Hawkins environmental

Acoustic Impact Assessment:

112a Great Russell Street

Central London Investments Limited

12th May 2020

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Table of Contents

List of Appendices

List of Tables

List of Figures

1. INTRODUCTION

1.1. Overview

In 2015, Hawkins Environmental were commissioned to carry out a noise assessment for the proposed redevelopment of 112a Great Russell Street, situated in the Bloomsbury District of the London Borough of Camden.

The development consisted of *"Change of use of part ground floor and basement levels -4 and -5 from Car Park (sui generis) to 166 bedroom hotel (Class C1), including alterations to openings, walls and fascia on ground floor elevations on Great Russell Street and Adeline Place"* (application ref 2015/3605/P). The development was eventually allowed at appeal (ref: APP/X5210/W/16/3147078).

Noise was one of the issues that was considered at the appeal. The London Borough of Camden raised concern as to whether noise from the proposed mechanical plant would have an impact on surrounding residential properties. In addition, concern was raised by the Planning Officers that there could be a *"potential adverse impact on neighbour's in terms of noise and general disturbance as a consequence of the hotel operation. In particular we have concerns about the increased level of activity on this quiet street frontage for example people congregating or smoking".* As a consequent of the planning appeal, it was decided that noise had been adequately addressed and noise should not be a constraint upon the development of the site.

A new planning application is being submitted, which changes the internal arrangement of the proposed hotel to form 208 rooms. This report updates the assessment carried out in 2015 to reflect changes to the design of the development and changes in policy/methodology.

The assessment adheres to the principles of Government planning policy in relation to noise, specifically enacted by the *National Planning Policy Framework (NPPF), the National Planning Practice Guidance (NPPG) on Noise* and *the Noise Policy Statement for England (NPSE).*

All noise measurements were conducted in accordance with BS 7445-2: 1991 *'Description and measurement of environmental noise Part 2: Guide to the acquisition of data pertinent to land use'.*

The assessment of plant noise egress from the proposed development has been assessed in accordance with British Standard BS 4142: 2014 +A1:2019 *'Methods for rating and assessing industrial and commercial sound'.*

It should be noted that it was originally intended to repeat the noise survey that was carried out in 2015 to accompany the original submission and appeal. However, the 2020 Coronavirus Outbreak and subsequent social distancing meant that this would not be possible. It was decided that any noise monitoring conducted while the United Kingdom was under lockdown would not be considered representative of normal conditions.

1.2. The Nature, Measurement and Effect of Noise

Noise is often defined as sound that is undesired by the recipient. Whilst it is impossible to measure nuisance caused by noise directly, it is possible to measure the loudness of that noise. 'Loudness' is related to both sound pressure and frequency, both of which can be measured. The human ear is sensitive to a wide range of sound levels. The sound pressure level of the threshold of pain is over a million times that of the quietest audible sound. In order to reduce the relative magnitudes of the numbers involved, a logarithmic scale of decibels (dB) is normally used, based on a reference level of the lowest audible sound.

The response of the human ear is not constant over all frequencies. It is therefore usual to weight the measured frequencies to approximate the human response. The resulting 'A' weighted decibel, dB(A), has been shown to correlate closely to the subjective human response.

When related to changes in noise, a change of ten decibels from say 60 dB(A) to 70 dB(A) would represent a doubling in 'loudness'. Similarly, a decrease in noise from 70 dB(A) to 60 dB(A) would represent a halving in 'loudness'. A change of 3 dB(A) is generally considered to be just perceptible. **Table 1.1** details typical noise levels. A glossary of acoustic terms can be found in **Appendix 1**.

Table 1.1: Typical Noise Levels

Approximate Noise Level (dB(A))	Example
0	Limit of hearing
30	Rural area at night
40	Library
50	Quiet office
60	Normal conversation at 1 m
70	In car noise without radio
80	Household vacuum cleaner at 1 m
100	Pneumatic drill at 1 m
120	Threshold of pain

1.3. Statement of Competency

The assessment has been carried out by Nick Hawkins MSc MIOA MIAQM MIEnvSc PIEMA, the managing director of Hawkins Environmental Limited. Nick is an environmental consultant with over 15 years of experience working within the field of noise/acoustics and environmental impact assessment.

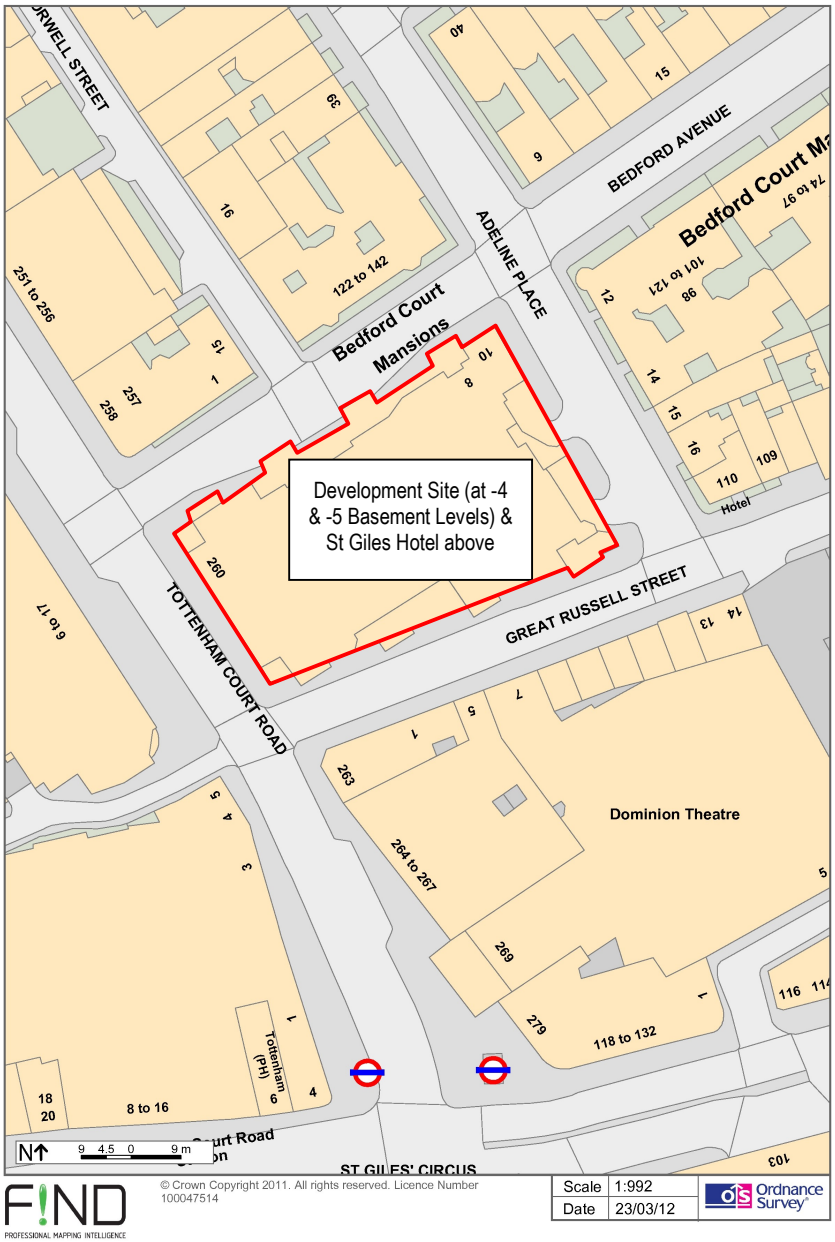
Nick is an alumnus of the University of East Anglia and the University of Southampton. Nick holds the Institute of Acoustics' Certificate of Competence in Environmental Noise Measurement and became a full Member of the Institute of Acoustics in 2010, having previously been an Associate Member. Nick is also a Member of the Institution of Environmental Sciences and a Member of the Institute of Air Quality Management.

Nick has worked on a range of projects, including a number of prestigious projects, including the noise impact assessments of the Thameslink railway scheme through central London, the construction of lines BXD of the Luas Light Rail System in Dublin, the expansion of Bournemouth Airport and the M25 widening between junctions 1b to 3 and 5 to 7. Nick was one of the first acoustic consultants to be given access to the Crossrail tunnels to conduct vibration compliance monitoring. In addition, Nick regularly conducts acoustic assessments for housing developments, wind turbines, air conditioning units, kitchen extract fans, supermarkets, public houses and other commercial developments.

1.4. Site Description

The proposed development site is situated in Bloomsbury in the London Borough of Camden, enclosed by Tottenham Court Road to the west, Great Russell Street to the south, Adeline Place to the east and Bedford Avenue to the north. The part of the site that forms the proposed development is currently a car park at the 4th and 5th levels below ground. The proposed development will see conversion of these existing floors into a hotel. A location plan of the proposed site can be seen in **Figure 1.1**.

Figure 1.1: Site Location Plan



2. PLANNING POLICY & GUIDANCE

2.1. National Planning Policy Framework (2019)

The National Planning Policy Framework (NPPF) was first published on the 27th March 2012 and revised July 2018 and again on the 20th February 2019. The NPPF outlines the Government's environmental, economic and social policies for England. The NPPF sets out a presumption in favour of sustainable development which should be delivered with three main dimensions: economic; social and environmental (Paragraphs 7, 8 10 and 11). The NPPF aims to enable local people and their councils to produce their own distinctive local and neighbourhood plans, which should be interpreted and applied in order to meet the needs and priorities of their communities.

The NPPF states that in the planning system *"Planning policies and decisions should contribute to and enhance the natural and local environment by… e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans"* (Paragraph 170).

Paragraph 180 of the NPPF talks specifically about noise stating that *"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…"*.

2.2. Noise Policy Statement for England (2010)

The Noise Policy Statement for England (NPSE) provides further guidance on the interpretation of Section 123 of the NPPF and states that: *"Within the context of 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."*

NPSE introduces established concepts originally from the field of toxicology that are now being applied to noise impacts. They are:

- **NOEL – No Observed Effect Level** - This is the level of noise 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 of noise 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.

NPSE goes on to state that *"it is not possible to have a single objective noise-based measure that defines 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. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."*

2.3. Planning Practice Guidance

The Planning Practice Guidance was launched on 6th March 2014 and provides additional guidance and interpretation to the Government's strategic policies, outlined within the NPPF, in a web-based resource. This is updated regularly.

The NPPG provides more guidance on the assessment of noise for planning purposes and builds on the concepts of NOEL, LOAEL and SOAEL introduced in NPSE to establish whether noise is a factor that needs to be taken into account. It states*: "Local planning authorities' plan-making and decision taking should take account of the acoustic environment and in doing so consider:*

- *whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur; and*
- *whether or not a good standard of amenity can be achieved.*

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation."

However, it goes into more detail about the subjective nature of noise and how the results of any assessment must be treated flexibly and pragmatically. The guidance states: *"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 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 (ie whether or not the noise contains particular high or low-frequency content) and the general character of the noise (ie whether or not the noise contains particular tonal*

characteristics or other particular features). The local topology and topography should also be taken into account along with the existing and, where appropriate, the planned character of the area.

More specific factors to consider when relevant:

- *where applicable, the cumulative impacts of more than one source should be taken into account along with the extent to which the source of noise is intermittent and of limited duration;*
- *consideration should also be given to whether 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. 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.*
- *Where relevant, Noise Action Plans, 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. Further information may be found on Defra's website. Particular consideration should be given to noisy development affecting designated sites.*
- *If 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.*
- *The potential effect on an existing business of a new residential development being located close to it should be carefully considered as the existing noise levels from the business may be regarded as unacceptable by the new residents and subject to enforcement action. In the case of an established business, the policy set out in the third bullet of paragraph 123 of the Framework should be followed.*
- *Some commercial developments including fast food restaurants, nightclubs 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."*

Table 2.1 shows examples of the noise hierarchy (adapted from the PPG) and shows that that the aim is to identify where the overall effect of the noise exposure falls in relation to SOAEL, LOAEL and NOEL. The implication of the advice is that only noise that is 'noticeable and very disruptive' would be considered unacceptable and therefore, should be prevented. The inference, therefore, is that all other outcomes can be acceptable, depending upon the specific circumstances and level of mitigation.

Table 2.1: Noise Exposure Hierarchy

Perception	Examples of outcomes	Increasing effect level	Action	
Not noticeable	No Effect	No Observed Effect	No specific measures required	Low Noise Level
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, eg turning up the 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. The potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum	Increasing Noise Levels ↓
Significant Observed Adverse Effect Level				
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, eg 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. The potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep.	Significant Observed Adverse Effect	Avoid	
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate the effect of noise leading to psychological stress or physiological effects, eg regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, eg auditory and non-auditory	Unacceptable Adverse Effect	Prevent	High Noise Level

2.4. The London Plan (2016)

The London Plan, published in 2011 with minor revisions in 2013, 2015 and 2016, provides an overall strategic plan for London, and it sets out a fully integrated economic, environmental, transport and social framework for the development of the capital to 2031. The Plan brings together the Mayor's strategies, including policy on a range of environmental issues, such as climate change, air quality, noise and waste. London Boroughs' local plans need to be in general conformity with the London Plan, and its policies guide decisions on planning applications by councils and the Mayor.

Policy 7.15 specifically relates to noise and states:

"Development proposals should seek to reduce noise by:

- *minimising the existing and potential adverse impacts of noise on, from, within, or in the vicinity of, development proposals;*
- *separating new noise sensitive development from major noise sources wherever practicable through the use of distance, screening, or internal layout in preference to sole reliance on sound insulation;*
- *promoting new technologies and improving practices to reduce noise at source."*

2.5. The New London Plan (2019 – Draft)

The New London Plan takes an even tougher approach to noise and when adopted, will replace the existing London Plan. The Examination in Public (EiP) on the London Plan was held between 15th January and 22nd May 2019. The Panel of Inspectors appointed by the Secretary of State issued their report and recommendations to the Mayor on 8th October 2019. The Mayor has considered the Inspectors' recommendations and, on the 9th December 2019, issued to the Secretary of State his intention to publish the London Plan along with a clean and tracked version of the Intend to Publish London Plan, a statement of reasons for any of the Inspectors' recommendations that the Mayor does not wish to accept and a note that sets out a range of interventions that will help achieve the housing delivery set out in the Plan.

The Plan notes that *"measures to design out exposure to poor air quality and noise from both external and internal sources, should be integral to development proposals and be considered early in the design process. Characteristics that increase pollutant or noise levels, such as poorly-located emission sources, street canyons and noise sources should also be designed out wherever possible. Optimising site layout and building design can also reduce the risk of overheating as well as minimising carbon emissions by reducing energy demand".*

Policy D13 Agent of Change notes:

"For a long time, the responsibility for managing and mitigating the impact of noise and other nuisances on neighbouring residents and businesses has been placed on the business or activity making the noise or other nuisance, regardless of how long the business or activity has been operating in the area. In many cases, this has led to newly-arrived residents complaining about noise and other nuisances from existing businesses or activities, sometimes forcing the businesses or other activities to close.

The Agent of Change principle places the responsibility for mitigating the impact of noise and other nuisances firmly on the new development. This means that where new developments are proposed close to existing noise-generating uses, for example, applicants will need to design them in a more sensitive way to protect the new

occupiers, such as residents, businesses, schools and religious institutions, from noise and other impacts. This could include paying for soundproofing for an existing use such as a music venue. The Agent of Change principle works both ways. For example, if a new noise-generating use is proposed close to existing noise-sensitive uses, such as residential development or businesses, the onus is on the new use to ensure its building or activity is designed to protect existing users or residents from noise impacts".

Policy D14 Noise goes on to state:

"In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:

1) avoiding significant adverse noise impacts on health and quality of life

2) reflecting the Agent of Change principle as set out in Policy D13.

3) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses

4) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)

5) separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation

6) where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles

7) promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver".

Policy D14 continues by stating that "*the management of noise also includes promoting good acoustic design of the inside of buildings. Section 5 of BS 8223:2014 provides guidance on how best to achieve this. The Institute of Acoustics has produced advice Pro:PG Planning and Noise (May 2017) that may assist with the implementation of residential*

2.6. London Plan – Housing Supplementary Planning Guidance (2016)

The Housing SPG, published in March 2016 highlights the elements of the London Plan that are relevant to housing development, and where applicable, provides more detail. The SPG states:

"Noise

Standard 30 (and Policy 7.15) – The layout of adjacent dwellings and the location of lifts and circulation spaces should seek to limit the transmission of noise to sound sensitive rooms within dwellings.

2.3.42 - Policy 7.15 Reducing and Managing Noise, Improving and Enhancing the Acoustic Environment and Promoting Appropriate Soundscapes requires development proposals to seek to reduce noise and manage the effects of noise to improve health and quality of life. It is another important aspect of retreat and privacy in a

dwelling. Noise from the street and adjoining properties can cause stress, sleep disturbance and friction between neighbours as recognised in the NPPF.

2.3.43 - All dwellings should be built with acoustic insulation and tested to current Building Regulations standards. However, acoustic insulation should not be relied upon as the only means of limiting noise and the layout and placement of rooms within the building should be considered at an early stage in the design process to limit the impact of external noise on bedrooms and living rooms. The impact of noise should also be considered in the placement of private external spaces."

2.7. Local Policy

The London Borough of Camden's Local Plan (2017) states in 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".

Appendix 3 goes on to determine the noise thresholds to applied in Camden. The Guidance states that if noise from a particular source is below the LOAEL (the Lowest Observed Adverse Effect Level) at an appropriate receptor, the source would be *"considered to be at an acceptable level"*.

In relation to industrial and commercial noise sources, the guidance states that:

"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)".

The Guidance goes on to clarify that outside living room, dining room or bedroom windows during the day, the Rating level should be at least 10 dB lower than the background noise level. At night, outside bedroom windows, the Rating level should be at least 10 dB lower than the background noise level. The 10dB should be increased to 15dB if the noise contains audible tonal elements.

3. ASSESSMENT METHODOLOGY & GUIDANCE

3.1. ProPG: Planning & Noise Professional Practice Guidance (2017)

Planning & Noise: Professional Practice Guidance on Planning and Noise: New Residential Development (the "ProPG"), published May 2017, provides a recommended approach for dealing with noise within the planning process, specifically in relation to new residential developments.

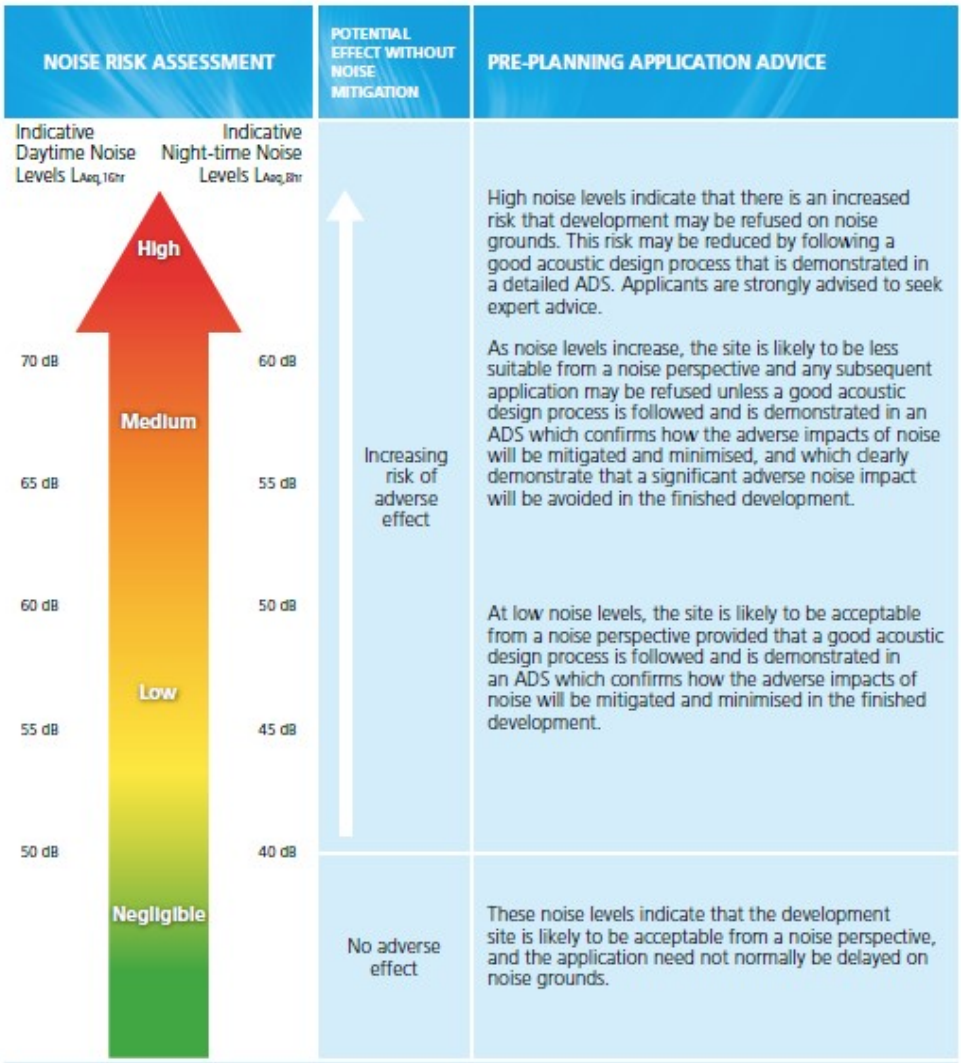
The ProPG follows a systematic, proportionate, risk based, 2-stage, approach. The two stages of the approach are:

- Stage 1 - an initial assessment where external noise is rated against the risk of adverse effect; and
- Stage 2 – a systematic consideration of four key elements to determine the suitability of the site for housing.

The results of the initial Site noise risk assessment will determine the appropriate risk of developing the Site from a noise perspective. This approach is intended to give the developer, the noise practitioner, and the decision maker an indication only of the likely suitability of the site for new residential development from a noise perspective. Thus, a site with a higher risk will be recognised as presenting more acoustic challenges than a site will a low or negligible risk.

Figure 3.1 outlines the initial site risk assessment. Stage 2 of the approach looks to determine whether a site is suitable for housing based on the noise risk of the site. Stage 2 essentially attempts to determine that good acoustic design principals have been incorporated into the design from the outset, that suitable internal noise levels can be achieved in habitable rooms and that suitable external noise levels can be achieved in gardens and outdoor amenity space.

Figure 3.1: Initial Site Risk Assessment (from the ProPG)



3.2. BS 8233: 2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'

Originally published in 1999, the 2014 edition of BS 8233, significantly updates the guidance in light of the policy changes as a result of the advent of the NPPF and the withdrawal of PPG 24. The 2014 edition of BS 8233 sees a change in the title of the Standard, moving from a *'Code of Practice'* to *'Guidance'*, as the text '*largely comprises guidance that does not support claims of compliance'*.

BS 8233:2014 indicates that to control external noise ingress into a proposed development, a number of planning stages should occur as follows:

a) *"Assess the site, identify significant existing and potential noise sources, measure or estimate noise levels, and evaluate layout options.*

b) *Determine design noise levels for spaces in and around the building(s).*

c) *Determine sound insulation of the building envelope, including the ventilation strategy".*

BS 8233:2014 suggests design noise levels for various types of building. The recommended noise levels for dwelling houses, flats and rooms in residential use (when unoccupied) can be seen in **Table 3.1** below. This is replicated from Table 4 of Section 7.7.2 of BS 8233:2014. The guidance suggests that *"In general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values"*. The noise levels in **Table 3.1** are marginally different to those published in BS 8233:1999 *'Sound insulation and noise reduction for buildings – Code of practice'*, but are based on the existing guidance from the current World Health Organisation (WHO) "Guidelines on Community Noise".

Table 3.1: Summary of Noise Criteria: BS 8233: 2014

Activity	Location	07:00 To 23:00	23:00 To 07:00
Resting	Living room	35 dB $L_{Aeq.16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq.16hour}$	-
Sleeping	Bedroom	35 dB $L_{Aeq.16hour}$	30 dB $L_{Aeq.8hour}$

When considering the noise level criteria considered in Table 3.1, the following points should be noted:

- BS 8233: 2014 suggests that the above criteria should be adopted flexibly and that *"where development is considered necessary or desirable... the internal target level may be relaxed by up to 5 dB and reasonable internal conditions still achieved"*.
- The noise levels quoted above are annual averages and *"do not need to be achieved in all circumstances*" e.g. New Year's Eve or fireworks night.
- The noise levels in Table 3.1 are *"for steady external noise sources"* such as traffic noise or plant noise. This is a departure from the 1999 version of BS 8233, where the recommended internal noise levels were irrespective of the external noise source and therefore included the suggestion that in order to achieve *"reasonable"* noise levels within bedrooms at night, L_{AFmax} noise levels should not exceed 45 dB.

Whilst this has been omitted from the 2014 version of BS 8233, it does state that *"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values."* Therefore, at sites which may be affected by individual noise events, it is more appropriate to use the guidance contained within the WHO *"Guidelines on Community Noise"* which suggest that good sleep will not generally be affected if internal levels of L_{AFmax} 45 dB are not exceeded more than 10-15 times per night.

- BS 8233:2014 notes that if the design of the building is *"relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the facade insulation or resulting noise level".*
- BS 8233 provides guidance for noise in gardens and outdoor amenity space. It suggests that *"it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB LAeq,T which would be acceptable in noisier environments."* The guidance does go on to say that these guideline values are not achievable in all circumstances and in some areas, *"such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."*

3.3. World Health Organisation Guidelines for Community Noise (1999)

The 1999 World Health Organisation (WHO) guidance *"Guidelines for Community Noise"*, provides recommendations on maximum internal and external noise levels in a range of situations. The WHO guidelines are a consequence of a comprehensive review of scientific evidence in relation community noise exposure and the health and social aspects of such exposure. Whilst not adopted policy, the recommendations within the WHO Guidelines are often quoted and form the basis of the recommendations within BS 8233 and other similar guidance. A summary of the noise criteria can be seen in **Table 3.2**.

Table 3.2: Summary of Noise Criteria: WHO

Residential Environment	Critical Heath Effect	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,	30	45	23:00-07:00

Residential Environment	Critical Heath Effect	L_{Aeq}	L_{AFmax}	Time Base
	night-time			
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	60	23:00-07:00

3.4. WHO Night Noise Guidelines for Europe (2009)

In 2009, the World Health Organisation published the *"Night Noise Guidelines for Europe"* as a partial update and extension to the *"Guidelines for Community Noise*", specifically in relation to development on the scientific evidence of night noise exposure. The 2009 guidance suggests that a *"$L_{night,outside}$ of 40 dB should be the target of the night noise guideline (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly"*. However, since that target would be impossible to achieve in many situations, a *"$L_{night,outside}$ value of 55 dB is recommended as an interim target for the countries where the NNG cannot be achieved in the short term for various reasons, and where policy-makers choose to adopt a stepwise approach"*.

3.5. BS 4142: 2014 +A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

British Standard BS 4142: 2014 +A1:2019 *"Methods for rating and assessing industrial and commercial sound"* provides a method for the measurement and rating of industrial noise or noise of an industrial nature and background noise levels outside dwellings in mixed residential and industrial areas. The rating level (defined in the BS) is used to rate the industrial noise source outside residential dwellings (this is defined as the "specific noise source").

The procedure defined in BS 4142 for predicting the likelihood of complaints is based on establishing the difference between the rating level and the background level outside the residential property of interest. The greater the difference the greater the likelihood of complaints and more specifically:

- *"A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;*
- *A difference of around +5 dB 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.*
- *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."*

The guidance goes on to state *that "where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is*

especially true at night." Consequently, when considering the impact within a BS 4142 assessment, it is often also necessary to consider the absolute noise levels experienced at the receptor location within relation to BS 8233 and World Health Organisation guidelines.

3.6. Possible Options for the Identification of SOAELs and NOAELs in Support of the NPSE (2014)

Published by Defra, based on a Research Project prepared by AECOM, *"Possible Options for the Identification of SOAELs and NOAELs in Support of the NPSE"* attempts to give values to the concepts of SOAELs and NOAELs, introduced by the Noise Policy Statement for England (NPSE). After the withdrawal of PPG24: Planning and Noise in 2012, which included Noise Exposure Categories, with specific numerical boundaries, the NPSE was heavily criticised for having no specific numerical guidance. Whilst the NPSE and NPPF encourages the development of location specific criteria, in the context of the specific environment, the absence of guidance meant the implementation of the NPSE was difficult. Consequently, the project identifies both specific possible values and possible ranges of values for SOAELs and NOAELs for different noise sources. These values can be seen in **Table 3.3**.

Table 3.3: Possible Value & Ranges of Values for LOAEL & SOAEL

Source	Effect	LOAEL	SOAEL
Road	Annoyance (Daytime)	**56** *(53-59)*	**66** *(64-68)*
	Sleep (Night-time)	**46** *(43-52)*	**56** *(51-64)*
Rail	Annoyance (Daytime)	**63** *(61-66)*	**72** *(70-74)*
	Sleep (Night-time)	**55** *(52-63)*	**68** *(61-77)*
Air	Annoyance (Daytime)	**52** *(50-54)*	**60** *(58-62)*
	Sleep (Night-time)	**41** *(40-49)*	**53** *(47-60)*

3.7. IEMA Guidelines for Environmental Noise Assessment (2014)

The 2014 IEMA *"Guidelines for Environmental Noise Assessment*" address the key principles of noise impact assessment and are applicable to all development proposals where noise effects may occur. The guidance provides advice with regards to the collection of baseline noise data, prediction of noise levels and how noise should be assessed.

Whilst the guidance contains a great deal of technical guidance for the noise practitioner, it also provides guidance on the assessment of significance, which is replicated later in this chapter.

The IEMA Guidelines provides guidance on how to assess the effects and significance of developments, but it stops short of providing specific assessment criteria which developments should achieve. The guidance instead suggests that the methodology adopted should be selected on a site by site basis with reference to relevant national and local standards, since the guidance recognises that the effect associated with a particular noise impact will be dependent on a number of factors including but not limited to the sensitivity of the receptor, frequency and duration of the noise source and time of day.

When describing the magnitude of the noise effect, the IEMA guide does not suggest a definitive method but does give a number of examples of ways of describing and determining the magnitude. One such example, which has been used in this assessment, is set out in Table 8.10 below.

Table 3.4: Magnitude of Change in Noise Levels

Long Term Impact Magnitude	Sound Level Change dB $L_{Aeq.T}$ (positive or negative) T= 16 hour day or 8 hour night
Negligible	≥ 0 dB and < 3 dB
Minor	≥ 3 dB and < 5 dB
Moderate	≥ 5 dB and < 10 dB
Major	≥ 10 dB

It should be noted that the effect of the noise, rather than the magnitude of the change, is a greater influence on determining whether an impact is considered to be significant. Consequently, it is not possible to simply state that a certain change in noise levels would be considered significant. Table 8.6 below provides a guide to the generic relationship between the noise impact (i.e. the magnitude), the noise (i.e. the noise impact and the significance), as well as the significance. This is adapted from the IEMA guide. Professional judgement has been used to determine the significance of effect based on the magnitude of effect, duration of impact and the sensitivity of affected receptors.

Table 3.5: Relationship Between Magnitude, Perception & Significance

Magnitude	Description of the Effect	Significance
Major Beneficial	**Receptor Perception = Marked Change** Causes a material change in behaviour and/or attitude; e.g. people begin to engage in activities previously avoided due to noise conditions.	More likely to be significant
Moderate Beneficial	**Receptor Perception = Noticeable Improvement** Improved noise climate resulting in small changes in behaviour and/or attitude, e.g. opening windows.	⇕
Minor Beneficial	**Receptor Perception = Just Noticeable Improvement** Improved noise climate resulting in small changes in behaviour and/or attitude, e.g. turning down volume on television; speaking more quietly; opening windows.	Less likely to be significant
Negligible	No noticeable effect on the receptor	Not Significant
Minor Adverse	**Receptor Perception = Just Noticeable Improvement** Noise impact can be heard but does not cause any change in behaviour or attitude, e.g. closing of windows.	Less likely to be significant
Moderate Adverse	**Receptor Perception = Just Noticeable Improvement** Noise impact can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television. Potential for sleep disturbance.	⇕
Major Adverse	**Receptor Perception = Disruptive** Causes a material change if behaviour and/or attitude e.g. avoided certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty getting to sleep.	More likely to be significant

4. SOUND MEASUREMENT STUDY

4.1. Overview

In order to determine the extent to which the site is affected by sound, a detailed sound measurement study has been carried out on the proposed development site. Sound measurements have been carried out in order to determine the background sound levels for the day and night time periods.

All sound monitoring was conducted using a Norsonic 140 sound level meter, which conforms to BS EN IEC 61672 as a Class 1 precision measurement system. A Norsonic 1251 field calibrator was used before and after the measurement periods in order to ensure that the equipment had remained within reasonable calibration limits (+/- 0.5 dB). All of the equipment used has current certificates of calibration.

All sound monitoring has been conducted in accordance with the guidance set out in BS 7445-2: 1991 *'Description and measurement of environmental noise Part 2: Guide to the acquisition of data pertinent to land use*'. This standard details information that should be recorded in addition to the actual measured levels such as meteorological data, and a description of the sound source itself.

The last noise survey carried out on the site was in 2015, to accompany the 2015 appeal. It was originally intended to repeat the noise survey, so that up-to-date monitoring could accompany the latest proposals. However, the 2020 Coronavirus Outbreak and subsequent social distancing meant that this would not be possible. It was decided that any noise monitoring conducted while the United Kingdom was under lockdown would not be considered representative of normal conditions. Consequently, it has been assumed that the 2015 survey would remain representative of current conditions and is considered the best source of data under the current circumstances.

The survey was conducted between Thursday 8th October and Monday the 12th October 2015 at 104a Bedford Court Mansions, one of the properties with the greatest potential to be affected by the proposed development. The sound monitoring was conducted by Nick Hawkins of Hawkins Environmental Limited. Nick is a Member of the Institute of Acoustics and holds the Institute of Acoustic's Certificate of Competence in Environmental Noise Measurement. Weather conditions were conducive to successful monitoring. **Table 4.1** summarises the weather conditions during the measurement period.

Table 4.1: Summary of Weather Conditions during the Sound Measurements

General Description	During the measurement period, conditions were generally sunny with some scattered cloud, fairly typical for the time of year. Fog was experienced on Friday 9th and cooler conditions experienced on Monday 12th.
Windspeed	Light winds were experienced, with average speeds around 0.5 m/s, with gusts of up to 1 m/s.
Temperature	The daytime temperatures peaked between 14° and 17°C, dropping to between 6° and 8°C overnight.

Precipitation The measurement period remained dry.

Noise measurements were carried out at the locations identified in **Figure 4.1**. The measurement location is considered to be representative of the ambient and background noise levels experienced by the closest affected properties on Bedford Court Mansions and was positioned in a facade location.

Noise levels in the vicinity of the site are characterised mainly by road traffic noise from surrounding roads in the vicinity of the site. During the daytime, it was also observed that noise from distant construction work was also occasionally audible.

For the Bedford Court Mansions measurement location, the noise measurement data is summarised in **Table 4.2** and **Figure 4.2** below and detailed in **Appendix 2**.

Table 4.2: Summary of Background Noise Measurements – Bedford Court Mansions

Period	Period	L_{Aeq}	L_{Amax}	L_{A90}
Thursday 8th	Day (part)	63.9	92.3	58.3
	Evening	59.5	84.6	55.2
	Night	59.0	87.0	51.4
Friday 9th	Day	66.0	101.1	58.3
	Evening	66.0	95.4	56.3
	Night	58.7	85.2	53.5
Saturday 10th	Day	63.2	96.4	56.7
	Evening	60.2	88.1	54.6
	Night	60.1	93.8	53.0
Sunday 11th	Day	60.3	89.6	55.0
	Evening	62.9	102.0	52.3
	Night	61.0	88.5	52.7
Monday 12th	Day (part)	67.4	99.6	58.4

Figure 4.1: Noise Measurement Location

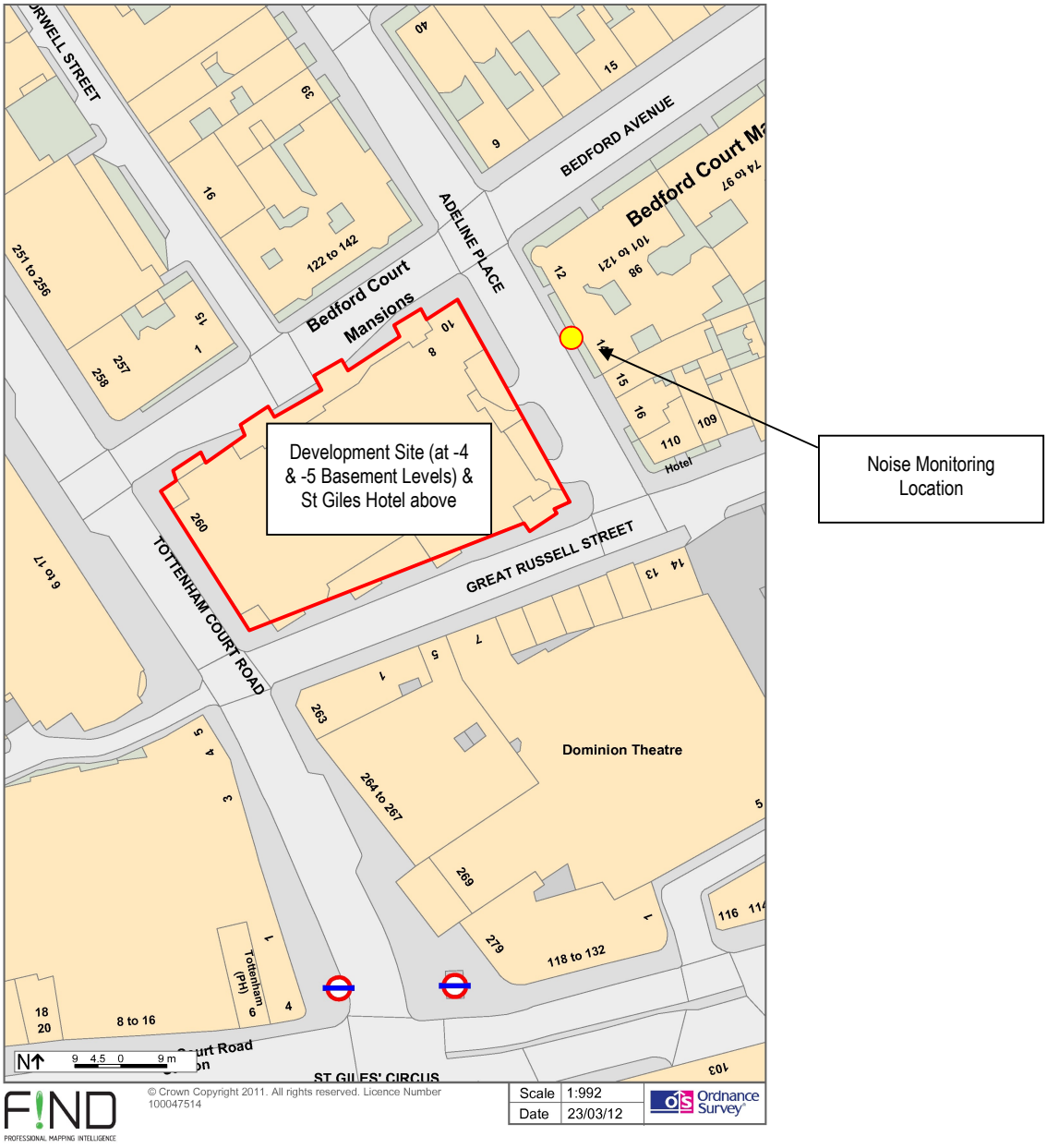
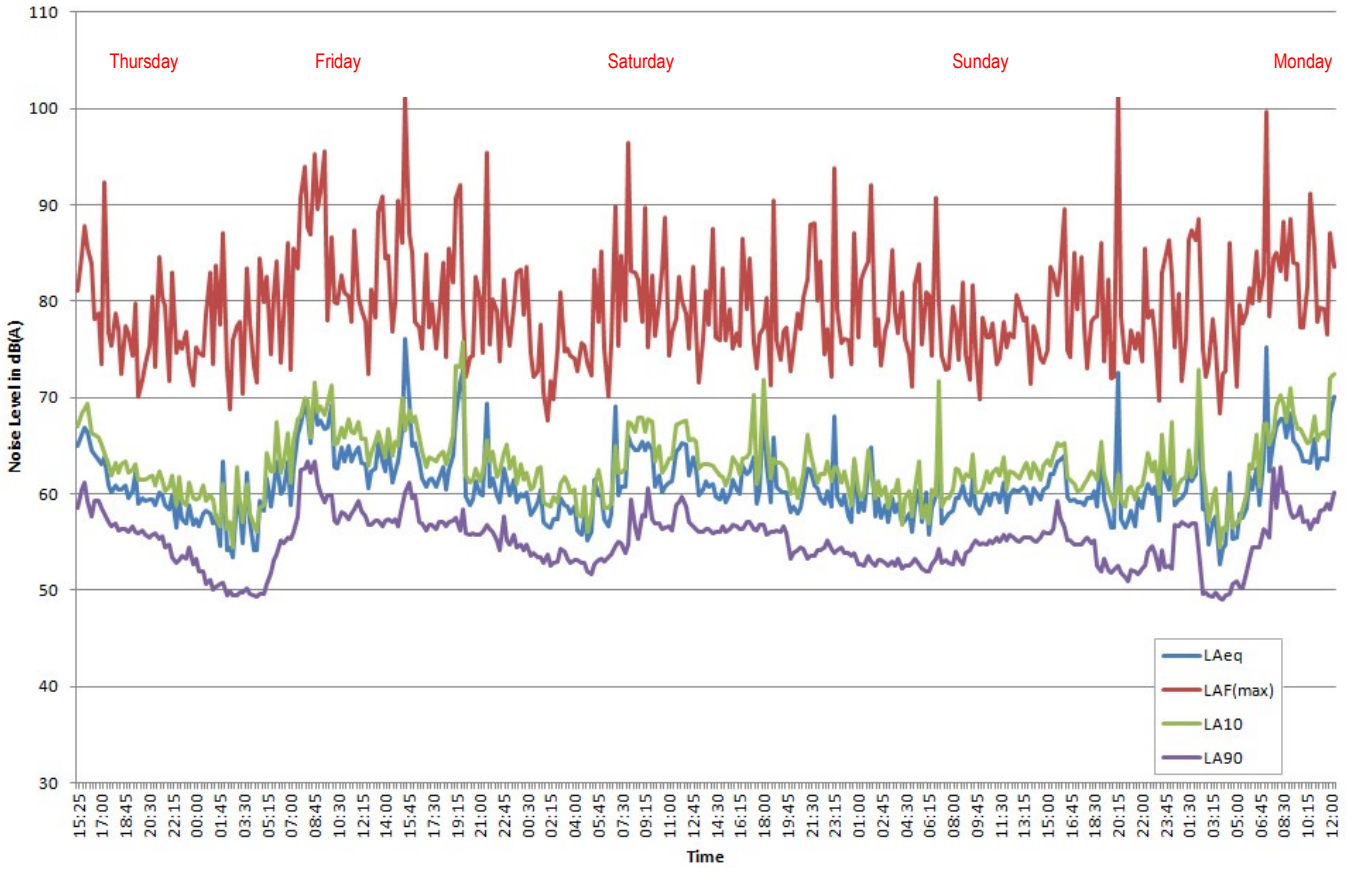


Figure 4.2: Summary of Noise Measurements at 104a Bedford Court Mansions



4.2. Determination of Background Noise Levels – Adeline Place

The background noise levels have been calculated in accordance with BS 4142:2014, which represents the most up-to-date guidance on the subject. Section 8.1 of BS 4142: 2014 states that "*for this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods. Among other considerations, diurnal patterns can have a major influence on background sound levels and, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes"*. The guidance goes on to say that *"a representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value"*.

In order to determine the background noise levels for the day and night time periods on Adeline Place, the background noise levels have been analysed over the appropriate time periods, 15 minutes for night time (11pm to 7am) and 1 hour for day time (7am to 11pm). **Figure 4.3** and **Figure 4.4** detail the distribution of the background noise levels as described in BS 4142: 2014 for the daytime and night time periods.

It can be seen from the figures that typical L_{A90} noise levels of 56 and 50 dB(A) have been determined for the day and night-time periods respectively.

4.3. Determination of Background Noise Levels – Great Russell Street

It should be noted that the 2015 noise survey related to noise levels on Adeline Place, as this was the location of the plant within the 2015 application and appeal. However, this revised application will see some of the plant, specifically the Air Handling Unit, located on Great Russell Street and not on Adeline Place as was previously the case.

Since receptors on Great Russell Street are likely to experience higher noise levels when compared to Adeline Place due to its reduced distance to Tottenham Court Road, it would normally be preferable to carry out an additional noise survey on Great Russell Street to characterise the noise environment on Great Russell Street. However, as previously noted, the 2020 Coronavirus Outbreak and subsequent social distancing meant that this would not be possible. It was decided that any noise monitoring conducted while the United Kingdom was under lockdown would not be considered representative of normal conditions.

In the absence of any additional survey data, it was decided to use monitoring data collected by Holtz Acoustics in January 2019 in connection with a planning application in relation to plant at the YMCA. The background noise monitoring is considered representative of receptors on Great Russell Street. The report noted that typical L_{A90} noise levels of 70 and 54 dB(A) have been determined for the day and night-time periods respectively.

Figure 4.3: Distribution of Daytime $L_{A90.1hour}$ Noise Levels

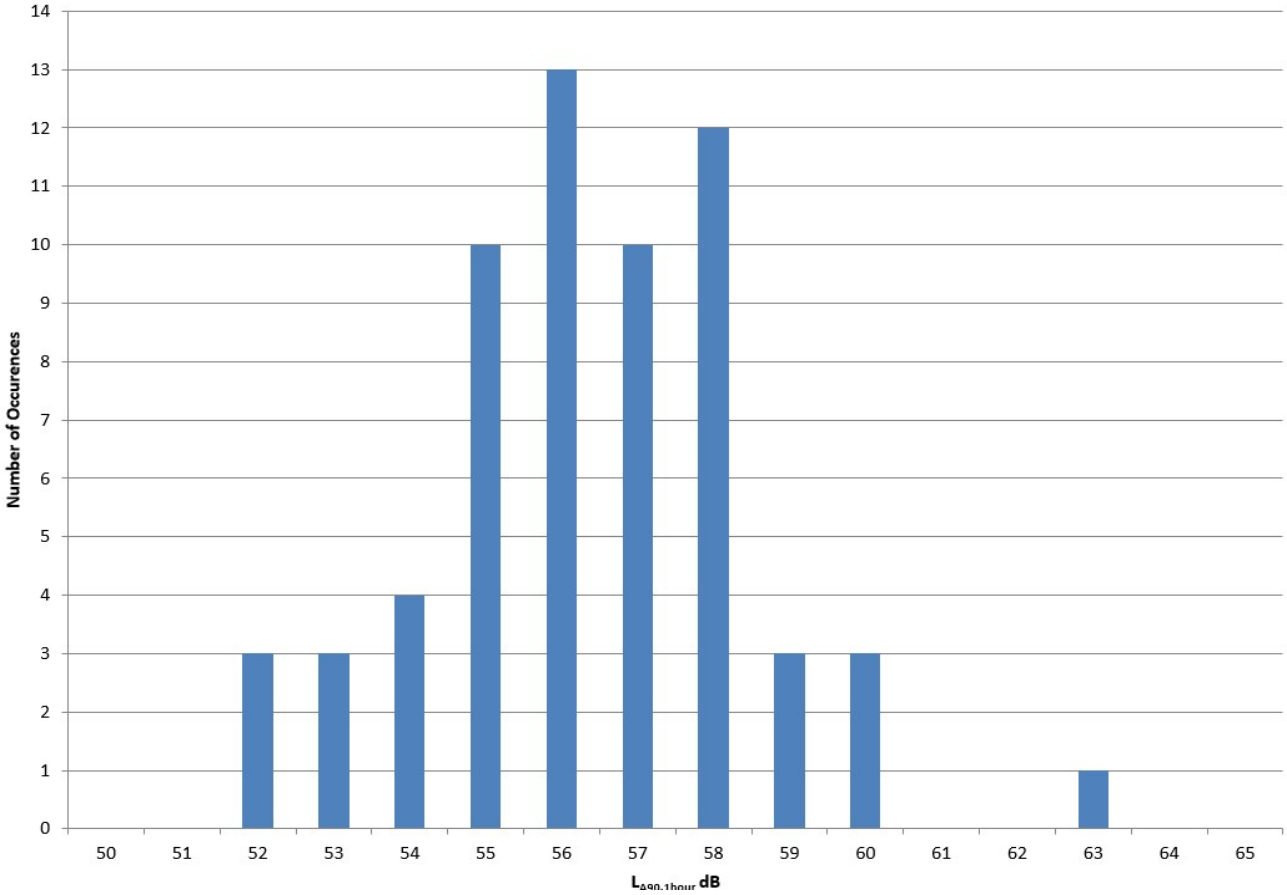
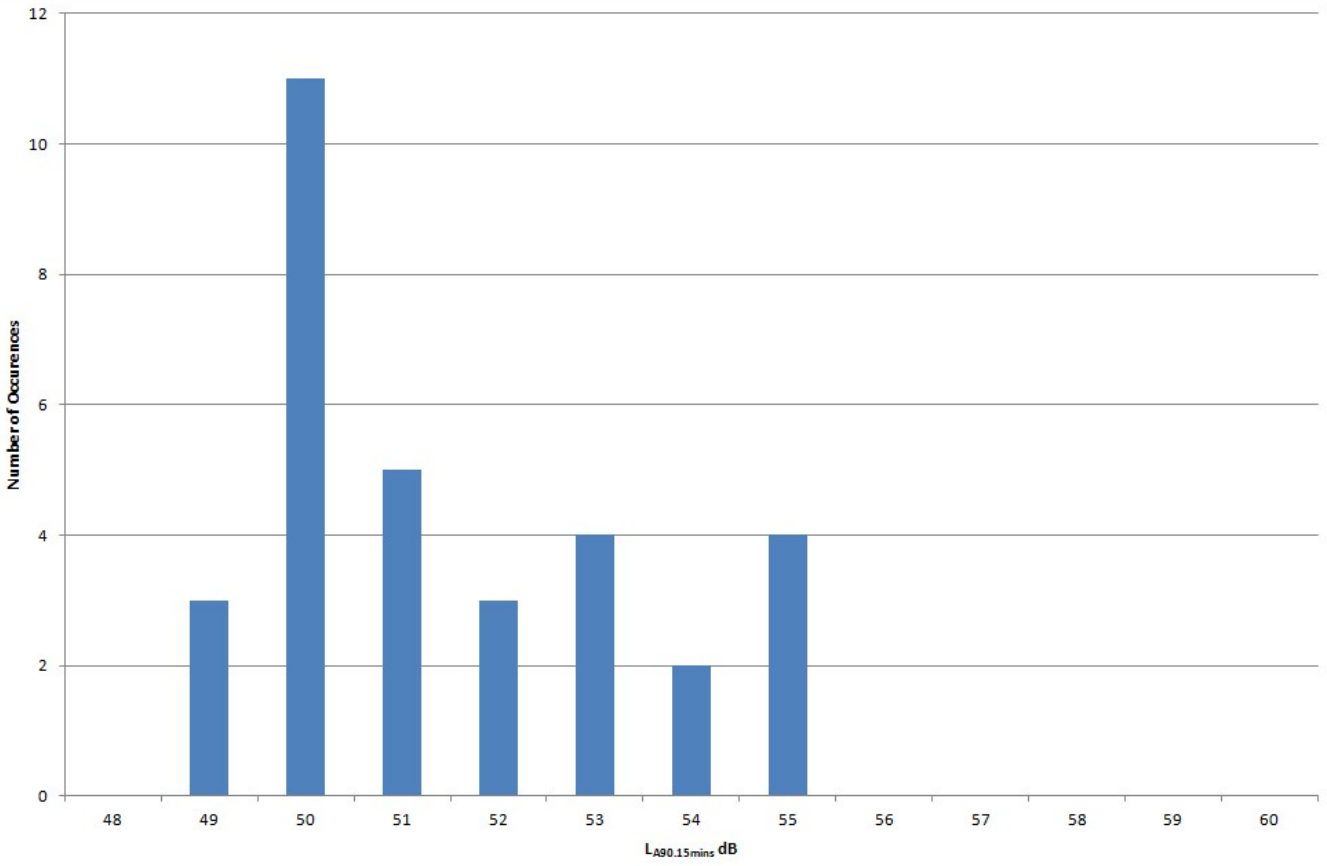


Figure 4.4: Distribution of Night Time $L_{A90.15mins}$ Noise Levels



5. PLANT NOISE IMPACT ASSESSMENT

5.1. Overview

The assessment is carried out in accordance with BS 4142: 2014 +A1:2019 *'Methods for rating and assessing industrial and commercial sound'.*

5.2. Proposed Fixed Plant and Machinery

The M&E consultants for the project have noted that the proposed hotel incorporates a number of items of plant and equipment that produce noise that would be audible externally. The following sections detail the noise from these items of plant. There will be a number of additional items of plant associated with the hotel. However, since it is acknowledged that the area has a sensitive noise environmental, with residential and commercial land uses in close proximity, where possible, plant has been located within the basement, such that they will not be audible externally. Furthermore, quiet plant has been specified where possible; for example electric boilers are to be utilised, as these will not be audible externally.

5.2.1. Air Handling Units

The plant room for the air handling units (AHU), which is used to ventilate the hotel, will be located on Basement -4 floor, just behind the hotel lobby. The inlet and outlet to the AHUs will be located at approximately 2nd floor level, facing onto Great Russell Street. Based on the published noise levels in relation to the AHU, **Table 5.1** shows the calculated noise levels of both the extract and supply AHU, incorporating duct and louvre attenuation.

Table 5.1: Sound Power Levels of the AHU at the Louvre

AHU Supply	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Fan Sound Power Level (Lw) at inlet	70	81	80	75	71	68	64	62
Intake Duct 1100x900 attenuation per Metre	0.3	0.15	0.15	0.1	0.06	0.06	0.06	0.06
Duct attenuation at 22.5m	6.8	3.4	3.4	2.3	1.4	1.4	1.4	1.4
Attenuation of 2x Corner	0	0	2	4	6	6	6	6
Louvre Attenuation	7	7	10	17	29	30	27	21
Sound Power Level at Louvre	56.3	70.6	64.6	51.8	34.7	30.7	29.7	33.7

AHU Extract	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Fan Sound Power Level (Lw) at outlet	74	85	82	82	79	74	69	66
Exhaust Duct 1100x900 attenuation per Metre	0.3	0.15	0.15	0.1	0.06	0.06	0.06	0.06
Duct attenuation at 14m	4.2	2.1	2.1	1.4	0.8	0.8	0.8	0.8
Attenuation of 1x Corner	0	0	1	2	3	3	3	3
Louvre Attenuation	7	7	10	17	29	30	27	21
Sound Power Level at Louvre	62.8	75.9	68.9	61.6	46.2	40.2	38.2	41.2

5.2.2. Dry Coolers

For cooling of the basement, dry coolers are proposed, which will be located in the B5 Ramp at ground floor level, behind a louvre. **Table 5.2** shows the calculated noise levels at the dry cooler louvre, incorporating louvre attenuation and the absorption and reflectance in the plant room.

Table 5.2: Sound Power Levels of the Dry Cooler Fans at the Louvre

Dry Cooler Plant Room	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Sound Power Level (L_w)	81	79	75	79	76	74	74	67
Distance from source to partition (r)	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Total area of room surfaces (source room) (S)	230.36	230.36	230.36	230.36	230.36	230.36	230.36	230.36
Average absorptive coefficient (α_{AVGE})	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Room Constant (R_C)	47.93	47.93	47.93	47.93	47.93	47.93	47.93	47.93
L_{DIRECT}	61.7	59.7	55.7	59.7	56.7	54.7	54.7	47.7
L_{REF}	70.2	68.2	64.2	68.2	65.2	63.2	63.2	56.2
Total sound pressure level at the partition (L_{TOTAL} or L_1)	70.8	68.8	64.8	68.8	65.8	63.8	63.8	56.8
Louvre Area	29.55	29.55	29.55	29.55	29.55	29.55	29.55	29.55
Insertion Loss of Louvre	7.0	7.0	10.0	17.0	29.0	30.0	27.0	21.0
Sound Power Level at Louvre	78.5	76.5	69.5	66.5	51.5	48.5	51.5	50.5

5.2.3. Communication Room Condensing Unit

A condensing unit, for the comms room cooling, is to be located within the B4 Ramp close to the access at ground floor level, behind a louvre. **Table 5.3** shows the calculated noise levels at the comms rooms air conditioning unit, incorporating louvre attenuation and the absorption and reflectance in the plant room.

Table 5.3: Sound Power Levels of the Dry Cooler Fans at the Louvre

Comms Room Air Con	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Sound Power Level (L_w)	57.0	59.0	57.0	52.0	47.0	45.0	38.0	36.0
Distance from source to partition (r)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Total area of room surfaces (source room) (S)	177.66	177.66	177.66	177.66	177.66	177.66	177.66	177.66
Average absorptive coefficient (α_{AVGE})	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
Room Constant (R_C)	57.13	57.13	57.13	57.13	57.13	57.13	57.13	57.13
L_{DIRECT}	38.0	40.0	38.0	33.0	28.0	26.0	19.0	17.0
L_{REF}	45.5	47.5	45.5	40.5	35.5	33.5	26.5	24.5
Total sound pressure level at the partition (L_{TOTAL} or L_1)	46.2	48.2	46.2	41.2	36.2	34.2	27.2	25.2
Louvre Area	23.56	23.56	23.56	23.56	23.56	23.56	23.56	23.56
Insertion Loss of Louvre	4.0	4.0	6.0	8.0	11.0	11.0	11.0	10.0
Sound Power Level at Louvre	55.9	57.9	53.9	46.9	38.9	36.9	29.9	28.9

5.3. Noise Level at Closest Properties

Plant that would be audible externally, will be located on two facades. There will be the inlet and outlet of the air handling units located at approximately 2nd floor level, facing onto Great Russell Street. In addition, there will be plant located in the access ramps facing Adeline Place, with the dry coolers located in the B5 Ramp at ground floor level and the eight ASHPs located in the B4 Ramp at ground floor level, all behind louvres. **Figure 5.1** shows the approximate location of the plant and the locations of the closest receptors.

In addition to the receptors noted on **Figure 5.1**, noise levels at the closest bedrooms within St Giles Hotel, which is located above the proposed development have also been assessed.

Appendix 3 summarises the calculations for the condensing unit, AHU and Dry Cooler Plant Room. **Table 5.4** summarises the calculations for the Adeline Place receptors. **Table 5.5** summarises the calculations for the Great Russell Street receptors.

The calculations utilise the methodology contained within ISO 9613: 1996: *Acoustics – Attenuation of sound during propagation outdoors - Part 2: General method of calculation* and taking into account (where

appropriate) the effects of building reflections on facade locations. For the AHU and the dry cooler plant room, acoustic louvres with an overall R_w of 21 dB have been assumed. For the condensing unit, acoustic louvres with an overall R_w of 11 dB has been assumed. The acoustic data used in the calculations is from the SS150 and CH300 louvres from Caice.

The overall noise levels in **Table 5.4** and **Table 5.5** also assume additional attenuation to both the dry cooler and the AHU. It is understood that the casing for the dry cooler can constructed with additional attenuation the calculations in **Table 5.4** assume that this casing has a minimum attenuation of 14 dB. It is also assumed that the AHU Supply is fitted with an attenuator with an overall attenuation of at least 8 dB, with the AHU Extract is fitted with an attenuator with an overall attenuation of at least 14 dB.

It should be noted that the attenuation quoted is an example and the louvres and attenuators specified should be tested within the parameters of the calculations to assess suitability. For example, if a higher level of attenuation is provided for the louvres, a lower specification of attenuators (for example in the AHU) may be acceptable.

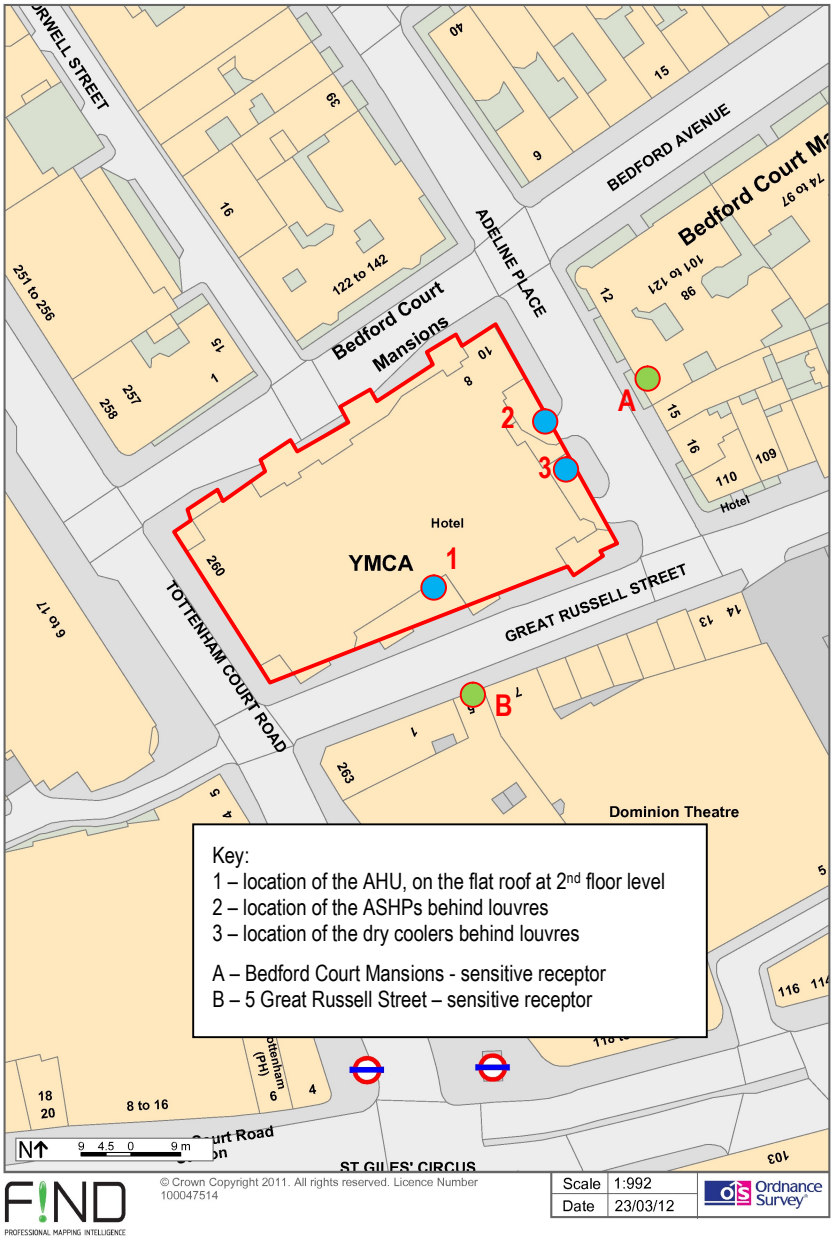
Table 5.4: Receptor Sound Levels – Adeline Place Receptors

	Facade Sound Level in dB(A)		
	Condenser	Dry Cooler	Cumulative
Bedford Court Mansions	26.4	30.0	31.6
St Giles Hotel – Adeline Place Façade	29.7	33.3	34.8

Table 5.5: Receptor Sound Levels – Great Russell Street Receptors

	Facade Sound Level in dB(A)		
	AHU Supply	AHU Extract	Cumulative
5 Great Russell Street	26.7	26.3	29.5
St Giles Hotel – Great Russell Street Façade – East of AHU	32.7	37.5	38.7
St Giles Hotel – Great Russell Street Façade – West of AHU	37.9	32.4	38.9

Figure 5.1: Plant and Sensitive Receptor Locations



5.4. Adherence to Sound Criteria

To assess the impact of the proposed plant, the predicted sound levels have been compared to the criteria in BS 4142. **Table 5.6** and **Table 5.7** below considers the sound levels in a BS 4142 assessment during night. In a BS 4142 assessment, the 'industrial' sound is rated by comparison against the background sound level. The difference between the rating sound level and lowest background sound level gives an indication of the likelihood of complaint.

Discussions with Edward Davis and Monica Mulowoza at the London Borough of Camden's Environmental Health Team on the 30th September 2015 have determined that the total cumulative noise level from all new plant subject to the planning application should be at least 10 dB(A) below the background noise level, during all periods of operation. However, during the subsequent appeal, 15 dB below the background noise level was agreed **Table 5.6** and **Table 5.7** show that with the louvre attenuation specified and additional attenuation as appropriate, the cumulative noise level from all plant will be approximately 15 dB(A) or more below the background noise level and will be considerably greater than 15 dB(A) below background during the daytime. Consequently, noise from the plant will adhere to Camden's Policy on noise.

Post construction, it is recommended that a plant maintenance schedule will also be drawn up in the Hotel Management Plan to ensure that plant is serviced regularly to avoid noise problems associated with poorly maintained plant. In addition, plant should also be set to quiet night-time modes were possible and plant should only operate when necessary.

Table 5.6: BS 4142 Assessment -Day

	Background Sound Level L_{A90}	Rating Sound Level L_{Aeq}	Difference between Rating Level and Background Sound Level
Bedford Court Mansions	56	31.6	-24.4
St Giles Hotel – Adeline Place Façade	56	34.8	-21.2
5 Great Russell Street	70	29.5	-40.5
St Giles Hotel – Great Russell Street Façade - East of AHU	70	38.7	-31.3
St Giles Hotel – Great Russell Street Façade - West of AHU	70	38.9	-31.1

Note: All sound levels are facade sound measurements.

Table 5.7: BS 4142 Assessment -Night

	Background Sound Level L_{A90}	Rating Sound Level L_{Aeq}	Difference between Rating Level and Background Sound Level
Bedford Court Mansions	50	31.6	-18.4
St Giles Hotel – Adeline Place Façade	50	34.8	-15.2
5 Great Russell Street	54	29.5	-24.5
St Giles Hotel – Great Russell Street Façade - East of AHU	54	38.7	-15.3
St Giles Hotel – Great Russell Street Façade - West of AHU	54	38.9	-15.1

Note: All sound levels are facade sound measurements.

5.5. Uncertainty

One of the main characteristics of the 2014 edition of BS 4142 is the requirement to comment upon and assess uncertainty in the calculations.

As previously noted, it was originally intended to repeat the noise survey that was carried out in 2015 to accompany the original submission and appeal. However, the 2020 Coronavirus Outbreak and subsequent social distancing meant that this would not be possible. It was decided that any noise monitoring conducted while the United Kingdom was under lockdown would not be considered representative of normal conditions. Consequently, there is some uncertainty regarding whether the background used are representative. Furthermore, the calculations for receptors on Great Russell Street utilised background noise levels measured on Adeline Place, since it was not possible to carry out additional monitoring. It is expected that background noise levels on Great Russell Street could be higher than those on Adeline Place; therefore, less onerous mitigation might be required.

6. ELECTRIC SERVICE VEHICLE IMPACT ASSESSMENT

In is understood that the hotel will be serviced using the existing car park ramp off Adeline Place. All deliveries will be offloaded from Adeline Place and then loaded onto a small electric vehicle (EV), which will remain in the ramp service area. The EV will then transport goods from the ground floor service entrance before depositing the goods in a designated service area at Level 5.

Since a typical EV has a sound pressure level of less than 45 dB(A) at a distance of one metre, it is not anticipated that noise from the EV will be audible or cause a nuisance to any of the surrounding neighbours. It is anticipated that it will only be used within daytime hours and as noted above, the EV will remain in the ramp service area and therefore there will not be direct line of sight to the properties at Bedford Court Mansions.

7. HOTEL NOISE IMPACT ASSESSMENT

In association with the original 2015 planning application, planning officers at London Borough of Camden commented that there could be a *"potential adverse impact on neighbour's in terms of noise and general disturbance as a consequence of the hotel operation. In particular we have concerns about the increased level of activity on this quiet street frontage for example people congregating or smoking".*

Discussions with the Bloomsbury Association in 2015 determined that there was concern with regards to noise from the development, especially from smokers congregating in Adeline Place.

The main entrance to the hotel will be situated on Great Russell Street, which is perpendicular to Tottenham Court Road, which is a very busy thoroughfare, both day and night. The entrance to the hotel will be situated approximately 30m from Tottenham Court Road. Observations and noise measurements show that in the vicinity of the hotel entrance, noise is significantly higher than those measured on Adeline Place. Short duration night time noise measurements were conducted on the 22nd October 2015 and showed that even at midnight on a Thursday, noise levels were in the region of 67-69 $L_{Aeq,5mins}$, in comparison to L_{Aeq} noise levels in the region of 56-58 dB(A) on Adeline Place

Whilst it is acknowledged that in some limited circumstances the necessity to smoke outside as a consequence of the smoking ban in England has resulted in some noise complaints elsewhere, there is no restaurant or bar associated with the development. Therefore, it is likely that any smokers will be limited in their number and will be individual guests smoking quietly and quickly, rather than large groups of smokers which lend to loiter for long periods and are the cause of most smoking related noise complaints

Given the background noise levels that are experienced on Great Russell Street, even at night-time, limited and infrequent smoking outside is unlikely to generate levels of noise over and above what is normally experienced in the vicinity of the area.

Observations of people smoking and loitering around the development site were made both during the day and at night. Observations show that at the St Giles Hotel, most of the frontage displays "No Smoking" signs; although a number of people clearly ignore these signs. However, St Giles designated smoking area is on Adeline Place, directly facing the noise measurement location. It has been observed that at times large groups of people (including staff members) congregate to smoke in this area. At St Giles Hotel it was also observed that there were rarely large groups of people waiting for taxis outside of the hotel nor were there large numbers of idling vehicles. Generally, people waiting inside the hotel (the entrance lobby was observed to be very busy at times) and most taxis had the engines switched off (since Camden now fines motorists who leave their engines running for too long). This was especially true at night, where most people on the street appeared to be unconnected to St Giles Hotel. At St Giles Hotel, door men or concierges were rarely seen near the door; therefore door supervision, traffic direction and policing of guests was minimal.

To reduce the likelihood of complaints at the new proposed hotel, the limited noise from guests will be managed through the implementation of the Hotel Management Plan. The key actions within the Hotel Management Plan designed specifically to reduce noise from patrons include:

1. The entrance will be operated 24hrs and be staffed at all times by either concierge or security staff.
2. All access into and out of the building will be carefully controlled and monitored.
3. To ensure that the privacy and peace of the neighbouring residential community is not disturbed, a Street Management Policy, to be included in the final Hotel Management Plan, will be put in place to effectively manage anyone within the vicinity of the Hotel. The Street Management Policy will also ensure to limit any adverse impacts caused by the hotels operations. For example, guests and staff will be directed towards the existing smoking area for the adjacent casino located on the corner of Tottenham Court Road and Great Russell Street. This area is away from surrounding residential properties and will reduce any possible noise impacts.
4. The hotel is situated in a location that is highly accessible by public transport. As such, the hotel will not provide onsite parking for hotel guests.
5. To reduce the likelihood of coaches dropping off patrons, bookings will be limited to a maximum of 8 guests and secured by S106 agreement. Group bookings will be restricted through the online booking system and advertised on the future operator's website including any third party booking site.
6. To ensure patrons safety upon exiting the premises, the hotel's concierge/security, located at the hotel entrance at street level, will be available to call taxis for patrons of the hotel. They will then be able to advise the patrons when the taxi arrives, reducing the need for patrons to wait on the pavement.
7. Security staff will operate at the hotel entrance between 19:00 and 7:00 to manage any possible congregation and antisocial behaviour by guests returning to the hotel in the early hours. This would include breaking up large groups and redirecting smokers to the designated smoking area located towards Tottenham Court Road.
8. All servicing and deliveries will be prebooked and spread evenly throughout the day at off peak times and between normal work hours to minimise the potential for any noise and disturbance to the nearby residents and hotel guests. Deliveries will avoided during the hours of 08:00 to10:00 and 17:00 to 19:00, which are the peak hours of departure and arrival of the guests.
9. It is observed that staff of the adjacent St Giles Hotel use the area along Adeline Place as an informal smoking area. This has been raised as a concern by the nearby residential community due to the noise it generates. All staff of the proposed hotel will be required to use the designated smoking area located near Tottenham Court Road, this will be monitored by CCTV.

Overall, it is anticipated that the management of the new hotel would take a more proactive approach to guest and traffic management and take positive steps to reduce conflict with neighbours.

8. NOISE FROM YMCA

In association with the original 2015 planning application, the London Borough of Camden expressed concern over the impact of noise from the YMCA sports centre on the floors immediately above the proposed hotel at floors -3 and above. However, regarding the potential impact of noise from floor -3 above the proposed development, a significant proportion of the floor -3 is taken up by uses that are unlikely to generate noise levels in excess of typical domestic noise levels. For example, the majority of the floor area is taken up by changing rooms, offices, tanning rooms, massage rooms and storage areas. Also situated on floor -3 is a squash court, fitness suite, weights room and the main sports hall; however it is acknowledged that these room uses, may generate levels of both airborne and impact noise in excess of typical domestic noise levels; however these rooms occupy the minority of the party floor space.

We know that the party floor will at minimum adhere to Approved Document E of the Building Regulations and therefore offer protection from typical domestic activities to the patrons of the hotel below. Furthermore, it is understood that the party floor is of thick concrete construction and has ensured that noise transmission from the car park of floor -4 to floor -3 was kept to a minimum; therefore it is anticipated that if the floor were to be tested in accordance with ISO 717-1 and ISO 140-4 for airborne sound insulation, it would be expected to pass the minimum requirements of Approved Document E of the Building Regulations, potentially by a large margin. Indeed, it is suggested that the thickness and mass of the floor may also offer significant protection from impact (footfall) noise from the rooms above. Therefore, we can say with reasonable confidence that for large areas of the party floor, noise transmission, particularly airborne noise, should not be an issue. For the remainder, i.e. the floor between the squash court, sports hall etc. and the proposed hotel below, whether or not noise transmission will be a problem will depend upon the level of noise generated in these rooms and the existing performance of the party floor – either way sound insulation could be improved such that noise would not be an issue. In a conversion such as this, it would be common for sound insulation testing of the party floor to be conducted prior to construction to confirm that remedial measures are likely to have the desired effect in order to adhere to the Building Regulations. Therefore it is proposed that at this stage prior to construction, noise transmission from the squash court, sports hall etc. is assessed and remedial measures implemented as appropriate.

9. NOISE IMPACT OF CROSSRAIL

Concerns have been raised by the London Borough of Camden regarding the potential impact of noise from the Crossrail project. In order to assessment the potential impact of Crossrail, we can only review what has been from the *"Assessment of Noise and Vibration Impacts - Technical Report - Volume 4 of 8 Central Section - Final Report"* prepared by RPS on behalf of Crossrail. The report investigates in detail the impacts of Crossrail on the surrounding environment. The report suggests that at the closest point of the proposed development to Crossrail, groundborne noise and vibration from operational impacts would be at *"worst case with standard trackform and piled buildings... 40 dB $L_{Amax,S}$ 0.2 $mms^{-1.75}$ VDV"*. The assessment criteria for the impact of vibration on humans is based upon the Vibration Dose Value (VDV) and is taken from BS 6472-1:2008 *Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting.* Based on this criterion, a VDV of 0.2 $mms^{-1.75}$ would suggest "*adverse comment is not expected*". It should be noted that a 40 dB $L_{Amax,S}$ 0.2 $mms^{-1.75}$ VDV is predicted closest to the line of the tunnel, whereas the proposed development site is approximately 160m from the closest tunnel. RPS's report suggests that by 25m from the tunnel, groundborne noise would have already attenuated due to distance to 25 dB $L_{Amax,S}$, suggesting that by the time it reaches the proposed development site, the level would be significantly below 40 dB $L_{Amax,S}$ 0.2 $mms^{-1.75}$ VDV, adding weight to the assertion that *"adverse comment is not expected"*.

10. CONCLUSIONS

It is proposed to redevelop basement levels -4 and -5 of 112a Great Russell Street. As part of the redevelopment it is proposed to convert the two basement floors into hotel accommodation. Since the hotel will be situated below ground, plant will be situated on the ground floor. Consequently, in accordance with the London Borough of Camden planning policy, a noise impact assessment has been conducted to ensure that noise levels at the closest sensitive properties are not increased.

It is understood that new plant that may be audible outside of the curtilage of the hotel includes a condensing unit, an air handling unit and a dry cooling unit. A noise survey has determined that typically L_{A90} noise levels of 56 and 50 dB(A) for the day and night time periods respectively on Adeline Place and 70 dB(A) and 54 dB(A) for the day and night time periods respectively on Great Russell Street. The maximum noise limits at each of the closest sensitive receptors were set at 15 below the background noise level.

Calculations have shown that noise from the fixed plant and machinery will be approximately 15 dB(A) or more below the existing measured background noise level and will be considerably more than 15 dB(A) below background during the daytime periods.

A plant maintenance schedule will also be drawn up in the Hotel Management Plan to ensure that plant is serviced regularly to avoid noise problems associated with poorly maintained plant.

Any limited noise from clients entering or leaving the hotel can be satisfactorily managed and mitigated through the implementation of the Hotel Management Plan, controlled and managed by staff and hotel management. Given the elevated ambient and background noise levels that are experienced on Great Russell Street, even at night time, the proposed development is unlikely to generate levels of noise over and above what is normally experienced in the vicinity of the area.

Appendix 1
Glossary of Acoustic Terms

Appendix 1: Glossary of Acoustic Terms

Decibel (dB)	This is a tenth (deci) of a bel. Decibel can be a measure of the magnitude of sound, changes in sound level and a measure of sound insulation. Decibels are not an absolute unit of measurement but are an expression of ratio between two quantities expressed in logarithmic form.
dB(A)	A-weighted decibels, i.e. decibel level incorporating a frequency weighting (A weighting), which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness.
Freefield	A situation in which the radiation from a sound source is completely unaffected by the presence of any reflecting boundaries.
Hertz (Hz)	Unit of frequency, equal to one cycle per second. Frequency of sound waves refers to the number of pressure fluctuations per second. Frequency is related to the pitch of a sound.
$L_{Aeq,T}$	The equivalent steady sound level in dB(A) containing the same acoustic energy as the actual fluctuating sound level over the given period, T. For example, daytime noise is generally measured over a 16 hour period, so T is 16 hours. $L_{Aeq,T}$ can be measured directly with an integrating sound level meter.
L_{A10}	The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 10 per cent of a given time and is the $L_{A10,T}$. The L_{A10} is used to describe the levels of road traffic noise at a particular location.
L_{A50}	The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 50 per cent of a given time and is the $L_{A50,T}$.
L_{A90}	The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 90 per cent of a given time and is the $L_{A90,T}$. The L_{A90} is used to describe the background noise levels at a particular location.
L_{Amax}	The 'A'-weighted maximum sound pressure level measured over a measurement period.
R_w (or SRI)	The weighted sound reduction index as a single number laboratory measured rating used to describe the sound insulation of building elements.

Appendix 2
Summary of Sound Measurements

Appendix 2: Summary of Sound Measurements

104a Bedford Court Mansions - 2015

Date	Time	L_{Aeq}	L_{Amax}	L_{A90}
08/10/2015	15:00	66.0	87.8	60.1
08/10/2015	16:00	64.8	85.6	58.9
08/10/2015	17:00	62.3	92.3	57.6
08/10/2015	18:00	60.7	78.8	56.5
08/10/2015	19:00	60.5	79.7	56.2
08/10/2015	20:00	59.4	80.5	55.8
08/10/2015	21:00	59.5	84.6	55.3
08/10/2015	22:00	58.7	82.9	53.6
08/10/2015	23:00	57.6	76.8	53.5
09/10/2015	00:00	57.6	78.7	51.9
09/10/2015	01:00	57.0	83.7	50.5
09/10/2015	02:00	58.7	87.0	49.9
09/10/2015	03:00	59.5	83.4	49.8
09/10/2015	04:00	56.7	84.4	49.5
09/10/2015	05:00	60.0	82.5	51.3
09/10/2015	06:00	62.0	86.1	54.8
09/10/2015	07:00	64.8	90.7	57.9
09/10/2015	08:00	68.5	95.3	62.9
09/10/2015	09:00	67.1	95.6	60.1
09/10/2015	10:00	65.8	86.6	58.0
09/10/2015	11:00	64.0	87.4	57.9
09/10/2015	12:00	63.1	80.3	58.0
09/10/2015	13:00	63.6	90.9	57.0
09/10/2015	14:00	63.0	84.7	57.3
09/10/2015	15:00	71.5	101.1	59.2

09/10/2015	16:00	64.0	85.0	58.4
09/10/2015	17:00	61.2	84.9	56.6
09/10/2015	18:00	61.9	85.5	56.9
09/10/2015	19:00	70.3	92.0	57.3
09/10/2015	20:00	59.9	82.5	55.8
09/10/2015	21:00	64.6	95.4	56.2
09/10/2015	22:00	61.0	82.2	55.8
09/10/2015	23:00	60.5	82.9	55.0
10/10/2015	00:00	59.5	83.6	54.3
10/10/2015	01:00	58.9	77.5	53.4
10/10/2015	02:00	57.0	75.0	53.0
10/10/2015	03:00	58.8	80.9	53.6
10/10/2015	04:00	57.2	75.7	53.0
10/10/2015	05:00	58.9	83.3	52.4
10/10/2015	06:00	58.1	85.2	53.4
10/10/2015	07:00	64.5	89.8	54.6
10/10/2015	08:00	65.1	96.4	56.5
10/10/2015	09:00	64.9	89.7	58.3
10/10/2015	10:00	61.0	88.7	56.7
10/10/2015	11:00	63.2	82.6	57.7
10/10/2015	12:00	64.2	83.6	58.0
10/10/2015	13:00	61.2	81.1	56.2
10/10/2015	14:00	60.3	87.5	56.1
10/10/2015	15:00	60.3	83.4	56.5
10/10/2015	16:00	61.5	86.5	56.6
10/10/2015	17:00	61.8	84.4	56.6
10/10/2015	18:00	65.8	90.5	56.2
10/10/2015	19:00	60.4	77.3	56.2
10/10/2015	20:00	58.3	78.7	53.9

10/10/2015	21:00	61.7	88.1	53.7
10/10/2015	22:00	59.9	84.2	54.5
10/10/2015	23:00	63.4	93.8	54.2
11/10/2015	00:00	60.3	87.1	53.8
11/10/2015	01:00	59.9	84.2	52.9
11/10/2015	02:00	61.0	92.0	53.0
11/10/2015	03:00	58.5	85.3	52.7
11/10/2015	04:00	57.9	80.9	52.7
11/10/2015	05:00	58.4	83.9	52.8
11/10/2015	06:00	58.9	90.8	52.5
11/10/2015	07:00	60.9	79.9	53.3
11/10/2015	08:00	59.7	82.0	53.2
11/10/2015	09:00	59.8	81.7	54.5
11/10/2015	10:00	58.9	78.3	54.9
11/10/2015	11:00	60.1	77.8	55.3
11/10/2015	12:00	59.8	80.6	55.4
11/10/2015	13:00	60.2	79.7	55.3
11/10/2015	14:00	60.2	77.4	55.4
11/10/2015	15:00	62.2	83.5	56.9
11/10/2015	16:00	62.1	89.6	56.1
11/10/2015	17:00	59.1	85.0	54.9
11/10/2015	18:00	59.6	78.4	54.6
11/10/2015	19:00	60.7	86.1	52.3
11/10/2015	20:00	66.9	102.0	51.9
11/10/2015	21:00	58.1	77.0	51.7
11/10/2015	22:00	60.0	85.4	53.4
11/10/2015	23:00	61.5	84.3	53.1
12/10/2015	00:00	61.4	86.3	54.6
12/10/2015	01:00	61.1	87.3	56.9

12/10/2015	02:00	64.8	88.5	52.6
12/10/2015	03:00	55.9	78.1	49.4
12/10/2015	04:00	58.1	86.0	49.7
12/10/2015	05:00	57.5	79.6	50.9
12/10/2015	06:00	61.2	85.1	54.2
12/10/2015	07:00	70.1	99.6	57.6
12/10/2015	08:00	67.2	88.3	60.4
12/10/2015	09:00	66.1	88.5	58.0
12/10/2015	10:00	64.0	91.2	57.0
12/10/2015	11:00	63.3	79.3	58.2
12/10/2015	12:00	69.3	87.0	59.3

Appendix 3
Summary of Plant Calculations

Appendix 3: Summary of Plant Calculations

Bedford Court Mansions Calculations

Hawkins environmental

ISO 9613-2:1996
Acoustics - Attenuation of sound during propogatio
Part 2: General method of calculations

Source: Comms Road
Receptor: Bedford Court Mansions

Calculation Summary

Frequency		63	125	250	500	1000	2000	4000	8000
L_w	(Sound Power Level)	55.9	57.9	53.9	46.9	38.9	36.9	29.9	28.9
D_c	(Directivity correction)	3	3	3	3	3	3	3	3
A	(Total Attenuation)	29.1	29.1	29.1	29.1	29.1	29.2	29.6	31.0
L_{ET} (DW)	(Sound Pressure Level at Receiver)	29.8	31.8	27.8	20.8	12.8	10.7	3.3	0.9
A-weighting		-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	1.1
L_{AT} (DW)	(A-Weighted SPL at Receiver)	3.6	15.7	19.2	17.6	12.8	11.9	4.3	2.0

Receptor Noise Level 26.4 dB(A) These are facade levels (+3 dB)

Overall Attenuation (A_{div} + A_{atm} + A_{gr} + A_{bar})

Frequency	63	125	250	500	1000	2000	4000	8000
Distance Attenuation (A_{div})	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1
Atmospheric Absorption Attenuation (A_{atm})	0.0	0.0	0.0	0.0	0.1	0.2	0.5	1.9
Ground Attenuation (A_{gr})	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Barrier Attenuation (A_{bar})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overall Attenuation (A)	29.1	29.1	29.1	29.1	29.1	29.2	29.6	31.0

Hawkins environmental

ISO 9613-2:1996
Acoustics - Attenuation of sound during propogatio
Part 2: General method of calculations

Source: Dry Cooler
Receptor: Bedford Court Mansions

Calculation Summary

Frequency		63	125	250	500	1000	2000	4000	8000
L_w	(Sound Power Level)	78.5	76.5	69.5	66.5	51.5	48.5	51.5	50.5
D_c	(Directivity correction)	3	3	3	3	3	3	3	3
A	(Total Attenuation)	29.1	29.1	29.1	29.1	29.1	29.2	29.6	31.0
L_{ET} (DW)	(Sound Pressure Level at Receiver)	52.4	50.4	43.4	40.4	25.4	22.3	24.9	22.5
A-weighting		-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	1.1
L_{AT} (DW)	(A-Weighted SPL at Receiver)	26.2	34.3	34.8	37.2	25.4	23.5	25.9	23.6

Receptor Noise Level 44.0 dB(A) These are facade levels (+3 dB)

Overall Attenuation (A_{div} + A_{atm} + A_{gr} + A_{bar})

Frequency	63	125	250	500	1000	2000	4000	8000
Distance Attenuation (A_{div})	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1
Atmospheric Absorption Attenuation (A_{atm})	0.0	0.0	0.0	0.0	0.1	0.2	0.5	1.9
Ground Attenuation (A_{gr})	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Barrier Attenuation (A_{bar})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overall Attenuation (A)	29.1	29.1	29.1	29.1	29.1	29.2	29.6	31.0

St Giles Hotel – Adeline Place Calculations

Hawkins environmental

ISO 9613-2:1996
Acoustics - Attenuation of sound during propagation
Part 2: General method of calculations

Source: Comms Road
Receptor: St Giles Hotel - Adeline Place

Calculation Summary

Frequency		63	125	250	500	1000	2000	4000	8000
L_w	(Sound Power Level)	55.9	57.9	53.9	46.9	38.9	36.9	29.9	28.9
D_c	(Directivity correction)	3	3	3	3	3	3	3	3
A	(Total Attenuation)	25.8	25.8	25.8	25.8	25.9	25.9	26.2	27.1
L_{ft} (DW)	(Sound Pressure Level at Receiver)	33.1	35.1	31.1	24.0	16.0	14.0	6.7	4.8
A-weighting		-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	1.1
L_{pT} (DW)	(A-Weighted SPL at Receiver)	6.9	19.0	22.5	20.8	16.0	15.2	7.7	5.9

Receptor Noise Level 29.7 dB(A) These are facade levels (+3 dB)

Overall Attenuation (A_{div} + A_{atm} + A_{gr} + A_{bar})

Frequency	63	125	250	500	1000	2000	4000	8000
Distance Attenuation (A_{div})	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8
Atmospheric Absorption Attenuation (A_{atm})	0.0	0.0	0.0	0.0	0.0	0.1	0.4	1.3
Ground Attenuation (A_{gr})	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Barrier Attenuation (A_{bar})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overall Attenuation (A)	25.8	25.8	25.8	25.8	25.9	25.9	26.2	27.1

Hawkins environmental

ISO 9613-2:1996
Acoustics - Attenuation of sound during propagation
Part 2: General method of calculations

Source: Dry Cooler
Receptor: St Giles Hotel - Adeline Place

Calculation Summary

Frequency		63	125	250	500	1000	2000	4000	8000
L_w	(Sound Power Level)	78.5	76.5	69.5	66.5	51.5	48.5	51.5	50.5
D_c	(Directivity correction)	3	3	3	3	3	3	3	3
A	(Total Attenuation)	25.8	25.8	25.8	25.8	25.9	25.9	26.2	27.1
L_{ft} (DW)	(Sound Pressure Level at Receiver)	55.7	53.7	46.7	43.6	28.6	25.6	28.3	26.4
A-weighting		-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	1.1
L_{pT} (DW)	(A-Weighted SPL at Receiver)	29.5	37.6	38.1	40.4	28.6	26.8	29.3	27.5

Receptor Noise Level 47.3 dB(A) These are facade levels (+3 dB)

Overall Attenuation (A_{div} + A_{atm} + A_{gr} + A_{bar})

Frequency	63	125	250	500	1000	2000	4000	8000
Distance Attenuation (A_{div})	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8
Atmospheric Absorption Attenuation (A_{atm})	0.0	0.0	0.0	0.0	0.0	0.1	0.4	1.3
Ground Attenuation (A_{gr})	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Barrier Attenuation (A_{bar})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overall Attenuation (A)	25.8	25.8	25.8	25.8	25.9	25.9	26.2	27.1

5 Great Russell Street Calculations

Hawkins environmental

ISO 9613-2:1996
Acoustics - Attenuation of sound during propagation
Part 2: General method of calculations

Source: AHU Supply
Receptor: 5 Great Russell Street

Calculation Summary

Frequency		63	125	250	500	1000	2000	4000	8000
L_w	(Sound Power Level)	56.3	70.6	64.6	51.8	34.7	30.7	29.7	33.7
D_c	(Directivity correction)	3	3	3	3	3	3	3	3
A	(Total Attenuation)	30.1	30.1	30.1	30.1	30.2	30.3	30.7	32.2
L_{ST} (DW)	(Sound Pressure Level at Receiver)	29.1	43.5	37.5	24.6	7.5	3.4	2.0	4.4
A-weighting		-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	1.1
L_{AT} (DW)	(A-Weighted SPL at Receiver)	2.9	27.4	28.9	21.4	7.5	4.6	3.0	5.5

Receptor Noise Level 34.7 dB(A) These are facade levels (+3 dB)

Overall Attenuation (A_{div} + A_{atm} + A_{gr} + A_{bar})

Frequency	63	125	250	500	1000	2000	4000	8000
Distance Attenuation (A_{div})	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1
Atmospheric Absorption Attenuation (A_{atm})	0.0	0.0	0.0	0.0	0.1	0.2	0.6	2.1
Ground Attenuation (A_{gr})	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Barrier Attenuation (A_{bar})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overall Attenuation (A)	30.1	30.1	30.1	30.1	30.2	30.3	30.7	32.2

Hawkins environmental

ISO 9613-2:1996
Acoustics - Attenuation of sound during propagation
Part 2: General method of calculations

Source: AHU Extract
Receptor: 5 Great Russell Street

Calculation Summary

Frequency		63	125	250	500	1000	2000	4000	8000
L_w	(Sound Power Level)	62.8	75.9	68.9	61.6	46.2	40.2	38.2	41.2
D_c	(Directivity correction)	3	3	3	3	3	3	3	3
A	(Total Attenuation)	30.1	30.1	30.1	30.1	30.2	30.3	30.7	32.2
L_{ST} (DW)	(Sound Pressure Level at Receiver)	35.7	48.8	41.8	34.5	19.0	12.9	10.5	11.9
A-weighting		-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	1.1
L_{AT} (DW)	(A-Weighted SPL at Receiver)	9.5	32.7	33.2	31.3	19.0	14.1	11.5	13.0

Receptor Noise Level 40.3 dB(A) These are facade levels (+3 dB)

Overall Attenuation (A_{div} + A_{atm} + A_{gr} + A_{bar})

Frequency	63	125	250	500	1000	2000	4000	8000
Distance Attenuation (A_{div})	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1
Atmospheric Absorption Attenuation (A_{atm})	0.0	0.0	0.0	0.0	0.1	0.2	0.6	2.1
Ground Attenuation (A_{gr})	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Barrier Attenuation (A_{bar})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overall Attenuation (A)	30.1	30.1	30.1	30.1	30.2	30.3	30.7	32.2

St Giles Hotel – Great Russell St – East of AHU Calculations

Hawkins environmental

ISO 9613-2:1996

Acoustics - Attenuation of sound during propagation

Part 2: General method of calculations

Source	AHU Supply
Receptor	St Giles - East of AHU

Calculation Summary

Frequency		63	125	250	500	1000	2000	4000	8000
L_w	(Sound Power Level)	56.3	70.6	64.6	51.8	34.7	30.7	29.7	33.7
D_c	(Directivity correction)	3	3	3	3	3	3	3	3
A	(Total Attenuation)	24.1	24.1	24.1	24.1	24.1	24.2	24.4	25.1
L_{ST} (DW)	(Sound Pressure Level at Receiver)	35.2	49.5	43.5	30.6	13.5	9.5	8.3	11.5
A-weighting		-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	1.1
L_{AT} (DW)	(A-Weighted SPL at Receiver)	9.0	33.4	34.9	27.4	13.5	10.7	9.3	12.6

Receptor Noise Level 40.7 dB(A) These are facade levels (+3 dB)

Overall Attenuation (A_{div} + A_{atm} + A_{gr} + A_{bar})

Frequency	63	125	250	500	1000	2000	4000	8000
Distance Attenuation (A_{div})	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1
Atmospheric Absorption Attenuation (A_{atm})	0.0	0.0	0.0	0.0	0.0	0.1	0.3	1.1
Ground Attenuation (A_{gr})	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Barrier Attenuation (A_{bar})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overall Attenuation (A)	24.1	24.1	24.1	24.1	24.1	24.2	24.4	25.1

Hawkins environmental

ISO 9613-2:1996

Acoustics - Attenuation of sound during propagation

Part 2: General method of calculations

Source	AHU Extract
Receptor	St Giles - East of AHU

Calculation Summary

Frequency		63	125	250	500	1000	2000	4000	8000
L_w	(Sound Power Level)	62.8	75.9	68.9	61.6	46.2	40.2	38.2	41.2
D_c	(Directivity correction)	3	3	3	3	3	3	3	3
A	(Total Attenuation)	19.0	19.0	19.0	19.0	19.0	19.0	19.1	19.6
L_{ST} (DW)	(Sound Pressure Level at Receiver)	46.8	59.9	52.9	45.6	30.2	24.1	22.0	24.6
A-weighting		-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	1.1
L_{AT} (DW)	(A-Weighted SPL at Receiver)	20.6	43.8	44.3	42.4	30.2	25.3	23.0	25.7

Receptor Noise Level 51.5 dB(A) These are facade levels (+3 dB)

Overall Attenuation (A_{div} + A_{atm} + A_{gr} + A_{bar})

Frequency	63	125	250	500	1000	2000	4000	8000
Distance Attenuation (A_{div})	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Atmospheric Absorption Attenuation (A_{atm})	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.6
Ground Attenuation (A_{gr})	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Barrier Attenuation (A_{bar})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overall Attenuation (A)	19.0	19.0	19.0	19.0	19.0	19.0	19.1	19.6

St Giles Hotel – Great Russell St – West of AHU Calculations

Hawkins environmental

ISO 9613-2:1996
Acoustics - Attenuation of sound during propagation
Part 2: General method of calculations

Source: AHU Supply
Receptor: St Giles - West of AHU

Calculation Summary

Frequency		63	125	250	500	1000	2000	4000	8000
L_w	(Sound Power Level)	56.3	70.6	64.6	51.8	34.7	30.7	29.7	33.7
D_c	(Directivity correction)	3	3	3	3	3	3	3	3
A	(Total Attenuation)	19.0	19.0	19.0	19.0	19.0	19.0	19.1	19.6
L_{ST} (DW)	(Sound Pressure Level at Receiver)	40.3	54.6	48.6	35.8	18.7	14.6	13.5	17.1
A-weighting		-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	1.1
L_{AT} (DW)	(A-Weighted SPL at Receiver)	14.1	38.5	40.0	32.6	18.7	15.8	14.5	18.2

Receptor Noise Level 45.9 dB(A) These are facade levels (+3 dB)

Overall Attenuation (A_{div} + A_{atm} + A_{gr} + A_{bar})

Frequency	63	125	250	500	1000	2000	4000	8000
Distance Attenuation (A_{div})	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Atmospheric Absorption Attenuation (A_{atm})	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.6
Ground Attenuation (A_{gr})	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Barrier Attenuation (A_{bar})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overall Attenuation (A)	19.0	19.0	19.0	19.0	19.0	19.0	19.1	19.6

Hawkins environmental

ISO 9613-2:1996
Acoustics - Attenuation of sound during propagation
Part 2: General method of calculations

Source: AHU Extract
Receptor: St Giles - West of AHU

Calculation Summary

Frequency		63	125	250	500	1000	2000	4000	8000
L_w	(Sound Power Level)	62.8	75.9	68.9	61.6	46.2	40.2	38.2	41.2
D_c	(Directivity correction)	3	3	3	3	3	3	3	3
A	(Total Attenuation)	24.1	24.1	24.1	24.1	24.1	24.2	24.4	25.1
L_{ST} (DW)	(Sound Pressure Level at Receiver)	41.7	54.8	47.8	40.5	25.0	19.0	16.8	19.0
A-weighting		-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	1.1
L_{AT} (DW)	(A-Weighted SPL at Receiver)	15.5	38.7	39.2	37.3	25.0	20.2	17.8	20.1

Receptor Noise Level 46.4 dB(A) These are facade levels (+3 dB)

Overall Attenuation (A_{div} + A_{atm} + A_{gr} + A_{bar})

Frequency	63	125	250	500	1000	2000	4000	8000
Distance Attenuation (A_{div})	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1
Atmospheric Absorption Attenuation (A_{atm})	0.0	0.0	0.0	0.0	0.0	0.1	0.3	1.1
Ground Attenuation (A_{gr})	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Barrier Attenuation (A_{bar})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overall Attenuation (A)	24.1	24.1	24.1	24.1	24.1	24.2	24.4	25.1