RBA ACOUSTICS

WAHACA
KENTISH TOWN
LONDON NW5

Plant Noise Assessment

REPORT 6466/PNA
Prepared: 17 October 2014
Revision Number: 1

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Plant Noise Assessment

WAHACA, KENTISH TOWN
LONDON NW5

REPORT 6466/PNA
Prepared: 17 October 2014

Revision	Comment	Date	Prepared By	Approved By
0	First issue of report	8 October 2014	Paul Taylor	Robert Barlow
1	Revised to assess to nearest office receptor	17 October 2014	Paul Taylor	Robert Barlow

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1.0 INTRODUCTION

In order to support the planning application for the location of new mechanical services equipment associated with a proposed restaurant above Kentish Town Underground Station, the 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 the standard Local Authority 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

Monitoring of the prevailing background noise was undertaken between Tuesday 23 September and Thursday 25 September 2014.

During the survey period, rain was noted to occur during the night of Tuesday 23 September. Otherwise, the weather conditions were generally appropriate for the noise measurement exercise, it being dry with light winds.

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

2.2 Measurement Location

The microphone was positioned on a tripod, 1.5m above the roof of Kentish Town Underground Station. Noise levels at this position were affected by noise from the traffic passing along Kentish Town Road and the adjacent plant installation associated with the underground station. The installation of the microphone is shown in Photo 6466/P1 and the measurement location is also detailed on the attached Site Plan 6466/SP1.

2.3 Instrumentation

The following equipment was used for the measurements.

Table 6466/T1 – Equipment Details

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Expiry Date
Larson Davis Type 1 Sound Level Meter	SLM824	3153	01913/1	2 July 2016
Larson Davis Pre Amplifier	PRM902	4467		
Larson Davis ½" Microphone	2541	8177		
01dB-Stell Calibrator	Cal 21	50442073	01797/3	30 April 2016

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

3.0 RESULTS

The noise levels recorded at the measurement position are shown as time-histories on the attached Graphs 6466/G1 and 6466/G2.

In order to ensure a worst-case assessment the lowest background L_{A90} (15 minutes) noise level measured has been used in our analyses. The lowest L_{A90} and the period averaged L_{Aeq} dB noise levels measured are summarised below.

It should be noted that refrigeration plant items are proposed to operate at all times and that plant related to ventilation is proposed to operate over reduced hours. Specific hours of operation are confirmed in Section 5.3.

Table 6466/T2 – Measured Levels

Measurement Period	Measured Sound Pressure Levels	
	Minimum $L_{90,15min}$ (dBA)	Average L_{eq} (dBA)
All hours (00:00 – 00:00)	51.4	58.3
Reduced Operating Hours (07:00 – 00:00)	53.5	59.2

4.0 CRITERIA

The general requirements of Camden Council for noise from mechanical plant items are outlined within the LDF Camden Local Development Framework: Camden Development Policies (2010). Table E: *Noise levels from plant and machinery at which planning permission will not be granted.* This table is reproduced in Table 6466/T3 for convenience.

Table 6466/T3 – Table E from Camden LDF (2010)

Noise Description and measurement location	Period	Time	Noise Level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000 - 2400	5dB(A) <LA90
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) <LA90
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) <LA90
Noise at 1 metre external to a sensitive façade where LA90>60dB	Day, evening and night	0000 - 2400	55dB L_{Aeq}

In-line with the Camden Council's requirements, we propose that L_{Aeq} average noise levels at the nearest noise sensitive façade should be 5dB below the minimum $L_{A90,15min}$ noise level measured during the proposed plant operating hours.
Should any item of plant be noted to have characteristic acoustic features such as those described in Table 6466/T3, a further 5dB reduction in criteria noise level should be applied to the applicable plant item.

Based on the standard Camden Council criteria, noise levels at the nearest residential receptor should therefore be below the criteria provided in Table 6466/T4.

Table 6466/T4 – Criteria Noise Levels

Measurement Period	Criteria Noise Level L_{Aeq} (dB)
All hours (00:00 – 00:00)	46
Reduced Operating Hours (07:00 – 00:00)	49

5.0 ASSESSMENT

Our assessment has been based upon the following information:

5.1 Mechanical Service Units

6No. Heat Pumps comprising

- 4No. Toshiba RAV-SM1603AT-E (CU1-CU4)
- 1No. Toshiba RAV-SM803AT-E (CU5)
- 1No. Toshiba RAV-SM563AT-E (CU6)

2No. Extract Fans comprising

- 1No. Helios Gigabox Fan GBD630/T120, 14000m^3/h, 450 Pa, (EF1)
- 1No Systemair Circular Duct Fan K250L, 0.28m^3/s, 70Pa, (EF2)

1No. Air Handling Unit comprising

- 1No. Air Design Air Handling Unit AHU1-0 Q03470-01-0, 2.5m^3/s, 561Pa (AHU1)

2No. Catering Condensers comprising (refrigeration)

- JRH20-150-M-1 or similar*

*Due to the project being in the early design stage, these refrigeration units have not been finalised. As such, we have been advised that the catering condensers noted are considered representative.

5.2 Position of Units

All plant items are to be located at roof level within the proposed plant deck area.

5.3 Hours of Operation

It is understood that the mechanical service units related to refrigeration are proposed to operate at all times (00:00 – 00:00) every day. This includes the following items:

- 4No. Toshiba RAV-SM1603AT-E (CU1-CU4)
- 1No. Toshiba RAV-SM803AT-E (CU5)
- 1No. Toshiba RAV-SM563AT-E (CU6)
- 2No Catering Condensers

It is understood that the ventilation systems are proposed to operate between the hours of 07:00 – 00:00 every day. This includes the following items:

- 1No. Helios Gigabox Fan GBD630/T120 (EF1)
- 1No Systemair Circular Duct Fan K250L (EF2)
- 1No. Air Design Air Handling Unit AHU1-0 Q03470-01-0 (AHU1)

As such, we have assessed the plant units over the respective proposed hours of operation.

5.4 Noise Levels

Information regarding the noise levels of the various plant items has been provided by the manufacturers of the units.

The octave band levels of the units are detailed as follows:

Table 6466/T5 – Manufacturer's Noise Levels

Unit	Parameter	Sound Level (dB) at Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Toshiba RAV-SM1603AT-E (CU1-CU4)	Lp @ 1m (dB) + Ground Reflections	59	59	43	52	46	42	38	34
Toshiba RAV-SM803AT-E (CU5)	Lp @ 1m (dB) + Ground Reflections	52	53	52	48	45	40	34	30
Toshiba RAV-SM563AT-E (CU6)	Lp @ 1m (dB) + Ground Reflections	49	51	50	46	42	38	32	28
Catering Condenser (JRH20-150-M-1 data)	Lp @ 10m (dB) Free Field	37dBA Overall							
Helios Gigabox 630/4 T120 (EF1)	Breakout Lw (dB)	88*	82	76	68	65	64	60	56
	Extract In-duct Lw (dB)	105*	97	91	87	84	81	76	70
Systemair Turbo K250L (EF2)	Extract In-duct Lw (dB)	89*	79	80	69	68	66	58	53
Air Handling Unit AHU1-0 Q03470-01-0 (AHU1)	Intake In-duct Lw (dB)	67	80	78	75	74	71	68	66

*Data has not been supplied by the manufacturer. Values noted represent predicted noise levels.

Data relating to noise breakout from the air handling unit (AHU1) has not been available for our assessment. We have therefore set criteria noise levels which the AHU must achieve in order to comply with the criteria. Noise levels measured at 1m from the air handling unit should achieve all criteria provided in Table 6466/T6.

Table 6466/T6 – Maximum Noise Levels

Unit	Parameter	Sound Level (dB) at Octave Band Centre Frequency (Hz)			
		63	125	250	dBA
Air Handling Unit AHU1-0 Q03470-01-0 (AHU1) - Breakout	Lp @ 1m (dB) + Ground Reflections	75	68	61	61

5.5 Tonality

Review of the octave band data as detailed in Table 6466/T5 and the predicted noise levels referred to in the Appendix, concludes that there are no tonal characteristics associated with the proposed plant.

Accordingly the 5 dB subtraction from the background noise levels (under BS4142:1997) as referred to in Section 4.0 of this report does not need to be applied as there will be no audible tonal noise created.

5.6 Location of Nearest Noise Sensitive Windows

The nearest residential windows to the proposed plant area are at 2nd floor level to the rear of adjacent properties on Kentish Town Road (No. 274). These windows are approximately 15m from the closest proposed rooftop plant item.

The nearest noise sensitive window serves an office which exists at 2nd floor level to the rear of the adjacent properties on Kentish Town Road (No. 272). This window is approximately 12m from the closest proposed rooftop plant item. We have assessed noise levels at this window as a worst-case, as this is the closest window to the proposed plant installation.

The nearest noise sensitive windows are identified on Site Plan 6466/SP1.

5.7 Calculation of Noise Levels at Nearest Noise Sensitive Receptor

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

- Source Term SPL/SWL (as appropriate)
- Duct Losses (ducted systems only)
- Grille End Reflections (ducted systems only)
- Directivity / Radiation (ducted systems only)
- Distance & Screening Attenuation

A calculation sheet is attached for further information in Appendix B.

The results of the calculations indicate the following noise levels at the nearest affected noise sensitive window:

Table 6466/T7 – Predicted Noise Level

Operating Period	Prediction (dBA)	Criterion (dBA)
All Hours (00:00 – 00:00)	34	46
Reduced Operating Hours (07:00 – 00:00)	46	49

As Table 6466/T7 indicates, noise from all the mechanical plant items meet the criterion noise levels at the nearest noise sensitive receptor assuming the following mitigation measures are adopted.

5.8 Attenuation Requirements

To reduce noise levels at the nearest residential façade we propose that an attenuator is installed to the to the extract outlet of the Helios Gigabox 630/4 T120 extract unit. The attenuator would be required to meet the performance criteria as shown in Table 6466/T8. An example attenuator capable of achieving this would be a 600mm long attenuator with 35% free area.

Table 6466/T8 – Required Acoustic Mitigation

Mitigation Measures	Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Extract Outlet Silencer	3	6	10	14	20	19	14	13

The attenuator cross-section should be appropriately sized to ensure the pressure drop is satisfactory. We would typically advise the pressure drop should not exceed 60Pa to ensure that self-generated noise is of an acceptable level. RBA would be pleased to review the proposed attenuator selection.

5.10 Screening Requirements

We have assumed a solid imperforate screen (minimum 15kg/m^2 e.g. 2mm thick steel sheet), which is at least 1.5m above the plant deck level, to surround the plant deck area as indicated on Site Plan 6466/SP2. The screen is required to extend vertically down such that a gap of no more than 50mm exists at the bottom edge.

5.11 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 condensing units and the AHU be 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.

6.0 CONCLUSION

Measurements of the existing background noise levels at the roof of Kentish Town Underground Station have been undertaken. The results of the measurements have been used in order to determine the required criteria for atmospheric noise emissions from the plant to be installed at the proposed Wahaca restaurant.

The results of the assessment indicate atmospheric noise emissions from the plant are 8dB below the lowest recorded background noise levels at the nearest noise sensitive window from the plant location.

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 – Plant Noise Calculations

Summary of Noise Levels at Nearest Noise Sensitive Receptor (Sound Pressure Levels)

Please note that the following values are subject to rounding errors.

Unit	Octave-band Noise Levels (dB)								Overall dBA
	63	125	250	500	1000	2000	4000	8000	
4No. Toshiba RAV-SM1603AT-E (CU1-CU4)	37	35	27	24	15	8	2	0	25
Toshiba RAV-SM803AT-E (CU5)	21	21	18	12	5	0	0	0	16
Toshiba RAV-SM563AT-E (CU6)	21	21	18	12	5	0	0	0	14
Gigabox 630/4 T120 fan (Extract)	59	53	45	37	22	19	19	14	41
Gigabox 630/4 T120 fan (Breakout)	61	54	45	35	29	25	19	16	42
Systemair Turbo K250L fan (Extract)	39	33	36	26	23	14	1	0	30
Air Handling Unit AHU1-0 Q03470-01-0 (Breakout)	53	46	39	33	31	30	27	17	39
Air Handling Unit AHU1-0 Q03470-01-0 (Inlet)	29	39	31	24	21	15	10	8	28
Total (Minus 2 No. Catering Condensers)	64	57	49	41	34	32	29	28	46
2No. Catering Condensers									34
Total (Including 2No. Catering Condensers)									46

Wahaca, Kentish Town, London NW5

L_{Aeq} Time History

Tuesday 24th September to Thursday 26th September 2014

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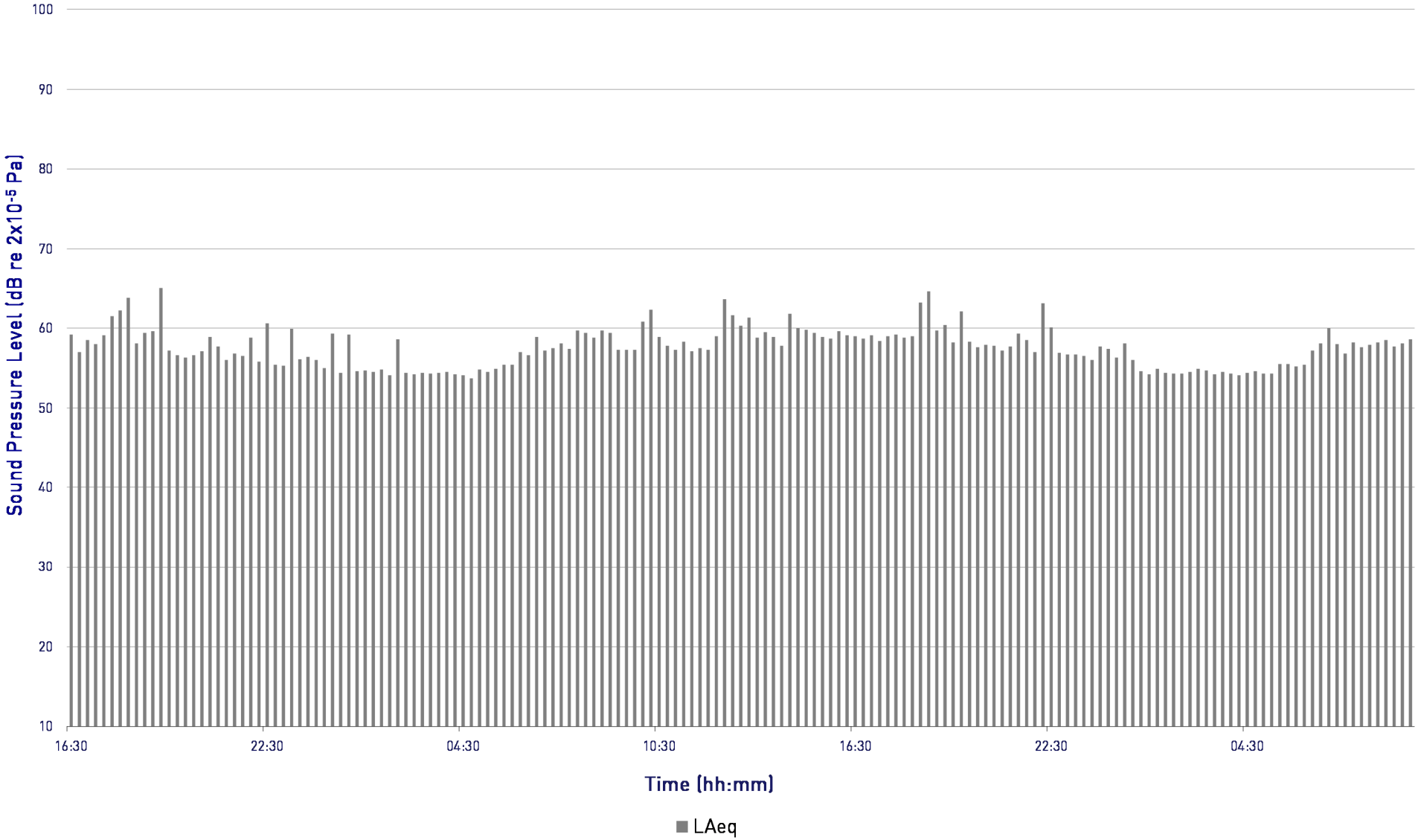
Graph 6466/G1



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L_{Amax} and L_{A90} Time History

Tuesday 24th September to Thursday 26th September 2014

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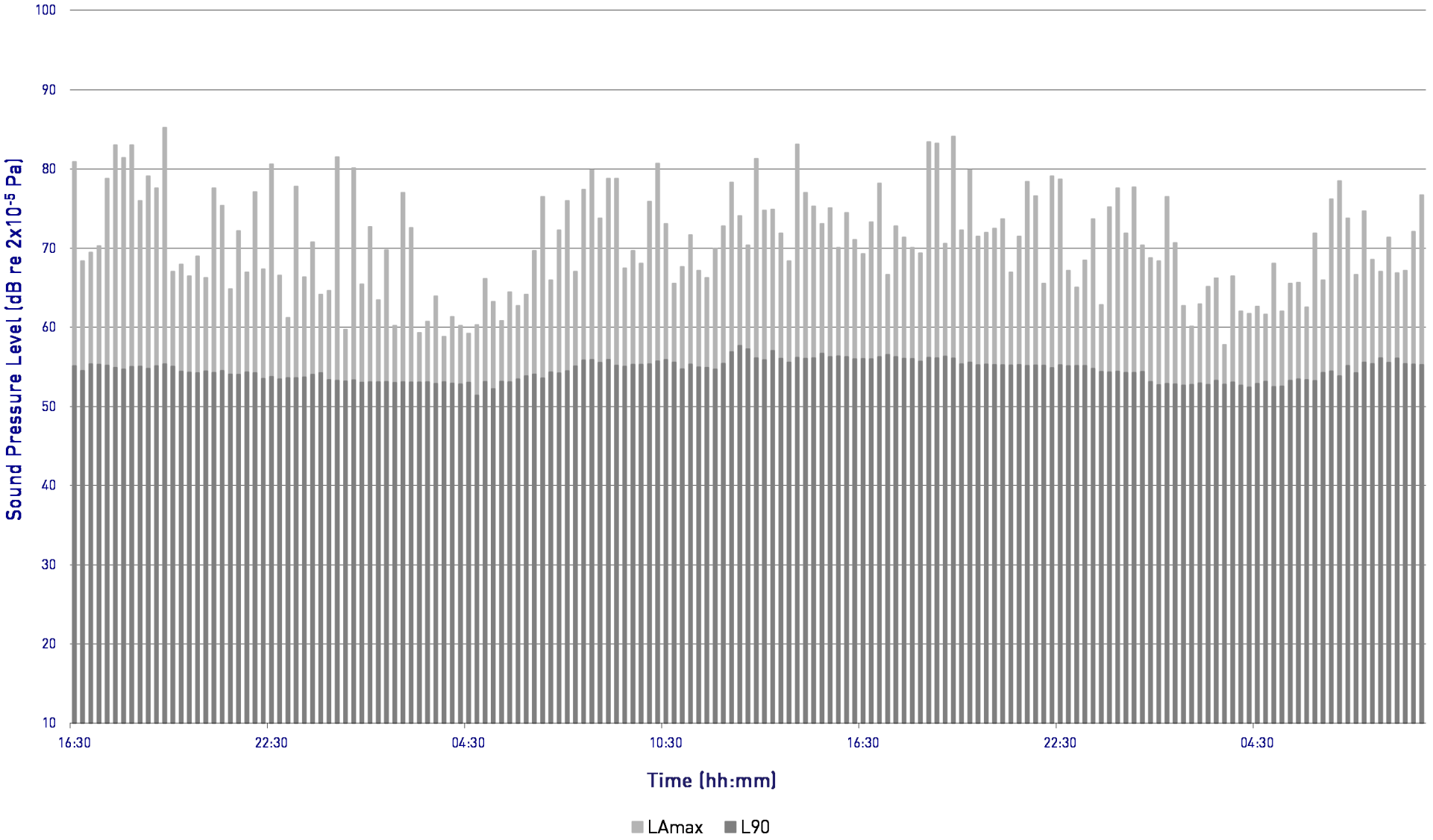
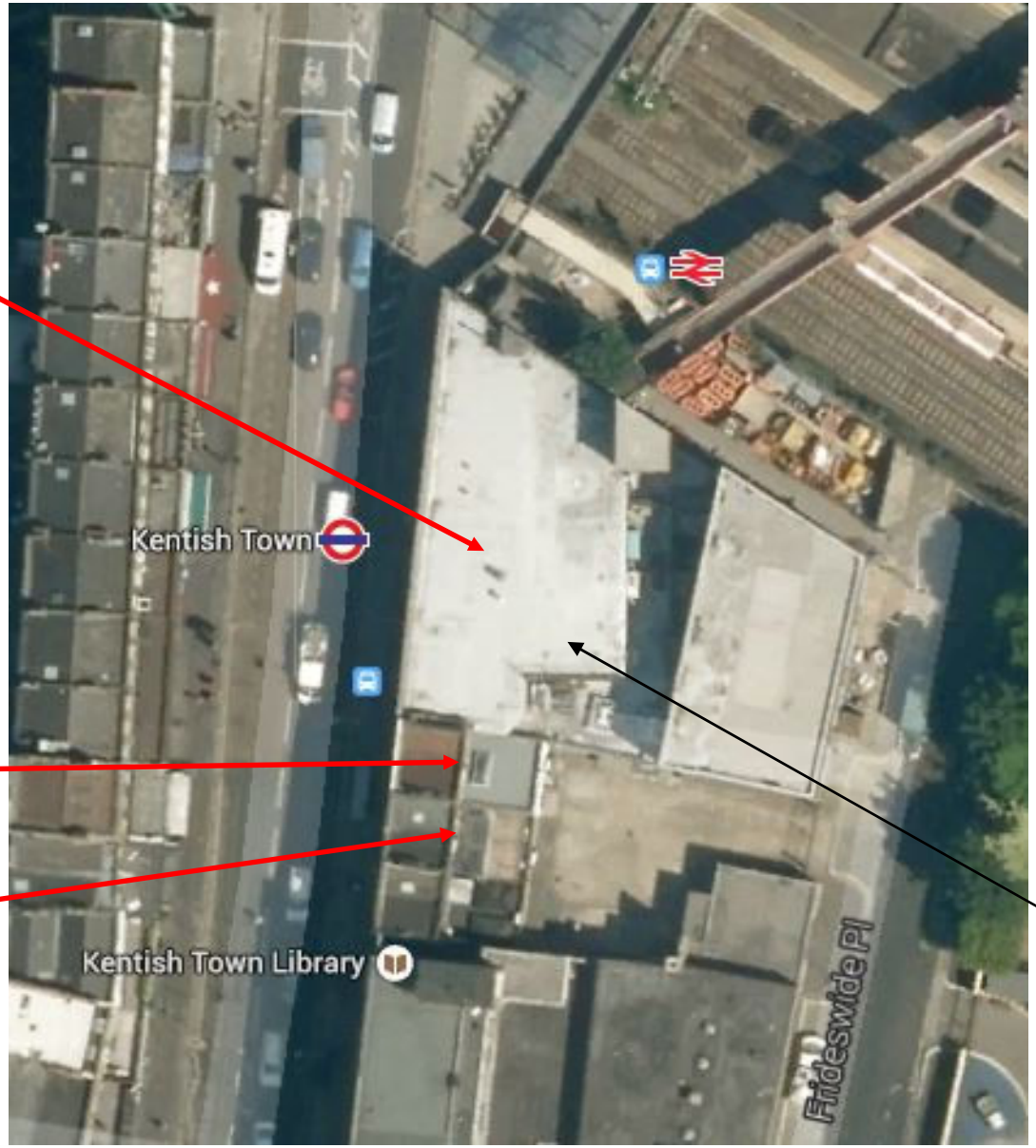
Graph 6466/G2



Rooftop Plant Location



Nearest noise sensitive receptor (No. 272)

Nearest residential receptor (No. 274)

Measurement Location

Wahaca, Kentish Town, London NW5

Site Plan Showing Measurement Location

Site Plan 6466/SP1

17 October 2014

Not to Scale

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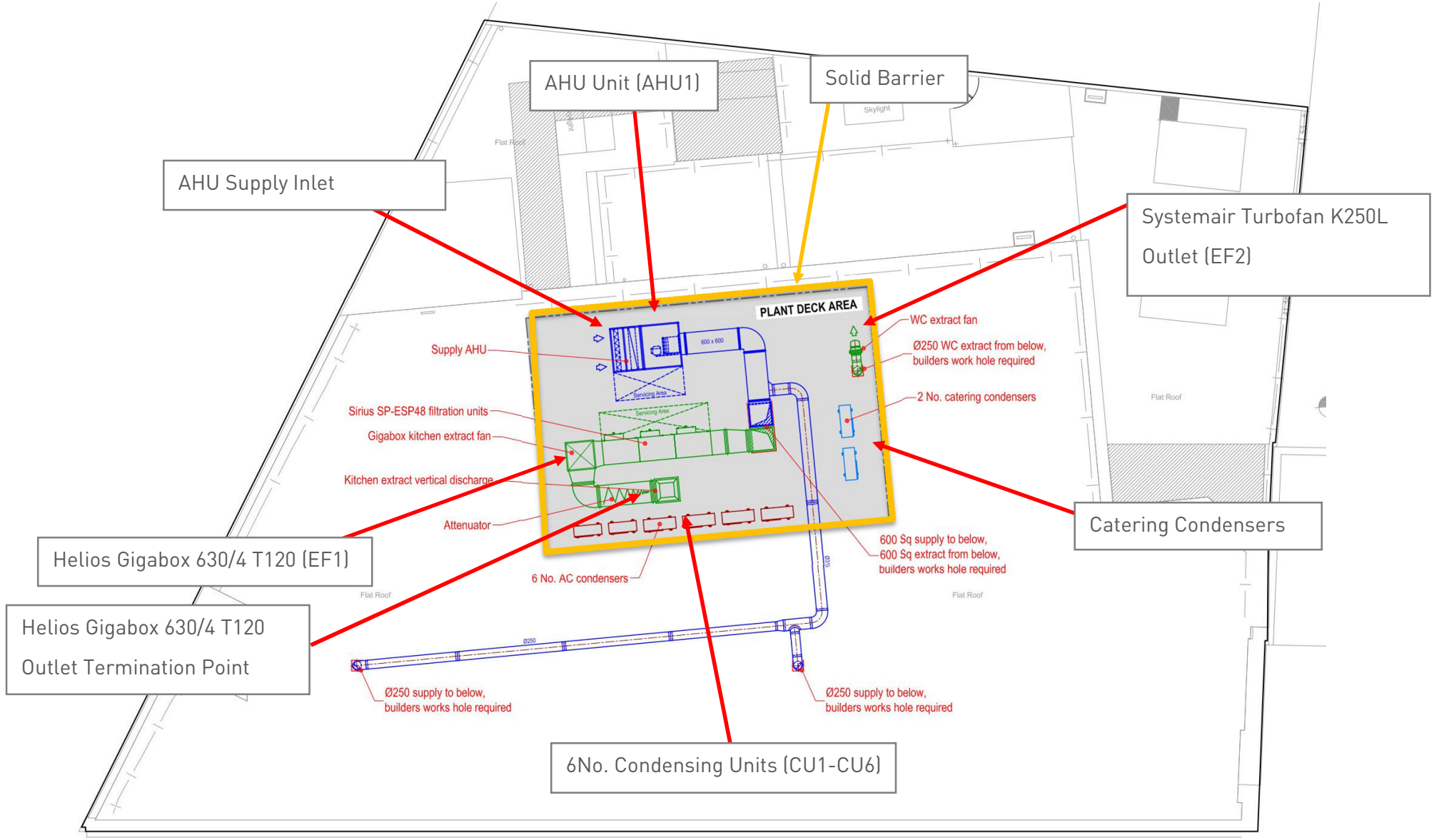

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Roof Plan Showing Plant Layout

Site Plan 6466/SP2

8 October 2014

Not to Scale

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Wahaca, Kentish Town, London NW5

Photograph Detailing Measurement Position

Photograph 6466/P1

8 October 2014

Not to Scale

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