1 Frognal Gardens
Hamstead

Environmental Noise Survey
and Plant Noise Assessment Report

29687/PNA1 Rev01

12 May 2022

For:
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Hann Tucker Associates

Environmental Noise Survey and Plant Noise Assessment Report Report 29687/PNA1 Rev01

Document Control

Rev	Date	Comment	Prepared by	Authorised by
1	12/05/2022	Condenser model changed		
			Rebeca Sanchez Assistant Consultant LArch, MSc (Hons)	John Gibbs Director MIOA MSEE CEnv
0	31/03/2022	-	Rebeca Sanchez Assistant Consultant LArch, MSc (Hons)	John Gibbs Director MIOA MSEE CEnv

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Environmental Noise Survey and Plant Noise Assessment Report Report 29687/PNA1 Rev01

Contents

Attachments

1.0 Introduction

It is proposed to refurbish the property on 1 Frognal Gardens, Hamstead. Works related to the refurbishment include renovations of the existing house and the installation of a new VRF condenser.

Hann Tucker Associates have therefore been commissioned to undertake a detailed 24-hour daytime and night-time fully automated environmental noise survey of the site to establish the currently prevailing noise climate and propose suitable plant noise emission criteria, based on the results of the survey and the requirements of the Local Authority.

An assessment has been carried out to determine the plant noise emissions at the nearest noise sensitive window and compare the predicted noise levels to the proposed criteria.

2.0 Objectives

To establish by means of an unmanned environmental noise survey the existing $L_{Amax,}$ L_{Aeq} and L_{A90} environmental noise levels at up to 2No. secure and accessible on-site positions, using fully computerised noise monitoring equipment.

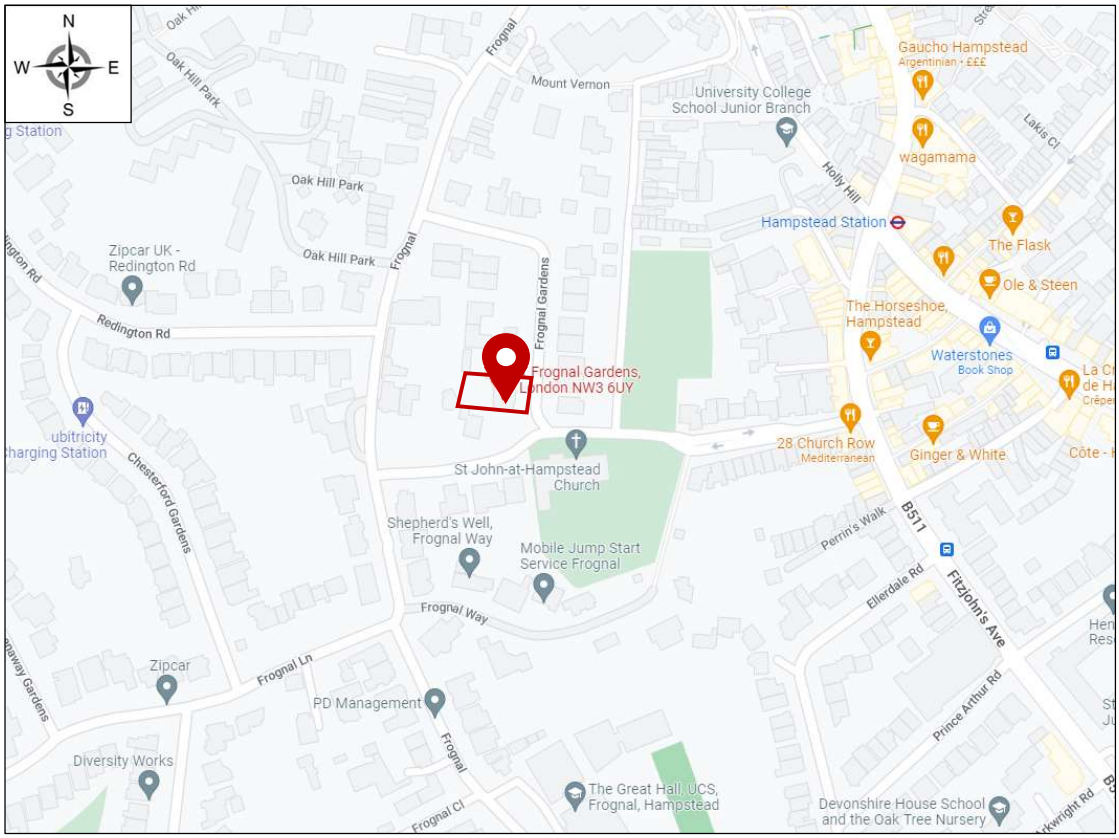
Based on the results of the noise survey, and with reference to the requirements of the Local Authority, to recommend suitable plant noise emission criteria.

To assess noise emissions from the proposed plant with reference to the proposed noise criteria and comment on its acceptability.

3.0 Site Description

3.1 Location

The site is located at 1 Frognal Gardens, Hamstead, NW3 6UY. The location is shown in the Location Map below.



Location Map (Map data © 2022 Google)

The site falls within the jurisdiction of London Borough of Camden.

3.2 Description

The site is bounded to the east with Frognal Gardens, and to the north, west and south by residential premises. Frognal Gardens is made up of predominately residential dwellings. To the west of the road, the buildings height varies between ground floor level and ground plus 1 storey. To the east of the road, the buildings height is ground plus two storeys with at least one basement level. St John-at-Hampstead Church is located approximately 25 m to the southeast of the property. The nearby road network includes Frognal Gardens to the east and Church Row to the south.

The site is shown in the Site Plan below.

Site Plan (Imagery © 2022 Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map Data © 2022 Google)

4.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

5.0 Project Proposals

5.1 Proposed Plant

We understand the proposed plant comprises 1 No. condenser model PURY-P300YNW-A1, make Mitsubishi.

5.2 Operating Hours

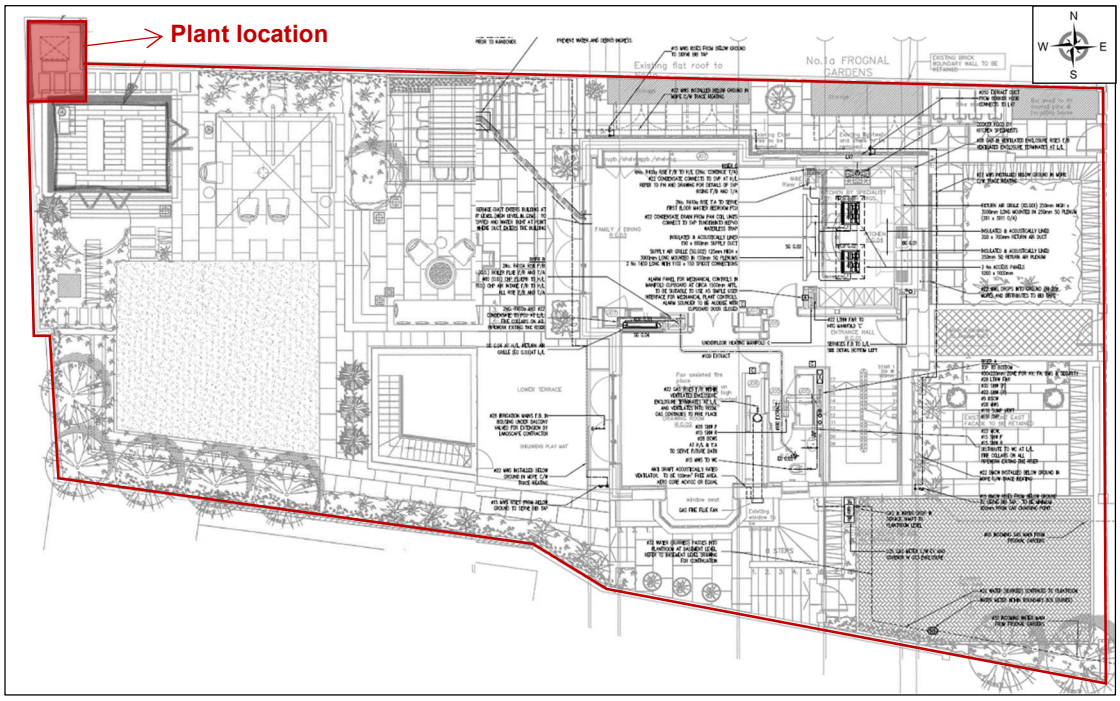
We understand that the operating hours of the proposed plant are as detailed in Section 11 of this report.

5.3 Drawings

Our acoustic analyses are based on the following drawing provided by 800 Group.

Reference	Title	Date
M-202-RD	Ground floor – Mechanical services layout	May 2013

A proposed site plan is shown below.



Proposed Site Plan (Plan provided by 800 Group)

6.0 Acoustic Standards and Guidelines

6.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was published in March 2010 (i.e. before the NPPF). The NPSE is the overarching statement of noise policy for England and applies to all forms of noise other than occupational noise, setting out the long term vision of Government noise policy which is to:

"Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."

"Through the effective management and control of environmental, neighbour and

neighbourhood noise within the context of Government policy on 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."*

The Explanatory Note to the NPSE has three concepts for the assessment of noise in this country:

NOEL – No Observed Effect Level
This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.

LOAEL – Lowest Observable Adverse Effect Level
This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level
This is the level above which significant adverse effects on health and quality of life occur.

None of these three levels are defined numerically and for the SOAEL the NPSE makes it clear that the noise level is likely to vary depending upon the noise source, the receptor and the time of day/day of the week, etc. The need for more research to investigate what may represent an SOAEL for noise is acknowledged in the NPSE and the NPSE asserts that not stating specific SOAEL levels provides policy flexibility in the period until there is further evidence and guidance.

The NPSE concludes by explaining in a little more detail how the LOAEL and SOAEL relate to the three NPSE noise policy aims listed above. It starts with the aim of avoiding significant adverse effects on health and quality of life, then addresses the situation where the noise impact falls between the LOAEL and the SOAEL when *"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."* The final aim envisages pro-active management of noise to improve health and quality of life, again taking into account the guiding principles of sustainable development which include the need to minimise travel distance between housing and employment uses in an area.

6.2 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) was first published in March 2012. This document replaced the existing Planning Policy Guidance Note 24 (PPG24) "Planning and Noise". A new edition of NPPF was published in July 2021 and comes into effect immediately.

The following paragraphs are from the NPPF (published July 2021):

185. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

Paragraph 185 also references the Noise Policy Statement for England (NPSE). This document does not refer to specific noise levels but instead sets out three aims:

- "Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

- Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development."

The NPPF document does not refer to any other documents or British Standards regarding nose other than the NPSE.

Paragraph 2 of the NPPF states that *"planning law required that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise."*

Paragraph 12 of the NPPF states that *"The presumption in favour of sustainable development does not change the statutory status of the development plan as the starting point for decision making. Where a planning application conflicts with an up-to-date development plan (including any neighbourhood plans that form part of the development plan), permission should not usually be granted. Local planning authorities may take decisions that depart from an up-to-date development plan, but only if material considerations in a particular case indicate that the plan should not be followed."*

6.3 Planning Practice Guidance on Noise

Planning Practice Guidance (PPG) under the NPPF has been published by the Government as a web based resource at http://planningguidance.planningportal.gov.uk/blog/guidance/. This includes specific guidance on Noise although, like the NPPF and NPSE the PPG does not provide any quantitative advice. It seeks to illustrate a range of effect levels in terms of examples of outcomes as set out in the following table:

Perception	Examples of Outcomes	Increasing effect level	Action
Not noticeable	No effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance.	Observed Adverse Effect	Mitigate and reduce to a minimum

Perception	Examples of Outcomes	Increasing effect level	Action
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable hard, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

6.4 Local Authority Requirements

The site lies within the jurisdiction of London Borough of Camden. Their advice regarding criteria for atmospheric noise emissions from building service plant is as follows:

"A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion).

Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)

Existing Noise sensitive receptor	***Assessment Location***	***Design Period***	***LOAEL (Green)***	***LOAEL to SOAEL (Amber)***	***SOAL (Red)***
*Dwellings***	*Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)*	*Day*	*'Rating level' 10dB* below background*	*'Rating level' between 9dB below and 5dB above background*	*'Rating level' greater than 5dB above background*

Existing Noise sensitive receptor	*Assessment Location*	*Design Period*	*LOAEL (Green)*	*LOAEL to SOAEL (Amber)*	*SOAL (Red)*
*Dwellings***	*Outside bedroom window (façade)*	*Night*	*'Rating level' 10dB* below background and no events exceeding 57dB L_{Amax}*	*'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB L_{Amax}*	*'Rating level' greater than 5dB above background and/or events exceeding 88dB L_{Amax}*

**10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.*

***levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.*

The periods in Table C correspond to 0700 hours to 2300 hours for the day and 2300 hours to 0700 hours for the night. The Council will take into account the likely times of occupation for types of development and will be amended according to the times of operation of the establishment under consideration.

There are certain smaller pieces of equipment on commercial premises, such as extract ventilation, air conditioning units and condensers, where achievement of the rating levels (ordinarily determined by a BS:4142 assessment) may not afford the necessary protection. In these cases, the Council will generally also require a NR curve specification of NR35 or below, dependant on the room (based upon measured or predicted Leq,5mins noise levels in octave bands) 1 metre from the façade of affected premises, where the noise sensitive premise is located in a quiet background area."

6.5 BS 4142:2014 + A1:2019

When setting plant noise emission criteria reference is commonly made to BS 4142:2014 "*Methods for rating and assessing industrial and commercial sound".*

The procedure contained in BS 4142:2014 provides an assessment of the likely effects of sound on people when comparing the specific noise levels from the source with representative background noise levels. Where the noise contains "a tone, impulse or other characteristic"

then various corrections can be added to the specific (source) noise level to obtain the "rating level".

BS 4142 states that: *"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs". An estimation of the impact of the specific noise can be obtained by the difference of the rating noise level and the background noise level and considering the following:*

• *"Typically, the greater this difference, the greater the magnitude of the impact."*

• *"A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."*

• *"A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context."*

• *"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."*

The determination of the "rating level" and the "background level" are both open to interpretation, depending on the context.

In summary it is not possible to set plant noise emission criteria purely on the basis of BS 4142:2014+A1:2019. It is reasonable to infer from the above, however, that a difference of around -5dB corresponds to "No Observed Effect Level" as defined in the Noise Policy Statement for England. It is also reasonable to infer from the above that if the plant noise rating level does not exceed the existing background noise level outside any noise sensitive residential window then the plant noise is of "low impact".

6.6 World Health Organisation Guidelines on Community Noise

BS8233:2014 is based upon the current World Health Organisation (WHO) guidance "*Guidelines on Community Noise".* A summary of the noise guidelines relevant to the proposed scheme is presented in the table below.

Residential Environment	Critical Health Effect(s)	L_{Aeq}	L_{AFmax}	Time Base
Outdoor living area	Serious annoyance, daytime and evening	55	-	07:00-23:00
	Moderate annoyance, daytime and evening	50	-	07:00-23:00
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	-	07:00-23:00
Inside bedrooms	Sleep disturbance, night-time	30	45	23:00-07:00
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	60	23:00-07:00

These WHO guidelines are based, in almost all cases, on the lower threshold below which the occurrence rates of any particular effect can be assumed to be negligible.

6.7 British Standard BS8233: 2014

British Standard 8233: 2014 "Guidance on sound insulation and noise reduction for buildings" provides guidance for the control of noise in and around buildings.

BS8233:2014 Section 7.7.2 titled "Internal ambient noise levels for dwellings" states:

"In general for steady external noise sources, it is desirable that internal ambient noise levels do not exceed the following guideline values:

Activity	*Location*	*Desirable Internal Ambient Criteria*	
		07:00 - 23:00	*23:00 - 07:00*
Resting	*Living Rooms*	*35 dB $L_{Aeq,16hour}$*	-
Dining	*Dining Room/Area*	*40 dB $L_{Aeq,16hour}$*	-
Sleeping (Daytime Resting)	*Bedroom*	*35 dB $L_{Aeq,16hour}$*	*30 dB $L_{Aeq,8hour}$*

6.8 Statutory Noise Nuisance

There is no quantitative definition of statutory noise nuisance. It is generally accepted however, that if the plant noise level is at least 5dB (or 10dB if tonal) below the minimum background $L_{90(15minutes)}$ at 1m from the nearest noise sensitive residential window, then the risk of a statutory noise nuisance is avoided. By adopting this as a design criterion the guidance contained in BS 4142:2014 should also be complied with.

7.0 Survey Methodology

The survey was undertaken by Rebeca Sanchez LArch, MSc(Hons).

7.1 Procedure

Fully automated environmental noise monitoring was undertaken from approximately 11:00 hours on Tuesday 29 March 2022 to 11:00 hours on Wednesday 30 March 2022.

During the periods we were on site the wind conditions were calm. The sky was generally overcast. We understand that generally throughout the survey period the weather conditions were dry. These conditions are considered suitable for obtaining representative measurement results.

Measurements were taken continuously of the A-weighted (dBA) L_{90}, L_{eq} and L_{max} sound pressure levels over 15 minute periods.

7.2 Measurement Positions

The noise level measurements were undertaken at 2No. positions as described in the table below.

Position No	Description
1	The microphone was positioned on the north boundary of the property, near a noise sensitive receptor, at a height of approximately 2 metres above ground floor level.
2	The microphone was positioned on the west boundary of the property, near a noise sensitive receptor, at a height of approximately 2 metres above ground floor level.

The positions are shown on the plan below.

Plan Showing Measurement Positions (Imagery © 2022 Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map Data © 2022 Google)

7.3 Instrumentation

The instrumentation used during the survey is presented in the Table below:

Description	Manufacturer	Type	Serial Number	Calibration
Position 1 Type 1 ½" Condenser Microphone	ACO Pacific	7052E	71839	Calibration on 03/11/2021
Position 1 Preamp	Svantek	SV18	75733	Calibration on 03/11/2021
Position 1 Type 1 Data Logging Sound Level Meter	Svantek	971	74368	Calibration on 03/11/2021
Position 2 Type 1 ½" Condenser Microphone	ACO Pacific	7052E	68293	Calibration on 31/01/2022
Position 2 Preamp	Svantek	SV18	72276	Calibration on 31/01/2022

Description	Manufacturer	Type	Serial Number	Calibration
Position 2 Type 1 Data Logging Sound Level Meter	Svantek	971	72538	Calibration on 31/01/2022
Type 1 Calibrator	Bruel & Kjaer	4230	1558535	Calibration on 14/12/2020

Each sound level meter, including the extension cable, was calibrated prior to and on completion of the surveys. No significant changes were found to have occurred (no more than 0.1 dB).

Each sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable. Each microphone was fitted with a windshield.

8.0 Results

The results have been plotted on Time History Graphs 29687/TH1 and 29687/TH2 enclosed, presenting the 15-minute A-weighted (dBA) L_{90} and L_{eq} noise levels at each measurement position throughout the duration of the survey.

The representative (modal) $L_{A90\ (15\ min)}$ measurements recorded during the survey are presented in the table below:

Position	Representative (Modal) Measured $L_{A90(15min)}$ Background Noise Level (dB re 2 x 10-5 Pa)		
	Daytime (07:00 – 23:00) Hours	Night-Time (23:00 – 07:00) Hours	24 Hours
1	39 dBA	28 dBA	28 dBA
2	40 dBA	26 dBA	26 dBA

9.0 Discussion Of Noise Climate

We conducted a site inspection and unmanned noise measurements to establish the existing airborne noise levels due to traffic and other environmental sources around the site. During the periods we were on site the dominant noise source was noted to be road traffic noise from the nearby road network.

10.0 Plant Noise Emission Criteria

Building services plant external noise emission levels will need to comply with local planning/environmental authority requirements and statutory noise nuisance legislation.

The requirements imposed by London Borough of Camden are stated on Section 6.4 of this report.

On the basis of the above and the results of the environmental noise survey, we propose that the following plant noise emission criteria be achieved at 1 metre from the nearest noise sensitive residential windows.

Façade	Plant Noise Emission Criteria (dB re $2x10^{-5}$ Pa)		
	Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)	24 hours
North	29 dBA	18 dBA	18 dBA
South	30 dBA	16 dBA	16 dBA

The above criteria are to be achieved with all of the proposed plant operating simultaneously. It should be noted that the above are subject to the final approval of the Local Authority.

11.0 Plant Noise Impact Assessment

We understand the proposed plant comprises 1 No. condenser model PURY-P300YNW-A1, make Mitsubishi.

11.1 Plant Noise Data

We understand the manufacturer's noise data for the equipment to be as follows:

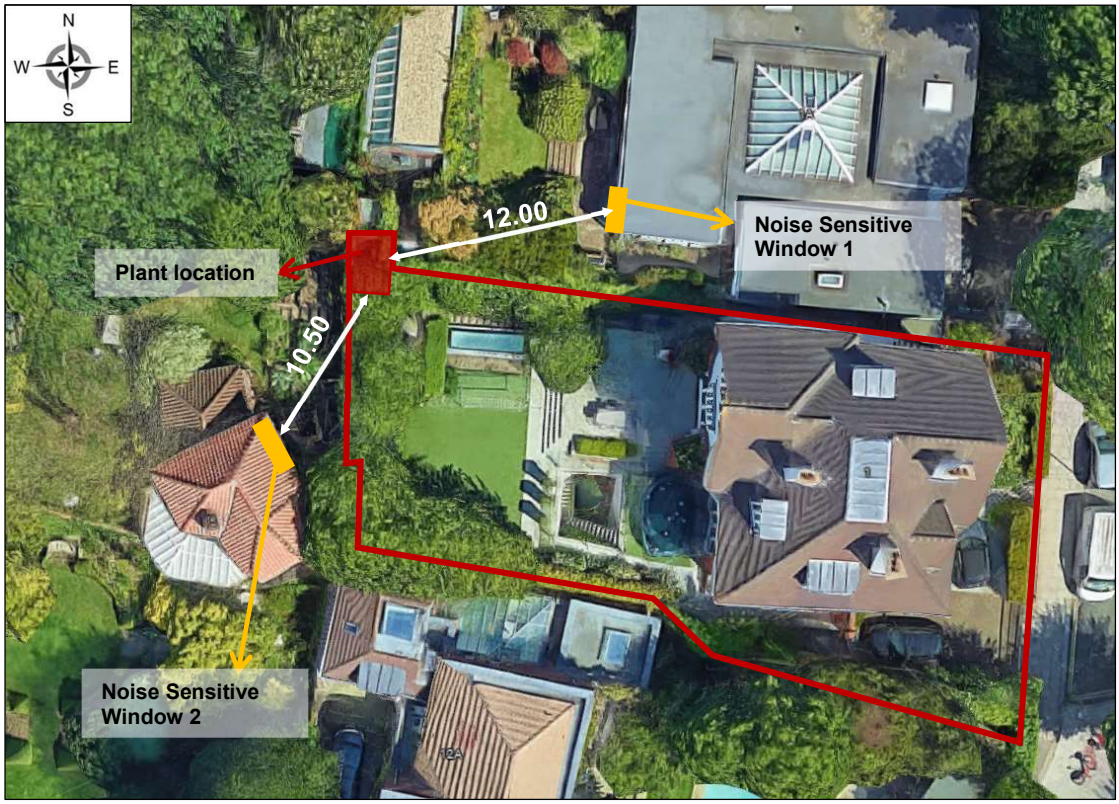
Plant Description	Sound Pressure Level (dB re $2x10^{-5}$ Pa) at 1 metre at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
PURY-P300YNW-A1	75.5	62.5	62.5	60.0	54.0	49.5	44.5	40.0	61.0

We understand that at 1 m the Sound Pressure Level at 100% capacity for cooling mode is 61 dBA, and at 75% capacity for cooling mode is 52 dBA.

11.2 Location of Plant

We understand the proposed plant will be located at ground floor level. The distance from the plant to Noise Sensitive Window 1 is 12 metres approximately. This window is part of a residential dwelling located at the north of the site. The distance from the plant to Noise Sensitive Window 2 is 10.5 metres approximately. This window is part of a residential dwelling located at the southwest of the site. All neighbouring windows are screened from the proposed condenser location by the boundary wall.

The location of the plant and the nearest noise sensitive window are shown on the plan below.



Proposed plant location plan (Imagery © 2022 Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map Data © 2022 Google)

11.3 Mitigation Measures

In order to control plant noise emissions in line with the proposed criterion, we recommend to install the units in an acoustic enclosure capable of achieving no less than 15 dB reduction. Please see attached specification and details of suitable suppliers.

11.4 Plant Noise Impact Assessment

We understand that the proposed unit will be operational during daytime/night-time hours. We understand that the equipment will be running at 100% capacity during daytime and at 75% capacity during night-time.

The following tables summarise our predictions of atmospheric noise emissions from the plantroom louvres to the nearest noise sensitive residential window.

Description	Sound Pressure Level (dB re 2x10-5 Pa)	
	Daytime	Night-time
Sound Pressure Level at 1m	61 (100% Capacity)	52 (75% Capacity)
Barrier Loss	-5	-5
Distance Loss	-22	-22
Façade Reflection	+ 3	+ 3
Proposed enclosure	-15	-15
Calculated Noise Level at Receptor 1	**22**	**13**

Description	Sound Pressure Level (dB re 2x10-5 Pa)	
	Daytime	Night-time
Sound Pressure Level at 1m	61 (100% Capacity)	52 (75% Capacity)
Barrier Loss	-5	-5
Distance Loss	-20	-20
Façade Reflection	+ 3	+ 3
Proposed enclosure	-15	-15
Calculated Noise Level at Receptor 2	**24**	**15**

Our calculations indicate that the proposed plant, in conjunction with the proposed mitigation measures, should be capable of achieving the requirements of the Local Authority outlined in Section 10.0.

12.0 Conclusions

An environmental noise survey has been undertaken in order to establish the currently prevailing noise levels.

Plant noise emission criteria have been recommended based on the results of the noise survey and with reference to the Local Authority's requirements.

An assessment has been carried out to determine the plant noise emissions at the nearest noise sensitive windows.

The assessment indicates that the proposed plant, in conjunction with the proposed attenuation, should be capable of achieving the proposed environmental noise criteria at the nearest noise sensitive residential window.

Appendix A

The acoustic terms used in this report are defined as follows:

dB — Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).

dBA — The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The $_A$ subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted

It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.

$L_{90,T}$ — L_{90} is the noise level exceeded for 90% of the period *T* (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.

$L_{eq,T}$ — $L_{eq,T}$ is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, *T*.

L_{max} — L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

Sound Pressure Level (L_p) is the sound pressure relative to a standard reference pressure of 2×10^{-5} Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).

Sound Power Level (SWL or L_w) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).

1 FROGNAL GARDENS

SPECIFICATION FOR

SMALL ACOUSTIC ENCLOSURES

The condenser units shall be supplied complete with acoustic treatment which shall achieve adequate levels of attenuation to ensure that the following limiting sound pressure levels are not exceeded when measured at a distance of 1m (free field over a reflecting plane) or [in any horizontal direction] or [in any horizontal or vertical direction] under any load conditions.

Duty/Time	Cumulative A-weighted Limiting Sound Pressure Level @ 1m (dB re 2 x 10-5 Pa)
24:00 hours	38

Furthermore they shall not exhibit any significant tonal content.

Exceedances in excess of the measurement tolerance for a Type 1 sound level meter shall constitute a failure.

The enclosed outer panels shall be constructed from galvanized sheet steel having a minimum thickness of 1.6mm and fixed at 300mm (max) centres. The enclosure inner panels shall be constructed from punch-perforated (round-hole) galvanised sheet steel facing, having a minimum thickness of 0.7mm fixed at 300mm (max) centres. Flattened-expanded ("Expamet") sheet shall not be used, unless all edges of the sheet are mechanically fixed to the panel casing and galvanised steel cover strips are used to prevent rivet heads pulling through the perforated sheet (trapping the Expamet between two solid steel layers).

The inert, rot and vermin proof, non-hygroscopic and non-combustible mineral wool or glass fibre acoustic medium shall be packed to a density of not less than 48kg/$m^{3.}$ This shall be faced with a glass fibre cloth, or other approved infill protection membrane. Panels shall be constructed and assembled so that no egress of the acoustic medium will occur under the operating conditions.

Doors, access panels, windows and ventilation ducts or electrical cable penetrations hall be treated so as to maintain the specified acoustic insulation of the assembled enclosure.

Demountable sections shall be designed to allow easy disassembly and reassembly by unskilled personnel without affecting the acoustic performance.

The supplier shall ensure that the assembled enclosure is designed and constructed to withstand site operating conditions such as wind and snow loads, roof mounted plant, etc., as appropriate, and if outside, to be suitably weatherproofed.

The acoustic media shall not comprise materials which are generally composed of mineral fibres, either man made or naturally occurring, which have a diameter of 3 microns or less and a length of 200 microns or less or which contain any fibres not sealed or otherwise stabilised to ensure that fibre migration is prevented.

Any deviations from the above specification must be agreed by, and confirmed in writing to, Hann Tucker Associates.

SUITABLE SUPPLIERS

Of

ACOUSTIC ENCLOSURES FOR SMALL AIR CONDITIONING UNITS

Name & Address	Telephone Number	Contact
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