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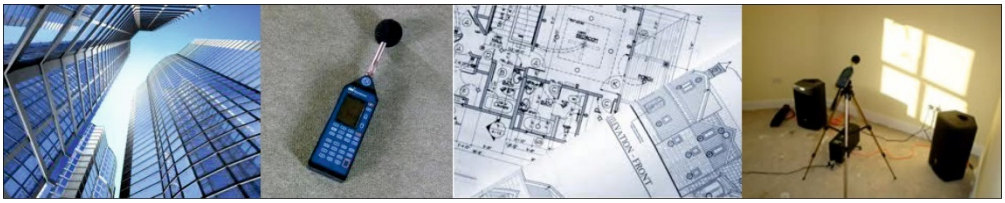

156 WEST END LANE
WEST HAMPSTEAD
LONDON
NW6 1SD

ASSESSMENT OF MECHANICAL PLANT NOISE
PLANNING PERMISSION 2019/4140 (14/07/21)
CONDITIONS 38 & 42

v.3

Client:
ASTIR LIVING LTD
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23rd December 2021
Ref: M4758

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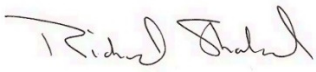
CONTENTS

Project Reference	M4758
Issue No.	3
Reviewed	Richard Sharland MA MSc CEng MIOA
Signature	
Author	Eddie Oxborough MSc MIOA
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Date	23rd December 2021

1. SUMMARY

1.1 Planning permission has been granted for the comprehensive redevelopment of 156 West End Lane, West Hampstead, London, NW6 1SD.

1.2 The original parent permission (2015/6455/P) and the subsequent S73 permission (2019/4140/P) approved the use of Combined Heat and Power (CHP). However, the applicant is now proposing the use of Air Source Heat Pumps (ASHP) and a supplementary boiler for the heating and hot water production for the residential units.

1.3 A number of conditions within the permission require the approval of details in relation to the use of the CHP. The applicant has therefore submitted a further S73 application to vary the wording of conditions 21, 22 and 38 to ensure that the use of ASHP is reflected and those details subsequently approved.

1.4 This noise impact assessment shall be used to discharge Condition 38, demonstrating how the future occupiers of the new building will be safeguarded from the plant noise.

1.5 It will also demonstrate noise levels affecting neighbouring properties will meet the limits defined in Condition 42.

1.6 The existing ambient noise climate affecting the site has been established (Section 3), and the survey has confirmed a typical variation in daytime and night-time levels. With reference to Conditions 38 and 42, and the proposed use of ASHP/boiler, design limits have been confirmed for new occupiers and the existing neighbouring noise-sensitive properties.

1.7 The plant will be contained within the lower ground floor of the east building (please refer to Section 6 and Figure 5 for further details).

1.8 It has been confirmed that the following acoustic measures will be required:

(i) ASHPs to be fitted with exhaust attenuators (as per Table 6.1)
(ii) ASHPs to be operated at night on a moderated 'night mode' setting.

1.9 With such mitigations in place, Table 1.1 confirms the noise targets derived from the Planning Conditions, and the predicted noise levels for each situation.

Location of Noise Sensitive Properties	**Day Time, 07.00 -23.00**	**Night Time, 23.00 – 07.00**
Neighbours, Lymington Road		
External Noise Target	≤37 dB(A)	≤29 dB(A)
Predicted External Noise	30 dB(A)	27 dB(A)
Future Occupiers, Flat Directly Over ASHP's & Plant Room		
On external balcony		
Target	≤55 dB(A)	N/A
Prediction	49 dB(A)	
Inside, Windows/Doors Closed		
Target	≤35 dB(A)	≤30 dB(A)
Prediction	22 dB(A)	18 dB(A)
Inside, Windows/Doors Open		
Target	≤40 dB(A)	≤35 dB(A)
Prediction	39 dB(A)	35 dB(A)

Table 1.1 – Target & Predicted Noise Levels at Key Locations

1.10 Overall, it is concluded that, with the recommended measures in place, noise emissions from the proposed plant will be compliant with the requirements of Conditions 38 and 42.

2. INTRODUCTION

2.1 On behalf of the applicant, Astir Living Ltd, a noise impact assessment of the proposed Air Source Heat Pump (ASHP) and supplementary boiler has been undertaken to discharge Condition 38 and ensure compliance with Condition 42, at 156 West End Lane, West Hampstead, London

.

2.2 The site is situated east of West End Lane and south of Lymington Road, and is north of the Thameslink, Overground and Jubilee Railways serving West Hampstead (Figure 1 – Site Location).

2.3 The approved scheme includes 180 residential units within two buildings (west and east buildings) with commercial floorspace on the ground and first floors of the west building.

2.4 Planning permission (2019/4140/P) was granted for the following:

> *"Variation of Conditions 2 (approved plans), 9 (wheelchair units), 33 (obscure glazing), 44 (cycling spaces) and 46 (unit numbers) of planning permission 2015/6455/P dated 23rd June 2017 for: Comprehensive redevelopment following demolition of all existing buildings to provide self-contained residential dwellings (Class C3), flexible non-residential use (Class A1-A3, D1, D2), employment floorspace (Class B1) and community meeting space (Class D1) in buildings ranging from 3 to 7 storeys. New vehicular access from West End Lane and provision of accessible car parking spaces. Provision of new public open space and widening of Potteries Path and associated cycle parking and landscaping".*

2.5 The residential and commercial areas of the building will be served by a variety of mechanical plant, and the Planning Consent has confirmed the requirement to control the noise emanating from this equipment:

> *38. CHP Noise Assessment*
>
> *Prior to the commencement of works on site, other than demolition site clearance and preparation, a noise impact assessment of the Combined Heat and Power plant o ne installed, including any necessary mitigation measures, shall be submitted to and approved by the Local Planning Authority. No occupation of the development shall be permitted until the mitigation measures recommended by the report have been implemented.*
>
> *Reason: To safeguard the amenities of the future occupiers in accordance with the requirements of Policies A1 (managing the impact of development) and A4 (Noise and vibration) of the London Borough of Camden Local Plan 2017.*

42. Noise Levels

Noise levels at a point 1m external to sensitive facades shall be at least 5 dB(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 façade shall be at least 10 dB(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 Policies A1 (managing the impact of development) and A4 (Noise and vibration) of the London Borough of Camden Local Plan 2017.

2.5 Whereas the approved schemes included the use of Combined Heat and Power (CHP) plant, the new London Plan (2021) now recognises that the carbon savings from gas engine CHP are declining as a result of national grid electricity decarbonising, and there is increasing evidence of adverse air quality impacts (paragraph 9.3.3). The applicant's energy and sustainability consultants have therefore been working on improvements to the approved Energy Strategy and now propose the use of more efficient Air Source Heat Pumps (ASHP) with a supplementary gas boiler to be located within the approved plant room of the lower ground floor in the east building.

2.6 Reflecting this change in approach, the objectives of the assessment may be summarised as follows:

(i) To determine the existing ambient noise climate in the vicinity of the development site.
(ii) To confirm the design limits for the proposed plant, both at existing neighbouring properties, and within the apartments of the new development.
(iii) To calculate likely noise levels based on the current design proposals, and to advise where acoustic amelioration is required.

2.7 This assessment details the investigations carried out in respect of each of these objectives and summarises the conclusions which have been reached.

3. SURVEY OF EXISTING NOISE LEVELS

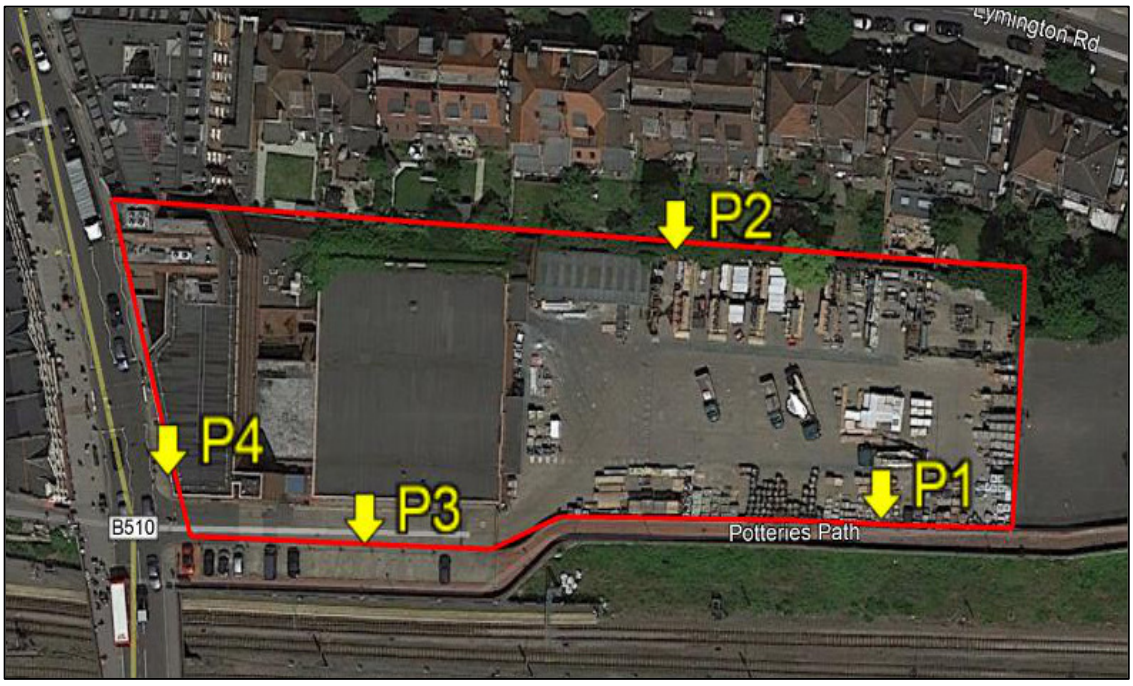
3.1 The first step in the assessment of potential impact is to measure and describe the existing ambient noise levels affecting the site.

3.2 A noise survey was undertaken from Monday 20th to Thursday 23rd July 2020.

3.3 Three Rion NL-52 Type 1 sound level meters were set up around the site,

- P1 – Along the southern boundary towards the eastern side of the site,
- P2 – Along the northern boundary near to the existing houses of Lymington Road,
- P3 – Along the southern boundary near to West End Lane.

In addition to the three locations stated, a short survey was conducted with the sound level meter set up in front of the existing building facing West End Lane (P4)



3.4 The microphones of the meters were attached to extendable light stands and set up as follows,

- P1 – Microphone height of 2.75m so it was above the existing brick wall,
- P2 – Microphone height of 2.4m,
- P3 – Microphone height of 3m so it was clearly above hoardings,
- P4 – Microphone height of 1.8m and 1m from existing façade.

3.5 The equipment was configured to measure 5minute samples of the following acoustic parameters:

LAeq The A-weighted equivalent continuous sound pressure level which, over the sample period, contains the same acoustic energy as the time-varying signal being recorded.

LAmax The A-weighted maximum sound pressure level recorded during each sample period (as measured on fast response).

LA90 A statistical parameter representing the A-Weighted noise level exceeded for 90% of each sample period. This is commonly used to describe the underlying background noise levels.

3.6 Weather conditions throughout the survey period are summarized in the following table.

Date	Average Temperature (°C)	Rainfall (mm)	Average Wind Speed m/sec	Wind Direction
Monday 20/07	19	0.0	1.8	Variable
Tuesday 21/07	19	0.0	2.0	NW
Wednesday 22/07	22	0.0	2.2	SW
Thursday 23/07	23	0.0	4.3	W

Table 3.1 - Summary of Weather Conditions

3.7 The equipment was calibrated before and after the survey and showed no significant variance.

3.8 Of particular interest to this assessment is the noise recorded on the north boundary of the site, Position P2, close to the residential neighbours on Lymington Road. The variation in noise at this position is shown in Figure 4.

3.9 Table 3.2 provides an analysis of the background noise level parameter, LA90:

Measure	Day Time, 07.00 -23.00	Night Time, 23.00 – 07.00
Mean	43	36
Modal	43	32
Median	42	36
90% Percentile	40	31
ASSESSED LEVEL	**42 dB(A)**	**34 dB(A)**

Table 3.2 – Background Noise Levels at Northern Residential Boundary

3.10 It is also noted that there are residential apartments over the shops on the west side of West End Lane, immediately to the west of the site.

3.11 An analysis of the data acquire from the long terms survey at position P3 (see Figure 4) confirms the following data:

Measure	Day Time, 07.00 -23.00	Night Time, 23.00 – 07.00
Mean	50	42
Modal	50	44
Median	50	42
90% Percentile	48	36
ASSESSED LEVEL	**50 dB(A)**	**41 dB(A)**

Table 3.2 – Background Noise Levels at Western Boundary

3.12 Section 5 of this report will discuss these noise levels, in respect of their suitability for residential building.

4. ASSESSMENT OF NOISE LEVELS

4.1 National Planning Policy Framework (July 2021)

4.1.1 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced.

4.1.2 Planning law requires that applications for planning permission be determined in accordance with the development plan, unless material considerations indicate otherwise. The National Planning Policy Framework must be considered in preparing the development plan and is a material consideration in planning decisions. Planning policies and decisions must also reflect relevant international obligations and statutory requirements.

4.1.3 The purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs.

4.1.4 Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives):

a) an economic objective – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure.

b) a social objective – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and

c) an environmental objective – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

4.1.5 These objectives should be delivered through the preparation and implementation of plans and the application of the policies in this Framework; they are not criteria against which every decision can or should be judged. Planning policies and decisions should play an active role in guiding development towards sustainable solutions, but in doing so should take local circumstances into account, to reflect the character, needs and opportunities of each area.

4.1.6 So that sustainable development is pursued in a positive way, at the heart of the Framework is a presumption in favour of sustainable development

4.1.7 Paragraph 185 of the NPPF states:

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 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[1] ;

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; and

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes, and nature conservation.

4.1.8 The Framework continues:

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.

188. The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.

[1] Refers here to the NPSE, discussed in Section 4.2 of this report.

4.2 National Policy Statement for England (March 2010)

4.2.1 The document "Noise Policy Statement for England" sets out the following vision for on-going noise policy:

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

4.2.2 This vision should be achieved through the following Noise Policy Aims:

> "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".

4.2.3 To achieve these objectives the Noise Policy Statement sets out three noise levels to be defined by the assessor:

- 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. Where levels lie between the LOAEL and SOAEL, the Statement 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, as set out in the NPPF.

- SOAEL - Significant Observed Adverse Effect Level
  This is the level above which significant adverse effects on health and quality of life occur. It notes, however, that "it is not possible to have a single objective noise-based measure that describes SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times".

4.2.4 Paragraph 2.7 states that "… the application of the NPSE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a policy, development or other activity may not have been given adequate weight when assessing the noise implications".

4.2.5 This provides clear guidance that noise must not be considered in isolation but as part of the overall scheme, taking into account the overall sustainability and associated impacts of the proposed development; there is no benefit in reducing noise to an excessively low level if this creates or increases some other adverse impact. Similarly, it may be appropriate in some cases for noise to have an adverse impact if this is outweighed by the reduction or removal of some other adverse impact that is of greater significance to the development.

4.2.6 The Noise Policy Statement considers that noise levels above the SOAEL would be seen to have, by definition, significant adverse effects and would be considered unacceptable. Where the assessed noise levels fall between the LOAEL and the SOAEL noise levels, the Policy Statement requires that:

> "all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development.... This does not mean that such adverse effects cannot occur."

4.2.7 Where noise levels are below the LOAEL it is considered there will be no adverse effect. Once noise levels are below the NOEL there will be no observable change. An indication of the numerical definition of LOAEL may be derived from the following guidance.

4.3 Planning Practice Guide 'Noise' (July 2019)

4.3.1 The Ministry of Housing Communities and Local Government provided further guidance to support the NPPF. The section, Noise, published in July 2019, provides the following advice:

When is noise relevant to planning?

> Noise needs to be considered when development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced). When preparing plans, or taking decisions about new development, there may also be opportunities to make improvements to the acoustic environment. Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.

What are the observed effect levels?

- Significant observed adverse effect level: This is the level of noise exposure above which significant adverse effects on health and quality of life occur.
- Lowest observed adverse effect level: this is the level of noise exposure above which adverse effects on health and quality of life can be detected.
- No observed effect level: this is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Although the word 'level' is used here, this does not mean that the effects can only be defined in terms of a single value of noise exposure. In some circumstances adverse

effects are defined in terms of a combination of more than one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of day the noise occurs.

How can it be established whether noise is likely to be a concern?

At the lowest extreme, when noise is not perceived to be present, there is by definition no effect. As the noise exposure increases, it will cross the 'no observed effect' level. However, the noise has no adverse effect so long as the exposure does not cause any change in behaviour, attitude or other physiological responses of those affected by it. The noise may slightly affect the acoustic character of an area but not to the extent there is a change in quality of life. If the noise exposure is at this level no specific measures are required to manage the acoustic environment.

As the exposure increases further, it crosses the 'lowest observed adverse effect' level boundary above which the noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise).

Increasing noise exposure will at some point cause the 'significant observed adverse effect' level boundary to be crossed. Above this level the noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is predicted to be above this level the planning process should be used to avoid this effect occurring, for example through the choice of sites at the plan-making stage, or by use of appropriate mitigation such as by altering the design and layout. While such decisions must be made taking account of the economic and social benefit of the activity causing or affected by the noise, it is undesirable for such exposure to be caused.

At the highest extreme, noise exposure would cause extensive and sustained adverse changes in behaviour and / or health without an ability to mitigate the effect of the noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be avoided.

4.3.2 The table below summarises the noise exposure hierarchy, based on the likely average response:

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, 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. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

Table 4.1 – Noise Exposure Hierarchy

4.3.3 The guidance further advises:

What factors influence whether noise could be a concern?

The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation.

These factors include:

- the source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day – this is because people tend to be more sensitive to noise at night as they are trying to sleep. The adverse effect can also be greater simply because there is less background noise at night.
- for a new noise making source, how the noise from it relates to the existing sound environment.
- for non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise.
- the spectral content of the noise (i.e. whether or not the noise contains particular high or low frequency content) and the general character of the noise (i.e. whether or not the noise contains particular tonal characteristics or other particular features), and.
- the local arrangement of buildings, surfaces and green infrastructure, and the extent to which it reflects or absorbs noise.

More specific factors to consider when relevant include:

- the cumulative impacts of more than one source of noise.
- whether any adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time (and the effect this may have on living conditions). In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations;
- In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise level may result in a significant adverse effect occurring even though little to no change in behaviour would be likely to occur.
- Noise Action Plans (where these exist), and, in particular the Important Areas identified through the process associated with the Environmental Noise Directive and corresponding regulations should be taken into account. Defra's website has information on Noise Action Plans and Important Areas. Local authority environmental health departments will also be able to provide information about Important Areas.
- the effect of noise on wildlife. Noise can adversely affect wildlife and ecosystems. Particular consideration needs to be given to the potential

effects of noisy development on international, national and locally designated sites of importance for biodiversity.

- where external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.
- some commercial developments including restaurants, hot food takeaways, night clubs and public houses can have particular impacts, not least because activities are often at their peak in the evening and late at night. Local planning authorities will wish to bear in mind not only the noise that is generated within the premises but also the noise that may be made by customers in the vicinity.

When proposed developments could include activities that would be covered by the licensing regime, local planning authorities will need to consider whether the potential for adverse noise impacts will be addressed through licensing controls (including licence conditions). Local planning authorities should not however presume that licence conditions will provide for noise management in all instances and should liaise with the licensing authority.

Are there further considerations relating to mitigating the impact of noise on residential developments?

Noise impacts may be partially offset if residents have access to one or more of:

- a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling.
- a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced if this area is exposed to noise levels that result in significant adverse effects.
- a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or
- a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5-minute walking distance).

4.4 Local Authority Policy

4.4.1 Camden council's Local Plan (adopted 2017) includes two policies which are relevant to the development:

Policy A1 Managing the impact of development

The Council will seek to protect the quality of life of occupiers and neighbours. We will grant permission for development unless this causes unacceptable harm to amenity.

We will:

a. seek to ensure that the amenity of communities, occupiers and neighbours is protected;

b. seek to ensure development contributes towards strong and successful communities by balancing the needs of development with the needs and characteristics of local areas and communities;

c. resist development that fails to adequately assess and address transport impacts affecting communities, occupiers, neighbours and the existing transport network; and

d. require mitigation measures where necessary.

The factors we will consider include:

e. visual privacy, outlook;

f. sunlight, daylight and overshadowing;

g. artificial lighting levels;

h. transport impacts, including the use of Transport Assessments, Travel Plans and Delivery and Servicing Management Plans;

i. impacts of the construction phase, including the use of Construction Management Plans;

j. noise and vibration levels;

k. odour, fumes and dust;

l. microclimate;

m. contaminated land; and

n. impact upon water and wastewater infrastructure.

Policy A4 Noise and vibration

The Council will seek to ensure that noise and vibration is controlled and managed. Development should have regard to Camden's Noise and Vibration Thresholds (Appendix 3).

We will not grant planning permission for:

a. development likely to generate unacceptable noise and vibration impacts; or

b. development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.

We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity. We will also seek to

minimise the impact on local amenity from deliveries and from the demolition and construction phases of development.

4.4.2 Appendix 3 of the Local Plan describes various noise thresholds to which developments should be design. The limits applicable to this assessment as repeated below:

Local Plan Appendix 3 - Industrial and Commercial Noise Sources
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 Camden Local Plan 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
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.

4.4.3 It is noted that the criteria here are more onerous than those written into the Planning Condition 42, and it is the latter which will be adopted in this report to discharge the condition.

4.5 BS4142:2014 - 'Method for Rating and Assessing Industrial and Commercial Sound'

4.5.1 Any formal assessment of commercial noise affecting residential properties would in all likelihood be based upon the recommendations of British Standard 4142:2014 "Methods for rating and assessing industrial and commercial sound".

4.5.2 In brief, this rating method determines "specific sound level" generated by the new plant, assessed immediately outside the residential properties most likely to be affected. For daytime (07.00 – 23.00hrs) only operation of the new plant, this would be the equivalent continuous noise level of the new noise, evaluated over a 1hr sampling period, its $L_{Aeq,1hr}$. For plant operating during the night-time (23.00 – 07.00hrs) only the reference time interval is 15mins.

4.5.3 Corrections of up to + 9 dB (A) are then made to this “specific sound level” if the new noise has certain acoustic features such as tonality, impulsivity, intermittency and any other sound characteristics, to give the "rating level".

4.5.4 An assessment of the impact of the specific sound level can be determined by subtracting the measured background level from the rating level, and consider the following:

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: 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.*BS4142

4.6 BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

4.6.1 There is much guidance on the levels of intrusive noise which would be considered acceptable within residential accommodation such as this. Typical advice is found in British Standard 8233:2014 "Guidance on Sound Insulation and Noise Reduction for buildings". Following similar guidance in the 1999 World Health Organisation report "Guidelines for Community Noise", the Standard sets out the following limits for indoor ambient noise levels within living rooms and bedrooms of residential accommodation. This suggests:

Activity	Location	0700 - 2300	2300 - 0700
Resting	Living Room	35 dB(A) $L_{Aeq, 16\ hr}$	-
Dining	Dining room/Area	40 dB(A) $L_{Aeq, 16\ hr}$	-
Sleeping	Bedroom	35 dB(A) $L_{Aeq, 16\ hr}$	30 dB(A) $L_{Aeq, 8\ hr}$

Table 4.2 - BS8233 Indoor Guideline Values

4.6.2 It is usually considered that an open window will provide a reduction of some 10-15 dB(A)[2]. Therefore the 'good' internal standards quoted above would broadly equate to the following targets immediately outside the buildings:

Activity	Location	0700 - 2300	2300 - 0700
Resting	Living Room	48 dB(A) $L_{Aeq, 16\ hr}$	-
Dining	Dining room/Area	53 dB(A) $L_{Aeq, 16\ hr}$	-
Sleeping	Bedroom	48 dB(A) $L_{Aeq, 16\ hr}$	43 dB(A) $L_{Aeq, 8\ hr}$

Table 4.3 - BS8233 Derived Facade Guideline Values

4.6.3 BS8233 recognises that, where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB, and reasonable conditions will be achieved.

4.6.4 It should be noted that the levels quoted in BS8233 are intended to reflect the acceptability of steady, continuous noise. Sources of intermittent and tonal noise may generate greater annoyance for a similar overall magnitude. Whilst BS8233 does not explicitly state a correction for those circumstances, it may be appropriate to consider that the Good and Reasonable standards would be achieved with levels which are perhaps 5 dB lower than stated in the table above.

4.6.5 It is also noted that BS8233 was written from a view of designing new buildings to protect occupants from existing noise sources. This does necessarily infer, however, that the acceptability of an occupant to an absolute level noise within a building will be different if the introduction of the noise source post-dates the construction of the building.

[2] Reference PPG24 Planning & Noise, which adopted a mid-range value of 13 dB(A)

4.7 World Health Organisation Guidelines

4.7.1 Further advice is provided in the 1999 WHO report "Guidelines for Community Noise".

4.7.2 This indicates that the steady noise level in external amenity areas, such as gardens or outdoor living areas should not exceed 55 dB(A) $L_{Aeq,\ t}$, and should preferably be designed below 50 dB(A) $L_{Aeq,\ t}$.

4.7.3 The document also provides guidance on the impact of peak noise levels on sleeping conditions. This suggests that levels above 45 dB(A) L_{Amax} inside a bedroom would be disturbing to sleep. With windows open, this would equate to a level of approximately 58 dB(A) L_{Amax} externally.

4.8 IOA/ANC Acoustics Ventilation and Overheating – Residential Design Guide

4.8.1 The Institute of Acoustic and Association of Noise Consultants have published the 'Acoustics Ventilation and Overheating – Residential Design Guide' (January 2021) to promote best practice in the design of residential buildings to control overheating in areas of high ambient noise.

4.8.2 When providing design targets inside the dwellings, the AVOG document advises that the internal noise standard of BS8233:2014 (as copied here in Table 5.1) should be achieved when providing adequate ventilation as defined in ADF. However, the document continues to propose that it is considered reasonable to allow higher levels of internal ambient noise from transport sources when higher rates of ventilation are required in relation to the overheating condition.

4.8.3 This proposition is based on the fact that overheating will occur for only part of the time, during which there may be a trade-off between acoustic and thermal conditions, given that residents would have some control over their environment (a principle well established in the field of thermal comfort).

4.8.4 The guide indicates that the sound level difference across a façade, with standard opening windows, would be 13 dB(A), but that this figure may be greater if windows are shielded by balconies.

4.8.5 BS8233:2014 states that, if internal noise levels are no more than 5 dB greater than the levels shown here in Table 4.2, this would be a 'reasonable' standard. Therefore, if external noise levels do not exceed the following values when windows are open, conditions should be considered wholly acceptable, and therefore the threshold between No and Low Observed Adverse Effect Levels:

Location	0700 - 2300	2300 - 0700
Living Room	53 dB(A) LAeq, 16 hr	-
Bedrooms	53 dB(A) LAeq, 16 hr	48 dB(A) LAeq, 8 hr

Table 4.4 – Proposed LOAEL Façade Noise Levels with Windows Open

4.8.6 To consider the upper limit, beyond which internal conditions should not be deemed acceptable, reference is made to issue of speech interference. With reference to the numerical values in BS8233 (see Table 4.6 above), the AVOG document adopts an internal daytime limit of 50 dB(A), which would then equate to an external limit of 63 dB(A) when windows are open.

4.8.7 At night, reference is made to the WHO Night Noise Guidelines, which developed the original WHO Guidelines for Community Noise report. This states that if external noise levels exceed 55 dB(A) L_{Aeq}, 'adverse health effects occur frequency and a sizeable proportion of the population is highly annoyed, and sleep disturbed'.

4.8.8 The table below therefore may be taken to represent the threshold for SOAEL:

Location	0700 - 2300	2300 - 0700
Living Room	63 dB(A) LAeq, 16 hr	-
Bedrooms	63 dB(A) LAeq, 16 hr	55 dB(A) LAeq, 8 hr

Table 4.5 – Proposed SOAEL Threshold Façade Noise Levels with Windows Open

5. DESIGN TARGETS

5.1 With reference to the measured environmental noise levels described in Section 3, and the detailed requirements of Planning Conditions 42, it is recommended that all mechanical plant which might affect existing neighbouring buildings is designed to the following limits:

Location	Day Time, $L_{Aeq, 07.00 -23.00}$	Night Time, $L_{Aeq, 23.00 – 07.00}$
Lymington Road	37 dB(A)	29 dB(A)
West End Lane	45 dB(A)	36 dB(A)

Table 5.1 – Design Targets for Neighbouring Noise Sensitive Buildings[3]

5.2 When considering the protection of occupiers of the new buildings, reference is made to the guidelines of British Standard 8233 (Section 4.6), the World Health Organisation (Section 4.7) and the IAO/ANC guidance of acoustics, ventilation and overheating (Section 4.8).

5.3 It is proposed that amenity will be safeguarded if the following limits are achieved:

Location / Condition	Day Time, $L_{Aeq, 07.00 -23.00}$	Night Time, $L_{Aeq, 23.00 – 07.00}$
On external balcony	≤55 dB(A)	N/A
Inside, Windows Closed	≤35 dB(A)	≤30 dB(A)
Inside, Windows Open	≤40 dB(A)	≤35 dB(A)

[3] If noise is of a particular character, targets should be lowered by 5 dB.

6. PROPOSED PLANT

6.1 The assessment of plant here is limited to the main residential plant room, on the lower ground floor of the East Building (see Figure 5). This is approximately 15m from neighbouring residential properties to the north, and immediately below a ground floor apartment at the west end of the East Block.

6.2 The main plant room will feature the following building services plant:

(i) 5 No. ASHPs, Mitsubishi CAHV-P500YB-HPB, immediately external – 59 dB(A) @1m
(ii) 1 No. Hoval Ultragas 600D boiler
(iii) Circulation pumps
LTHW Grundfos TPED 80-400/2
Boiler Heating, Grundfos Magna1 65-150F
ASHPs, Grundfos Magna3 80-120F

6.3 It is noted that the ASHP's will be fitted with an acoustically lined bend and exhaust attenuator above each fan. The acoustic performance of the attenuators has been confirmed by Allaway Acoustics as follows:

Frequency	Hz	63	125	250	500	1000	2000	4000	8000
Allaway Attenuators	dB	12	20	30	40	47	40	33	22

Table 6.1 – ASHP Attenuator Performance

6.4 It is also noted that the ASHPs will be programmed to operated on a reduced capacity 'night mode' setting overnight, thereby reducing maximum emissions by some 5 dB(A).

7. PREDICTED NOISE LEVELS & ASSESSMENT

7.1 Residential Neighbours on Lymington Road

7.1.1 Appendix 1 provides calculations of noise from the plant room, in the direction of the houses to the north of the site[4].

7.1.2 Table 7.1 summarises the predictions, alongside the target levels:

Location of Noise Sensitive Properties	Day Time, 07.00 -23.00	Night Time, 23.00 – 07.00
Lymington Road		
Target	≤37 dB(A)	≤29 dB(A)
Prediction	30 dB(A)	27 dB(A)

Table 7.1 – Assessment of Predicted Noise at Neighbouring Properties

7.1.3 It is confirmed that noise is not expected to be noticeably tonal, intermittent or impulsive.

7.1.4 On that basis, it can be concluded that the scheme currently proposed will be meet the test of Condition 42.

[4] Whilst there are residential properties to the west of the site, on the opposite of West End Lane, the potential impact of the residential plant room there is insignificant compared to potential impact at properties on Lymington Road – due to both extra distance and the screening of the West Block.

7.2 Occupiers of Apartment Directly Over Plant Room

7.2.1 Appendix 2 provides calculations of noise from the plant room to the apartment directly above the lower ground plant room. Consideration is given to the two bedrooms on the north elevation of the building – one having a glazed door leading onto an open balcony and one having standard double-glazed windows.

7.2.2 The table below confirms the predicted noise levels:

Location / Condition	**Day Time, $L_{Aeq,\ 07.00\ -23.00}$**	**Night Time, $L_{Aeq,\ 23.00\ –\ 07.00}$**
On external balcony		
Target	≤55 dB(A)	N/A
Prediction	49 dB(A)	-
Inside, Windows/Doors Closed		
Target	≤35 dB(A)	≤30 dB(A)
Prediction	22 dB(A)	18 dB(A)
Inside, Windows/Doors Open		
Target	≤40 dB(A)	≤35 dB(A)
Prediction	39 dB(A)	35 dB(A)

Table 7.2 – Assessment of Predicted Noise at Adjacent Apartment

7.2.3 The predicted conditions inside the apartment are significantly lower than the threshold limits when the windows are closed.

7.2.4 If the windows are open, the situation remains compliant, though somewhat closer to the design limits. It is noted that all apartments are served by a Mechanical Heat Recovery Unit. These provide fresh air to the habitable rooms, and extract exhaust air from the wet rooms (whilst capturing otherwise wasted energy in the process). The system operates most efficiently when the windows are closed, and therefore reduces the reliance on open windows or grills for ventilation. The MVHR units will therefore provide effective mitigation of any adverse impact which would otherwise occur if the windows were open.

7.2.5 It is therefore concluded that the design will safeguard the amenity of future occupiers, in accordance with the requirements of Condition 39

FIGURE 1 - SITE LOCATION

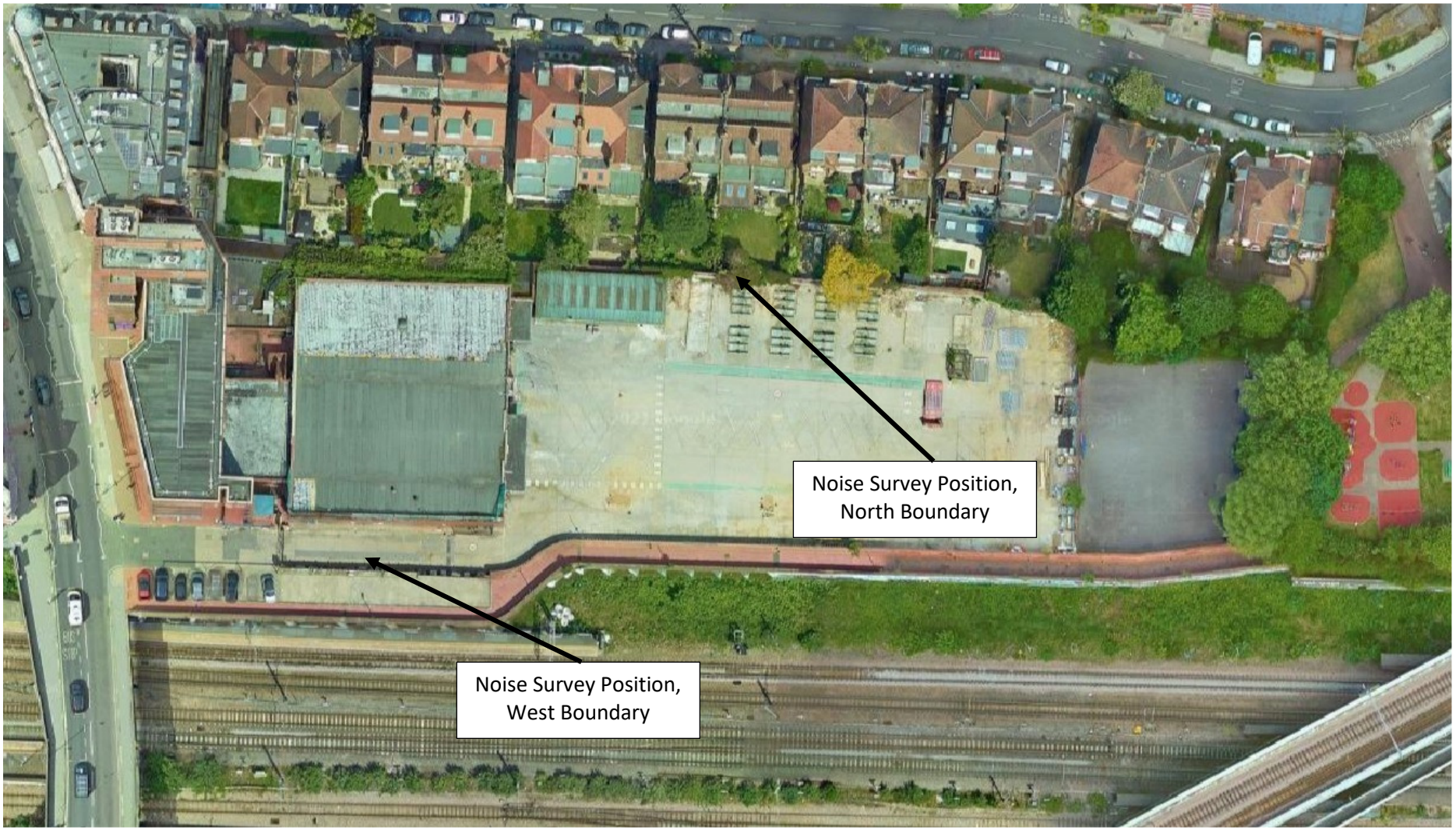


FIGURE 2 - SITE LAYOUT PLAN

FIGURE 3 - VARIATION OF AMBIENT NOISE, NORTH BOUNDARY

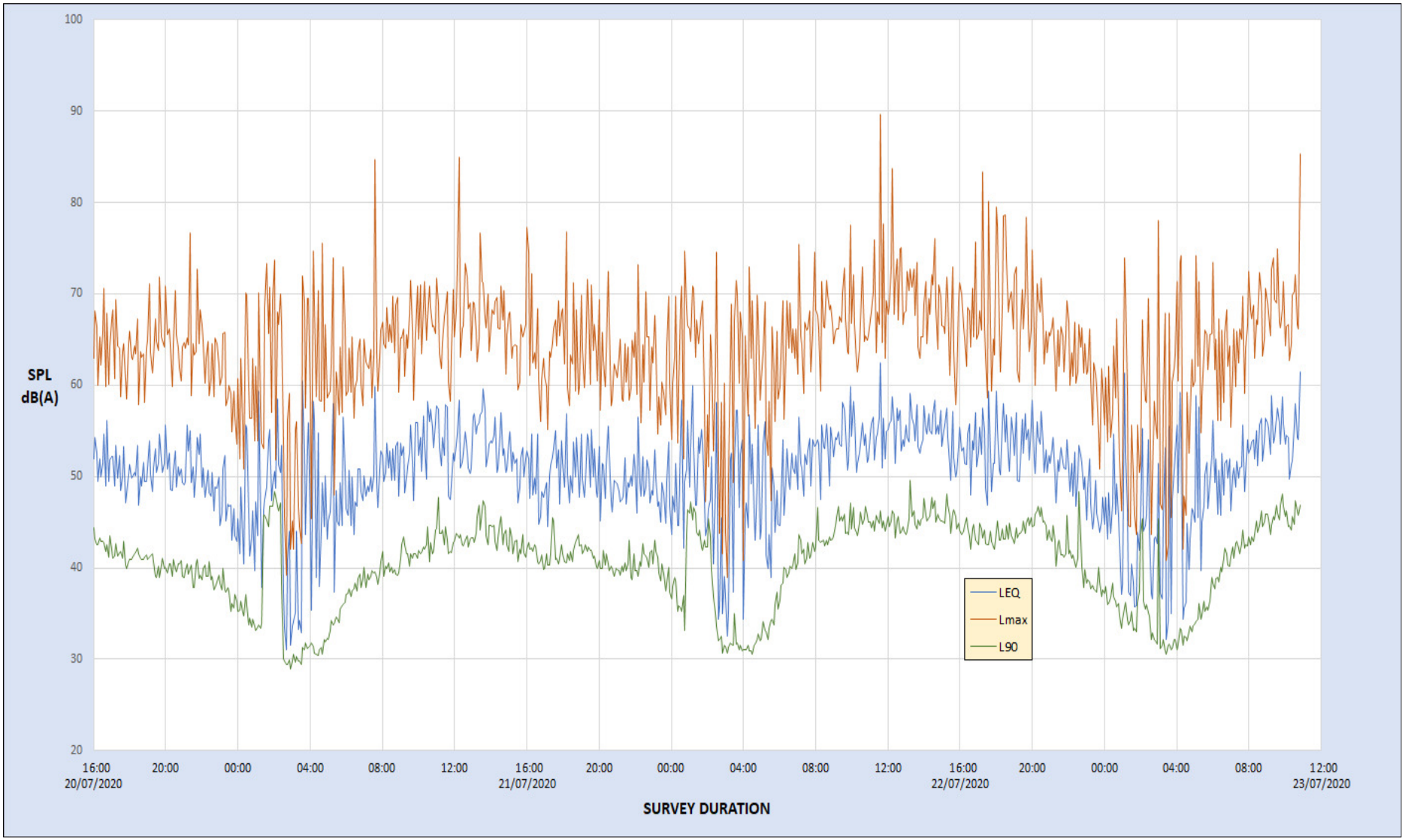


FIGURE 4 - VARIATION OF AMBIENT NOISE, WEST BOUNDARY

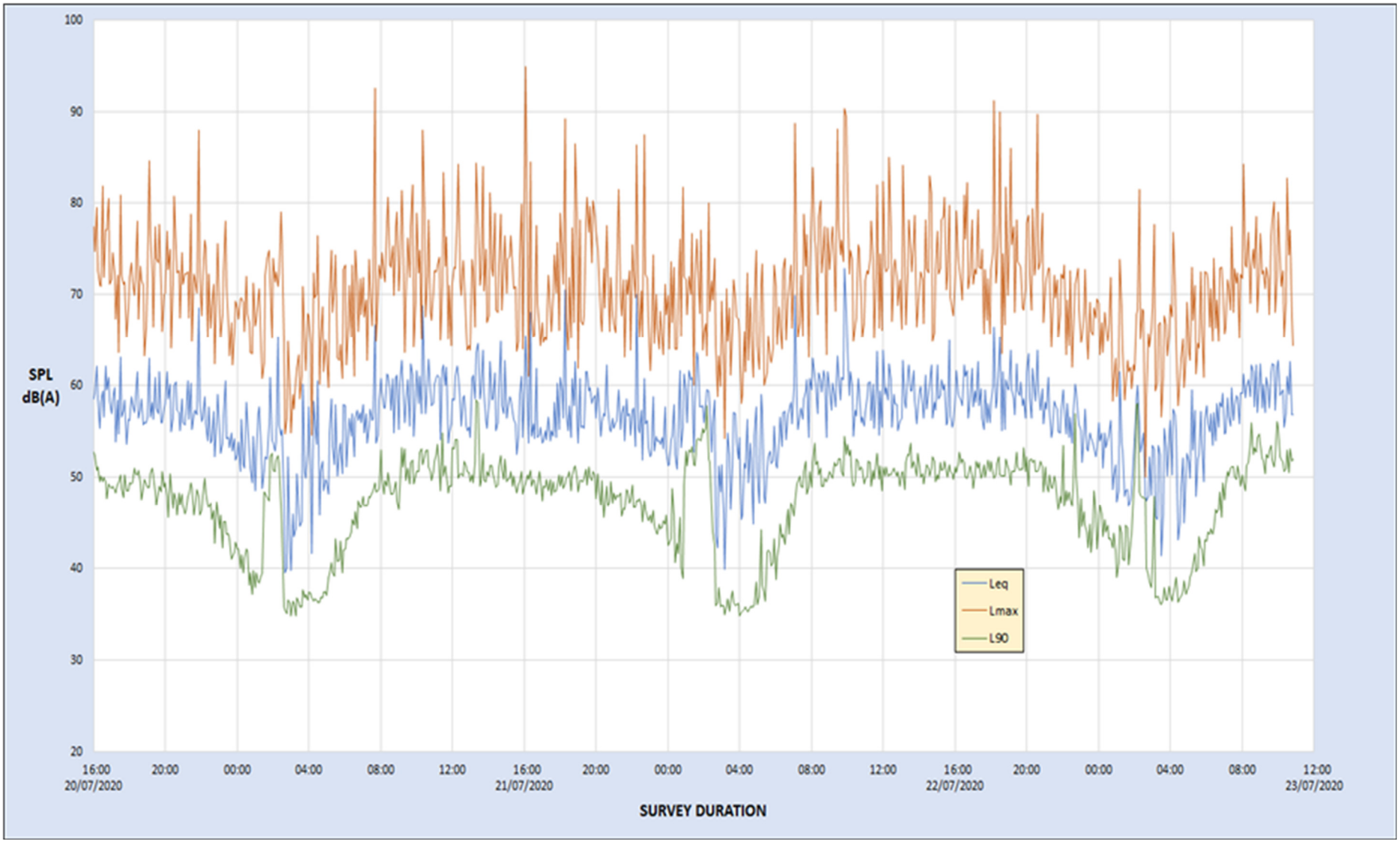
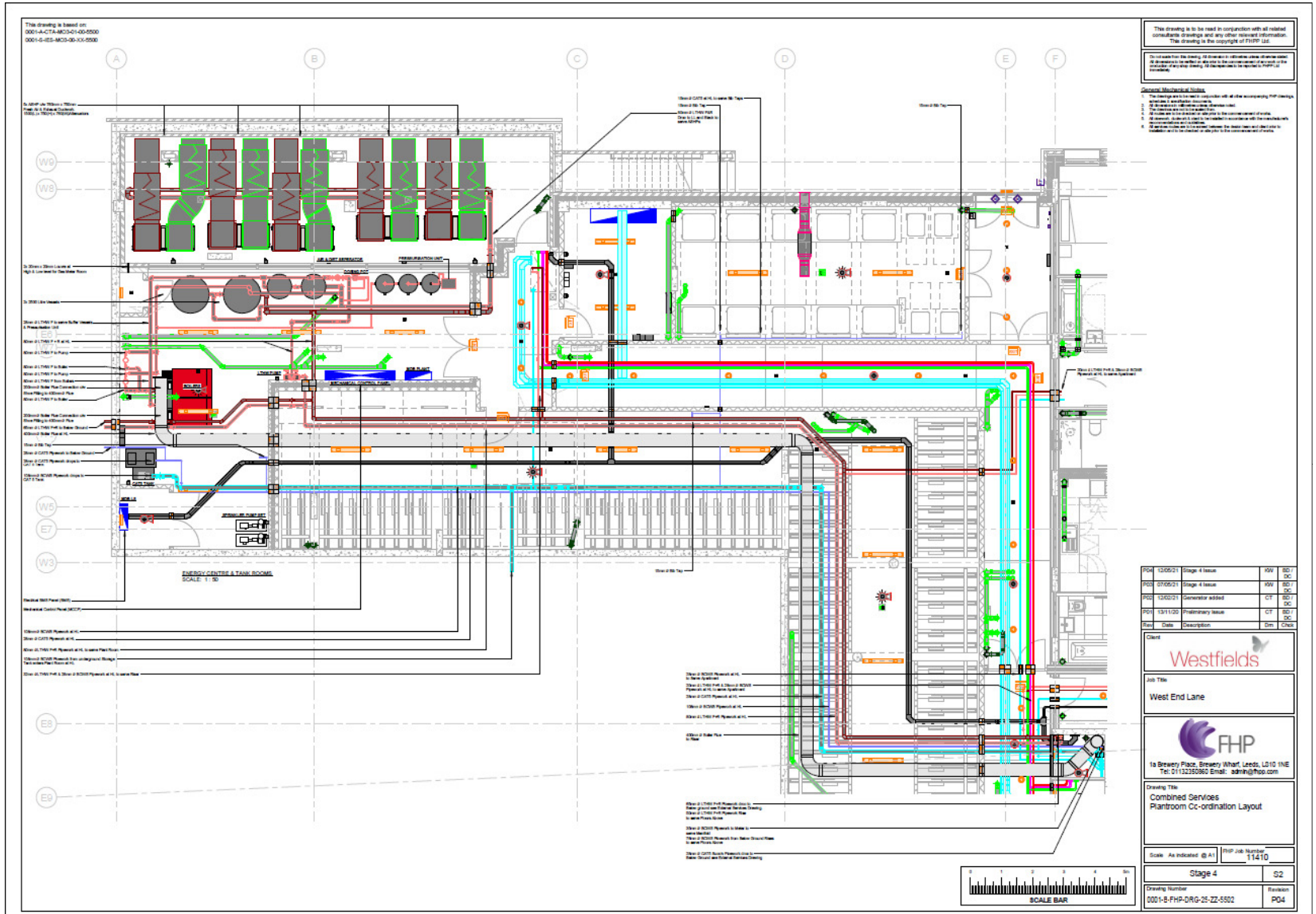


FIGURE 5 - EAST BUILDING PLANT ROOM



APPENDIX 1 – PLANT NOISE CALCULATIONS

Calculation to Houses of Lymington Road:

Frequency	Hz	63	125	250	500	1000	2000	4000	8000	dB(A)
East Building Plant Room										
ASHP Exhaust Noise										
Mutsibushi CAHV-P500YB-HPB, SPL @1m	**dB**	70	65	60	57	52	46	48	45	**59**
Sound Power Level	dB	86	81	76	73	68	62	64	61	**75**
Allaway Attenuator	dB	12	20	30	40	47	40	33	22	
Lined Bend	dB	5	5	5	5	5	5	5	5	
Net SWL	dB	69	56	41	28	16	17	26	34	**45**
5 No. Units	dB	7	7	7	7	7	7	7	7	
Directivity	dB	-8	-8	-8	-8	-8	-8	-8	-8	
Distance to houses, 15m	dB	-24	-24	-24	-24	-24	-24	-24	-24	
Site Boundary Barrier Loss	dB	-5	-5	-5	-5	-5	-5	-5	-5	
Façade Correction	dB	3	3	3	3	3	3	3	3	
Net SPL	dB	42	29	14	1	-11	-10	-1	7	**18**
ASHP Inlet Noise										
Mutsibushi CAHV-P500YB-HPB, SPL @1m	**dB**	70	65	60	57	52	46	48	45	**59**
Sound Power Level	dB	86	81	76	73	68	62	64	61	**75**
Loss through inlet coils	dB	-10	-10	-10	-10	-10	-10	-10	-10	
Net SWL	dB	76	71	66	63	58	52	54	51	**65**
5 No. Units	dB	7	7	7	7	7	7	7	7	
Directivity	dB	-8	-8	-8	-8	-8	-8	-8	-8	
Distance to houses, 15m	dB	-24	-24	-24	-24	-24	-24	-24	-24	
Site Boundary Barrier Loss	dB	-8	-10	-12	-15	-17	-20	-23	-26	
Façade Correction	dB	3	3	3	3	3	3	3	3	
Net SPL	dB	46	39	32	26	19	10	9	3	**29**
Plant Room Noise										
Sound Power Levels										
Hoval 600D boiler, SWL	dB	75	73	70	66	66	64	64	51	**72**
Gundfos TPED 80-400/2, 60 dB(A) @1m	dB	68	67	65	62	62	60	60	58	**68**
Grundfos Magna1 65-150F, 55 dB(A) @1m	dB	63	62	60	57	57	55	55	53	**63**
Grundfos Magna3 80-120F, 55 dB(A)@1m	dB	63	62	60	57	57	55	55	53	**63**
Total Sound Power Level in Room	**dB**	**76**	**74**	**72**	**68**	**68**	**66**	**66**	**61**	**74**
Room Correction	dB	-9	-9	-9	-9	-9	-9	-9	-9	
SPL In plant room	**dB**	**67**	**65**	**63**	**59**	**59**	**57**	**57**	**52**	**65**
SRI Vent Louvres	dB	-3	-3	-3	-3	-3	-3	-3	-3	
Area, 20m2	dB	13	13	13	13	13	13	13	13	
Inside to outside Correction	dB	-6	-6	-6	-6	-6	-6	-6	-6	
Directivity	dB	-8	-8	-8	-8	-8	-8	-8	-8	
Distance to houses, 15m	dB	-24	-24	-24	-24	-24	-24	-24	-24	
Site Boundary Barrier Loss	dB	-8	-10	-12	-15	-17	-20	-23	-26	
Façade Correction	dB	3	3	3	3	3	3	3	3	
Net SPL	dB	34	31	26	20	17	12	9	0	**23**
Combined SPL at Houses from Plant Room	**dB**	**48**	**40**	**33**	**27**	**21**	**14**	**12**	**9**	**30**
Night Time Predictions										
Combined SPL at Houses from Plant Room	dB	**43**	**36**	**29**	**24**	**18**	**13**	**10**	**5**	**27**

APPENDIX 2 – PLANT NOISE CALCULATIONS

Calculation to Apartment above Plant Room:

Frequency	Hz	63	125	250	500	1000	2000	4000	8000	dB(A)
East Building Plant Room										
ASHP Exhaust Noise										
Mutsibushi CAHV-P500YB-HPB, SPL @1m	**dB**	70	65	60	57	52	46	48	45	**59**
Sound Power Level	dB	86	81	76	73	68	62	64	61	**75**
Allaway Attenuator	dB	12	20	30	40	47	40	33	22	
Lined Bend	dB	5	5	5	5	5	5	5	5	
Net SWL	dB	69	56	41	28	16	17	26	34	**45**
5 No. Units	dB	7	7	7	7	7	7	7	7	
Directivity	dB	-11	-11	-11	-11	-11	-11	-11	-11	
Distance to window, 1m	dB	0	0	0	0	0	0	0	0	
Directivity @180o	dB	-3	-5	-7	-10	-10	-10	-10	-10	
Façade Correction	dB	3	3	3	3	3	3	3	3	
Net SPL	dB	64	49	32	16	4	5	14	22	**40**
ASHP Inlet Noise										
Mutsibushi CAHV-P500YB-HPB, SPL @1m	**dB**	70	65	60	57	52	46	48	45	**59**
Sound Power Level	dB	86	81	76	73	68	62	64	61	**75**
Loss through inlet coils	dB	-10	-10	-10	-10	-10	-10	-10	-10	
Net SWL	dB	76	71	66	63	58	52	54	51	**65**
5 No. Units	dB	7	7	7	7	7	7	7	7	
Directivity	dB	-8	-8	-8	-8	-8	-8	-8	-8	
Distance to houses, 2m	dB	-6	-6	-6	-6	-6	-6	-6	-6	
Screening of Balcony	dB	-10	-10	-10	-10	-10	-10	-10	-10	
Façade Correction	dB	3	3	3	3	3	3	3	3	
Net SPL	dB	61	56	51	48	43	37	39	36	**50**
Plant Room Noise										
Sound Power Levels										
Hoval 600D boiler, SWL	dB	75	73	70	66	66	64	64	51	**72**
Gundfos TPED 80-400/2, 60 dB(A) @1m	dB	68	67	65	62	62	60	60	58	**68**
Grundfos Magna1 65-150F, 55 dB(A) @1m	dB	63	62	60	57	57	55	55	53	**63**
Grundfos Magna3 80-120F, 55 dB(A)@1m	dB	63	62	60	57	57	55	55	53	**63**
Total Sound Power Level in Room	**dB**	**76**	**74**	**72**	**68**	**68**	**66**	**66**	**61**	**74**
Room Correction	dB	-9	-9	-9	-9	-9	-9	-9	-9	
SPL In plant room	**dB**	**67**	**65**	**63**	**59**	**59**	**57**	**57**	**52**	**65**
SRI Vent Louvres	dB	-3	-3	-3	-3	-3	-3	-3	-3	
Area, 20m2	dB	13	13	13	13	13	13	13	13	
Inside to outside Correction	dB	-6	-6	-6	-6	-6	-6	-6	-6	
Directivity	dB	-8	-8	-8	-8	-8	-8	-8	-8	
Distance to houses, 2m	dB	-10	-10	-10	-10	-10	-10	-10	-10	
Screening of Balcony	dB	-10	-10	-10	-10	-10	-10	-10	-10	
Façade Correction	dB	3	3	3	3	3	3	3	3	
Net SPL	dB	46	44	42	38	38	36	36	31	**44**
Combined SPL at Houses from Plant Room	**dB**	**66**	**57**	**52**	**49**	**45**	**40**	**41**	**38**	**52**
Night Time Predictions										
Combined SPL at Houses from Plant Room	dB	**61**	**53**	**48**	**45**	**41**	**38**	**38**	**34**	**48**
Calculations from Outside to Inside Apartment										
SRI 30 dB Rw Doorset or 4/16/4 Double Glazing	dB	15	18	23	27	30	31	34	40	
Area of Doors	dB	3	3	3	3	3	3	3	3	
Room Absorption	dB	-10	-10	-10	-10	-10	-10	-10	-10	
Net SPL door closed, day	**dB**	**44**	**33**	**22**	**15**	**8**	**2**	**0**	**-9**	**22**
Net SPL door closed, night	**dB**	**40**	**28**	**18**	**11**	**4**	**0**	**-2**	**-13**	**18**

APPENDIX 3 - TERMINOLOGY RELATING TO NOISE

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level	The sound level is the sound pressure relative to a standard reference pressure of 20µPa (20x10-6 Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20µPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
Leq,T	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
Lmax,T	A noise level index defined as the maximum noise level during the period T. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L90,T	A noise level index. The noise level exceeded for 90% of the time over the period T. L90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m.
Façade Noise Level	At a distance of 1m in front of a large sound reflecting object such as a façade.
Fast/Slow Time Weighting	Averaging times used in sound level meters.
Octave Band	Range of frequencies whose upper limit is twice the lower limit.
DnT,w	The single number quantity that characterises airborne sound insulation between rooms over a range of frequencies.
Rw	Single number quantity that characterises the airborne sound insulating properties of a material or building element over a range of frequencies.