (outlet)	81	77	69	69	69	65	59	57
			L_w (breakout)	67	59	49	40	31	27	29	23