

73-75 AVENUE ROAD, LONDON

PLANNING NOISE ASSESSMENT

Acoustics Report A820/R01a
23rd March 2016

Report for:

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1 Introduction

Ion Acoustics is appointed by Ridge and Partners LLP to carry out a noise assessment for new external air conditioning heating and cooling plant at 73-75 Avenue Road, London. The overall scheme comprises the demolition of an existing house at the site (75 Avenue Road), and the construction of two new houses in its place (73 & 75 Avenue Road). As part of the scheme, a variety of internal and external plant units are proposed for installation. This report describes an assessment of external plant noise only and can be submitted with the planning application. A previous assessment was carried out and a report provided for an earlier plant scheme; this new report is prepared for a different plant scheme and supersedes the previous report.

The external noise assessment has been carried out in accordance with London Borough of Camden's standard guidance. As part of the external assessment, a noise survey has been carried out to determine the existing baseline noise levels in the area and calculations have been made of the noise of the proposed external plant at the nearest affected residential locations. In particular, this report describes:

- A noise survey carried out to determine underlying background noise levels in the area;
- The standard planning guidance specified by Camden Council in relation to external plant noise;
- Calculations of plant noise to the nearest residential locations and a comparison with the proposed criteria;
- Details of noise control measures to ensure that the noise limits are met.

2 Scheme Details

2.1 Site Location

An aerial photograph of the site is shown below in Figure 1, showing the location of the existing building in relation to surrounding streets and nearby housing. The unattended measurement positions used at the front and rear façades during the noise survey are also indicated. 75 Avenue Road is located within a primarily residential area in London, to the west of Camden. The front façade overlooks Avenue Road, which is relatively busy in terms of road traffic flow; Avenue Road runs south-east towards Regent's Park and north-west to meet the A41. The rear façade overlooks residential properties at Queen's Grove to the south-west and Queensmead to the west. Each new house will have its own plant and the adjacent new house will need to be assessed as a sensitive receptor in each case.

The majority of the proposed plant for both houses will be located in the garden area, to the rear of the site, and will comprise three large condensers contained within an acoustic enclosure. One additional smaller condenser unit will be located on the roof of each house. The nearest sensitive receptor to 73 Avenue Road will be 75 Avenue Road, with rear façade windows 30m from the garden plant and dormer windows 11m from the rooftop plant. The nearest sensitive receptor to 75 Avenue Road will be 73 Avenue Road, with windows 28m from the garden plant and dormer windows 11m from the rooftop plant.

The rooftop condensers will be located close to skylights associated with 73 and 75 Avenue Road. The skylights will not be above sensitive habitable rooms, and will be non-openable double glazed units. Therefore, the internal noise impact of the rooftop condensers on the new properties at 73 & 75 Avenue Road is not considered to be an issue. However, the impact of the rooftop condensers on the dormer windows of both properties has been considered, as these windows are relatively close to the rooftop condensers.

The two rooftop condensers will face towards 77 Avenue Road, the nearest existing property on the front façade, which has windows at top floor level. Although 77 Avenue Road has dormer windows at top floor level, the new 73 & 75 Avenue Road houses will be taller than 77 Avenue Road, so these dormer windows will not have a line of sight to the rooftop condensers. 77 Avenue Road has a rear façade window approximately 46m away from the garden condensers proposed for 73 Avenue Road and approximately 23m away from the garden condensers proposed for 75 Avenue Road.

The nearest existing residential property at the rear of the site will be 38 Queen's Grove which has a 1st floor window approximately 21m away from the garden plant for 73 Avenue Road and 23m away from the garden plant for 75 Avenue Road. This window is approximately 42m away from the rooftop condenser proposed for 73 Avenue Road and approximately 44m away from the rooftop condenser proposed for 75 Avenue Road.



Figure 1 – Site location showing nearby streets and housing (Google Maps)

2.2 Plant Details

The proposed external plant comprises external air conditioning plant, which will provide heating and cooling to both of the new houses. The main air conditioning plant for each house comprises three large condenser units, as shown below:

- 1 x Mitsubishi PURY-EP350YLM-A condenser unit
- 2 x Mitsubishi PURY-EP200YLM-A condenser unit

These three units will be provided for each house, so a total of six large condensers will be located in the new gardens to the rear of the site. The large condensers have a fan located at the top of the unit, and discharge air (and noise) vertically. The condensers will be contained within a custom acoustic enclosure to reduce noise levels.

The condenser units located at roof level will be used for localised cooling to a comms room for each house; the specification for these units is shown below:

- 1 x Mitsubishi PUHZ-ZRP60VHA condenser unit

One of these units will be provided for each house, so there will be a total of two smaller condensers. The overall scheme comprises eight condensers: six large units and two smaller units.

The location of all proposed external plant in relation to the nearby housing is shown on Figure 2, and a more detailed layout showing the location of the rooftop condensers is shown on Figure 3.

It is noted that the condenser units operate according to demand, and could therefore operate at any time of day over a 24-hour period, although it is unlikely that all would ever need to operate throughout the night.

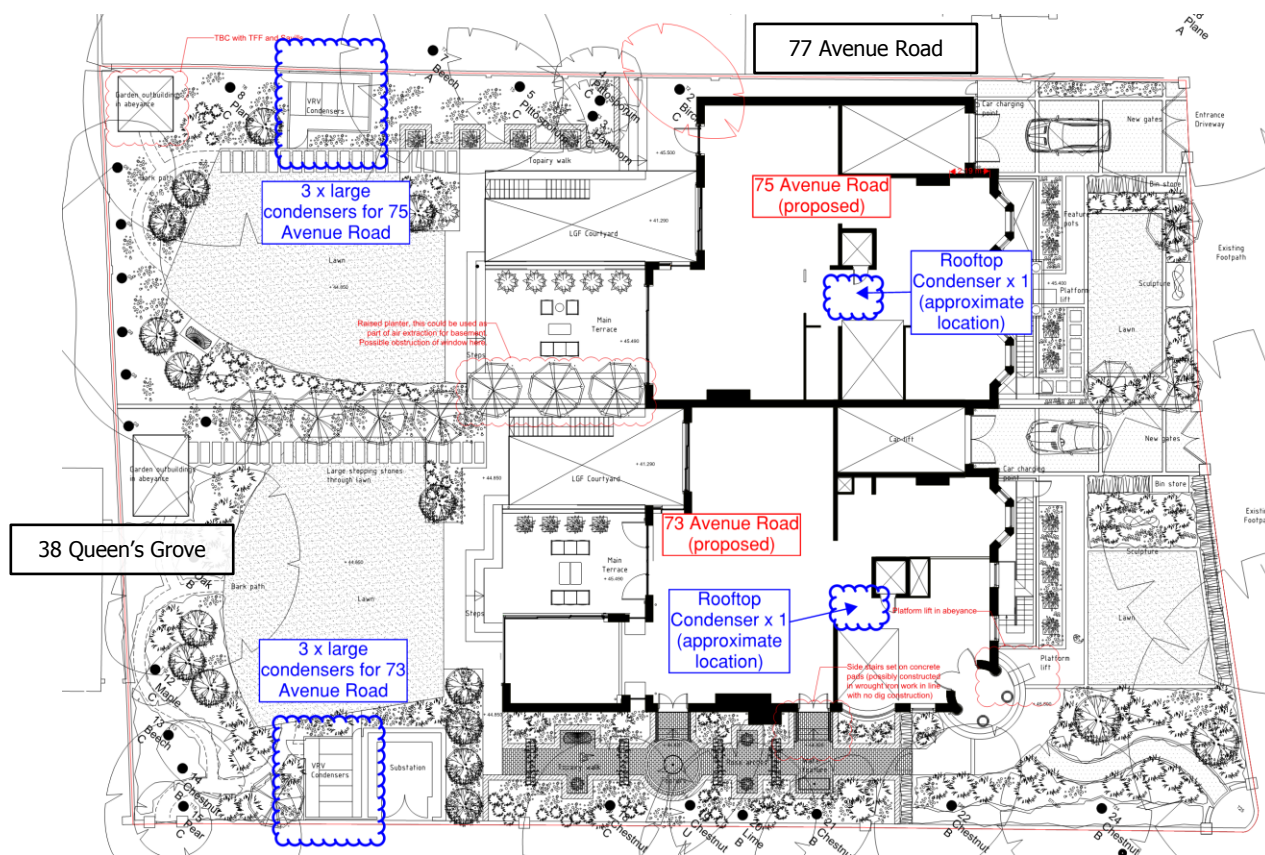


Figure 2 – Plan showing proposed plant locations in garden areas to the rear of the site and on roof level of 73 Avenue Road/75 Avenue Road and nearest residential housing

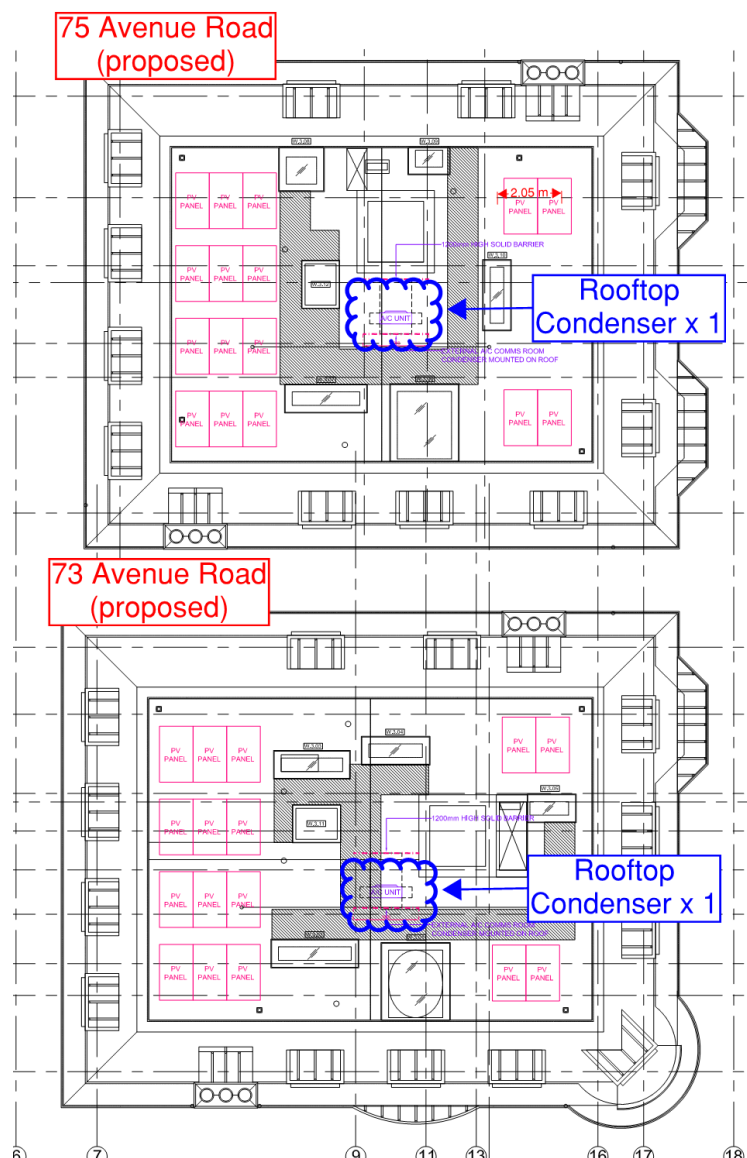


Figure 3 – Plan showing proposed plant locations on rooftops of 73 & 75 Avenue Road

The following scenarios have been considered for the external noise assessment:

- Impact of all plant from 73 & 75 Avenue Road on 38 Queen's Grove
- Impact of all plant from 73 & 75 Avenue Road on 77 Avenue Road
- Impact of all plant from 73 Avenue Road on 75 Avenue Road
- Impact of all plant from 75 Avenue Road on 73 Avenue Road

3 Noise Criteria

3.1 Camden Guidance

Camden Council has standard guidance for assessing new external plant and any planning noise conditions imposed on the new scheme would likely be based on this guidance. The assessment criteria are found in Development Policy 28: Noise and Vibration (DP28), which forms part of the London Borough of Camden Local Development Framework Development Policies. Noise limits for new external plant are found in Table E of DP28, which is shown below in Figure 4.

Table E: Noise levels from plant and machinery at which planning permission will not be granted

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) <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 sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dBL _{max}

Figure 4 – Camden Council DP 28 Table E indicating recommended noise limits for new external plant

DP28 requires external noise emission from new external plant to be controlled to a level of 5 dB(A) below the background noise level (L_{A90}, dB) during the daytime, evening and night-time periods.

DP28 defines the daytime period as 07:00 to 19:00 hours, the evening period as 19:00 to 23:00 hours and the night-time period as 23:00 hours to 07:00 hours. The noise limit applies at a distance of 1m from the building façade of the nearest residential receptor to the new external plant.

DP28 does not state the method by which the background noise level is determined, but does give reference to the now superseded Planning Policy Guidance 24 (PPG24): Planning and Noise. DP28 states: *'...when development that generates noise is proposed, the Council will require an acoustic report to ensure compliance with PPG24: Planning and noise. A condition will be imposed to require that the plant and equipment which may be a source of noise pollution is kept working efficiently and within the required noise limits and time restrictions. Conditions may also be imposed to ensure that attenuation measures are kept in place and effective throughout the life of the development'*.

It is noted that does not include a method for assessing external plant noise, but refers to BS4142: 'Methods for rating and assessing industrial and commercial sound'. The latest version of BS4142 was published in 2014, and includes guidance for assessing external plant noise, and in particular, for determining the background noise level at a measurement location.

BS4142: 2014 states: *'In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods'*.

Therefore, the 'typical' background noise levels (L_{A90}) have been determined from the noise levels measured during the noise survey, in order to set noise limits at the nearest housing for the daytime (07:00 to 19:00 hours), evening (19:00 to 23:00 hours) and night-time (23:00 to 0700 hours) periods.

It is assumed that the limits will apply to the air-conditioning plant only.

The standby generators are not proposed for continuous use, and would only be in use for emergency situations and for occasional testing purposes. Therefore, it is our view that the standby generators should not be assessed in the same manner as the air conditioning plant, which could potentially operate on a 24-hour basis. An alternative noise limit for the standby generators is proposed and discussed in Section 4.3. The approach of using a less onerous noise limit for standby generators has been taken on every other planning scheme we have carried out including generators; however this has not included any in LB Camden.

3.2 Previous Planning Application

Planning permission was granted in March 2012 for a scheme involving the demolition of the existing property and construction of a single dwelling at the site (ref: 2011/2388/P). In granting planning permission, several conditions were imposed by Camden Council. Condition 13 states:

Noise levels at a point 1 metre external to sensitive facades shall be at least 5dB(A) less than the existing background measurement (L_{A90}), expressed in dB(A) when all plant/equipment (or any part of it) is in operation unless the plant/equipment hereby permitted will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or if there are distinct impulses (bangs, clicks, clatters, thumps), then the noise levels from that piece of plant/equipment at any sensitive facade shall be at least 10dB(A) below the L_{A90} , expressed in dB(A).

Reason: To safeguard the amenities of the adjoining premises and the area generally in accordance with the requirements of policy CS5 of the London Borough of Camden Local Development Framework Core Strategy and policies DP26 and DP28 of the London Borough of Camden Local Development Framework Development Policies.

The existing planning application expired on 28th March 2015. As the proposed scheme involves the construction of two new properties at the site, a new planning application is required. However, it is anticipated that any planning conditions issued for the new scheme will be similar to those issued for the original application. It is noted that this condition is identical in nature to Camden Council's standard guidance specified in DP28.

4 Noise Survey

4.1 Procedure

A baseline noise survey was carried out at the front and rear façades over a 48-hour period from Monday 9th January 2015 to Wednesday 11th February 2015 to determine the typical underlying noise levels around 75 Avenue Road.

Measurements were made using two separate Larson Davis LD820 sound level meters, both of which were calibrated prior to and on completion using a Brüel & Kjær Type 4231 calibrator. The microphone at the front façade was mounted on railings outside a 1st floor window, 1m from the building façade, as shown in Figure 5. The microphone at the front façade faced towards Avenue Road. Noise levels at this location were representative of noise levels at the front façade of the adjacent residential property, 77 Avenue Road.



Figure 5 – Unattended Front Façade Noise Survey Measurement Position

The microphone at the rear façade was mounted on railings outside a 2nd floor window, 1m from the building façade, as shown in Figure 6. The microphone at the rear façade faced towards housing at 38 Queen's Grove, to the rear of the building. The rear façade measurement position was the closest secure location to 38 Queen's Grove, which will be the closest residential location to the new external plant. It was not possible to position the measurement microphone further down the existing garden, due to security considerations, and due to the fact that there are several trees within the garden, which could have adversely affected noise level measurements.



Figure 6 – Unattended Rear Façade Noise Survey Measurement Position

Both sound level meters were set up to log noise levels in consecutive 15-minute periods and were unattended except for the set up and collection. Both sound level meters logged noise levels from 13:00 hours on Monday 9th February 2015 to 13:00 hours on Wednesday 11th February 2015.

Noise levels at the front façade were mainly determined by road traffic noise on Avenue Road, distant road traffic noise from surrounding streets and general neighbourhood noise such as individuals walking by. Noise levels measured at the front façade were higher than those measured at the rear façade. Noise levels at the rear façade were characterised by distant road traffic noise and general environmental noise such as individuals walking by.

The weather conditions for the survey were sunny and dry – no rain was noted during the survey period.

4.2 Results – Front and Rear Façade

The noise levels measured at the front façade are shown graphically in Figure 7a and Figure 7b and the noise levels measured at the rear façade are shown in Figure 8a and 8b. All measured noise levels are tabulated in Appendix B.

Noise levels are reported in terms of the L_{Aeq} , $L_{Amax, F}$ and L_{A90} in fifteen minute periods. The L_{Aeq} is defined as the steady state noise level with the same energy as the actual time varying noise. It is effectively an average noise level over the measurement period. The L_{A90} is defined as the noise level exceeded for 90% of the measurement time. This is used to describe the background noise; that is the underlying noise level in the absence of short-term events. The L_{Amax} is simply the maximum noise level in the measurement period. Measurements at both façades include the reflecting effect of the façade which is taken to result in a 3dB increase when compared to the “free-field” equivalent in the absence of reflections.

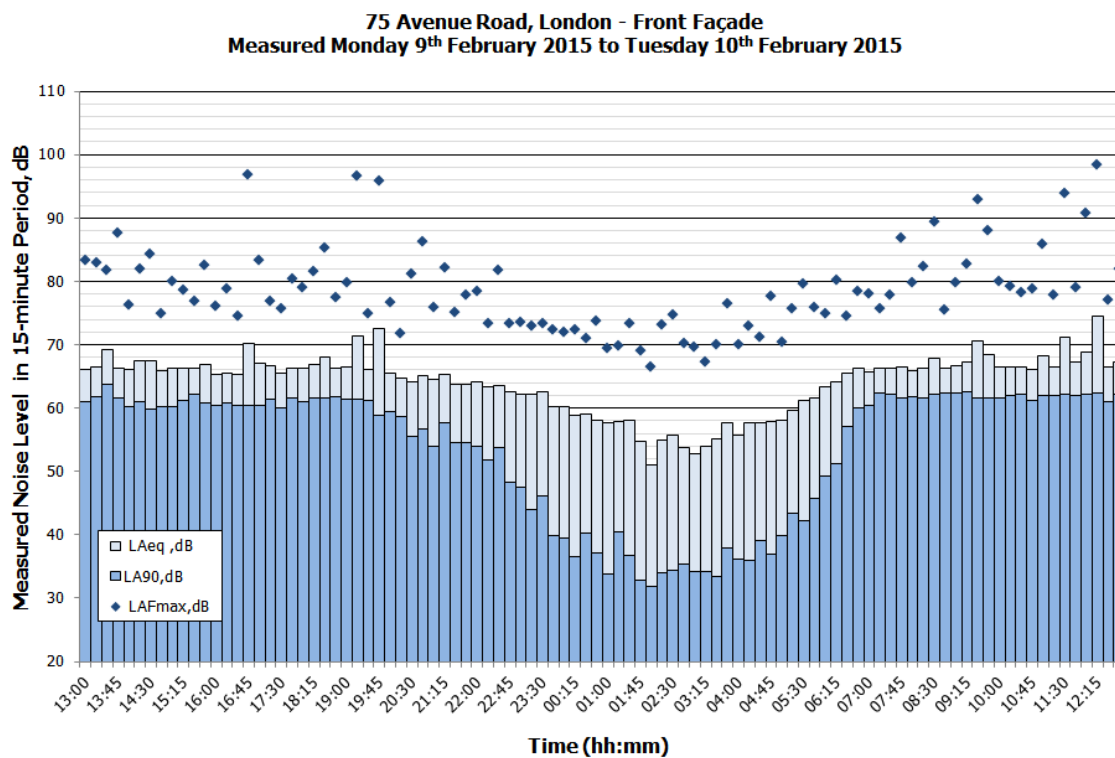


Figure 7a – Front Façade Measured Noise Levels Monday 9th to Tuesday 10th February 2015

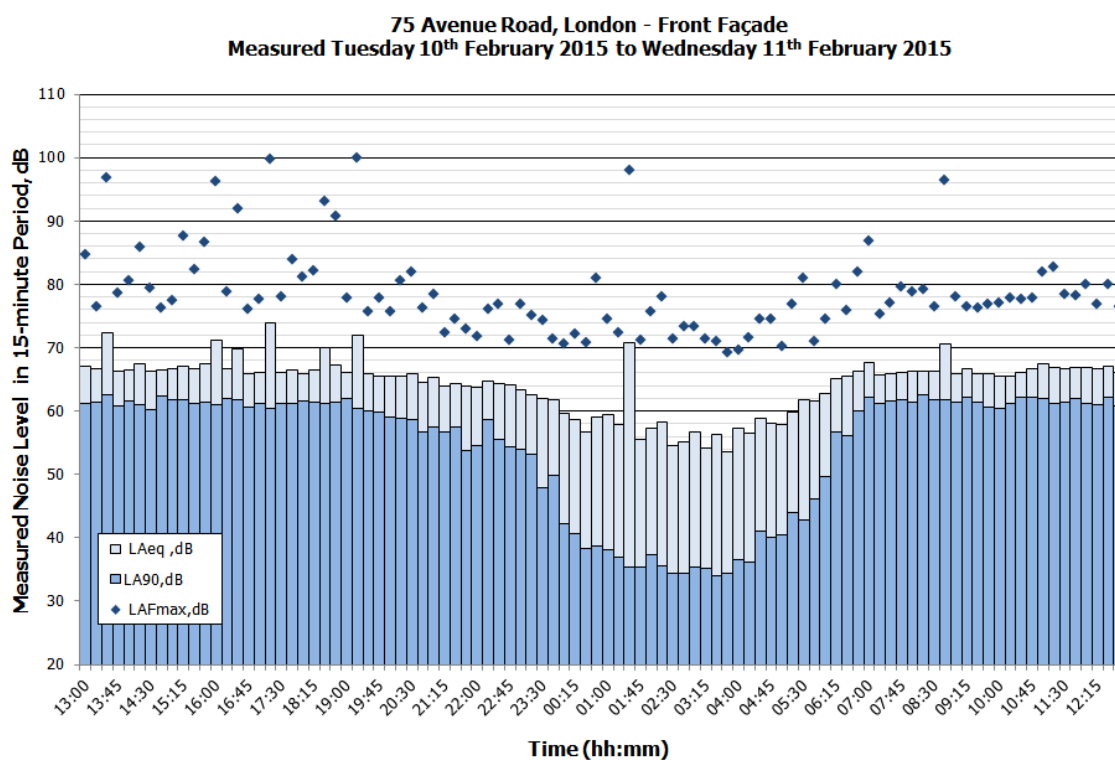


Figure 7b – Front Façade Measured Noise Levels Tuesday 10th to Wednesday 11th February 2015

Front Façade

Daytime external noise levels at the front façade over the survey period are between 66 dB L_{Aeq} and 74 dB L_{Aeq} and are characterised by road traffic activity in Avenue Road and surrounding streets and general neighbourhood noise. Evening noise levels reduce steadily from approximately 19:30 hours onwards on both days, to between 63 dB L_{Aeq} and 65 dB L_{Aeq} . Night-time noise levels reduce further from 23:00 hours onwards, before increasing gradually from 05:00 hours onwards, due to increased activity from road traffic in surrounding streets. There is a period at 01:30 hours on Wednesday 11th February when noise levels increase to a level of 71 dB L_{Aeq} ; it has not been possible to identify the source of this increase, but the increase only lasted for one 15-minute period, and noise levels reduced significantly in the next 15-minute period.

Background noise levels at the front façade are typically between 60 dB L_{A90} and 63 dB L_{A90} during the day, reducing to between 52 dB L_{A90} and 58 dB L_{A90} in the evening. Background noise levels reduce further during the night-time period after 23:00 hours, to between 34 dB L_{A90} and 40 dB L_{A90} . The behaviour of the measured noise levels is similar for both of the 24-hour periods, in that noise levels are relatively steady during the daytime, before reducing in the evening, then reducing further at night after 23:00 hours, before steadily increasing after 05:00 hours, due to increased road traffic activity.

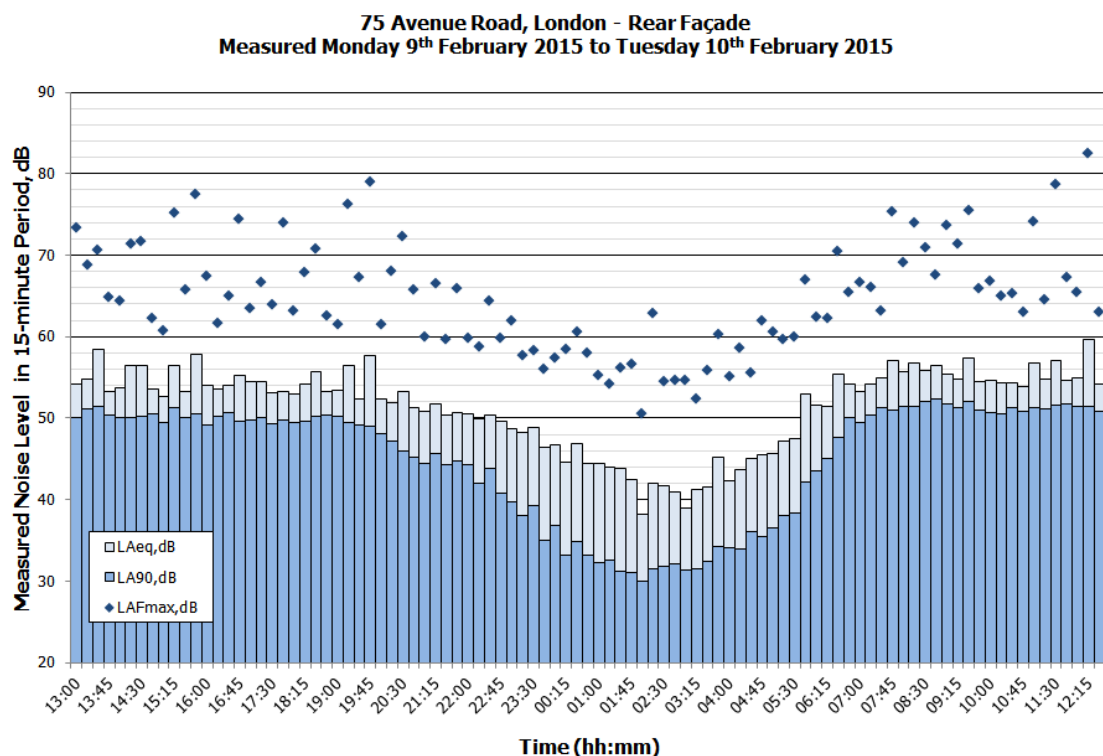


Figure 8a – Rear Façade Measured Noise Levels Monday 9th to Tuesday 10th February 2015

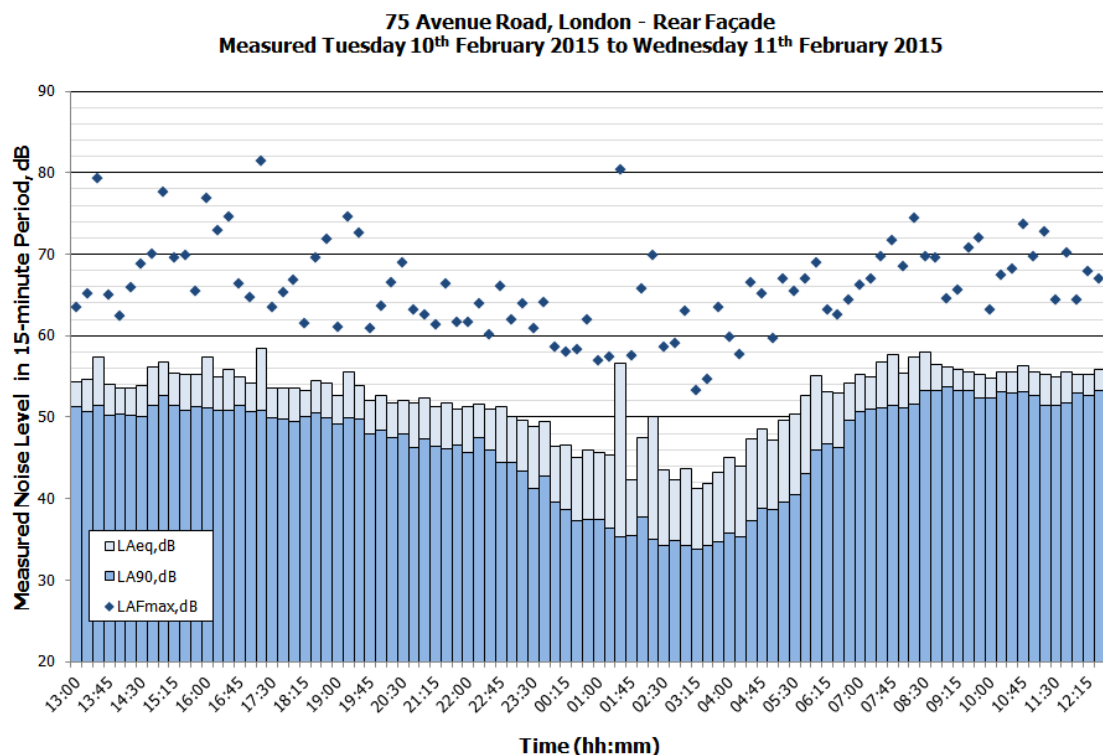


Figure 8b – Rear Façade Measured Noise Levels Tuesday 10th to Wednesday 11th February 2015

Rear Façade

Noise levels measured at the rear façade are lower than those measured at the front façade during the survey period. Daytime external noise levels over the survey period are between 53 dB L_{Aeq} and 58 dB L_{Aeq} and are characterised by distant road traffic in surrounding streets and general neighbourhood noise. Evening noise levels reduce from approximately 19:30 hours onwards on both days, to between 50 dB L_{Aeq} and 53 dB L_{Aeq} . Night-time noise levels reduce further from 23:00 hours onwards, before increasing gradually from 05:00 hours onwards, due to increased neighbourhood activity such as road traffic in surrounding streets. The increase in noise levels seen at the front façade at 01:30 hours on Wednesday 11th February is also shown in the noise levels at the rear façade – the noise level at the rear façade during this 15-minute period was 57 dB L_{Aeq} , but noise levels reduced significantly in the next 15-minute period.

Background noise levels at the rear façade are typically between 50 dB L_{A90} and 52 dB L_{A90} during the day, reducing to between 44 dB L_{A90} and 49 dB L_{A90} in the evening. Background noise levels reduce further during the night-time period after 23:00 hours, to between 38 dB L_{A90} and 42 dB L_{A90} .

Noise levels measured at the rear façade follow the pattern of the noise levels measured at the front façade; they are relatively steady during the day, before reducing in the evening, reducing further at night, then increasing from 05:00 onwards with increased neighbourhood activity.

4.3 Derived Noise Limits

The noise limits to be applied depend on the existing background noise levels ($L_{A90,r}$ dB). As discussed in Section 3.1, the 'typical' background noise level at the front and rear façades has been determined from the noise levels measured during the noise survey. The background noise levels and derived noise limits for the daytime (07:00 – 19:00 hours), evening (19:00 – 23:00 hours) and night-time (23:00 – 07:00 hours) periods are shown in Table 1.

The Camden Council noise limit will apply at a distance of 1 metre from the nearest residential façade, in accordance with DP 28: Noise and Vibration. Therefore, the noise limit will be based on a noise level which includes the 3dB increase due to the reflecting effect of the façade. As a result, the background noise levels used to determine the noise limit for new external plant include the reflecting effect of the façade as was measured in both cases.

Table 1 – Summary of Measured Background Noise Levels and Derived Noise Limits at front and rear façades

Facade	Period	Typical $L_{A90,r}$ dB (façade)	Therefore Noise Limit (1m from façade) dB(A)
Front Façade	Daytime (07:00 to 19:00)	62	57
	Evening (19:00 to 23:00)	54	49
	Night-time (23:00 to 07:00)	35	30
Rear Façade	Daytime (07:00 to 19:00)	51	46
	Evening (19:00 to 23:00)	46	41
	Night-time (23:00 to 07:00)	32	27

As Table 1 shows, background noise levels measured at the front façade are higher than those measured at the rear façade. The large condenser units for 73 Avenue Road will be located in the rear garden area; therefore the rear façade noise limits will apply at the nearest residential property, which will be the new 75 Avenue Road property. This noise limit will only apply to plant from 73 Avenue Road, as 75 Avenue Road cannot be considered as a sensitive receptor for its own plant. The rear façade noise limit will also apply when considering the impact of the plant for 75 Avenue Road on 73 Avenue Road.

The rear façade noise limit will apply at 38 Queen's Grove and 77 Avenue Road for assessing the combination of all operational plant from 73 & 75 Avenue Road.

5 Calculations

The noise levels of the large condensers are stated by the manufacturer as follows:

- Mitsubishi PURY-EP350YLM-A: A-weighted sound pressure level of 62.5dB(A) at 1m in standard mode and 50dB(A) at 1m in low noise mode.
- Mitsubishi PURY-EP200YLM-A: A-weighted sound pressure level of 59dB(A) at 1m and 44dB(A) at 1m in low noise mode.

It is noted that the stated sound pressure level is based on test measurements made at a distance of 1m in front of the condensers, at a height of 1m above ground level. The units are 1.65m in height. As previously noted, the condensers have a fan located on top of the unit, so sound will discharge vertically – the stated sound pressure levels are therefore not indicative of the noise levels being produced above the unit. Receptors with a height greater than the condenser (i.e. above 1.65m) would be more exposed to noise from the fan.

Initial scoping calculations were made to determine the suitability of the garden condensers in terms of noise levels. Based on the stated sound pressure levels, the rear façade evening and night noise limits would have been exceeded, even with the low noise mode operational. Noise levels would be increased further due to the window at 38 Queen's Grove having a clear line of sight to the top of the condensers. It is also noted that sound power levels were not available from the manufacturer for these units.

Mitigation has been proposed based on the initial calculations, and the client has requested details of a custom Louvremax enclosure from Environ which is proposed for this scheme (or a similar equivalent). Two separate enclosures are proposed, which will each contain three large condensers. The enclosures will be located in the garden areas of 73 & 75 Avenue Road, as shown in Figure 2. The design of the enclosure is such that the top elevation will comprise a solid interlocking panel system which incorporates acoustic foam lining, so noise will not propagate significantly from the top of the enclosure. Air and noise will discharge through the front and rear elevations of the enclosure to the external as shown in Figure 9.

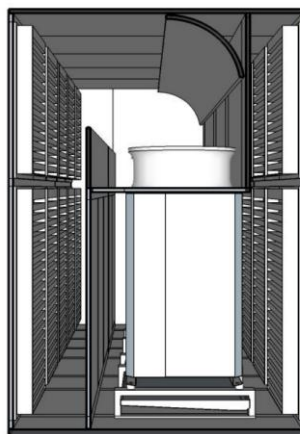


Figure 9 -Environ Louvremax enclosure detail showing air discharge through front and rear elevations

Environ has provided information on the performance and they advise that a sound pressure level of 41dB(A) at 1m in front of the enclosure can be achieved, based on the combination of the three large condenser operating in standard mode. The noise breakout from the rear will also be 41dB(A). The rear of both enclosures will be adjacent to a reflective surface, so noise breakout from the rear will be increased by 3dB

The Mitsubishi PUHZ-ZRP60VHA rooftop condensers have an A-weighted sound power level of 67 dB L_{WA} when operating in standard mode according to the manufacturer. The manufacturer states a reduction of 3-4dB(A) when the condenser is operating in low noise mode, which would reduce the sound power level to 63-64 dB L_{WA} . Octave band sound power level data was not available from the manufacturer for the standard or low noise modes.

Noise is reduced by distance attenuation and shielding due to the locations of the proposed plant in relation to the nearest residential windows. Noise levels will however be increased by reflections due to nearby reflecting surfaces, and as the plant noise limit is set at 1m from the nearest building façade, the calculations have included a +3dB correction to account for this.

All Condensers to 38 Queen's Grove

Calculations have been made of the noise levels produced by the combination of all plant from 73 & 75 Avenue Road to the nearest residential window at 38 Queen's Grove, with the garden plant contained within the Environ Louvremax enclosure. Calculations indicate that with all condenser operating simultaneously in standard mode, the calculated façade noise level is 25dB(A), which meets the daytime noise limit of 46dB(A), evening noise limit of 41dB(A) and night-time noise limit of 27dB(A). Noise levels at night will be lower still, due to the low noise operating modes of the condensers. The night-time noise level at 38 Queen's Grove is calculated as 20dB(A), which is 7dB(A) below the night-time noise limit of 27dB(A).

All Condensers to 77 Avenue Road

Calculations have been made of the noise levels produced by the combination of all plant from 73 & 75 Avenue Road to the nearest residential window at 77 Avenue Road with the garden plant contained within the Environ Louvremax enclosure. The garden enclosure for 75 Avenue Road will be shielded by an existing boundary wall and the garden enclosure for 73 Avenue Road will have a reduced angle of view to 77 Avenue Road due to the orientation of the enclosure. The rooftop condensers will be shielded from 77 Avenue Road, as the new 73 & 75 Avenue Road houses will be taller than 77 Avenue Road.

Calculations indicate that with all condensers operating simultaneously in standard mode, the calculated façade noise level is 30.5dB(A), which meets the daytime noise limit of 46dB(A), and evening noise limit of 41dB(A) but exceeds the night-time noise limit of 27dB(A). The night-time noise level at 77 Avenue Road with the low noise mode operational for all condensers is calculated as 27dB(A), which meets the night-time noise limit of 27dB(A).

73 Avenue Road to 75 Avenue Road

Calculations have been made of the noise levels produced by the combination of all plant from 73 Avenue Road to the nearest rear façade residential window at 75 Avenue Road with the

garden plant contained within the Environ Louvremax enclosure. Calculations indicate that with all condensers operating simultaneously in standard mode, the calculated façade noise level is 26dB(A), which meets the daytime noise limit of 46dB(A), evening noise limit of 41dB(A) and night-time noise limit of 27dB(A). The night-time noise level at 73 Avenue Road will be lower again with the low noise mode operational for all condensers, and is calculated as 23dB(A), which meets the night-time noise limit of 27dB(A).

75 Avenue Road to 73 Avenue Road

Calculations have been made of the noise levels produced by the combination of all plant from 75 Avenue Road to the nearest rear façade residential window at 73 Avenue Road with the garden plant contained within the Environ Louvremax enclosure. Calculations indicate that with all condensers operating simultaneously in standard mode, the calculated façade noise level is 26dB(A), which meets the daytime noise limit of 46dB(A), evening noise limit of 41dB(A) and night-time noise limit of 27dB(A). The night-time noise level at 75 Avenue Road will reduce further again with the low noise mode operational for all condensers, and is calculated as 22.6dB(A), which meets the night-time noise limit of 27dB(A).

Rooftop condensers to dormer windows of 73 & 75 Avenue Road

The rooftop condensers will be located close to dormer windows of the adjacent house; for both houses the distance between the condensers and dormer windows is approximately 11m. The front façade noise limits will apply at the dormer windows, which are less onerous than the night-time noise limits. Calculations between 73 Avenue Road and 75 Avenue Road indicate that the predicted façade noise level is 41.2dB(A), which meets the front façade daytime noise limit of 57dB(A) and evening noise limit of 49dB(A), but exceeds the night-time noise limit of 30dB(A). With the condenser operating in low noise mode, the calculated noise level is 38dB(A), which exceeds the night-time noise limit by 8dB(A). The noise levels of the rooftop condenser from 75 Avenue Road to 73 Avenue Road will be almost identical.

Mitigation is therefore proposed to reduce the noise levels at the dormer windows. The agreed approach is to provide a solid barrier of 1.2m height in front and behind the condensers. The height of 1.2m is required as the condensers are 943mm tall, and will sit on 100mm mounts. The barrier in front of the condenser will block the line of sight between the condenser and dormer window, but the barrier at the rear is required to prevent reflections from the front barrier becoming incident on the dormer windows of the other house. The barrier details are proposed as follows:

- The barrier can be constructed from a solid material such as brick, steel, plywood or cement fibre board on a timber or steel stud framework.
- Mineral fibre lining (e.g. Rockwool, minimum 33kg/m³) should be provided to the internal faces of the barrier. This can be protected by perforated metal (minimum 25% open area or an expanded metal mesh).
- The barrier should be solid with no gaps.
- Appropriate weatherproofing would be required.

It is noted that noise level calculations have been made with all condenser units operational simultaneously. In practice the condenser units would not be expected to operate simultaneously, particularly at night, and the calculated noise levels represent the worst-case operational scenario. It is recommended to locate the rooftop condenser units proposed for 73 and 75 Avenue Road on anti-vibration mounts, to prevent transmission of vibration into the new properties.

6 Summary

A total of eight air-conditioning units are proposed for installation at each of two separate new properties at Avenue Road, London, as part of a demolition and new-build scheme at the existing site. The plant will be located in rear gardens and at roof level on the new properties. A noise survey has been carried out to determine background noise levels at the front and rear façades of the existing building and the results have been used to determine noise limits for the proposed units at the nearest affected residential properties, 38 Queen's Grove, 77 Avenue Road and the new 73 & 75 Avenue Road houses. These noise limits are derived from Camden Council's standard guidance related to external plant noise.

Manufacturer's data has been used to calculate the combined noise level from the proposed units. At the rear façade, mitigation has been agreed to contain the garden condensers in a large custom acoustic enclosure to meet the rear façade noise limits. The rooftop condensers will require mitigation in the form of a solid 1.2m barrier, to reduce noise levels incident on new dormer windows, for compliance with the front façade noise limits. All proposed plant can comply with the proposed noise limits derived in line with Camden Council's standard guidance with implementation of the proposed mitigation. Therefore, there is no reason to refuse permission on the grounds of noise.

Front façade – Measured Noise Levels Monday 9th February 2015 to Tuesday 10th February 2015

Date	Start Time	Duration	LAeq dB	LAFmax dB	LA01 dB	LA10 dB	LA90 dB
09/02/2015	13:00	15:00	66.1	83.2	71.2	68.6	61.0
09/02/2015	13:15	15:00	66.5	83.0	72.6	69.1	61.8
09/02/2015	13:30	15:00	69.3	81.8	77.9	71.9	63.7
09/02/2015	13:45	15:00	66.3	87.6	72.3	68.7	61.5
09/02/2015	14:00	15:00	66.1	76.2	72.5	68.8	60.2
09/02/2015	14:15	15:00	67.5	81.9	74.8	70.1	61.0
09/02/2015	14:30	15:00	67.4	84.2	75.3	69.8	59.8
09/02/2015	14:45	15:00	65.8	74.9	71.4	68.6	60.3
09/02/2015	15:00	15:00	66.3	79.9	74.5	68.9	60.3
09/02/2015	15:15	15:00	66.2	78.6	73.6	68.8	61.1
09/02/2015	15:30	15:00	66.2	76.9	71.3	68.5	62.2
09/02/2015	15:45	15:00	66.8	82.6	75.7	69.3	60.8
09/02/2015	16:00	15:00	65.2	76.1	70.7	67.8	60.5
09/02/2015	16:15	15:00	65.5	78.7	72.8	67.9	60.7
09/02/2015	16:30	15:00	65.3	74.5	71.5	67.9	60.5
09/02/2015	16:45	15:00	70.1	96.7	78.9	68.9	60.4
09/02/2015	17:00	15:00	67.0	83.3	74.3	69.5	60.5
09/02/2015	17:15	15:00	66.6	76.8	73.0	69.2	61.4
09/02/2015	17:30	15:00	65.4	75.7	71.9	68.2	60.0
09/02/2015	17:45	15:00	66.3	80.3	72.9	68.7	61.5
09/02/2015	18:00	15:00	66.2	78.9	72.1	68.8	61.0
09/02/2015	18:15	15:00	66.8	81.6	75.6	69.1	61.5
09/02/2015	18:30	15:00	68.0	85.2	79.4	69.0	61.6
09/02/2015	18:45	15:00	66.3	77.5	70.9	68.6	61.8
09/02/2015	19:00	15:00	66.5	79.7	72.2	68.9	61.3
09/02/2015	19:15	15:00	71.3	96.6	77.4	69.1	61.4
09/02/2015	19:30	15:00	66.1	74.8	72.3	68.6	61.1
09/02/2015	19:45	15:00	72.5	95.8	83.5	69.8	58.8
09/02/2015	20:00	15:00	65.4	76.7	71.3	68.5	59.5
09/02/2015	20:15	15:00	64.7	71.7	70.0	67.8	58.7
09/02/2015	20:30	15:00	64.1	81.2	70.3	67.4	55.6
09/02/2015	20:45	15:00	65.1	86.3	70.0	67.5	56.6
09/02/2015	21:00	15:00	64.5	75.8	71.1	67.9	53.9
09/02/2015	21:15	15:00	65.2	82.1	71.2	67.7	57.6
09/02/2015	21:30	15:00	63.8	75.1	70.5	67.2	54.6
09/02/2015	21:45	15:00	63.7	77.9	69.9	67.1	54.5
09/02/2015	22:00	15:00	64.2	78.4	72.5	67.5	54.0
09/02/2015	22:15	15:00	63.4	73.3	70.6	67.4	51.7
09/02/2015	22:30	15:00	63.6	81.8	70.8	66.9	53.8
09/02/2015	22:45	15:00	62.6	73.3	70.6	66.4	48.3
09/02/2015	23:00	15:00	62.1	73.6	69.8	66.2	47.4
09/02/2015	23:15	15:00	62.1	73.0	69.7	66.2	43.9
09/02/2015	23:30	15:00	62.6	73.4	70.2	66.6	46.1
09/02/2015	23:45	15:00	60.3	72.3	68.8	64.6	39.8
10/02/2015	00:00	15:00	60.2	72.0	68.7	64.9	39.4
10/02/2015	00:15	15:00	58.9	72.4	68.0	63.6	36.6
10/02/2015	00:30	15:00	59.1	71.0	69.1	63.4	40.3
10/02/2015	00:45	15:00	58.1	73.8	68.4	62.0	37.2

Date	Start Time	Duration	LAeq dB	LAFmax dB	LA01 dB	LA10 dB	LA90 dB
10/02/2015	01:00	15:00	57.7	69.4	67.2	62.5	33.8
10/02/2015	01:15	15:00	57.8	69.8	67.6	62.6	40.5
10/02/2015	01:30	15:00	58.1	73.4	69.3	62.1	36.7
10/02/2015	01:45	15:00	54.8	69.1	66.3	59.3	32.9
10/02/2015	02:00	15:00	51.0	66.4	63.7	54.6	31.9
10/02/2015	02:15	15:00	55.0	73.1	65.6	59.6	34.0
10/02/2015	02:30	15:00	55.7	74.6	67.2	60.4	34.4
10/02/2015	02:45	15:00	53.7	70.1	64.8	58.4	35.4
10/02/2015	03:00	15:00	52.7	69.6	64.5	57.3	34.2
10/02/2015	03:15	15:00	54.0	67.2	64.2	59.0	34.2
10/02/2015	03:30	15:00	55.1	70.0	66.9	59.3	33.4
10/02/2015	03:45	15:00	57.6	76.5	68.7	60.5	37.9
10/02/2015	04:00	15:00	55.8	70.0	65.9	60.2	36.1
10/02/2015	04:15	15:00	57.7	73.0	69.7	61.8	36.0
10/02/2015	04:30	15:00	57.6	71.1	66.7	62.3	39.0
10/02/2015	04:45	15:00	57.9	77.6	69.0	61.5	37.0
10/02/2015	05:00	15:00	58.1	70.4	66.9	62.7	39.8
10/02/2015	05:15	15:00	59.7	75.6	69.1	63.8	43.3
10/02/2015	05:30	15:00	61.2	79.5	71.0	65.2	42.2
10/02/2015	05:45	15:00	61.5	75.9	69.5	65.9	45.7
10/02/2015	06:00	15:00	63.4	74.8	70.5	67.1	49.3
10/02/2015	06:15	15:00	64.2	80.2	71.1	67.4	51.2
10/02/2015	06:30	15:00	65.5	74.5	71.8	68.4	57.1
10/02/2015	06:45	15:00	66.3	78.4	72.0	68.9	60.0
10/02/2015	07:00	15:00	65.6	78.1	71.8	68.1	60.4
10/02/2015	07:15	15:00	66.2	75.7	72.4	68.5	62.4
10/02/2015	07:30	15:00	66.2	77.8	72.4	68.6	62.1
10/02/2015	07:45	15:00	66.5	86.9	72.7	68.2	61.6
10/02/2015	08:00	15:00	65.8	79.7	71.6	68.2	61.7
10/02/2015	08:15	15:00	66.2	82.4	72.7	68.5	61.6
10/02/2015	08:30	15:00	67.9	89.3	75.5	69.6	62.1
10/02/2015	08:45	15:00	66.3	75.4	72.3	68.7	62.4
10/02/2015	09:00	15:00	66.6	79.8	72.9	69.1	62.4
10/02/2015	09:15	15:00	67.3	82.7	75.7	69.6	62.5
10/02/2015	09:30	15:00	70.6	92.8	81.7	68.7	61.5
10/02/2015	09:45	15:00	68.4	88.0	79.0	69.3	61.5
10/02/2015	10:00	15:00	66.5	79.9	75.1	68.9	61.6
10/02/2015	10:15	15:00	66.4	79.2	74.0	68.9	61.9
10/02/2015	10:30	15:00	66.5	78.2	73.1	69.0	62.1
10/02/2015	10:45	15:00	66.0	78.8	72.0	68.7	61.1
10/02/2015	11:00	15:00	68.2	85.9	79.1	69.9	61.9
10/02/2015	11:15	15:00	66.5	77.8	71.8	69.0	62.0
10/02/2015	11:30	15:00	71.1	93.8	80.4	70.1	62.2
10/02/2015	11:45	15:00	67.2	79.0	74.1	70.0	62.0
10/02/2015	12:00	15:00	68.9	90.8	77.4	69.9	62.2
10/02/2015	12:15	15:00	74.5	98.3	85.7	70.0	62.3
10/02/2015	12:30	15:00	66.4	77.1	72.3	69.3	61.0
10/02/2015	12:45	15:00	67.3	81.9	74.1	69.8	62.1

Front façade – Measured Noise Levels Tuesday 10th February 2015 to Wednesday 11th February 2015

Date	Start Time	Duration	LAeq dB	LAFmax dB	LA01 dB	LA10 dB	LA90 dB
10/02/2015	13:00	15:00	67.1	84.7	73.6	69.6	61.2
10/02/2015	13:15	15:00	66.6	76.5	72.7	69.4	61.3
10/02/2015	13:30	15:00	72.4	96.7	83.4	69.8	62.5
10/02/2015	13:45	15:00	66.3	78.6	72.8	68.8	60.7
10/02/2015	14:00	15:00	66.4	80.6	73.2	69.0	61.5
10/02/2015	14:15	15:00	67.4	85.8	76.0	69.3	60.9
10/02/2015	14:30	15:00	66.3	79.3	73.8	69.0	60.2
10/02/2015	14:45	15:00	66.4	76.2	71.7	68.8	62.4
10/02/2015	15:00	15:00	66.7	77.5	73.6	69.2	61.7
10/02/2015	15:15	15:00	67.1	87.6	74.2	68.8	61.8
10/02/2015	15:30	15:00	66.7	82.3	73.5	69.2	61.2
10/02/2015	15:45	15:00	67.5	86.6	76.0	69.0	61.4
10/02/2015	16:00	15:00	71.1	96.3	83.3	69.1	60.9
10/02/2015	16:15	15:00	66.7	78.8	72.9	69.3	61.9
10/02/2015	16:30	15:00	69.7	92.0	77.9	69.0	61.7
10/02/2015	16:45	15:00	65.8	76.0	71.7	68.5	60.6
10/02/2015	17:00	15:00	66.1	77.6	72.5	68.6	61.1
10/02/2015	17:15	15:00	73.9	99.8	83.3	69.7	60.5
10/02/2015	17:30	15:00	66.1	78.1	71.4	68.6	61.2
10/02/2015	17:45	15:00	66.4	83.9	73.4	68.3	61.2
10/02/2015	18:00	15:00	65.9	81.1	72.3	68.4	61.5
10/02/2015	18:15	15:00	66.5	82.2	73.6	68.9	61.4
10/02/2015	18:30	15:00	69.9	93.1	78.9	69.7	61.2
10/02/2015	18:45	15:00	67.3	90.8	71.9	68.2	61.4
10/02/2015	19:00	15:00	66.1	77.8	71.3	68.8	61.9
10/02/2015	19:15	15:00	71.9	99.9	79.3	69.1	60.4
10/02/2015	19:30	15:00	65.9	75.7	71.8	68.7	60.1
10/02/2015	19:45	15:00	65.5	77.9	71.3	68.1	59.8
10/02/2015	20:00	15:00	65.5	75.6	71.2	68.5	59.1
10/02/2015	20:15	15:00	65.5	80.6	72.8	68.2	58.8
10/02/2015	20:30	15:00	65.9	81.9	72.8	68.5	58.7
10/02/2015	20:45	15:00	64.6	76.2	70.8	67.6	56.7
10/02/2015	21:00	15:00	65.2	78.4	72.1	68.3	57.4
10/02/2015	21:15	15:00	64.0	72.3	69.8	67.4	56.6
10/02/2015	21:30	15:00	64.4	74.5	71.1	67.4	57.5
10/02/2015	21:45	15:00	64.0	73.0	70.6	67.8	53.7
10/02/2015	22:00	15:00	63.7	71.8	70.1	67.3	54.5
10/02/2015	22:15	15:00	64.7	76.0	70.4	67.7	58.6
10/02/2015	22:30	15:00	64.3	76.9	71.2	67.8	55.6
10/02/2015	22:45	15:00	64.1	71.2	69.8	67.5	54.3
10/02/2015	23:00	15:00	63.4	76.8	70.8	66.9	53.9
10/02/2015	23:15	15:00	62.6	75.0	69.6	66.2	53.1
10/02/2015	23:30	15:00	61.9	74.2	69.6	66.2	47.8
10/02/2015	23:45	15:00	61.7	71.4	68.8	65.8	49.9
11/02/2015	00:00	15:00	59.7	70.5	67.9	64.3	42.3
11/02/2015	00:15	15:00	58.6	72.2	68.8	62.8	40.6
11/02/2015	00:30	15:00	56.7	70.8	66.2	61.2	38.2
11/02/2015	00:45	15:00	59.0	81.0	68.5	63.3	38.7

Date	Start Time	Duration	LAeq dB	LAFmax dB	LA01 dB	LA10 dB	LA90 dB
11/02/2015	01:00	15:00	59.4	74.4	68.9	63.7	38.1
11/02/2015	01:15	15:00	57.8	72.3	68.1	62.1	36.9
11/02/2015	01:30	15:00	70.7	97.9	83.9	61.1	35.4
11/02/2015	01:45	15:00	55.6	71.2	66.6	60.5	35.3
11/02/2015	02:00	15:00	57.3	75.7	67.9	61.4	37.4
11/02/2015	02:15	15:00	58.2	78.0	71.3	61.4	35.6
11/02/2015	02:30	15:00	54.5	71.3	66.1	58.8	34.4
11/02/2015	02:45	15:00	55.2	73.3	68.0	58.2	34.4
11/02/2015	03:00	15:00	56.7	73.4	68.5	60.2	35.3
11/02/2015	03:15	15:00	54.2	71.4	65.8	58.4	35.1
11/02/2015	03:30	15:00	56.3	70.9	68.2	60.3	34.0
11/02/2015	03:45	15:00	53.6	69.3	64.9	58.4	34.4
11/02/2015	04:00	15:00	57.2	69.6	67.4	61.7	36.5
11/02/2015	04:15	15:00	56.4	71.6	67.2	60.7	36.2
11/02/2015	04:30	15:00	58.8	74.5	68.5	62.7	41.0
11/02/2015	04:45	15:00	58.1	74.4	68.6	62.0	40.0
11/02/2015	05:00	15:00	57.9	70.2	66.4	62.6	40.4
11/02/2015	05:15	15:00	59.8	76.8	69.1	64.2	43.9
11/02/2015	05:30	15:00	61.7	81.0	70.8	65.6	42.8
11/02/2015	05:45	15:00	61.5	71.0	69.0	65.8	46.1
11/02/2015	06:00	15:00	62.8	74.5	70.1	66.7	49.7
11/02/2015	06:15	15:00	65.1	79.9	72.5	68.1	56.6
11/02/2015	06:30	15:00	65.4	75.9	71.7	68.1	56.1
11/02/2015	06:45	15:00	66.2	81.9	72.7	68.6	60.0
11/02/2015	07:00	15:00	67.6	86.9	76.5	69.1	62.1
11/02/2015	07:15	15:00	65.6	75.3	71.5	68.2	61.1
11/02/2015	07:30	15:00	65.9	77.1	72.3	68.2	61.5
11/02/2015	07:45	15:00	66.1	79.6	73.8	68.5	61.8
11/02/2015	08:00	15:00	66.2	78.8	73.4	68.8	61.4
11/02/2015	08:15	15:00	66.3	79.1	73.2	68.8	62.6
11/02/2015	08:30	15:00	66.2	76.4	73.4	68.9	61.8
11/02/2015	08:45	15:00	70.5	96.5	79.0	68.9	61.7
11/02/2015	09:00	15:00	65.8	78.1	72.5	68.6	61.3
11/02/2015	09:15	15:00	66.6	76.5	73.7	69.3	62.2
11/02/2015	09:30	15:00	65.9	76.3	73.0	68.4	61.3
11/02/2015	09:45	15:00	65.8	76.8	72.7	68.5	60.6
11/02/2015	10:00	15:00	65.4	77.1	71.7	68.2	60.5
11/02/2015	10:15	15:00	65.4	77.8	71.6	68.2	61.1
11/02/2015	10:30	15:00	66.1	77.7	72.1	68.6	62.1
11/02/2015	10:45	15:00	66.7	77.8	72.6	69.6	62.2
11/02/2015	11:00	15:00	67.4	82.0	75.4	69.6	62.0
11/02/2015	11:15	15:00	66.9	82.7	73.7	69.5	61.2
11/02/2015	11:30	15:00	66.7	78.4	72.9	69.4	61.3
11/02/2015	11:45	15:00	66.8	78.2	74.2	69.2	61.9
11/02/2015	12:00	15:00	66.8	79.9	72.8	69.5	61.2
11/02/2015	12:15	15:00	66.7	76.9	73.5	69.4	60.9
11/02/2015	12:30	15:00	67.0	80.0	73.2	69.6	62.1
11/02/2015	12:45	15:00	66.1	76.4	72.5	68.7	60.8

Rear façade – Measured Noise Levels Monday 9th February 2015 to Tuesday 10th February 2015

Date	Start Time	Duration	LAeq dB	LAFmax dB	LA01 dB	LA10 dB	LA90 dB
09/02/2015	13:00	15:00	54.1	73.3	59.9	55.9	50.0
09/02/2015	13:15	15:00	54.8	68.7	62.5	56.9	51.1
09/02/2015	13:30	15:00	58.5	70.6	66.2	61.1	51.5
09/02/2015	13:45	15:00	53.3	64.8	57.3	55.4	50.4
09/02/2015	14:00	15:00	53.7	64.3	59.7	56.3	50.1
09/02/2015	14:15	15:00	56.4	71.4	63.7	59.6	50.0
09/02/2015	14:30	15:00	56.4	71.7	64.4	59.2	50.2
09/02/2015	14:45	15:00	53.6	62.3	58.4	55.9	50.5
09/02/2015	15:00	15:00	52.7	60.7	58.4	55.1	49.4
09/02/2015	15:15	15:00	56.5	75.2	68.2	56.7	51.2
09/02/2015	15:30	15:00	53.3	65.8	58.0	55.8	50.0
09/02/2015	15:45	15:00	57.8	77.4	72.0	57.0	50.5
09/02/2015	16:00	15:00	54.0	67.4	61.8	56.7	49.2
09/02/2015	16:15	15:00	53.5	61.6	58.8	55.9	50.2
09/02/2015	16:30	15:00	54.0	64.9	58.8	56.3	50.6
09/02/2015	16:45	15:00	55.3	74.4	66.3	56.6	49.6
09/02/2015	17:00	15:00	54.4	63.5	60.7	57.2	49.7
09/02/2015	17:15	15:00	54.5	66.7	62.5	56.8	50.1
09/02/2015	17:30	15:00	53.1	63.9	58.7	55.6	49.3
09/02/2015	17:45	15:00	53.3	73.9	58.9	55.1	49.8
09/02/2015	18:00	15:00	53.0	63.2	58.4	55.4	49.4
09/02/2015	18:15	15:00	54.1	67.9	62.4	56.8	49.6
09/02/2015	18:30	15:00	55.7	70.8	68.3	56.4	50.2
09/02/2015	18:45	15:00	53.3	62.5	58.6	55.4	50.3
09/02/2015	19:00	15:00	53.4	61.4	58.3	55.6	50.2
09/02/2015	19:15	15:00	56.5	76.2	66.3	57.7	49.5
09/02/2015	19:30	15:00	52.4	67.2	57.4	54.6	49.1
09/02/2015	19:45	15:00	57.7	78.9	71.9	56.9	49.0
09/02/2015	20:00	15:00	52.4	61.4	58.2	54.9	48.1
09/02/2015	20:15	15:00	51.9	68.0	57.6	54.6	47.1
09/02/2015	20:30	15:00	53.3	72.2	64.0	55.1	46.0
09/02/2015	20:45	15:00	51.3	65.7	56.6	53.6	45.2
09/02/2015	21:00	15:00	50.8	59.9	56.9	53.7	44.5
09/02/2015	21:15	15:00	51.7	66.5	60.3	53.7	45.7
09/02/2015	21:30	15:00	50.3	59.7	56.1	53.3	44.3
09/02/2015	21:45	15:00	50.6	65.9	56.6	53.4	44.8
09/02/2015	22:00	15:00	50.5	59.8	56.8	53.6	44.2
09/02/2015	22:15	15:00	49.9	58.7	56.0	52.9	42.0
09/02/2015	22:30	15:00	50.3	64.4	56.8	53.3	43.8
09/02/2015	22:45	15:00	49.6	59.8	55.9	53.1	40.7
09/02/2015	23:00	15:00	48.7	62.0	57.3	51.8	39.7
09/02/2015	23:15	15:00	48.2	57.7	54.8	51.7	38.0
09/02/2015	23:30	15:00	48.9	58.3	54.8	52.4	39.3
09/02/2015	23:45	15:00	46.4	56.0	54.3	50.6	35.0
10/02/2015	00:00	15:00	46.7	57.4	53.2	50.7	36.8
10/02/2015	00:15	15:00	44.6	58.4	53.6	48.5	33.2
10/02/2015	00:30	15:00	46.9	60.5	55.5	50.8	34.8
10/02/2015	00:45	15:00	44.4	57.9	52.6	48.7	33.1

Date	Start Time	Duration	LAeq dB	LAFmax dB	LA01 dB	LA10 dB	LA90 dB
10/02/2015	01:00	15:00	44.5	55.2	52.6	48.9	32.3
10/02/2015	01:15	15:00	44.0	54.2	52.6	48.3	32.5
10/02/2015	01:30	15:00	43.8	56.2	53.3	48.5	31.2
10/02/2015	01:45	15:00	42.4	56.6	52.4	47.4	31.1
10/02/2015	02:00	15:00	38.2	50.5	48.6	42.9	30.0
10/02/2015	02:15	15:00	42.0	62.9	50.8	46.0	31.5
10/02/2015	02:30	15:00	41.7	54.5	51.8	46.8	31.8
10/02/2015	02:45	15:00	40.9	54.6	50.0	45.7	32.1
10/02/2015	03:00	15:00	38.9	54.6	50.3	41.9	31.3
10/02/2015	03:15	15:00	41.2	52.4	50.5	46.1	31.5
10/02/2015	03:30	15:00	41.6	55.9	50.9	46.4	32.4
10/02/2015	03:45	15:00	45.2	60.3	55.3	49.6	34.3
10/02/2015	04:00	15:00	42.3	55.1	50.5	46.6	34.1
10/02/2015	04:15	15:00	43.6	58.6	54.2	47.4	33.9
10/02/2015	04:30	15:00	45.0	55.6	53.0	48.9	36.1
10/02/2015	04:45	15:00	45.5	62.0	55.8	48.7	35.5
10/02/2015	05:00	15:00	45.6	60.5	52.9	49.5	36.5
10/02/2015	05:15	15:00	47.1	59.6	54.7	50.6	38.1
10/02/2015	05:30	15:00	47.5	59.9	54.8	51.6	38.4
10/02/2015	05:45	15:00	53.0	67.0	62.5	57.0	42.1
10/02/2015	06:00	15:00	51.6	62.4	58.4	54.9	43.5
10/02/2015	06:15	15:00	51.5	62.3	57.9	54.4	45.0
10/02/2015	06:30	15:00	55.4	70.4	65.4	57.9	47.6
10/02/2015	06:45	15:00	54.1	65.5	60.0	56.6	50.1
10/02/2015	07:00	15:00	53.3	66.7	59.4	55.6	49.5
10/02/2015	07:15	15:00	54.2	66.0	59.5	56.8	50.4
10/02/2015	07:30	15:00	55.0	63.1	60.7	57.6	51.2
10/02/2015	07:45	15:00	57.0	75.3	64.9	60.0	51.0
10/02/2015	08:00	15:00	55.7	69.1	64.0	58.2	51.4
10/02/2015	08:15	15:00	56.8	73.9	65.9	59.6	51.5
10/02/2015	08:30	15:00	55.8	70.9	62.7	58.1	52.0
10/02/2015	08:45	15:00	56.4	67.6	62.7	58.9	52.4
10/02/2015	09:00	15:00	55.4	73.6	61.6	57.7	51.8
10/02/2015	09:15	15:00	54.8	71.3	60.2	57.1	51.3
10/02/2015	09:30	15:00	57.4	75.5	69.0	58.5	52.1
10/02/2015	09:45	15:00	54.4	65.9	60.6	56.8	51.0
10/02/2015	10:00	15:00	54.6	66.8	62.3	57.2	50.7
10/02/2015	10:15	15:00	54.3	64.9	60.6	56.9	50.5
10/02/2015	10:30	15:00	54.3	65.3	60.4	56.6	51.3
10/02/2015	10:45	15:00	53.9	63.0	60.7	56.1	50.8
10/02/2015	11:00	15:00	56.8	74.1	70.5	57.3	51.3
10/02/2015	11:15	15:00	54.7	64.5	60.5	57.2	51.1
10/02/2015	11:30	15:00	57.0	78.6	68.4	57.4	51.6
10/02/2015	11:45	15:00	54.6	67.3	60.5	56.6	51.7
10/02/2015	12:00	15:00	55.0	65.4	62.1	57.5	51.4
10/02/2015	12:15	15:00	59.6	82.4	72.3	57.7	51.4
10/02/2015	12:30	15:00	54.1	63.0	59.3	56.4	50.8
10/02/2015	12:45	15:00	54.4	66.2	59.6	56.8	51.2

Rear façade – Measured Noise Levels Tuesday 10th February 2015 to Wednesday 11th February 2015

Date	Start Time	Duration	LAeq dB	LAFmax dB	LA01 dB	LA10 dB	LA90 dB
10/02/2015	13:00	15:00	54.3	63.5	59.4	56.5	51.2
10/02/2015	13:15	15:00	54.6	65.1	61.5	57.0	50.6
10/02/2015	13:30	15:00	57.3	79.3	67.8	57.6	51.5
10/02/2015	13:45	15:00	54.0	65.0	59.4	56.5	50.2
10/02/2015	14:00	15:00	53.6	62.4	59.1	56.0	50.4
10/02/2015	14:15	15:00	53.6	65.9	59.7	56.1	50.2
10/02/2015	14:30	15:00	53.8	68.8	60.5	56.2	50.0
10/02/2015	14:45	15:00	56.1	70.0	64.0	59.2	51.5
10/02/2015	15:00	15:00	56.8	77.6	66.0	58.4	52.6
10/02/2015	15:15	15:00	55.4	69.6	62.5	57.5	51.5
10/02/2015	15:30	15:00	55.2	69.9	61.2	57.8	50.8
10/02/2015	15:45	15:00	55.3	65.4	61.4	58.1	51.3
10/02/2015	16:00	15:00	57.3	76.9	68.8	57.9	51.1
10/02/2015	16:15	15:00	54.9	72.9	63.5	56.5	50.8
10/02/2015	16:30	15:00	55.9	74.5	66.3	57.2	50.8
10/02/2015	16:45	15:00	55.0	66.3	60.8	57.6	51.5
10/02/2015	17:00	15:00	54.2	64.6	59.8	56.5	50.7
10/02/2015	17:15	15:00	58.5	81.4	69.9	57.9	50.8
10/02/2015	17:30	15:00	53.6	63.5	59.8	56.1	49.9
10/02/2015	17:45	15:00	53.6	65.3	59.7	56.3	49.7
10/02/2015	18:00	15:00	53.6	66.8	60.3	56.3	49.5
10/02/2015	18:15	15:00	53.3	61.4	58.7	55.8	50.1
10/02/2015	18:30	15:00	54.5	69.6	64.9	56.0	50.5
10/02/2015	18:45	15:00	54.2	71.8	61.7	56.0	49.9
10/02/2015	19:00	15:00	52.7	61.0	58.6	55.1	49.2
10/02/2015	19:15	15:00	55.5	74.5	67.1	56.1	49.9
10/02/2015	19:30	15:00	53.8	72.6	59.9	55.6	49.7
10/02/2015	19:45	15:00	52.1	60.8	57.8	54.5	47.9
10/02/2015	20:00	15:00	52.7	63.6	59.3	55.1	48.4
10/02/2015	20:15	15:00	51.8	66.5	57.6	54.1	47.5
10/02/2015	20:30	15:00	52.0	68.9	57.8	54.6	47.9
10/02/2015	20:45	15:00	51.8	63.1	58.9	54.4	46.3
10/02/2015	21:00	15:00	52.3	62.6	59.0	54.7	47.3
10/02/2015	21:15	15:00	51.3	61.3	57.9	53.8	46.4
10/02/2015	21:30	15:00	51.7	66.4	60.0	53.7	46.1
10/02/2015	21:45	15:00	51.0	61.6	55.9	53.7	46.6
10/02/2015	22:00	15:00	51.2	61.6	57.5	53.9	45.7
10/02/2015	22:15	15:00	51.6	63.9	57.5	54.0	47.5
10/02/2015	22:30	15:00	51.0	60.1	56.5	53.8	45.9
10/02/2015	22:45	15:00	51.2	66.1	57.7	53.7	44.5
10/02/2015	23:00	15:00	50.1	61.9	56.6	53.0	44.5
10/02/2015	23:15	15:00	49.6	63.9	58.1	52.6	43.4
10/02/2015	23:30	15:00	48.8	60.8	56.2	51.8	41.3
10/02/2015	23:45	15:00	49.5	64.1	55.7	52.6	42.8
11/02/2015	00:00	15:00	46.4	58.6	53.5	49.8	39.6
11/02/2015	00:15	15:00	46.5	58.0	55.4	50.1	38.6
11/02/2015	00:30	15:00	45.0	58.3	53.1	49.0	37.3
11/02/2015	00:45	15:00	45.9	62.0	54.4	49.9	37.5

Date	Start Time	Duration	LAeq dB	LAFmax dB	LA01 dB	LA10 dB	LA90 dB
11/02/2015	01:00	15:00	45.6	56.9	52.8	49.5	37.4
11/02/2015	01:15	15:00	45.3	57.3	54.1	49.2	36.4
11/02/2015	01:30	15:00	56.6	80.4	68.7	49.3	35.3
11/02/2015	01:45	15:00	42.3	57.5	51.9	46.5	35.4
11/02/2015	02:00	15:00	47.5	65.8	57.6	51.4	37.8
11/02/2015	02:15	15:00	50.0	69.9	63.6	50.2	35.0
11/02/2015	02:30	15:00	43.5	58.6	55.0	46.9	34.3
11/02/2015	02:45	15:00	42.3	59.1	52.7	45.0	34.8
11/02/2015	03:00	15:00	43.6	63.0	54.4	47.4	34.2
11/02/2015	03:15	15:00	41.3	53.3	50.6	45.9	33.8
11/02/2015	03:30	15:00	41.9	54.6	52.2	46.2	34.3
11/02/2015	03:45	15:00	43.2	63.5	52.7	47.2	34.7
11/02/2015	04:00	15:00	45.0	59.8	54.4	49.3	35.7
11/02/2015	04:15	15:00	44.0	57.6	53.3	47.8	35.3
11/02/2015	04:30	15:00	47.3	66.5	57.0	50.8	37.3
11/02/2015	04:45	15:00	48.5	65.1	58.9	51.9	38.8
11/02/2015	05:00	15:00	47.2	59.6	56.6	50.8	38.6
11/02/2015	05:15	15:00	49.6	66.9	59.7	53.4	39.5
11/02/2015	05:30	15:00	50.4	65.5	60.1	53.7	40.5
11/02/2015	05:45	15:00	52.6	66.9	60.3	56.3	43.0
11/02/2015	06:00	15:00	55.1	68.9	64.3	59.1	45.9
11/02/2015	06:15	15:00	53.1	63.2	59.8	56.2	46.7
11/02/2015	06:30	15:00	52.9	62.6	58.9	55.8	46.3
11/02/2015	06:45	15:00	54.1	64.4	60.6	56.8	49.6
11/02/2015	07:00	15:00	55.2	66.2	63.0	57.9	50.7
11/02/2015	07:15	15:00	54.9	67.0	61.1	57.8	51.0
11/02/2015	07:30	15:00	56.8	69.7	66.1	59.7	51.1
11/02/2015	07:45	15:00	57.6	71.7	67.6	60.2	51.5
11/02/2015	08:00	15:00	55.4	68.4	63.2	57.8	51.1
11/02/2015	08:15	15:00	57.3	74.4	67.9	58.6	51.6
11/02/2015	08:30	15:00	57.9	69.7	65.2	61.2	53.2
11/02/2015	08:45	15:00	56.4	69.6	63.6	58.3	53.3
11/02/2015	09:00	15:00	56.1	64.5	60.0	57.9	53.7
11/02/2015	09:15	15:00	55.8	65.6	60.0	58.0	53.2
11/02/2015	09:30	15:00	55.6	70.7	60.6	57.7	53.2
11/02/2015	09:45	15:00	55.3	72.0	63.1	56.6	52.3
11/02/2015	10:00	15:00	54.7	63.1	59.9	56.6	52.3
11/02/2015	10:15	15:00	55.5	67.4	60.4	57.4	53.1
11/02/2015	10:30	15:00	55.5	68.1	60.3	57.5	52.9
11/02/2015	10:45	15:00	56.3	73.6	64.0	57.5	53.1
11/02/2015	11:00	15:00	55.5	69.7	60.6	57.4	52.6
11/02/2015	11:15	15:00	55.3	72.7	61.6	57.3	51.4
11/02/2015	11:30	15:00	55.0	64.4	60.7	57.4	51.5
11/02/2015	11:45	15:00	55.6	70.2	65.4	56.9	51.8
11/02/2015	12:00	15:00	55.3	64.4	60.0	57.3	52.9
11/02/2015	12:15	15:00	55.3	67.9	60.0	57.3	52.7
11/02/2015	12:30	15:00	55.8	67.0	61.0	57.5	53.3
11/02/2015	12:45	15:00	54.5	65.9	61.0	56.5	50.8

Appendix B – Calculations

21st March 2016		
73-75 Avenue Road, London		
Calc- all plant to nearest façade at 38 Queen's Grove - NIGHT		
<u>3 x large condensers in garden of 73 Avenue Road</u>		
1 x Mitsubishi PURY-EP350YLM-A condenser unit		
2 x Mitsubishi PURY-EP200YLM-A condenser unit		
Breakout from Enclosure (front & rear)		
1a Front of Enclosure		
Lp	41	
d ref	1	
d	21	
distance loss 20 log (d / dref)	26.4	dB
shielding	10.0	dB
Lp from front of enclosure at housing	4.6	dB(A)
1b Rear of Enclosure		
Lp	41	
reflection from adjacent wall	3	
d ref	1	
d	22.5	
distance loss 20 log (d / dref)	27.0	dB
shielding	10.0	dB
Lp from rear of enclosure at housing	7.0	dB(A)
Combined Lp from front and rear of enclosure	8.9	dB(A)
<u>1 x smaller condenser on roof of 73 Avenue Road</u>		
1c A/C Unit Comms Room Mitsubishi PUHZ-ZRP60VHA		
Lw	67	
Lp = Lw - 20 log r - 11 + DI		
r	42.00	
20 log r	32.5	dB
-11	-11	
DI	3	
shielding (reduced angle of view)	10	dB
Lp from Comms Room unit at housing	16.5	dB(A)
<u>3 x large condensers in garden of 75 Avenue Road</u>		
1 x Mitsubishi PURY-EP350YLM-A condenser unit		
2 x Mitsubishi PURY-EP200YLM-A condenser unit		
Breakout from Enclosure (front & rear)		
2a Front of Enclosure		
Lp	41	
d ref	1	
d	23	
distance loss 20 log (d / dref)	27.2	dB
shielding	0.0	dB
Lp from front of enclosure at housing	13.8	dB(A)
2b Rear of Enclosure		
Lp	41	
reflection from adjacent wall	3	
d ref	1	
d	24.5	
distance loss 20 log (d / dref)	27.8	dB
shielding	0.0	dB
Lp from rear of enclosure at housing	16.2	dB(A)
Combined Lp from front and rear of enclosure	18.2	dB(A)
<u>1 x smaller condenser on roof of 75 Avenue Road</u>		
2c A/C Unit Comms Room Mitsubishi PUHZ-ZRP60VHA		
Lw	67	
Lp = Lw - 20 log r - 11 + DI		
r	44.0	
20 log r	32.9	dB
-11	-11	
DI	3	
shielding (reduced angle of view)	10	dB
Lp from Comms Room unit at housing	16.1	dB(A)
façade reflection	3.00	
Lp from ALL plant at 38 Queens Grove	25.0	dB(A)
Daytime Noise Limit	46	dB
Margin below Daytime limit	21	dB
Evening Noise Limit	41	dB
Margin below Evening limit	16	dB

Appendix B – Calculations

21st March 2016		
73-75 Avenue Road, London		
Calc- all plant to nearest façade at 38 Queen's Grove - NIGHT		
3 x large condensers in garden of 73 Avenue Road		
1 x Mitsubishi PURY-EP350YLM-A condenser unit		
2 x Mitsubishi PURY-EP200YLM-A condenser unit		
Breakout from Enclosure (front & rear)		
1a Front of Enclosure		
Lp	41	
d ref	1	
d	21	
distance loss 20 log (d / dref)	26.4	dB
shielding	10.0	dB
Lp from front of enclosure at housing	4.6	dB(A)
1b Rear of Enclosure		
Lp	41	
reflection from adjacent wall	3	
d ref	1	
d	22.5	
distance loss 20 log (d / dref)	27.0	dB
shielding	10.0	dB
Lp from rear of enclosure at housing	7.0	
Combined Lp from front and rear of enclosure - std mode	8.9	dB(A)
Low noise mode reduction (conservative)	10	dB
Combined Lp from front and rear of enclosure - low noise	-1.1	dB(A)
1 x smaller condenser on roof of 73 Avenue Road		
1c A/C Unit Comms Room Mitsubishi PUHZ-ZRP60VHA		
Lw (low noise mode 3dB reduction)	64	
Lp = Lw - 20 log r - 11 + DI		
r	42.00	
20 log r	32.5	dB
-11	-11	
DI	3	
shielding (reduced angle of view)	10	dB
Lp from Comms Room unit at housing - low noise mode	13.5	dB(A)
3 x large condensers in garden of 75 Avenue Road		
1 x Mitsubishi PURY-EP350YLM-A condenser unit		
2 x Mitsubishi PURY-EP200YLM-A condenser unit		
Breakout from Enclosure (front & rear)		
2a Front of Enclosure		
Lp	41	
d ref	1	
d	23	
distance loss 20 log (d / dref)	27.2	dB
shielding	0.0	dB
Lp from front of enclosure at housing	13.8	dB(A)
2b Rear of Enclosure		
Lp	41	
reflection from adjacent wall	3	
d ref	1	
d	24.5	
distance loss 20 log (d / dref)	27.8	dB
shielding	0.0	dB
Lp from rear of enclosure at housing	16.2	
Combined Lp from front and rear of enclosure - std mode	18.2	dB(A)
Low noise mode reduction (conservative)	10	dB
Combined Lp from front and rear of enclosure	8.2	dB(A)
1 x smaller condenser on roof of 75 Avenue Road		
2c A/C Unit Comms Room Mitsubishi PUHZ-ZRP60VHA		
Lw (low noise mode 3dB reduction)	64	
Lp = Lw - 20 log r - 11 + DI		
r	44.0	
20 log r	32.9	dB
-11	-11	
DI	3	
shielding (reduced angle of view)	10	dB
Lp from Comms Room unit at housing - low noise mode	13.1	dB(A)
façade reflection	3.00	
Lp from ALL plant at 38 Queens Grove	20.0	dB(A)
Night-time Noise Limit	27	
Margin below Night-time limit	7	dB

Appendix B – Calculations

21st March 2016		
73-75 Avenue Road, London		
Calc- all plant to nearest façade at 77 Avenue Road - DAY		
<u>3 x large condensers in garden of 73 Avenue Road</u>		
1 x Mitsubishi PURY-EP350YLM-A condenser unit		
2 x Mitsubishi PURY-EP200YLM-A condenser unit		
Breakout from Enclosure (front & rear)		
1a Front of Enclosure		
Lp	41	
d ref	1	
d	46	
distance loss 20 log (d / dref)	33.3	
shielding	10.0	dB
Lp from front of enclosure at housing	-2.3	dB(A)
1b Rear of Enclosure		
Lp	41	
reflection from adjacent wall	3	
d ref	1	
d	47	
distance loss 20 log (d / dref)	33.4	dB
shielding	10.0	dB
Lp from rear of enclosure at housing	0.6	
Combined Lp from front and rear of enclosure	2.4	dB(A)
<u>1 x smaller condenser on roof of 73 Avenue Road</u>		
1c A/C Unit Comms Room Mitsubishi PUHZ-ZRP60VHA		
Lw	67	
Lp = Lw - 20 log r - 11 + DI		
r	31.00	
20 log r	29.8	dB
-11	-11	
DI	3	
shielding (reduced angle of view)	10	dB
Lp from Comms Room unit at housing	19.2	dB(A)
<u>3 x large condensers in garden of 75 Avenue Road</u>		
1 x Mitsubishi PURY-EP350YLM-A condenser unit		
2 x Mitsubishi PURY-EP200YLM-A condenser unit		
Breakout from Enclosure (front & rear)		
2a Front of Enclosure		
Lp	41	
d ref	1	
d	23	
distance loss 20 log (d / dref)	27.2	dB
shielding	10.0	dB
Lp from front of enclosure at housing	3.8	dB(A)
2b Rear of Enclosure		
Lp	41	
reflection from adjacent wall	3	
d ref	1	
d	24	
distance loss 20 log (d / dref)	27.6	dB
shielding	10.0	dB
Lp from rear of enclosure at housing	6.4	
Combined Lp from front and rear of enclosure	8.3	dB(A)
<u>1 x smaller condenser on roof of 75 Avenue Road</u>		
2c A/C Unit Comms Room Mitsubishi PUHZ-ZRP60VHA		
Lw	67	
Lp = Lw - 20 log r - 11 + DI		
r	13.0	
20 log r	22.3	dB
-11	-11	
DI	3	
shielding (reduced angle of view)	10	dB
Lp from Comms Room unit at housing	26.7	dB(A)
façade reflection	3.00	
Lp from ALL plant at 77 Avenue Road	30.5	dB(A)
Daytime Noise Limit	46	
Margin below Daytime limit	15.5	dB
Evening Noise Limit	41	
Margin below Evening limit	10.5	dB

Appendix B – Calculations

21st March 2016		
73-75 Avenue Road, London		
Calc- all plant to nearest façade at 77 Avenue Road - NIGHT		
3 x large condensers in garden of 73 Avenue Road		
1 x Mitsubishi PURY-EP350YLM-A condenser unit		
2 x Mitsubishi PURY-EP200YLM-A condenser unit		
Breakout from Enclosure (front & rear)		
1a Front of Enclosure		
Lp	41	
d ref	1	
d	46	
distance loss 20 log (d / dref)	33.3	dB
shielding	10.0	dB
Lp from front of enclosure at housing	-2.3	dB(A)
1b Rear of Enclosure		
Lp	41	
reflection from adjacent wall	3	
d ref	1	
d	47	
distance loss 20 log (d / dref)	33.4	dB
shielding	10.0	dB
Lp from rear of enclosure at housing	0.6	
Combined Lp from front and rear of enclosure - std mode	2.4	dB(A)
Low noise mode reduction (conservative)	10	dB
Combined Lp from front and rear of enclosure - low noise	-7.6	dB(A)
1 x smaller condenser on roof of 73 Avenue Road		
1c A/C Unit Comms Room Mitsubishi PUHZ-ZRP60VHA		
Lw (low noise mode 3dB reduction)	64	
Lp = Lw - 20 log r - 11 + DI		
r	31.00	
20 log r	29.8	dB
-11	-11	
DI	3	
shielding (reduced angle of view)	10	dB
Lp from Comms Room unit at housing - low noise mode	16.2	dB(A)
3 x large condensers in garden of 75 Avenue Road		
1 x Mitsubishi PURY-EP350YLM-A condenser unit		
2 x Mitsubishi PURY-EP200YLM-A condenser unit		
Breakout from Enclosure (front & rear)		
2a Front of Enclosure		
Lp	41	
d ref	1	
d	23	
distance loss 20 log (d / dref)	27.2	dB
shielding	10.0	dB
Lp from front of enclosure at housing	3.8	dB(A)
2b Rear of Enclosure		
Lp	41	
reflection from adjacent wall	3	
d ref	1	
d	24	
distance loss 20 log (d / dref)	27.6	dB
shielding	10.0	dB
Lp from rear of enclosure at housing	6.4	
Combined Lp from front and rear of enclosure - std mode	8.3	dB(A)
Low noise mode reduction (conservative)	10	dB
Combined Lp from front and rear of enclosure	-1.7	dB(A)
1 x smaller condenser on roof of 75 Avenue Road		
2c A/C Unit Comms Room Mitsubishi PUHZ-ZRP60VHA		
Lw (low noise mode 3dB reduction)	64	
Lp = Lw - 20 log r - 11 + DI		
r	13.0	
20 log r	22.3	dB
-11	-11	
DI	3	
shielding (reduced angle of view)	10	dB
Lp from Comms Room unit at housing - low noise mode	23.7	dB(A)
façade reflection	3.00	
Lp from ALL plant at 38 Queens Grove	27.4	dB(A)
Night-time Noise Limit	27	
Margin below Night-time limit	-0.4	dB

Appendix B – Calculations

	21st March 2016		
	73-75 Avenue Road, London		
	Calc- 75 Avenue Road to nearest façade at 73 Avenue Road - DAY		
	<u>3 x large condensers in garden of 75 Avenue Road</u>		
	1 x Mitsubishi PURY-EP350YLM-A condenser unit		
	2 x Mitsubishi PURY-EP200YLM-A condenser unit		
	Breakout from Enclosure (front & rear)		
1a	<u>Front of Enclosure</u>		
	Lp	41	
	d ref	1	
	d	28	
	distance loss 20 log (d / dref)	28.9	dB
	shielding	0.0	dB
	Lp from front of enclosure at housing	12.1	dB(A)
1b	<u>Rear of Enclosure</u>		
	Lp	41	
	reflection from adjacent wall	3	
	d ref	1	
	d	29	
	distance loss 20 log (d / dref)	29.2	dB
	shielding	10.0	dB
	Lp from rear of enclosure at housing	4.8	
	Combined Lp from front and rear of enclosure	12.8	dB(A)
	<u>1 x smaller condenser on roof of 75 Avenue Road</u>		
1c	A/C Unit Comms Room Mitsubishi PUHZ-ZRP60VHA		
	Lw	67	
	$L_p = L_w - 20 \log r - 11 + DI$		
	r	21.0	
	20 log r	26.4	dB
	-11	-11	
	DI	3	
	shielding (reduced angle of view)	10	dB
	Lp from Comms Room unit at housing	22.6	dB(A)
	façade reflection	3.00	
	Lp from ALL plant at 77 Avenue Road	26.0	dB(A)
	Daytime Noise Limit	46	dB
	Margin below Daytime limit	20	dB
	Evening Noise Limit	41	dB
	Margin below Evening limit	15	dB

Appendix B – Calculations

	21st March 2016		
	73-75 Avenue Road, London		
	Calc- 75 Avenue Road to nearest façade at 73 Avenue Road - NIGHT		
	3 x large condensers in garden of 75 Avenue Road		
	1 x Mitsubishi PURY-EP350YLM-A condenser unit		
	2 x Mitsubishi PURY-EP200YLM-A condenser unit		
	Breakout from Enclosure (front & rear)		
1a	Front of Enclosure		
	Lp	41	
	d ref	1	
	d	28	
	distance loss $20 \log (d / d_{ref})$	28.9	dB
	shielding	0.0	dB
	Lp from front of enclosure at housing	12.1	dB(A)
1b	Rear of Enclosure		
	Lp	41	
	reflection from adjacent wall	3	
	d ref	1	
	d	29	
	distance loss $20 \log (d / d_{ref})$	29.2	dB
	shielding	10.0	dB
	Lp from rear of enclosure at housing	4.8	
	Combined Lp from front and rear of enclosure - std mode	12.8	dB(A)
	Low noise mode reduction (conservative)	10	
	Combined Lp from front and rear of enclosure	2.8	dB(A)
	1 x smaller condenser on roof of 75 Avenue Road		
1c	A/C Unit Comms Room Mitsubishi PUHZ-ZRP60VHA		
	Lw (low noise mode 3dB reduction)	64	
	$L_p = L_w - 20 \log r - 11 + DI$		
	r	21.0	
	$20 \log r$	26.4	dB
	-11	-11	
	DI	3	
	shielding (reduced angle of view)	10	dB
	Lp from Comms Room unit at housing	19.6	dB(A)
	façade reflection	3.00	
	Lp from ALL plant at 77 Avenue Road	22.6	dB(A)
	Night-time Noise Limit	27	
	Margin below Night-time limit	4.4	dB

	21st March 2016		
	73-75 Avenue Road, London		
	Calc- 73 Avenue Road to nearest façade at 75 Avenue Road - DAY		
	<u>3 x large condensers in garden of 73 Avenue Road</u>		
	1 x Mitsubishi PURY-EP350YLM-A condenser unit		
	2 x Mitsubishi PURY-EP200YLM-A condenser unit		
	Breakout from Enclosure (front & rear)		
1a	<u>Front of Enclosure</u>		
	Lp	41	
	d ref	1	
	d	31	
	distance loss 20 log (d / dref)	29.8	dB
	shielding	0.0	dB
	Lp from front of enclosure at housing	11.2	dB(A)
1b	<u>Rear of Enclosure</u>		
	Lp	41	
	reflection from adjacent wall	3	
	d ref	1	
	d	32	
	distance loss 20 log (d / dref)	30.1	dB
	shielding	10.0	dB
	Lp from rear of enclosure at housing	3.9	
	Combined Lp from front and rear of enclosure	11.9	dB(A)
	<u>1 x smaller condenser on roof of 73 Avenue Road</u>		
1c	A/C Unit Comms Room Mitsubishi PUHZ-ZRP60VHA		
	Lw	67	
	$Lp = Lw - 20 \log r - 11 + DI$		
	r	20.0	
	20 log r	26.0	dB
	-11	-11	
	DI	3	
	shielding (reduced angle of view)	10	dB
	Lp from Comms Room unit at housing	23.0	dB(A)
	façade reflection	3.00	
	Lp from ALL plant at 77 Avenue Road	26.3	dB(A)
	Daytime Noise Limit	46	dB
	Margin below Daytime limit	19.7	dB
	Evening Noise Limit	41	dB
	Margin below Evening limit	14.7	dB

Appendix B – Calculations

	21st March 2016		
	73-75 Avenue Road, London		
	Calc- 73 Avenue Road to nearest façade at 75 Avenue Road - NIGHT		
	<u>3 x large condensers in garden of 75 Avenue Road</u>		
	1 x Mitsubishi PURY-EP350YLM-A condenser unit		
	2 x Mitsubishi PURY-EP200YLM-A condenser unit		
	Breakout from Enclosure (front & rear)		
1a	<u>Front of Enclosure</u>		
	Lp	41	
	d ref	1	
	d	31	
	distance loss 20 log (d / dref)	29.8	dB
	shielding	0.0	dB
	Lp from front of enclosure at housing	11.2	dB(A)
1b	<u>Rear of Enclosure</u>		
	Lp	41	
	reflection from adjacent wall	3	
	d ref	1	
	d	32	
	distance loss 20 log (d / dref)	30.1	dB
	shielding	10.0	dB
	Lp from rear of enclosure at housing	3.9	
	Combined Lp from front and rear of enclosure - std mode	11.9	dB(A)
	Low noise mode reduction (conservative)	10	
	Combined Lp from front and rear of enclosure	1.9	dB(A)
	<u>1 x smaller condenser on roof of 75 Avenue Road</u>		
1c	A/C Unit Comms Room Mitsubishi PUHZ-ZRP60VHA		
	Lw (low noise mode 3dB reduction)	64	
	Lp = Lw - 20 log r - 11 + DI		
	r	20.0	
	20 log r	26.0	dB
	-11	-11	
	DI	3	
	shielding (reduced angle of view)	10	dB
	Lp from Comms Room unit at housing	20.0	dB(A)
	façade reflection	3.00	
	Lp from ALL plant at 77 Avenue Road	23.0	dB(A)
	Night-time Noise Limit	27	
	Margin below Night-time limit	4	dB

21st March 2016			
73-75 Avenue Road, London			
Calc- Rooftop condenser only - 73 Avenue Road to nearest dormer window at 75 Avenue Road			
<u>1 x smaller condenser on roof of 73 Avenue Road</u>			
<u>Daytime - No shielding</u>			
1a	A/C Unit Comms Room Mitsubishi PUHZ-ZRP60VHA		
	Lw	67	
	$L_p = L_w - 20 \log r - 11 + DI$		
	r	11.0	
	$20 \log r$	20.8	dB
	-11	-11	
	DI	3	
	shielding	0	dB
	façade reflection	3	dB
	Lp from Comms Room unit at dormer window	41.2	dB(A)
<u>Daytime - barrier shielding</u>			
1b	A/C Unit Comms Room Mitsubishi PUHZ-ZRP60VHA		
	Lw	67	
	$L_p = L_w - 20 \log r - 11 + DI$		
	r	11.0	
	$20 \log r$	20.8	dB
	-11	-11	
	DI	3	
	shielding	10	dB
	façade reflection	3	dB
	Lp from Comms Room unit at dormer window	31.2	dB(A)
<u>Night-time - No shielding</u>			
2a	A/C Unit Comms Room Mitsubishi PUHZ-ZRP60VHA		
	Lw (low noise mode 3dB reduction)	64	
	$L_p = L_w - 20 \log r - 11 + DI$		
	r	11.0	
	$20 \log r$	20.8	dB
	-11	-11	
	DI	3	
	shielding	0	dB
	façade reflection	3	dB
	Lp from Comms Room unit at dormer window	38.2	dB(A)
<u>Night-time - barrier shielding</u>			
2b	A/C Unit Comms Room Mitsubishi PUHZ-ZRP60VHA		
	Lw (low noise mode 3dB reduction)	64	
	$L_p = L_w - 20 \log r - 11 + DI$		
	r	11.0	
	$20 \log r$	20.8	dB
	-11	-11	
	DI	3	
	shielding	10	dB
	façade reflection	3	dB
	Lp from Comms Room unit at dormer window	28.2	dB(A)