Plant Noise Assessment

For

41 Frognal, London

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Revision	0

CONTENTS:

1 INTRODUCTION

1.01 CSG Acoustics has been appointed by BTP Group to undertake a noise assessment to support a planning application for 41 Frognal, London, NW3 6YD.

1.02 A number of plant items are to be installed at the site, and therefore a noise assessment is required in accordance with Camden Borough Council's planning policy.

1.03 The assessment includes:

- The results of a noise survey conducted at the site over a typical 24 hour period;
- Plant noise limits based on the Local Authority's planning policy;
- Prediction of noise impacts based on the proposed details of the items of plant and their location with respect to noise sensitive receptors; and
- Mitigation, should it be required, to ameliorate potential noise impacts.

1.04 This report is technical in nature, therefore to assist the reader explanations of the relevant terminology are presented in Appendix A.

2 EXISTING AND PROPOSED SITE

2.01 The site is located to the west of Frognal Road and approximately 100 metres east of Finchley Road in a predominantly residential area of West Hampstead.

2.02 The site is slightly raised from local topography with the current two-storey residential building located approximately 40 metres west of Frognal Road and is accessed via a large landscaped drive.

2.03 Proposals are to extend and renovate the ground and first floor levels and to construct new basement and a second storey levels. Proposals are to include a one bedroom flat separate from the main house but within the building footprint.

2.04 As part of the redevelopment of the site an Air Handling Unit (AHU) is to be located on the second storey roof of the site, and there are to be a number of internally located plant that will vent externally to the building.

2.05 The internally located plant are currently proposed to be located within a dedicated plant space at basement level which will be ducted to atmosphere at ground floor level to the north-easterly facing elevation of the building.

2.06 The mechanical services contractor has provided the following preliminary plant specification, which also includes the items potential operating period;

Internal Plant Items (ducted to ground floor north-eastern elevation)

- Basement AHU – Nuaire S6-XB (Day/Eve)
- Pool AHU – Calorex AA900VH (Day/Eve/Night)
- Gym AHU – Nuaire XB4 (Day/Eve)
- Air Cooled Chiller – Carrier 30RBY 021 Aquasnap (Day/Eve)

External Plant Items (Rooftop)

- Roof AHU – XBC65 (Day/Eve/Night)

2.07 A copy of the manufacturers noise emission data is presented in Appendix B of this report. The stated data has been used in the calculations, which have been undertaken in full octaves where possible.

2.08 There are a number of other internally located plant items including ground source heat pumps, however these will be locally treated for noise control, as they are not proposed to be ducted to the external atmosphere.

2.09 Based on the proposed locations of the above stated plant, the following location represents the closest noise sensitive location;

- The rear second floor windows of properties on Frognal Close, approximately 19 metres to the north-west of the proposed plant locations.

2.10 It is likely that some of the windows will have a direct line of sight to the AHU at second floor level, however, windows that do have line of sight will be screened from the intake and exhaust terminations for the basement plant level.

2.11 All other noise sensitive receptors are at a greater distance from the proposed location of the units, or are protected by more screening by the intervening structures, and as such will be subject to lower levels of noise.

2.12 A site plan is provided in Appendix C showing the likely locations of the plant items and their proximity to the receptor stated above.

3 GUIDANCE

3.01 This assessment has been undertaken in accordance with National and Local planning policy and relevant British Standards.

3.02 A summary of the pertinent point of each document are presented below, with a more detailed summary presented in Appendix D.

National Planning Policy

3.03 The National Planning Policy Framework (NPPF) and the Noise Policy Statement for England (NPSE) form the overarching noise policy for developments within England and the UK.

3.04 A summary of the four aims of the NPPF are presented below;

- avoid noise from giving rise to significant adverse impacts;
- mitigate noise and reduce to a minimum;
- recognise that development will often create some noise; and
- identify and protect areas of tranquillity.

3.05 The NPPF does not provide any detail with regards to criteria or impacts relating to noise. However, the NPSE, which is referenced with regards to the NPPF, has similar aims and provides the following effect categorisations;

> *"NOEL – No Observed Effect Level*
>
> *This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.*
>
> *LOAEL – Lowest Observed Adverse Effect Level*
>
> *This is the level above which adverse effects on health and quality of life can be detected.*
>
> *2.21 Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.*
>
> *SOAEL – Significant Observed Adverse Effect Level*
>
> *This is the level above which significant adverse effects on health and quality of life occur."*

3.06 It is not made clear in either document, the noise level at which the 'effect' is triggered.

3.07 As such, and with relation to this application, it is standard practise to rely on the guidance contained in British Standard (BS) 4142:2014 – *'Methods for rating and assessing*

industrial and commercial sound' which provides a framework to predict noise related impacts associated with items of fixed plant.

3.08 BS4142 states;

> *"The likelihood of noise provoking complaints is assessed by subtracting the background noise level from the rating noise level. BS4142 states:*
>
> *a) Typically, the greater this difference, the greater the magnitude of the impact.*
>
> *b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
>
> *c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
>
> *d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background*

sound level, this is an indication of the specific sound source having a low impact, depending on the context."

3.09 Relating the above back to the aims of the NPPF and 'effects' listed in the NPSE would imply the following;

- SOAEL – 10dB above the measured background noise level;
- LOAEL – 5dB above the measured background noise level; and
- NOEL – 10dB below the measured background noise level.

3.10 The above 'effect' levels form the basis of this assessment against the aims of the NPPF.

Local Planning Policy

3.11 Camden Borough Council's 'development plan' alongside the 'Mayor's London Plan' form the basis for planning decisions in the borough.

3.12 The Mayor's London Plan sets out an integrated economic, environmental, transport and social framework for the development of the capital over the next 20-25 years. The aims set-out in the London Plan reflect those provided in both the NPPF and NPSE.

3.13 Camden's Local Development Framework consists of a number of documents, including the Core Strategy, Development Policies and Camden Planning Guidance.

3.14 The Core Strategy (2010-2025) sets out the key vision for the borough and lists DP28 Noise and Vibration as a Development Policy, which sets out detailed planning criteria that is used to determine applications for planning permission in the borough.

Development Policy 26 (DP26) references noise and vibration by stating;

"The Council will protect the quality of life of occupiers and neighbours by only granting permission for development that does not cause harm to amenity."

3.15 The pertinent text stated in Policy D28 relating to this application is reproduced below as an extract from Table E of that policy;

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	55dBLAeq'

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

3.16 A noise sensitive development is stated in the policy as including housing, schools and hospitals as well as offices, workshops and open spaces.

3.17 As none of the proposed items exhibit the characteristics in the second and third rows of Table E, for the purposes of this assessment, the design target will be to ensure that the rating noise (L_{Ar}) level of the new plant is at least 5dB less than the existing background noise at the noise sensitive locations.

3.18 With regard to the aspirations of the NPPF and NPSE the limits adopted above would suggest that noise emissions would be considered to have a low impact, depending on the noise conditions and site context and would therefore be categorised as being between the NOEL and the LOAEL.

4 MEASUREMENTS

4.01 Environmental noise measurements have been carried out over a 22-hour weekday period, between 1215 hours on 16th March 2015 and concluded 1000 hours the following day, to establish the existing noise levels at the site. The survey methodology and results are set out below.

4.02 Noise measurements have been carried out at the following location:

- Position 1: located in front of the north-easterly facing building elevation, at a height of approximately 1.5 metres above local ground level, but not within 3.5 metres of any other reflective surface. This measurement location was chosen to represent background noise levels in close proximity to the site.

5 EQUIPMENT

5.01 The equipment used for the survey was as follows:-

- 01dB Metravib Black Solo Integrating Sound Level Meter conforming to Class 1 BS EN 61672, Type 1 BS EN 60804 & BS EN 60651: 1994;
- 01dB Metravib MCE 212 Condenser Microphone, PRE 21 S Pre-amp and Connecting Leads;
- 01dB Outdoor Microphone Kit and a
- Tripod.

Sound Level Meter 01dB Black Solo	Serial No.	60672
	Calibration Date	12/03/2014
	Cal Certificate No.	CE-DTE-T-14-PVE-72841
½" MCE 212 Condenser Mic.	Serial No.	80836
	Calibration Date	12/03/2014
	Cal Certificate No.	CE-DTE-T-14-PVE-72841
Calibrator Model 4231	Serial No.	2153318
	Calibration Date	17 March 2014
	Cal. Certificate No.	01708/1

Table 5.1: Noise Survey Equipment

6 RESULTS

6.01 The weather during the survey was suitable for noise measurement, it being dry with little wind for the duration of the survey.

6.02 Noise sources at the site include local and distant road traffic and noise from sporadic construction taking place at 39 Frognal. There were no other sources of noise considered abnormal for a residential location in an inner city area.

6.03 A summary of the time averaged ambient levels, lowest measured background levels and the median of the measured background levels over the measurement periods are shown in Table 6.1. The lowest and median L_{A90} are based on a 15-minute measurement period.

6.04 A list of the levels measured is included in Appendix E and represented graphically in Appendix F.

Measurement Position	Period	Average $L_{Aeq,T}$ – dB	Lowest/Median L_{A90} – dB
Position 1	Day time (0700-1900 hrs)	53	44/45
	Evening (1900-2300 hrs)	49	36/41
	Night-time (2300-0700 hrs)	46	35/36

Table 6.1: Free-Field Measured Ambient and Lowest Background Noise Levels

6.05 The lowest and median of the measured L_{A90} noise level are presented to provide the reader an indication of the deviation from the likely 'typical' background noise level. The comparison provides information on if the measured lowest noise level is likely to be an anomaly in the data set.

6.06 In this case, and by inspection of Table 6.1, it is clear that the lowest L_{A90} measured during the evening of 36dBA is likely to be an anomaly, and as such for this period the median shall be taken.

7 PLANT ASSESSMENT

7.01 This report is to support a planning application at 41 Frognal, which includes a number of proposed items of mechanical plant.

7.02 Based on the standard requirements of Camden Council and the lowest measured background noise level in each time period, Table 7.1 sets out the recommended noise limits, based on achieving 5dB below the measured background noise level.

Measurement Position	Period	Proposed Noise Limit L_{Ar}
1	Day	39dBA
	Evening	36dBA
	Night	30dBA

Table 7.1: Suggested Plant Noise Emission Limits Based Measured L_{A90}, Free-field dB

7.03 Note that the limits suggested above are rating levels and as such any design should take into account the acoustic characteristics of the plant. In this instance the proposed units display none of the characteristics whereby the acoustic correction should be applied.

7.04 It should be noted that should any other items of plant be installed as part of the development, the cumulative noise from all items should not exceed the limits stated in Table 7.1.

7.05 Assuming the proposed items meet the noise limits set out in Table 7.1 noise will be between the LOAEL and the NOEL respect to the NPPF.

7.06 With regards to the Calorex Pool AHU, proposed to be located within the basement area, the data provided is as a sound pressure level measured at a distance of 3m, and not an induct sound power level. In light of this, a correction of 22dB has been applied to convert the stated highest sound pressure level to an approximate in-duct sound power level based on the approximate dimensions of the unit (assumed to be 1.5m*1.5m*0.6m). The calculation has assumed that the effect of the end correction is included in the measurement, and therefore this has not been included in the calculation, and that the intake and exhaust levels of the unit are the same.

7.07 Table 7.2 presents the predicted noise levels at the closest noise sensitive receptor based on the inclusion of the stated attenuators. Note that the attenuator sizes are provided for feasibility only, and the sizing should not be used for procurement.

Item	Operating Period	Approximate Attenuator Lengths	Predicted Noise Level
Basement AHU - Ducted	Day/Eve	Intake/Exhaust - 1200mm	28dBA
Pool AHU - Ducted	Day/Eve/Night	Intake/Exhaust - 1500mm	27dBA
Gym AHU- Ducted	Day/Eve	Intake/Exhaust - 600mm	29dBA
Chiller- Ducted	Day/Eve	Intake/Exhaust - 600mm	29dBA
Roof AHU- Ducted	Day/Eve/Night	Intake – 900mm Exhaust -1200mm	26dBA
Roof AHU – Case Radiated	Day/Eve/Night	N/A	22dBA

Table 7.1: Calculated Noise Levels Based on Proposed Attenuation dB

7.08 The full calculations and insertion loss requirements for the attenuation is provided in Appendix G.

7.09 Table 7.3 presents the predicted cumulative noise levels during the relevant period

Period	Potential Operating Plant	Predicted Noise Level	Planning Criteria	Exceedance of Criteria
Day	All Items	36	39	-3
Evening	All Items	36	36	0
Night	Pool AHU /Roof AHU	30	30	0

Table 7.2: Assessment of Predicted Noise Levels Based on Proposed Noise Limit, Free-field dB(A)

7.10 It can be seen from the above table that assuming the attenuators stated in Table 7.2 are installed within the relevant duct-work, predicted noise levels will meet the planning noise criteria during all periods of operation at the closest noise sensitive receptor.

7.11 With regards to BS4142, the predicted noise levels would be below the measured background noise levels, therefore, would be considered to have a low impact on the noise climate surrounding the site.

7.12 With respect to the NPPF, achieving the noise limits would be classified as being between the LOAEL and the NOEL.

8 CONCLUSION

8.01 CSG Acoustics has been appointed by BTP Group to undertake a noise assessment to support a planning application for 41 Frognal, London, NW3 6YD.

8.02 The assessment has been carried out in accordance with national planning guidance and the requirements of Camden Council, and is based on an environmental noise survey conducted at the site over a mid-week period.

8.03 Plant noise limits have been set based on the methodology contained in BS4142, the results of a background noise survey and the requirements of DP28 of the Borough's Development Policies, to control the noise from the proposed units

8.04 A noise assessment has been undertaken to evaluate the potential noise impact of the proposed internal and external plant units at the closest worst affected noise sensitive receptor.

8.05 Predictions have shown that the requirements of DP28 (5dB below the measured background noise level), is met at all assessment locations during all periods of the proposed operation of the units, assuming that attenuators are installed within the duct-runs of all items.

8.06 With regards to BS4142, the predicted noise levels would be below the measured background noise levels, therefore, would be considered to have a low impact on the noise climate surrounding the site.

8.07 Assessing the site in accordance with the principles of the National Planning Policy Framework has shown that predicted noise levels would be between the LOAEL and the NOEL

8.08 On the basis of this assessment it is considered that noise does not pose a material constraint to the operation of the proposed units at the site.

APPENDIX A

GLOSSARY OF TECHNICAL TERMS

TECHNICAL TERMS AND UNITS

Decibel (dB) - The unit used to describe sound. A logarithmic scale is used to describe sound pressure levels and sound power levels. The logarithms used are to base 10; hence, an increase of 10dB in sound pressure level corresponds to a doubling in perceived loudness of the sound.

Sound Power Level (SWL) - This is a product of the source alone and is independent of its surroundings. It is a measure of the amount of sound power output measured in decibels.

Sound Pressure Level (SPL) - This is a function of the source and its surroundings and is a measure of the sound pressure at a point in space. The sound pressure measured or reported can be influenced by room/mounting conditions and the distance that the measurement is taken.

Octave Bands - The human ear is sensitive to sound over a range of approximately 20 Hz to 20 KHz and is generally more sensitive to medium and high frequencies than to low frequencies. In order to define the frequency content of a noise, the spectrum is divided into frequency bands and the sound pressure level is measured in each band. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it.

"A" Weighting - A number of frequency weightings have been developed to imitate the ear's varying sensitivity to sound of different frequencies. The most commonly used weighting is the "A" weighting. The "A" weighted SPL can be measured directly or derived from octave or one-third octave band SPLs. The result is a single figure index which gives some idea of the subjective loudness of the sound, but which contains no information as to its frequency content.

Intermittency and Time-Weighting - The degree of annoyance caused by a noise also depends on its duration and intermittency of a noise. Intermittent, impulsive or repetitive noises tend to be more annoying than continuous noises. Various time-weightings have been derived to measure sounds of differing intermittences and these can be measured directly on modern equipment. The most common time-weightings in use are as follows:-

L_{90} This is the sound pressure level exceeded for 90% of the measurement period. It is widely used to measure background noise levels.

L_{eq} The equivalent continuous noise level is often used to measure intermittent noise. It is defined as the notional steady noise level that would contain the same acoustic energy as the varying noise. Because the averaging process used is logarithmic, the L_{eq} level tends to be dominated by the higher noise levels measured.

APPENDIX B

MANUFACTURERS NOISE DATA

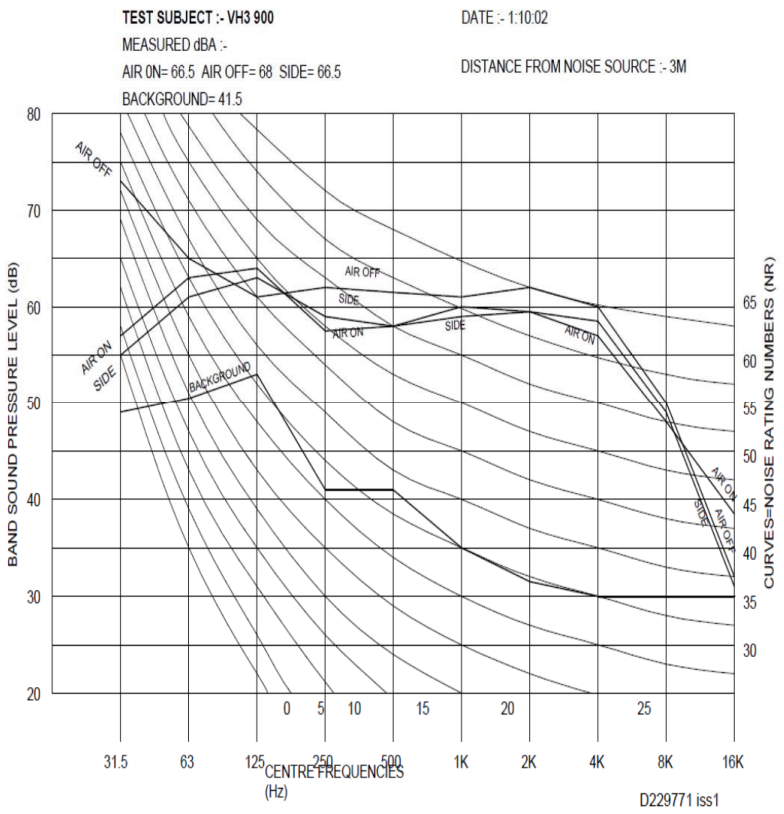
Ref	Plant	Location	No.	Manufacturer	Model	Dimensions- mm (DxWxH)	Noise Data
1	ground source heat pump	Basement Plantroom 1	2	Veissmann	Vitocal 300-G BW 129	1085x780x1074	Sound Power Level 44dB(A)
2	Air handling unit (basment)	Basement Plantroom 1	1	Nuaire	S6-XB	1700x1150x700	S6-XB dB Information Page 2
3	Air handling unit (pool)	Basement Plantroom 2	1	Calorex	AA900VH	1310x700x2245	AA900VH dB Information Page 3
4	Air handling unit (gym)	Basement Plantroom 2	1	Nuaire	XB4	1360x1000x340	XB4 dB Information Page 4
5	Air cooled chiller	Basement Plantroom 2	1	Carrier	30RBY 021 Aquasnap	1135x584x1608	Sound Power level radiated from unit - 82 dB(A) Sound Power level at unit discharge / in duct - 80 dB(A)
6	Air handling unit (G - 2nd)	Roof Level	1	Nuaire	XBC65	1900x1560x620	XBC65 dB Information Page 5

Nuaire S6-XB

	Induct Sound Power Levels dB re 1pW								Breakout
Octave Bands (Hz)	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dBA @ 3m***
Intake	82	86	80	68	67	64	57	51	47
Supply	76	79	76	67	62	59	50	40	
Discharge	85	86	80	74	72	68	61	54	
Extract	77	80	73	64	59	55	47	44	

*** 'A' weighted sound pressure level**

Calorex Variheat III AA900VH



Nuaire XB4

	Induct Sound Power Levels dB re 1pW								Breakout
Octave Bands (Hz)	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dBA @ 3m***
Intake	76	75	71	70	69	60	57	53	36
Supply	64	62	63	61	59	56	46	36	
Discharge	74	73	70	73	70	68	63	56	
Extract	67	63	55	57	54	45	37	30	

*** 'A' weighted sound pressure level**

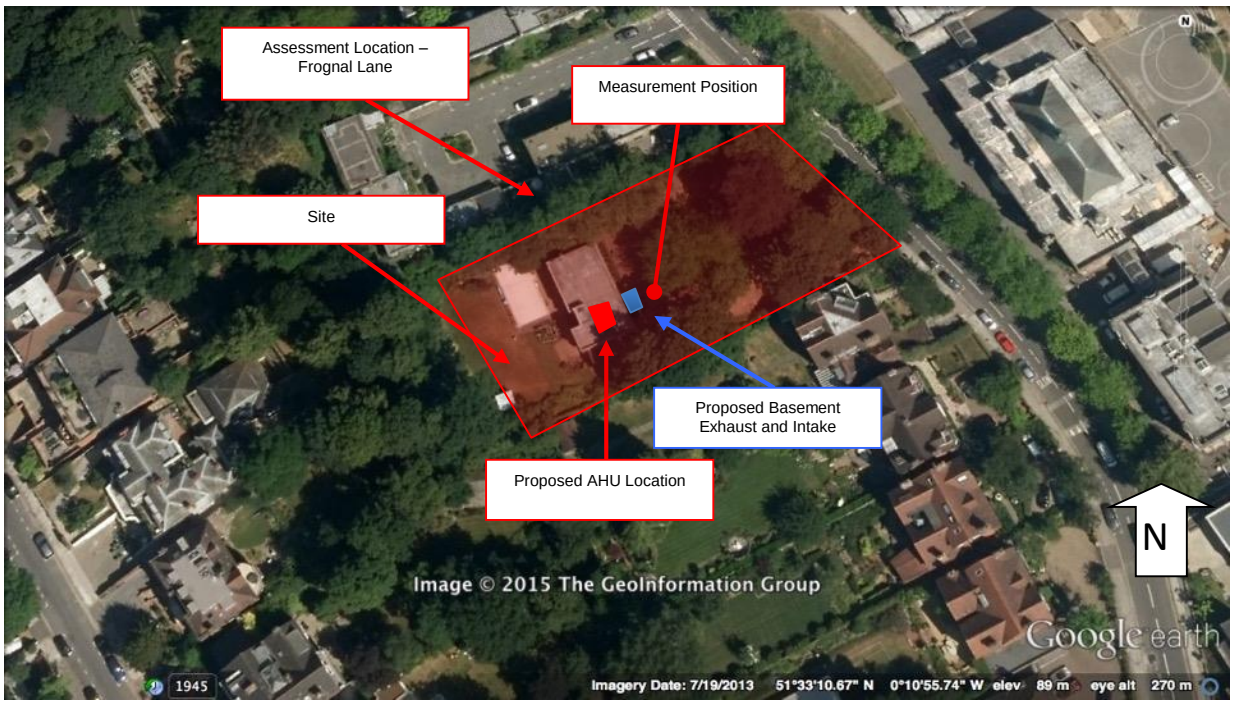
Nuaire XBC65

	Induct Sound Power Levels dB re 1pW								Spherical
Octave Bands (Hz)	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dBA @ 3m***
Intake	79	79	72	66	64	59	48	34	
Supply	83	85	79	74	72	68	61	54	
Discharge	85	85	79	75	72	69	61	55	35
Extract	81	79	70	67	64	60	48	35	
Casing Radiated**	71	69	56	51	45	41	35	20	

*** 'A' weighted sound pressure level**
**** Breakout**

APPENDIX C

SITE PLAN
&
MEASUREMENT LOCATION


Assessment Location – Frognal Lane
Measurement Position
Site
Proposed Basement Exhaust and Intake
Proposed AHU Location
N
Image © 2015 The GeoInformation Group
Google earth
1945
Imagery Date: 7/19/2013 51°33'10.67" N 0°10'55.74" W elev 89 m eye alt 270 m

APPENDIX D

PLANNING POLICY AND GUIDANCE

PLANNING POLICY AND GUIDANCE

National Planning Policy

National Planning Policy Framework and the Noise Policy Statement for England

The Department for Communities and Local Government published the National Planning Policy Framework (NPPF) on 27th March 2012 and upon its publication, the majority of planning policy statements and guidance notes were withdrawn, including Planning Policy Guidance 24 Planning and Noise, which previously presented the government's overarching planning policy on noise.

The NPPF contains four aims, which are set out at paragraph 123 in Section 11 of the document, titled *Conserving and enhancing the natural environment*:

> *"Planning policies and decisions should aim to:*
>
> *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
>
> *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
>
> *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable*

restrictions put on them because of changes in nearby land uses since they were established; and

identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."

The Department for Environment Food and Rural Affairs published the Noise Policy Statement for England (NPSE) in March 2010. The explanatory note of NPSE defines the following terms used in the NPPF:

"NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

2.21 Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur."

The NPSE does not define any of the above effect levels numerically.

The NPSE presents the Noise Policy Aims as:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy and sustainable development:

avoid significant adverse impacts on health and quality of life;

mitigate and minimise adverse impacts on health and quality of life; and

where possible, contribute to the improvement of health and quality of life."

It can be seen that the first two bullet points are similar to Section 11 of the NPPF, with a third aim that seeks to improve health and quality of life. The NPSE later expands on the Noise Policy Aims, stating:

"2.23 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development (paragraph 1.8).

2.24 The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.

2.25 This aim (the third aim)*, seeks where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into*

account the guiding principles of sustainable development (paragraph 1.8), recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim."

It is clear that noise described in the NPSE as SOAEL that would lead to significant adverse effects should be avoided, although there is no definition as to what constitutes a significant adverse effect. Similarly, noise should be mitigated where it is high enough to lead to adverse effects, termed the LOAEL, but not so high that it leads to significant adverse effects.

Local Planning Policy

London Plan (2015)

The Mayor's London Plan 2015 (FALP) presents the overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years.

It is provided to ensure that Boroughs' local development documents are 'in general conformity' and is also legally part of the development plan that has to be taken into account when planning decisions are made in any part of London.

The document deals with transport, economic development, housing, culture, a range of social issues such as children and young people, health inequalities and food, a range of environmental issues such as climate change, air quality, noise and waste.

Chapter 7, London's living spaces and places, specifically references noise in Policy 7.15, pertinent elements of which are reproduced below;

> Planning decisions
>
> > Development proposals should seek to manage noise by:
> >
> > a - avoiding significant adverse noise impacts on health and quality of life as a result of new development;
> >
> > b - mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens on existing businesses;
> >
> > c - improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity);
> >
> > d - separating new noise sensitive development from major noise sources (such as road, rail, air transport and some types of industrial development) through the use of distance, screening or internal layout – in preference to sole reliance on sound insulation;
> >
> > e - where it is not possible to achieve separation of noise sensitive development and noise sources, without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through the application of good acoustic

it is clear from the above that the aims of the London Plan are in line with those presented in the NPPF and NPSE.

Planning Policy in Camden

The Council has adopted a number of planning documents that (alongside the Mayor's London Plan) form the Local Development Framework (LDF).

Included in the Council's planning documents are the Core Strategy, Development Policies and Camden Planning Guidance

The Core Strategy (2010-2025) sets out the key vision for the borough and lists DP28 Noise and Vibration as a Development Policy, which sets out detailed planning criteria that are used to determine applications for planning permission in the borough.

Development Policy 26 (DP26) references noise and vibration by stating;

> *"The Council will protect the quality of life of occupiers and neighbours by only granting permission for development that does not cause harm to amenity."*

It then goes on to site the mitigation measures stated in DP28.

'DP28 Noise and Vibration' sets out Camden Council's planning policy with regards to noise. We note that the policy refers to PPG24, which is no longer an extant planning document. Below is a copy of the text relevant to this application.

> *"DP28 Policy*
>
> *The Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for:*
>
> *a) development likely to generate noise pollution; or*
>
> *b) development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided.*
>
> *Development that exceeds Camden's Noise and Vibration Thresholds will not be permitted.*
>
> *The Council will only grant permission for plant or machinery if it can be operated without cause harm to amenity and does not exceed our noise thresholds.*
>
> *The Council will seek to minimise the impact on local amenity from the demolition and construction phases of development. Where these phases are likely to cause harm, conditions and planning obligations may be used to minimise the impact.*
>
> *The effect of noise and vibration can be minimised by separating uses sensitive to noise from development that generates noise and by taking measures to reduce any impact. Noise sensitive development includes housing, schools and hospitals as well as offices, workshops and open spaces, while noise is generated by rail, road and air traffic, industry, entertainment (e.g. nightclubs, restaurants and bars) and other uses.*
>
> *In assessing applications, we will have regard to the Noise and Vibration Thresholds, set out below. These represent an interpretation of the standards in PPG24 and include an evening period in addition to the day and night standards contained in the PPG, which provide a greater degree of control over noise and vibration during a period when noise is often an issue in the borough."*

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	55dBLAeq'

Camden Planning Guidance provides advice and information on how the Local Authority apply planning policies. The Guidance is to support the policies in the Local Development Framework (LDF) consistent with the core strategy and development policies that comprise our Local Development Framework (LDF).

Chapter 4 of CPG6 – *Amenity*, presents the key issues controlling and managing noise and vibration as;

- Limit the impact of existing noise and vibration sources on new development; and
- Limit noise and vibration emissions from new development.

It follows that DP28 of the Development Policy's provides the associated noise and vibration limits.

British Standard 4142

British Standard (BS) 4142: 2014 *Methods for rating and assessing industrial and commercial sound* is intended to be used to assess whether noise from factories, industrial

premises or fixed installations and sources of an industrial nature in commercial premises is likely to give rise to complaints from people residing in nearby dwellings.

The procedure contained in BS4142 for assessing the likelihood of complaints is to compare the "*specific sound level*", which is the measured or predicted sound level from the source in question immediately outside the dwelling, with the background sound level.

NOTE 1 of paragraph 8.1.4 states that when determining the background sound level for the assessment;

> *"A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value"*

BS4142 provides various corrective methods depending on if the sound source is tonal (0 to +6dB), impulsive (0 to +9dB) or distinctive (0 to 3dB), which can be applied.

> *"The likelihood of noise provoking complaints is assessed by subtracting the background noise level from the rating noise level. BS4142 states:*
>
> *a) Typically, the greater this difference, the greater the magnitude of the impact.*
>
> *b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
>
> *c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
>
> *d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*
>
> *NOTE 2 Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."*

In the context of the NPPF, it is considered that a situation between where BS4142 suggests a low impact (specific sound levels below the measured background noise level) and an indication of significant adverse impact (specific sound levels exceed +10dB above the measured background noise level) would equate to the Lowest Observed Adverse Effect Level (LOAEL).

Noise levels that are more than 10dB below the measured background would equate to the No Observed Effect Level (NOEL).

Setting plant noise limits in accordance with the requirements of the LA will result in noise levels between the LOAEL and the NOEL.

This assessment is carried out over a one hour period for the daytime and a fifteen minute period for the night-time. Day or night are not defined in the standard but it states that night should cover the times when the general adult population are preparing for sleep or are

actually sleeping. For the purposes of this assessment, it is assumed that daytime and night-time are 07:00 to 23:00 hours and 23:00 to 07:00 hours respectively.

BS4142 has been referenced in setting noise limits for any fixed plant proposed as part of the proposed development.

APPENDIX E

SURVEY RESULTS
(TABULAR)

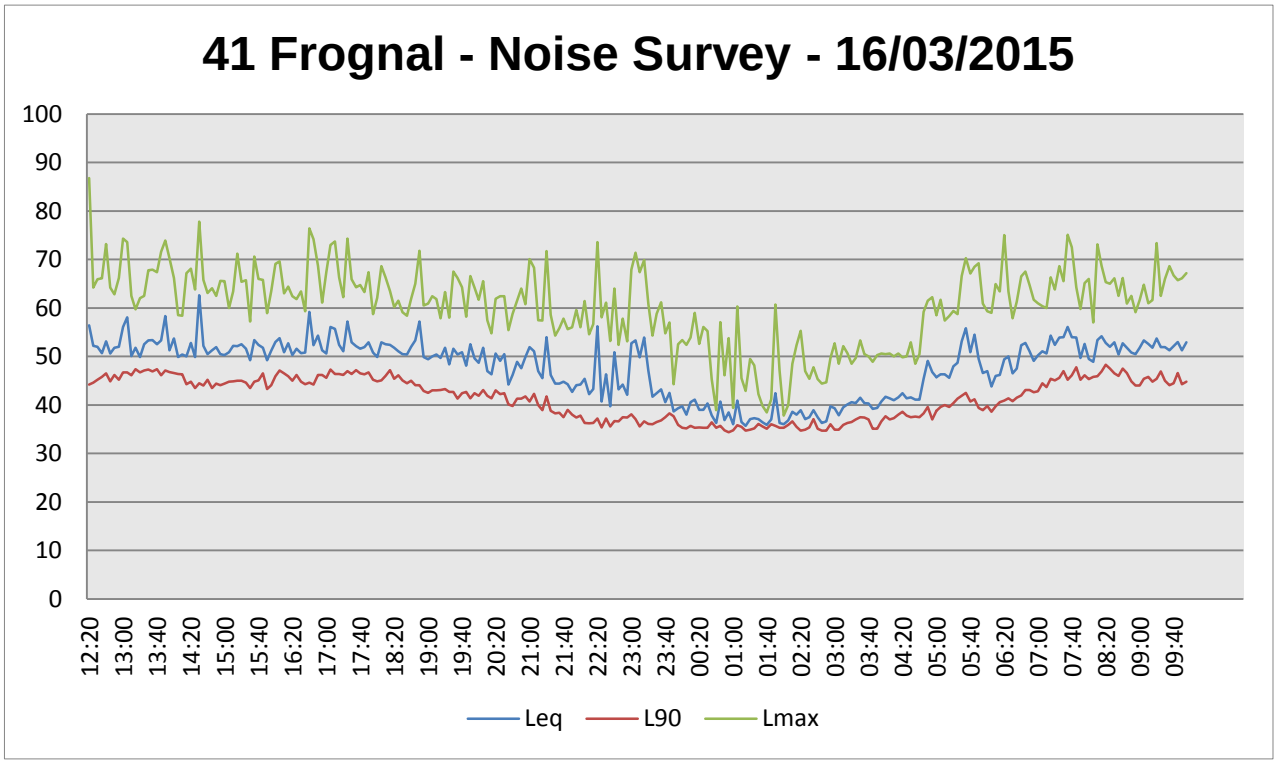
Period	L_{Aeq}	L_{A90}	L_{AFMax}
16/03/15 12:15:00:000	54.6	44.4	86.8
16/03/15 12:30:00:000	52.0	45.8	73.2
16/03/15 12:45:00:000	51.5	45.3	66.2
16/03/15 13:00:00:000	55.8	46.5	74.3
16/03/15 13:15:00:000	51.5	47.0	62.5
16/03/15 13:30:00:000	53.1	47.2	67.9
16/03/15 13:45:00:000	55.3	46.6	73.9
16/03/15 14:00:00:000	51.7	46.5	66.2
16/03/15 14:15:00:000	51.1	44.1	68.1
16/03/15 14:30:00:000	58.5	44.5	77.8
16/03/15 14:45:00:000	51.3	43.9	65.6
16/03/15 15:00:00:000	51.2	44.7	65.5
16/03/15 15:15:00:000	52.1	44.8	71.2
16/03/15 15:30:00:000	52.0	44.2	70.6
16/03/15 15:45:00:000	50.8	44.0	65.8
16/03/15 16:00:00:000	52.7	46.4	69.6
16/03/15 16:15:00:000	51.7	45.4	64.4
16/03/15 16:30:00:000	55.6	44.6	76.4
16/03/15 16:45:00:000	52.8	45.2	74.2
16/03/15 17:00:00:000	54.8	46.1	73.7
16/03/15 17:15:00:000	54.4	46.4	74.3
16/03/15 17:30:00:000	52.2	46.6	65.9
16/03/15 17:45:00:000	52.0	45.9	67.4
16/03/15 18:00:00:000	52.0	45.3	68.6
16/03/15 18:15:00:000	51.8	46.1	63.5
16/03/15 18:30:00:000	51.0	44.9	61.9
16/03/15 18:45:00:000	54.4	43.6	71.8
16/03/15 19:00:00:000	49.9	42.8	62.4
16/03/15 19:15:00:000	50.2	42.9	63.3
16/03/15 19:30:00:000	51.0	42.2	67.5
16/03/15 19:45:00:000	50.5	42.2	66.6
16/03/15 20:00:00:000	49.6	42.1	65.5
16/03/15 20:15:00:000	49.0	42.1	62.4
16/03/15 20:30:00:000	47.8	40.3	62.4
16/03/15 20:45:00:000	48.9	41.5	64.0
16/03/15 21:00:00:000	50.5	40.7	70.1
16/03/15 21:15:00:000	50.4	39.3	71.7
16/03/15 21:30:00:000	44.5	37.9	57.8
16/03/15 21:45:00:000	43.8	37.8	59.6
16/03/15 22:00:00:000	44.1	36.5	61.4
16/03/15 22:15:00:000	51.8	35.9	73.6

16/03/15 22:30:00:000	47.7	36.1	64.0
16/03/15 22:45:00:000	43.2	37.2	57.8
16/03/15 23:00:00:000	52.2	36.2	71.4
16/03/15 23:15:00:000	50.2	36.2	69.9
16/03/15 23:30:00:000	42.2	36.8	61.2
16/03/15 23:45:00:000	40.5	36.8	57.0
17/03/15 00:00:00:000	39.5	35.3	53.9
17/03/15 00:15:00:000	39.8	35.3	59.0
17/03/15 00:30:00:000	38.4	35.5	55.2
17/03/15 00:45:00:000	39.0	34.7	57.1
17/03/15 01:00:00:000	38.4	35.2	60.3
17/03/15 01:15:00:000	36.8	34.9	49.5
17/03/15 01:30:00:000	36.5	35.4	42.2
17/03/15 01:45:00:000	39.5	35.5	60.7
17/03/15 02:00:00:000	37.3	35.6	48.5
17/03/15 02:15:00:000	38.0	34.9	55.3
17/03/15 02:30:00:000	38.0	35.4	47.8
17/03/15 02:45:00:000	37.8	34.9	49.7
17/03/15 03:00:00:000	39.0	35.2	52.7
17/03/15 03:15:00:000	40.4	36.6	50.7
17/03/15 03:30:00:000	40.8	37.3	53.3
17/03/15 03:45:00:000	39.8	35.3	50.6
17/03/15 04:00:00:000	41.4	37.3	50.6
17/03/15 04:15:00:000	41.8	38.1	50.6
17/03/15 04:30:00:000	41.3	37.5	52.9
17/03/15 04:45:00:000	47.4	38.1	62.2
17/03/15 05:00:00:000	46.1	39.4	61.7
17/03/15 05:15:00:000	47.6	40.2	59.4
17/03/15 05:30:00:000	53.7	41.5	70.3
17/03/15 05:45:00:000	51.4	39.5	69.2
17/03/15 06:00:00:000	45.8	39.0	64.9
17/03/15 06:15:00:000	48.8	40.9	75.0
17/03/15 06:30:00:000	49.5	41.4	66.5
17/03/15 06:45:00:000	51.2	42.9	67.5
17/03/15 07:00:00:000	50.7	43.7	61.0
17/03/15 07:15:00:000	53.6	45.4	68.6
17/03/15 07:30:00:000	54.8	46.1	75.1
17/03/15 07:45:00:000	52.4	45.8	65.1
17/03/15 08:00:00:000	51.1	45.7	73.1
17/03/15 08:15:00:000	53.1	47.4	68.7
17/03/15 08:30:00:000	52.1	46.5	66.2
17/03/15 08:45:00:000	51.1	44.9	62.5

17/03/15 09:00:00:000	52.6	45.0	64.8
17/03/15 09:15:00:000	52.6	45.4	73.4
17/03/15 09:30:00:000	51.8	44.5	68.6
17/03/15 09:45:00:000	52.5	45.0	67.2

APPENDIX F

SURVEY RESULTS
(GRAPHICAL)


41 Frognal - Noise Survey - 16/03/2015
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Leq
L90
Lmax

APPENDIX G

NOISE CALCULATIONS

SWL Point Source Unit Calculation

Type of Unit	Base AHU (Intake+Exhaust)
No of Units	1
Distance Between Enclosure and Receiver Location	19
Directivity (Q) of Surroundings	2
Noise Limit dBA	30

Dimension	Length	Depth	Height
Maximum Unit Dimensions	1.5	0.5	1.5

Frequency	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Cumulative Plant Sound Power Level	87	89	83	75	73	69	62	56
SPL at 1m	79	81	75	67	65	61	54	48
Screening (no line of sight)	5	5	5	5	5	5	5	5
Attenuator (1200mm)	3	11	20	36	39	31	21	15
Point Source Attenuation	26	26	26	26	26	26	26	26
Additional Directivity	3	3	3	3	3	3	3	3
Resultant @ Receiver	22	26	18	0	-1	4	7	4

Point Source dBA at Receiver	28

SWL Point Source Unit Calculation

Type of Unit	Pool AHU (Intake+Exhaust)
No of Units	1
Distance Between Enclosure and Receiver Location	19
Directivity (Q) of Surroundings	2
Noise Limit dBA	30

Dimension	**Length**	**Depth**	**Height**
Maximum Unit Dimensions	1.5	0.5	1.5

Frequency	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
Cumulative Plant Sound Power Level	87	86	84	84	84	85	82	72
SPL at 1m	79	78	76	76	76	77	74	64
Screening (no line of sight)	5	5	5	5	5	5	5	5
Attenuator (1500mm)	4	13	23	39	44	38	26	18
Point Source Attenuation	26	26	26	26	26	26	26	26
Additional Directivity	3	3	3	3	3	3	3	3
Resultant @ Receiver	21	21	16	6	4	12	21	17

Point Source dBA at Receiver	**27**

SWL Point Source Unit Calculation

Type of Unit	**Gym AHU (Intake+Exhaust)**
No of Units	**1**
Distance Between Enclosure and Receiver Location	**19**
Directivity (Q) of Surroundings	**2**
Noise Limit dBA	**30**

Dimension	**Length**	**Depth**	**Height**
Maximum Unit Dimensions	1.5	0.5	1.5

Frequency	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
Cumulative Plant Sound Power Level	78	77	74	75	73	69	64	58
SPL at 1m	70	69	66	67	65	61	56	50
Screening (no line of sight)	5	5	5	5	5	5	5	5
Attenuator (600mm)	1	3	9	15	16	15	11	9
Point Source Attenuation	26	26	26	26	26	26	26	26
Additional Directivity	3	3	3	3	3	3	3	3
Resultant @ Receiver	16	23	20	21	21	19	18	12

Point Source dBA at Receiver	**29**

SWL Point Source Unit Calculation

Type of Unit	Chiller (Intake+Exhaust)
No of Units	1
Distance Between Enclosure and Receiver Location	19
Directivity (Q) of Surroundings	2
Noise Limit dBA	30

Dimension	**Length**	**Depth**	**Height**
Maximum Unit Dimensions	1.5	0.5	1.5

Frequency	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
Cumulative Plant Sound Power Level (Assumed)	78	77	74	75	73	69	64	58
SPL at 1m	70	69	66	67	65	61	56	50
Screening (no line of sight)	5	5	5	5	5	5	5	5
Attenuator (600mm)	1	3	9	15	16	15	11	9
Point Source Attenuation	26	26	26	26	26	26	26	26
Additional Directivity	3	3	3	3	3	3	3	3
Resultant @ Receiver	16	23	20	21	21	19	18	12

Point Source dBA at Receiver	**29**

SWL Point Source Unit Calculation

Type of Unit	Rooftop AHU (Intake)
No of Units	1
Distance Between Enclosure and Receiver Location	19
Directivity (Q) of Surroundings	2
Noise Limit dBA	30

Dimension	**Length**	**Depth**	**Height**
Maximum Unit Dimensions	1.56	0.62	1.9

Frequency	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
Cumulative Plant Sound Power Level	79	79	72	66	64	59	48	34
SPL at 1m	71	71	64	58	56	51	40	26
End Reflection (500mm*500mm)	9	5	2	0	0	0	0	0
Attenuator (900mm)	2	7	14	24	26	24	16	13
Point Source Attenuation	26	26	26	26	26	26	26	26
Additional Directivity	3	3	3	3	3	3	3	3
Resultant @ Receiver	11	20	16	8	7	5	2	-11

Point Source dBA at Receiver	**23**

SWL Point Source Unit Calculation

Type of Unit	Rooftop AHU (Exhaust)
No of Units	1
Distance Between Enclosure and Receiver Location	19
Directivity (Q) of Surroundings	2
Noise Limit dBA	30

Dimension	**Length**	**Depth**	**Height**
Maximum Unit Dimensions	1.56	0.62	1.9

Frequency	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
Cumulative Plant Sound Power Level	85	85	79	75	72	69	61	55
SPL at 1m	77	77	71	67	64	61	53	47
End Reflection (500mm*500mm)	9	5	2	0	0	0	0	0
Attenuator (1200mm)	3	11	20	36	39	31	21	15
Point Source Attenuation	26	26	26	26	26	26	26	26
Additional Directivity	3	3	3	3	3	3	3	3
Resultant @ Receiver	16	22	17	5	2	8	10	8

Point Source dBA at Receiver	**25**

SWL Conformal Unit Calculation

Type of Unit	Rooftop AHU (Breakout)
No of Units	1
Distance Between Enclosure and Receiver Location	19
Directivity (Q) of Surroundings	2
Noise Limit dBA	30

Dimension	**Length**	**Depth**	**Height**
Maximum Unit Dimensions	1.56	0.62	1.9

Frequency	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
Cumulative Plant Sound Power Level	71	69	56	51	45	41	35	20
SPL at 1m	54	52	39	34	28	24	18	4
Composite Enclosure SRI	0	0	0	0	0	0	0	0
Distance Loss (Conformal Losses)	20	20	20	20	20	20	20	20
Additional Directivity	3	3	3	3	3	3	3	3
Resultant @ Receiver	11	19	13	14	11	8	-4	-15

Conformal dBA at Receiver	**22**