Hawkins environmental

Noise Impact Assessment: 112a Great Russell Street, London

Central London Investments Ltd

6th November 2015

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1. INTRODUCTION

1.1. Overview

Hawkins Environmental Limited has been commissioned by Central London Investments Ltd to carry out a noise assessment in respect of the proposed redevelopment of basement levels -4 and -5 of 112a Great Russell Street, situated in the London Borough of Camden. **Appendix 1** shows a location plan of the proposed development site.

The site is currently a 'Quick Parking' car park; however it is proposed to convert the two basement floors into hotel accommodation. During the planning process, concern has been raised as to whether noise from the proposed mechanical plant will have an impact on surrounding residential properties. In addition, concern has been raised by the Planning Officers at the London Borough of Camden 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".*

Consequently, this report summarises background noise levels in the vicinity of the development site, the likely noise output of the proposed plant and assesses the impact of the plant and noise from the operation of the hotel on surrounding sensitive premises.

1.2. Changes to the October Update of this Report

This version of the report has been prepared in response to comments provided by Sandy Brown Acoustic Consultants on behalf of the Bloomsbury Association who are objecting to the application. The Bloomsbury Association's response included comments on several of the submission documents; however, specifically relating to the noise assessment, their comments could be summarised as follows:

1. They see the noise survey as unrepresentative due to its location, duration and when it was carried out;
2. They perceive the suggested plant noise limit as unsuitable due to the methodology of determination;
3. They have suggested a large range of plant should have been considered in the assessment; and
4. They have ongoing concerns regarding how noise from traffic and pedestrians accessing the hotel will be managed.

2. NOISE CRITERIA

2.1. The National Planning Policy Framework

The National Planning Policy Framework (NPPF), published in March 2012 provides the framework within which Local Planning Authorities should determine planning applications.

Section 123 of the NPPF talks specifically about noise stating that *"Planning policies and decisions should aim to:*

- *Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

The purpose of the NPPF is for Local Planning Authorities to determine for themselves whether a "*new development is appropriate for its location"* or how to determine what constitutes "*a good standard of amenity for all…future occupants of buildings"*.

2.2. Noise Policy Statement for England

The Noise Policy Statement for England(NPSE)[1] 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.

[1] The Noise Policy Statement for England, March 2010, Defra.

- **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. National Planning Practice Guidance on Noise

The NPPG provides more guidance on the assessment of noise for planning purposes and builds on the concepts of NOEL, LOAEL etc 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 flexible 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, night clubs and public houses can have particular impacts, not least because activities are often at their peak in the evening and late at night. Local planning authorities will wish to bear in mind not only the noise that is generated within the premises but also the noise that may be made by customers in the vicinity."*

2.4. BS 4242: 2014 'Methods for rating and assessing industrial and commercial sound'

British Standard BS 4142: 2014 '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."*

2.5. 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 2.1** 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 2.1** 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 2.1: Summary of Noise Criteria: BS8233:2014

Activity	Location	07:00 to 23:00	23:00 to 0700
Resting	Living room	35 dB $L_{Aeq.16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq.16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq.16hour}$	30 dB $L_{Aeq.8hour}$

When considering the noise level criteria considered in **Table 2.1**, the following points should be noted:

1. 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".*
2. The noise levels quoted above are annual averages and *"do not need to be achieved in all circumstances"* e.g. New Years Eve or fireworks night.
3. The noise levels in **Table 2.1** 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.
4. 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".*
5. 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 $L_{Aeq,T}$ 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."*

2.6. The London Plan

The London Plan – The Spatial Development Strategy for London consolidated with alterations since 2011, 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 on 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:

a) *minimise the existing and potential; adverse impacts of noise on, from, within, or in the vicinity of, development proposals;*

b) *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;*

c) *promoting new technologies and improving practices to reduce noise at source."*

2.7. London Plan – Housing Supplementary Planning Guidance

The Housing SPG, published in November 2012 highlights the elements of the London Plan that are relevant to housing development, and where applicable, provides more detail. The SPG states:

"Noise - Baseline

Standard 5.3.1 (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.

Policy 7.15 Reducing Noise and Enhancing Soundscapes requires development proposals to seek to reduce noise and manage the effects of noise. 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 NPPF154.

2.3.35 All dwellings should be built with acoustic insulation and tested to current Building Regulations standards155. 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."

2.8. Local Policy

The London Borough of Camden's Development Policies 2010-2025 document states in Policy DP28 Noise and Vibration that *"The Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for: a) development likely to generate noise pollution;...The Council will only grant permission for plant or machinery if it can be operated without cause harm to amenity and does not exceed our noise thresholds."*

The policy document goes on to describe noise thresholds at which noise levels will be acceptable:

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

Noise description and location of measurement	***Period***	***Time***	***Noise level***
Noise at 1 metre external to a sensitive façade	*Day, evening and night*	*0000-2400*	*5dB(A) <L_{A90}*
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	*Day, evening and night*	*0000-2400*	*10dB(A) <L_{A90}*
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	*Day, evening and night*	*0000-2400*	*10dB(A) <L_{A90}*

Noise at 1 metre external to sensitive façade where L_{A90}>60dB	*Day, evening and night*	*0000-2400*	*55dBL_{Aeq}"*

3. NOISE MEASUREMENT STUDY

3.1. Noise Survey

In order to determine the extent to which closest noise sensitive premises will be affected by noise from the proposed plant, it is important to determine the existing noise climate of the site. Therefore, a detailed noise measurement study has been carried out.

All noise 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. **Appendix 3** summarises the equipment used including serial numbers and calibration data.

All noise 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 noise source itself. The following statistical parameters were recorded during the survey: L_{Aeq}, L_{Amax}, L_{A10}, L_{A50}, L_{A90}.

The Sandy Brown report on behalf of the Bloomsbury Association stated that they were concerned with the original noise survey as it was conducted in May 2012 and stated that *"it is our understanding that noise surveys generally need to be within the previous two years of an application"*; furthermore they were concerned that it was only for a single 24 hour period, which did not capture the Sunday night/Monday morning period which they stated would typically experience the lowest noise levels. Their final comment related to the fact that the monitoring was conducted close to operational plant, including some that were subject to enforcement notices.

There is no guidance that states that noise surveys should not be any older than two years. The noise survey must be a true representation of the noise climate of the area and, in our view, since the noise climate has not changed significantly over the past three years, it is considered that the original noise survey is an accurate representation of the site. Indeed, if it has changed, it is only likely to have become noisier.

In Central London, Sunday nights are generally not any quieter than weekdays, and therefore the monitoring carried out is representative of the local environment.

The original monitoring location was chosen as it was as far away from operational plant as possible. It certainly wasn't near to any plant, but was certainly closer to plant than the closest affected properties would be. However, given the available access, this was seen as the best available location for the noise monitoring at the time.

However, in light of the comments, an extended noise survey was conducted between Thursday 8th October and Monday the 12th October at 104a Bedford Court Mansions, one of the properties with the greatest potential to be affected by the proposed development. Conversations with the London Borough of Camden have confirmed that there are currently no outstanding enforcement notices on any plant in the vicinity of the development site; therefore the noise measurements collected at 104a Bedford Court Mansions would be considered representative of future and existing background conditions.

The noise 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. The noise measurement setup was observed by Reena Mehtani from Sandy Brown working on behalf of the Bloomsbury Association, who is also a Member of the Institute of Acoustics. The measurement position and survey methodology was agreed with Reena Mehtani.

Weather conditions were conducive to successful monitoring. **Table 3.1** summarises the weather conditions during the measurement period.

Table 3.1: Summary of Weather Conditions during the Noise 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 **Appendix 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 3.2** and **Figure 3.1** below, and detailed in **Appendix 4**.

Table 3.2: 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

Period	Period	L_{Aeq}	L_{Amax}	L_{A90}
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

The results of the extended noise survey indicate that the measured noise levels are very similar to those measured during the 2012 survey. Noise measurements conducted over Sunday night through to Monday Morning indicate that noise levels measured at this time are not quieter than a typical week day.

3.2. Determination of Background Noise Levels

One of the comments from the Sandy Brown report suggested that the method for determining the background noise level was incorrect. The methodology incorporated within the original report utilised the guidance contained within BS 4142:2014 to determine typical noise levels. Sandy Brown suggested that *"as a new standard (this) does not yet comply to Camden's requirements"* and go on to say that *"the lowest L_{A90} values should be used"*. However, this is incorrect. The 1997 version of BS 4142 does not mention the requirement to use the lowest L_{A90} value (or indeed how to determine the background noise level at all); however in the absence of alternative guidance this practice has been (erroneously) adopted by consultants and policy markers alike. One of the main corrections the 2014 version of BS 4142 is to clarify how to determine background noise levels, i.e. to determine a "typical" background noise level. Camden's policy does not mention the requirement to use the lowest L_{A90} noise level and since the latest guidance clearly steers away from using the lowest background noise level, the use of this level in a BS 4142 assessment would be incorrect. This approach was discussed with Edward Davis and Monica Mulowoza at the London Borough of Camden's Environmental Health Team on the 30th September 2015, where they confirmed that whilst they were still accepting noise assessment reports adopting the (more onerous) 1997 approach, they confirmed that the 2014 approach is the correct methodology to be using, as it incorporates the most up-to-date guidance on the subject, providing that noise monitoring period included multiple days and incorporated the Sunday night/Monday morning period.

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, evening and night time periods, 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 7pm) and evening (7pm to 11pm). **Figure 3.2, Figure 3.3** and **Figure 3.4** detail the distribution of the background noise levels as described in BS 4142: 2014 for the daytime, evening and night time periods.

It can be seen from the figures that typical L_{A90} noise levels of 58, 56 and 50 dB(A) have been determined for the day, evening and night time periods respectively. The previous noise survey determined that typical L_{A90} noise levels where 57, 56 and 51 dB(A) determined for the day, evening and night time periods respectively, i.e. broadly similar background noise levels were measured in both surveys.

Figure 3.1: Summary of Noise Measurements at 104a Bedford Court Mansions

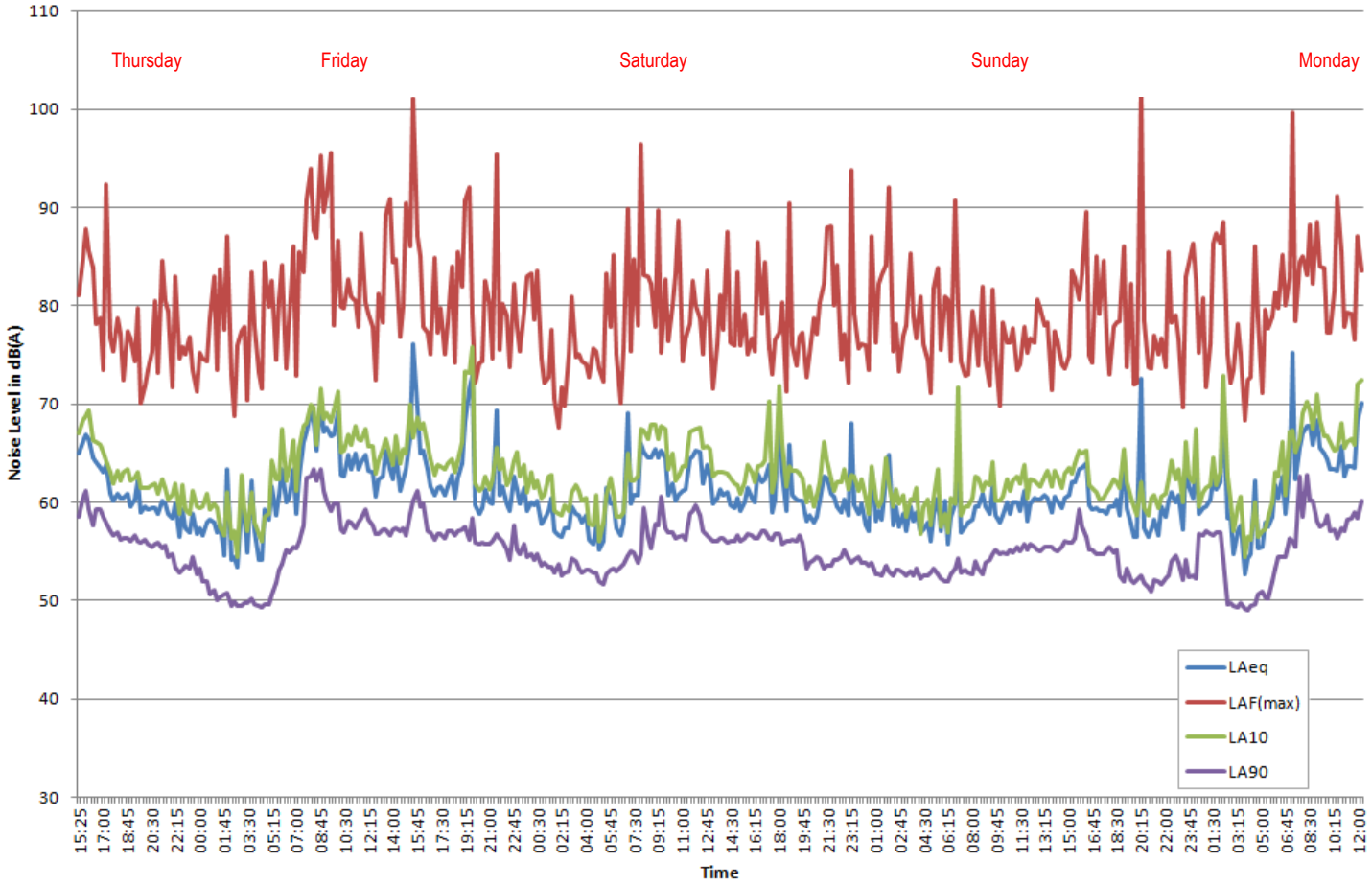


Figure 3.2: Distribution of Daytime $L_{A90.1hour}$ Noise Levels

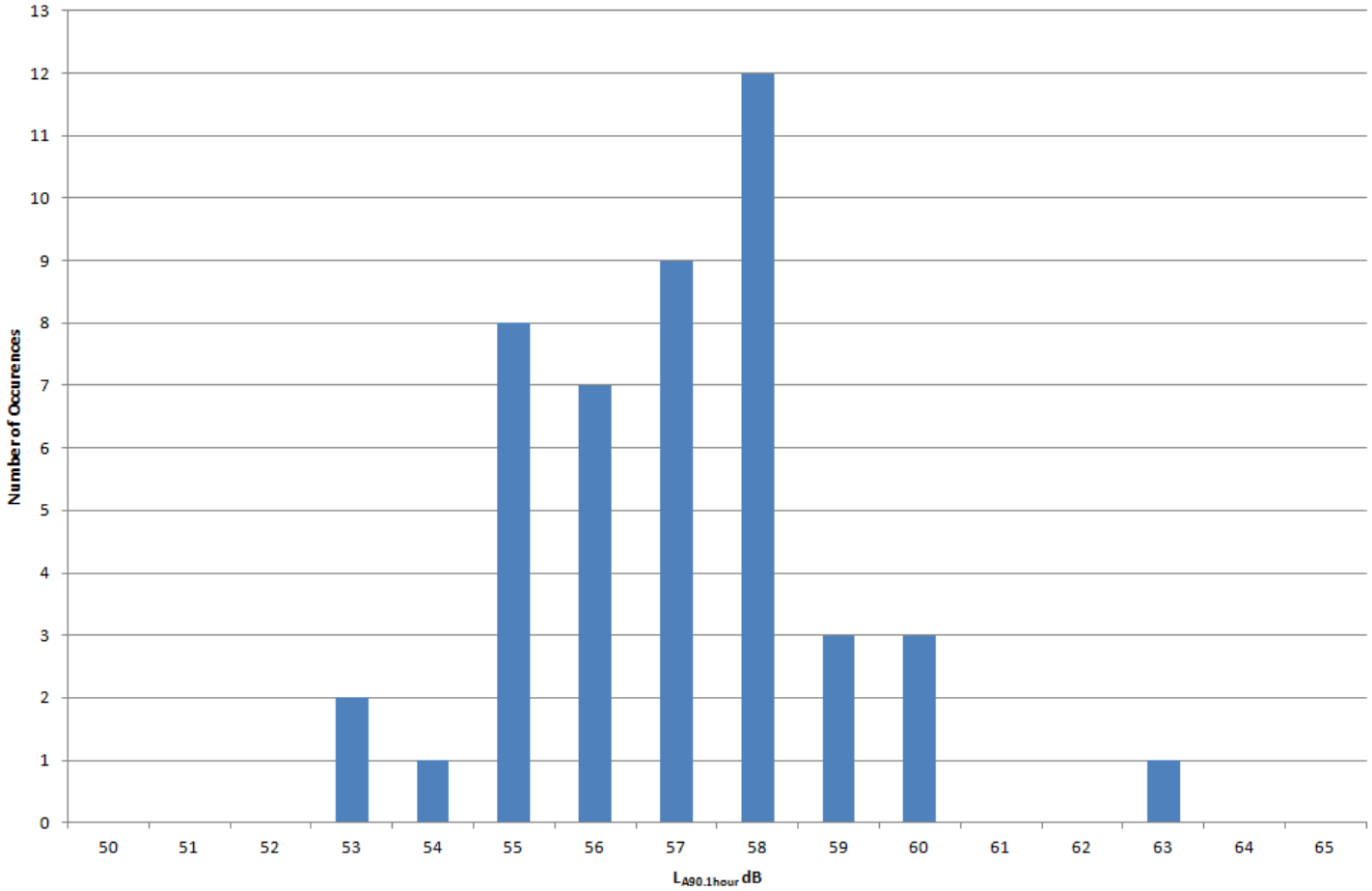


Figure 3.3: Distribution of Evening $L_{A90.1hour}$ Noise Levels

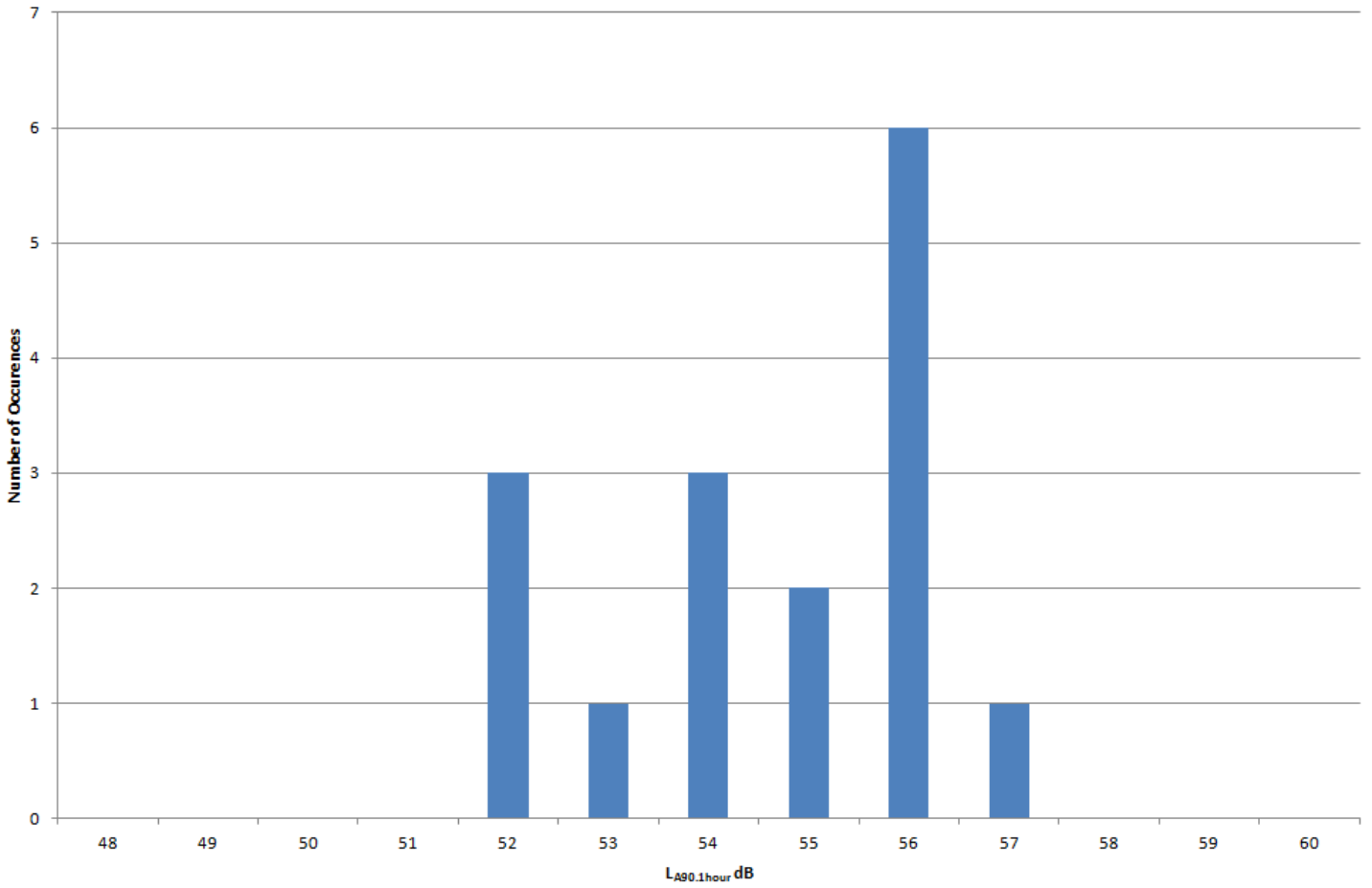
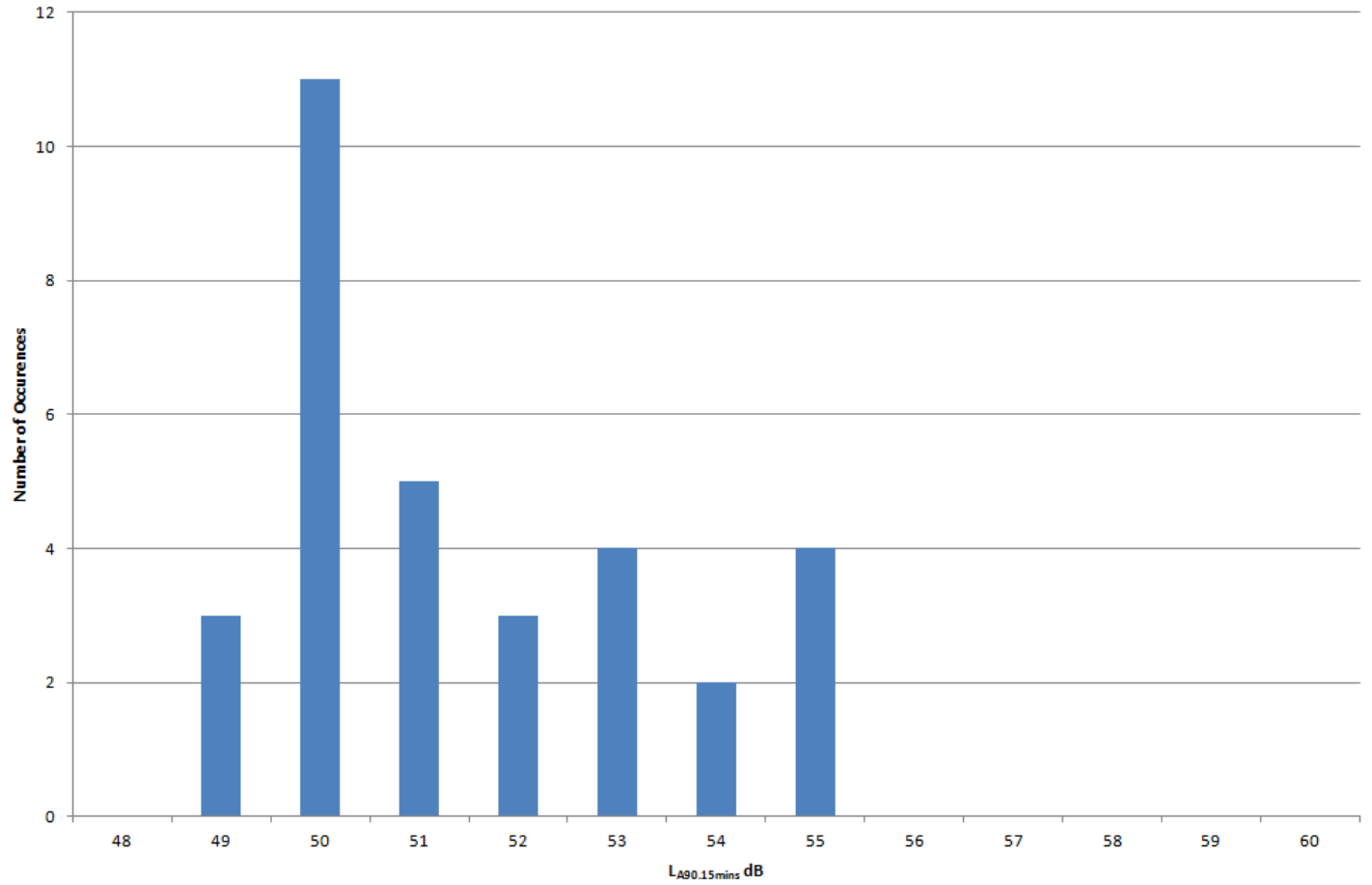


Figure 3.4: Distribution of Night Time $L_{A90.15mins}$ Noise Levels



4. PLANT NOISE IMPACT ASSESSMENT

4.1. Proposed Fixed Plant and Machinery

Hoare Lea, the M&E consultants for the project, have noted that the proposed hotel incorporates the following items of equipment that will have varying levels of noise generated from them:

1. Air handling units;
2. Air source heat pumps;
3. Standby generator for life safety systems;
4. Electrical substation; and
5. Existing systems with ducted extensions from the current location on the ramp to the new façade.

The exact specification for the plant has not been determined at this early stage; this will take place once a detailed design M&E specification is drawn up prior to construction. Accordingly, typical noise levels from plant have been determined and sample calculations have been conducted to give an indication of the typical cumulative noise levels expected from the items of plant, as well as an indication of the magnitude of the attenuation required to demonstrate that the attenuation of noise from the proposed development is within the parameters of technical feasibility.

4.1.1. Air Handling Units

The air handling units (AHU) are located at levels -4 and -5 and are connected to the outside via ductwork. As is convention, these units will be connected to attenuators to achieve a sound pressure level at 1m from the external louvre of between 50 dB(A) and 60 dB(A). Since this is a noise sensitive site and the design should incorporate best practice wherever possible, for the purposes of the calculations it is assumed that the sound pressure level at 1m from the external louvre will be no greater than 50 dB(A). The exact location of the external louvre has not been specified, but for the purposes of the calculations, it is assumed that it will be in the external wall at ground level on Adeline Place.

4.1.2. Air Source Heat Pumps

The air source heat pumps (ASHP) are located on the existing car park ramp and inboard of the louvre. Typical sound pressure level for each heat pump is 65 dB(A) at 1m. The current design indicates a requirement for five of these units. It is assumed that all five ASHPs could operate concurrently.

4.1.3. Standby Generator

The standby generator is provided for life safety systems and will only operate automatically under conditions where the mains power has failed. Testing will be required on a monthly basis and will be undertaken during daytime hours. The emergency generator will be located adjacent to the ASHPs in the plant room, behind a louvre. At this stage in the design process a sound level for the plant has not been determined; however discussions with the Environmental Health team at the London Borough of Camden indicate that for testing, the plant can exceed background noise levels by 10 dB(A) as long as it runs only during noisy periods.

Consequently, the maximum output of the standby generator will set as 10 dB(A) above the existing daytime background noise level at the closest receptor.

4.1.4. Electrical Substation

A new electrical substation is to be provided. This is totally enclosed and provided with ventilation openings to meet the requirements of the equipment supplier/owner. The noise generated by the transformer within the enclosure has a maximum sound power level of 59 dB(A), but it is understood that under normal operating conditions, the sound level would potentially be much lower.

4.1.5. Existing Systems

There are three existing air systems that are located on the wall of/protruding into the existing car park ramp. To maintain the functionality of these systems it will be necessary to extend the ductwork to the new building line. It is not anticipated that the extensions of these systems will increase sound levels at the closest receptors, as although the duct opening may be closer to the sensitive receptor than at present, any increase in noise level should be offset by the additional duct attenuation. However, it is proposed to ensure that noise measurements are conducted adjacent to these existing systems prior to the commencement of any works and post completion to ensure at the closest sensitive receptors, sound levels from these systems are no greater than the existing levels.

4.2. Noise Level at Closest Properties

The closest sensitive receptors are located at Bedford Court Mansions, on the opposite side of Adeline Place and on the first floor of the St Giles Hotel. Bedford Court Mansions is at a distance of 17m from the louvres, with St Giles Hotel situated above the louvres at a distance of 11m. Using 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 affects of building reflections on facade locations, it has been possible to determine total noise level at the closest sensitive receptor locations. As identified in **Section 4.1**, the only plant that will be operating under normal conditions that require consideration is the ASHP, AHU and the electricity substation. **Table 4.1**, **Table 4.2** and **Table 4.3** summarise the calculation of the plant noise at a location 1m from the facade of each of the closest sensitive receptors. **Table 4.4** then summarises the cumulative noise level from all plant operating concurrently at the closest sensitive receptors.

For the receptor located above the plant location at St Giles Hotel, a nominal 5 dB(A) correction has been applied for the affects of partial screening. A correction of 3 dB(A) has been applied to all receptor noise levels to replicate facade conditions and to allow direct comparison to the measured background noise levels. It is assumed that the louvre on the plant room will have an insertion loss of 15 dB(A). This level of attenuation is typical of a fairly standard acoustic louvre. No additional attenuation has been assumed in the calculations for the electricity substation. It is assumed that it will also be behind a louvre; however the sound output from the substation is comparatively low and therefore the omission of any additional attenuation does not alter the receiver noise levels.

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Table 4.1: Noise Levels Calculations - APSH

Receptor	Bedford Court Mans.	St Giles Hotel
Sound Pressure Level of 1x APSH @ 1m dB(A)	65	
Sound Power Level of 5x APSH dB(A)	83.0	
Distance from source to louvre (m)	3	
Average absorptive coefficient	0.10	
Room Constant	32.76	
Direct Sound Pressure Level at louvre dB(A)	62.4	
Reverberant Sound Pressure Level at louvre dB(A)	73.9	
Total Sound Pressure Level at louvre dB(A)	74.2	
Resultant Sound Power Level of louvre dB(A)	83.7	
Insertion loss of louvre dB(A)	15	
Distance from louvre to receptor (m)	16	11
Screening attenuation dB(A)	0	5
Distance attenuation dB(A)	32.1	28.8
Facade correction dB(A)	3	3
Receptor Noise Level @1m from facade dB(A)	**39.6**	**37.9**

Table 4.2: Noise Levels Calculations – Electricity Substation

Receptor	Bedford Court Mans.	St Giles Hotel
Sound Power Level of dB(A)	59	
Distance from plant to receptor (m)	16	11
Screening attenuation dB(A)	0	5
Distance attenuation dB(A)	32.1	28.8
Facade correction dB(A)	3	3
Receptor Noise Level @1m from facade dB(A)	**29.9**	**28.2**

Table 4.3: Noise Levels Calculations – AHU

Receptor	Bedford Court Mans.	St Giles Hotel
Sound Pressure Level @ 1m dB(A)	50	
Distance from plant to receptor (m)	15	11
Screening attenuation dB(A)	0	5
Distance attenuation dB(A)	23.5	20.8
Facade correction dB(A)	3	3
Receptor Noise Level @1m from facade dB(A)	**29.5**	**27.2**

Table 4.4: Noise Levels Calculations – Cumulative Noise Levels

Receptor		Bedford Court Mans.	St Giles Hotel
Receptor Noise Level @1m from facade dB(A)	ASHP	39.6	37.9
	Substation	29.9	28.2
	AHU	29.5	27.2
	Total Noise Level	**40**	**38**

Table 4.4 shows that the cumulative noise level from all plant operating concurrently at Bedford Court Mansions will be 40 dB(A) and 38 dB(A) at St Giles Hotel.

4.3. Adherence to Noise Criteria

To assess the impact of the proposed plant, the predicted noise levels have been compared to the criteria in BS 4142 and Camden's policy on noise. **Table 4.5, Table 4.6** and **Table 4.7** considers the noise levels in a BS 4142 assessment for the daytime, evening and night-time periods respectively.

Table 4.5: BS 4142 Assessment -Daytime

	Background Noise Level L_{A90}	Cumulative Plant Noise Level L_{Aeq}	Difference between Plant Level and Background Noise Level
Bedford Court Mans.	58	40	-18
St Giles Hotel	58	38	-20

Table 4.6: BS 4142 Assessment -Evening

	Background Noise Level L_{A90}	Cumulative Plant Noise Level L_{Aeq}	Difference between Plant Level and Background Noise Level
Bedford Court Mans.	56	40	-16
St Giles Hotel	56	38	-18

Table 4.7: BS 4142 Assessment –Night-time

	Background Noise Level L_{A90}	Cumulative Plant Noise Level L_{Aeq}	Difference between Plant Level and Background Noise Level
Bedford Court Mans.	50	40	-10
St Giles Hotel	50	38	-12

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. **Table 4.5, Table 4.6** and **Table 4.7** show that with the louvre attenuation specified, the cumulative noise level from all plant will be at least 10 dB(A) below the background noise level and will be considerably greater than 10 dB(A) below background during the daytime and evening periods.

Consequently, noise from the plant will adhere to Camden's Policy DP28 on noise.

It is important to note that the above noise calculations are indicative only and full detailed noise calculations, using octave band data were available, should be conducted at the detailed design stage and attenuation levels amended as necessary.

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.

5. 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 4.

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.

6. HOTEL NOISE IMPACT ASSESSMENT

Planning officers at London Borough of Camden have 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 have determined that there is 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, the street perpendicular to where the plant will be situated. Great Russell Street is itself 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 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.

7. NOISE FROM YMCA

The London Borough of Camden have 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.

8. 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"*.

9. 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 guidance set on in Policy DP28 of the London Borough of Camden's Development Policies 2010-2025, a noise impact assessment has been conducted to ensure that noise levels at the closest sensitive properties are not increased.

It is understood that plant that may be audible outside of the curtilage of the hotel includes some air source heat pumps, an air handling unit, an electricity substation and a standby generator. A noise survey has determined that typically L_{A90} noise levels of 58, 56 and 50 dB(A) are observed for the day, evening and night time periods respectively and therefore noise limits at the closest sensitive receptors should be no greater than 48, 46 and 40 dB(A) for the day, evening and night time periods respectively.

The exact specification for the plant has not been determined at this early stage; this will take place once a detailed design M&E specification is drawn up prior to construction. Accordingly, typical noise levels from plant have been determined and sample calculations have been conducted to give an indication of the typical cumulative noise levels expected from the items of plant, as well as an indication of the magnitude of the attenuation required to demonstrate that the attenuation of noise from the proposed development is within the parameters of technical feasibility.

The calculations have shown that based on indicative plant noise levels, using standard attenuation products noise from the fixed plant and machinery will be at least 10 dB(A) below the existing measured background noise level and will be considerably more than 10 dB(A) below background during the day and evening 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.

It is important to note that floors -4 and -5, which are to be converted into a hotel as part of this development, are currently a car park. The closure of this car park is likely to result in an improvement in noise levels, with a reduction a large number of movements per day on Adeline Place and the surrounding roads. Whilst this has not been quantified, but it is possible that this proposed development will actually have a positive impact on the local noise environment and may lead to a reduction in ambient noise levels for local residents.

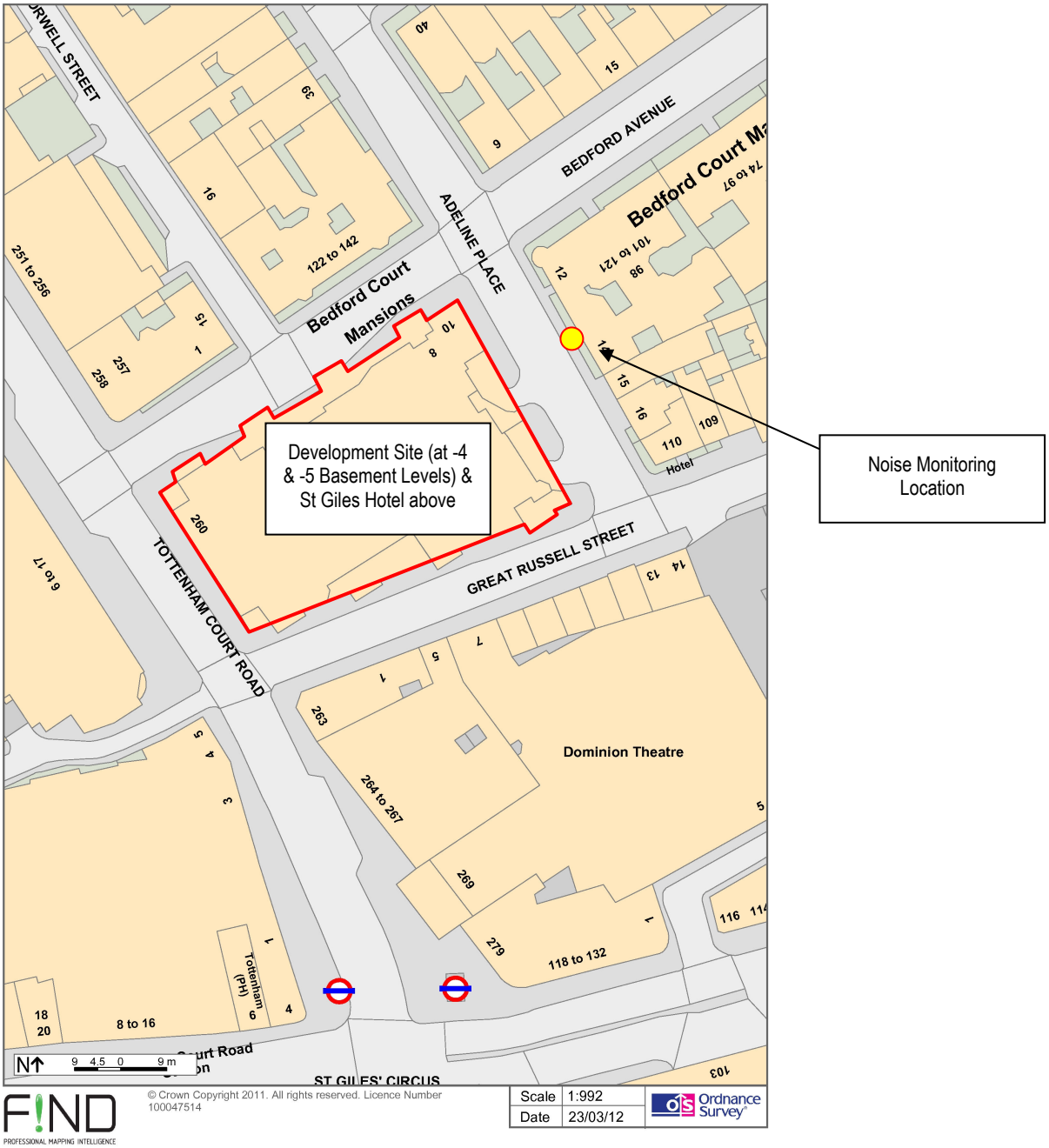
This updated version of the report has been prepared to respond to the comments from the Bloomsbury Association, specifically relating to the methodology of the noise survey and assessment, the adequacy and range of plant to be assessed, as well as noise from pedestrians and traffic.

This revised report incorporates a number of the suggestions made by the Bloomsbury Association regarding methodology and includes an updated and extended noise survey, as well as clarifies a number of points of methodology agreed with the London Borough of Camden. The scope of the plant noise assessment has been increased and the expected cumulative noise level from all new plant has been determined and the assessment shows that through the implementation of standard acoustic control measures, noise from the plant will adhere to Camden's Policy DP28 on noise. The Hotel Management Plan has been revised to address noise concerns and it has now been demonstrated that noise can be satisfactorily managed and mitigated through the implementation of the Hotel Management Plan.

Overall it is considered that the concerns of the Bloomsbury Association have been addressed in this updated report and that the development proposals will remain acceptable in terms of noise and that the conclusions of the original report still stand.

Appendix 1
Site Plan

Appendix 1: Site Plan



Appendix 2
Glossary of Acoustic Terms

Appendix 2: Glossary of Acoustic Terms

'A'-Weighting - This is the main way of adjusting measured sound pressure levels to take into account human hearing, and our uneven frequency response.

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.

$L_{Aeq,T}$ - The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over the given period, T. T may be as short as 1 second when used to describe a single event, or as long as 24 hours when used to describe the noise climate at a specified location. $L_{Aeq,T}$ 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_{A10T}. 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_{A50T}.

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_{A90T}. 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.

Appendix 3
Schedule of Equipment

Appendix 3: Schedule of Equipment

Equipment Set 3056:

Equipment Type	Manufacturer	Serial Number	Calibration Certification Number	Calibration Type	Date of Last Calibration Check	Date of Next Calibration Check
Nor-140 Type 1 Sound Level Meter	Norsonic	1403056	16831	Traceable to NPL London by Campbell Associates	13th August 2014	13th August 2016
Nor-1209 Pre-amplifier	Norsonic	12528	16830	Traceable to NPL London by Campbell Associates	13th August 2014	13th August 2016
Nor-1225 Microphone	Norsonic	14360	16830	Traceable to NPL London by Campbell Associates	13th August 2014	13th August 2016
Nor-1251 Sound Calibrator	Norsonic	32849	19738	Traceable to NPL London by Campbell Associates	1st October 2015	1st October 2016
Nor-1284 Dehumidifier	Norsonic	222	Not Applicable			
Nor- 1212 Weather Protection Kit	Norsonic	Not Applicable				
Nor1408A/5 Extension Cable	Norsonic/Lemo	Not Applicable				

Calibration Report

Certificate Number:-16831

Norsonic Type: 140 Serial no: 1403056

Customer:	**Hawkins Environmental Ltd**
Address:	**70 Wentworth Crescent, Basingstoke, Hampshire. RG22 4WX.**
Contact Person:	**Nick Hawkins.**

Instrument software version: V1.4.6238

Microphone :	Norsonic	Type: 1225	Serial no: 14360	Sens:-24.81dB
Preamplifier	Norsonic	Type: 1209	Serial no: 12528	
Calibrator:	Norsonic	Type: 1251	Serial no: 32849	Level:113.98dB
Wind screen	Norsonic	Type: Nor1451		

Mains adapter was included Interface cable was included

This sound level meter has been calibrated as specified in BS 7580. PART 1: 1997. The results are traceable to NPL, UK.
Measurement Results:

Indication at the calibration check frequency - BS7580 Clause 5.4	Passed
Noise test - BS 7580 Clause 5.5.2	Passed
Level Linearity Test - BS 7580, Clause 5.5.3	Passed
Frequency weightings: A Network - BS 7580 Clause 5.5.4	Passed
Frequency weightings: C Network - BS 7580 Clause 5.5.4	Passed
Frequency weightings: Z Network - BS 7580 Clause 5.5.4	Passed
Time weightings F and S - BS7580 Clause 5.5.5	Passed
Peak response - BS7580 Clause 5.5.6	Passed
RMS accuracy - BS7580 Clause 5.5.7	Passed
Time weighting I - BS7580 Clause 5.5.8	Passed
Integrating Test : Time averaging - BS7580 Clause 5.5.9	Passed
Integrating Test : Pulse range - BS7580 Clause 5.5.10	Passed
Integrating Test : Sound exposure level - BS 7580 Clause 5.5.11	Passed
Overload SPL Test - BS 7580 Clause 5.5.12	Passed
Overload Leq Test - BS 7580 Clause 5.5.12	Passed
Acoustic tests - BS 7580 Clause 5.4 and 5.6	Passed
Summation of acoustic tests - BS 7580 Clause 5.5.4	Passed

Comment:
Correct level with associated calibrator is 113.8dB(A).

Environmental conditions:

Pressure:	Temperature:	Relative humidity:
99.810 kPa	22.8 °C	45.5 %RH

Date of calibration: 13/08/2014
Date of issue: 13/08/2014
Supervisor: Darren Batten TechIOA
Engineer

Michael Tickner

Campbell Associates
www.campbell-associates.co.uk

Software version: 6.0d

Calibration Report

Certificate Number:-16830

Manufacturer:	**Norsonic**
Type:	**1225**
Serial no:	**14360**

Customer:	**Hawkins Environmental Ltd**
Address:	**70 Wentworth Crescent, Basingstoke, Hampshire. RG22 4WX.**
Contact Person:	**Nick Hawkins.**

Measurement Results:

	Sensitivity: (dB re 1V/Pa)	Capacitance: (pF)
1:	-24.82	20.9
2:	-24.81	20.9
3:	-24.81	20.9
Result (Average):	**-24.81**	**20.9**
Expanded Uncertainty:	0.10	2.00
Degree of Freedom:	>100	>100
Coverage Factor:	2.00	2.00

The following correction factors have been applied during the measurement:
Pressure:-0.001 dB/kPa Temperature:0.005 dB/°C Relative humidity:0.000 dB/%RH

Reference Calibrator: WSC2 - GRAS42AA-18277 Volume correction: 0.000 dB
Records:K:\C A\Calibration\Nor-1504\Nor-1017 MicCal\2014\NOR1225_14360_M1.nmf
Measurement procedure: TP05
All results quoted are directly traceable to National Physical Laboratory, London

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2, which for a normal distribution corresponds to coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA publication EA-4/02.

Comment:

Environmental conditions:

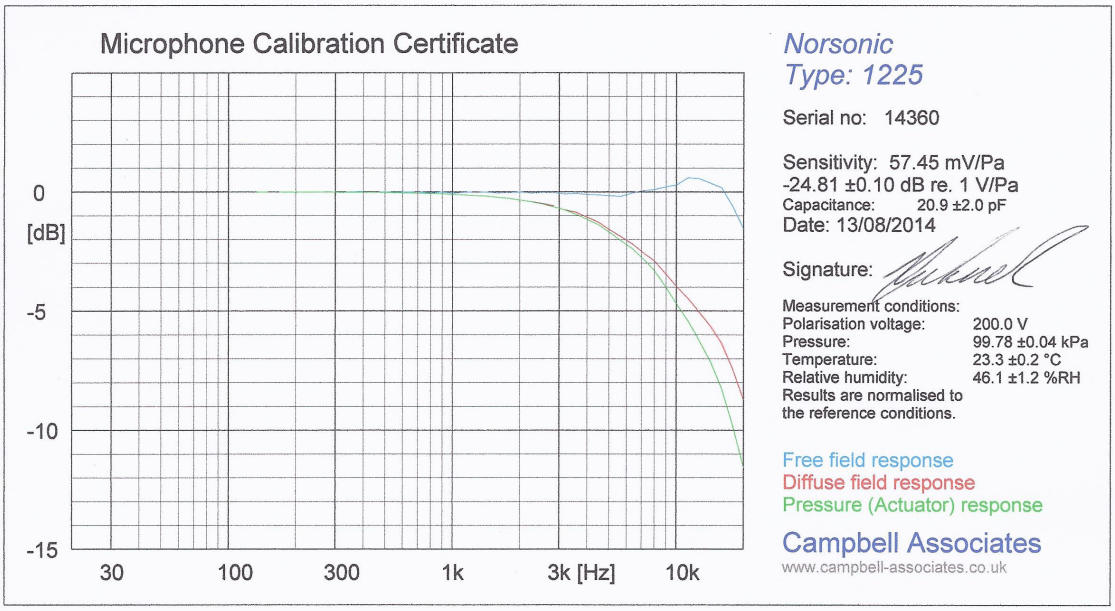
Pressure:	Temperature:	Relative humidity:
99.781 ± 0.040 kPa	23.3 ± 0.2 °C	46.1 ± 1.2 %RH

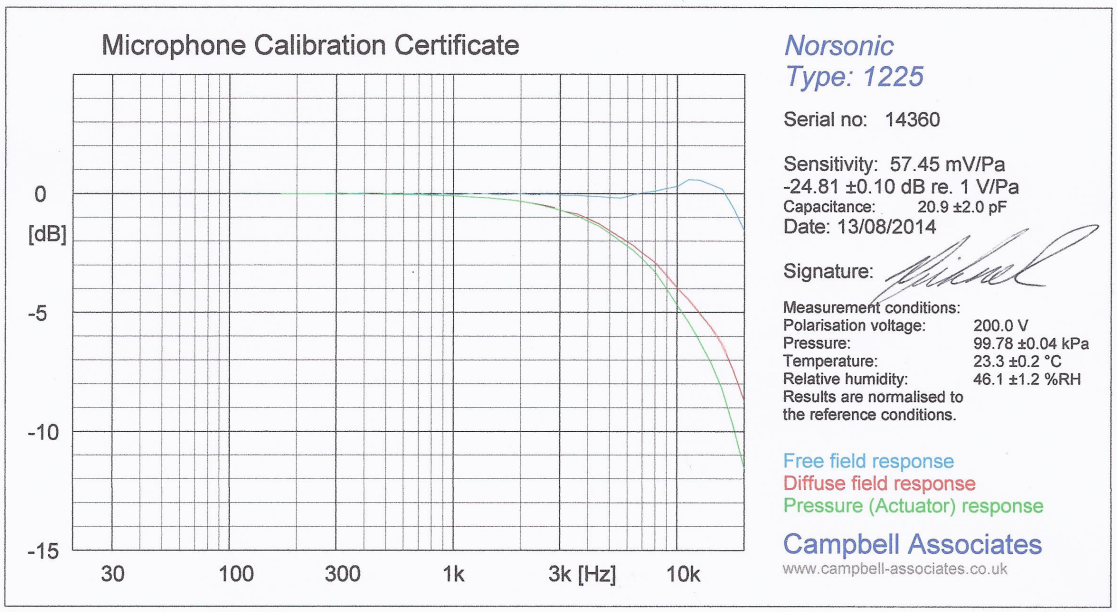
Date of calibration: 13/08/2014
Date of issue: 13/08/2014

Supervisor : Darren Batten TechIOA
Engineer :

Campbell Associates
www.campbell-associates.co.uk

Michael Tickner
Software version: 6.0h


Microphone Calibration Certificate
0
[dB]
-5
-10
-15
30
100
300
1k
3k [Hz]
10k
Norsonic
Type: 1225
Serial no: 14360
Sensitivity: 57.45 mV/Pa
-24.81 ±0.10 dB re. 1 V/Pa
Capacitance: 20.9 ±2.0 pF
Date: 13/08/2014
Signature:
Measurement conditions:
Polarisation voltage: 200.0 V
Pressure: 99.78 ±0.04 kPa
Temperature: 23.3 ±0.2 °C
Relative humidity: 46.1 ±1.2 %RH
Results are normalised to the reference conditions.
Free field response
Diffuse field response
Pressure (Actuator) response
Campbell Associates
www.campbell-associates.co.uk


Microphone Calibration Certificate
0
[dB]
-5
-10
-15
30
100
300
1k
3k [Hz]
10k
Norsonic
Type: 1225
Serial no: 14360
Sensitivity: 57.45 mV/Pa
-24.81 ±0.10 dB re. 1 V/Pa
Capacitance: 20.9 ±2.0 pF
Date: 13/08/2014
Signature:
Measurement conditions:
Polarisation voltage: 200.0 V
Pressure: 99.78 ±0.04 kPa
Temperature: 23.3 ±0.2 °C
Relative humidity: 46.1 ±1.2 %RH
Results are normalised to the reference conditions.
Free field response
Diffuse field response
Pressure (Actuator) response
Campbell Associates
www.campbell-associates.co.uk

Comment:

Campbell Associates Ltd
5b Chelmsford Road Industrial Estate
GREAT DUNMOW, CM6 1HD, England
www.campbell-associates.co.uk
info@campbell-associates.co.uk
Phone 01371 871030 Facsimile 01371879106

CALIBRATION

Certificate number: 19738

Certificate of Calibration and Conformance

Test object:	**Sound Calibrator**
Manufacturer:	**Norsonic**
Type:	**1251**
Serial no:	**32849**
Customer:	Hawkins Environmental Ltd
Address:	70 Wentworth Crescent, Basingstoke, Hants. RG22 4WX.
Contact Person:	Nick Hawkins.

Measurement Results:	Level	Level Stability	Frequency	Frequency Stability	Distortion
1:	114.05 dB	0.01 dB	999.67 Hz	0.00 %	<0.3 %
2:	114.04 dB	0.01 dB	999.67 Hz	0.00 %	<0.3 %
3:	114.04 dB	0.01 dB	999.67 Hz	0.00 %	<0.3 %
Result (Average):	**114.04 dB**	**0.01 dB**	**999.67 Hz**	**0.00 %**	**<0.3 %**
Expanded Uncertainty:	0.10 dB	0.02 dB	1.00 Hz	0.01 %	0.10 %
Degree of Freedom:	>100	>100	>100	>100	>100
Coverage Factor:	2.00	2.00	2.00	2.00	2.00

The stated level is relative to 20µPa. The level is traceable to National Standards.
The stated level is valid at reference conditions. The following correction factors have been applied during the measurement: Pressure: 0.0005 dB/kPa Temperature: 0.003 dB/°C Relative humidity: 0.000 dB/%RH Load volume : 0.0003 dB/mm3
The reported expanded uncertainty of measurements is based on a standard uncertainty multiplied by the coverage factor of k=2, providing a level of confidence of approximately 95%. Where the degrees of freedom are insufficient to maintain this confidence level, the coverage factor is increased to maintain this confidence level. The uncertainty has been determined in accordance with UKAS requirements.
Records: K:\C A\Calibration\Nor-1504\Nor-1018 CalCal\2015\NOR1251_32849_M1.nmf

Environmental conditions:	Pressure:	Temperature:	Relative humidity:
Reference conditions:	101.325 kPa	23.0 °C	50 %RH
Measurement conditions:	102.552 ± 0.042 kPa	22.0 ± 0.2 °C	47.1 ± 0.9 %RH

Date received for calibration:	24/09/2015
Date of calibration:	01/10/2015
Date of issue:	01/10/2015
Engineer	Michael Tickner
Supervisor	Darren Batten TechIOA

Appendix 4
Summary of Noise Measurements

Appendix 4: Summary of Noise Measurements

104a Bedford Court Mansions - 2015

Date	Time	L_{Aeq}	$L_{AF(max)}$	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
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11/10/2015	01:00	59.9	84.2	52.9
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11/10/2015	03:00	58.5	85.3	52.7
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11/10/2015	05:00	58.4	83.9	52.8
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11/10/2015	08:00	59.7	82.0	53.2
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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