9 Lincoln's Inn Fields, London WC2A 3BP

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Environmental Noise Assessment of Proposed Mechanical Plant

TECHNICAL REPORT

22562 R1

Environmental Noise Assessment of Proposed Mechanical Plant

Technical Report 22562

Prepared for: Lamberts Chartered Surveyors, Edward House, 2 Wakley Street, London EC1V 7LT

Site location: 9 Lincoln's Inn Fields, London WC2A 3BP

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SSC PROJECT NO: 22562		
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DOCUMENT REVISION AND CHANGE CONTROL		
REVISION	**CHANGE DESCRIPTION**	**SUPPLEMENT TO**
1	Original Report	-

1. INTRODUCTION

1.1 A planning application was submitted to the London Borough of Camden for the installation of an air conditioning condenser to the rear 3rd floor roof and an air conditioning cassette to front 3rd floor office and associated pipework at 9 Lincoln's Inn Fields, London, WC2A 3BP. A Plan of the Application Site is provided in Appendix B

1.2 The planning application Ref: 2015/2978 was deemed incomplete as the London Borough of Camden stated in correspondence dated 21st July 2015 that "A Noise Impact Assessment report is required for all appliances for air handling units".

1.3 As a result of the invalid planning application Sound Solution Consultants were commissioned by Lamberts Chartered Surveyors to conduct an Environmental Noise Impact Assessment that considers the requirements of the London Borough of Camden's Noise and Vibration Policy DP28.

1.4 This document is to accompany a revised planning application to be submitted to the London Borough of Camden. The intention of this report is to demonstrate any potential impact on the amenity of the locale at the application site as a result of the proposal to install mechanical plant.

1.5 The objective of this study is to quantify the acoustic environment at the proposed development site by conducting a noise assessment in accordance with BS4142. On 6th August 2015, Duty Planning Officer Tessa Craig consulted with Camden's Environmental Health Department and confirmed that BS 4142:1997 "Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas" [1] is the Council's required Standard for an assessment of this nature.

1.6 Ultimately, in accordance with the specified Standard BS4142:1997, this study will determine a Rating Sound Level for the proposed mechanical plant that will be compared to the measured Background Sound Level. The suitability for the installation of the proposed plant can then be determined in line with the London Borough of Camden's Planning Policy.

1.7 A Glossary of Acoustic Terms can be found in Appendix A that may assist with the terminology used within this report.

2. DEVELOPMENT SITE

1.0 The following outdoor mechanical plant is proposed to be installed, as part of the development proposals, at 9 Lincoln's Inn Fields, London, WC2A 3BP. Appendix D illustrates the manufacturers' specification of the proposed plant and offers a photograph, dimensions etc.

- Mitsubishi PUHZ – P Outdoor Unit Model Reference PUHZ-P100VHA3/YHA

1.1 The proposed location for the above plant is on a flat roof on the 3rd floor to the rear of the premises. Appendix C illustrates the precise location of the proposed installation.

1.2 The manufactures specification in relation to the sound output of the proposed plant is illustrated in Appendix D. It is specified the plant's loudest operation is during heating at 54 dBA at 1m. The heating operation is used in the calculations as it demonstrates worst case scenario.

1.3 The intended time for operation of the plant is in connection with the office development.

1.4 The nearest noise sensitive receptors are office windows located 3.5m to the south west of the proposed plant. These offices are associated with 8 Lincoln's Inn Fields. There is existing plant a floor below this receptor. (See Appendix E, Figure 1)

1.5 Opposite the proposed installation, north west at a distance of 15m, are hotel bedrooms to the rear of Chancery Court Hotel. Whetstone Park, a service road, lies between the proposed installation and the hotel. (See Appendix E, Figure 2)

1.6 There are office receptors located at 10 Lincoln's Inn Fields 5.6m north east. The office windows are obscured a direct line of sight with the proposed installation by virtue of a protruding brick wall. There is also a significant amount of acoustically screened plant located in front of this receptor. (See Appendix E, Figure 3).

1.7 The following tasks have been conducted as part of this noise assessment:

- A survey of background sound levels at the application site, representing the noise climate of properties in the vicinity of the proposed development.
- Calculation of sound levels from the proposed scheme at the nearest noise sensitive locations using manufactures' specific data.
- A comparison of the calculated proposed plant's sound levels with the measured background levels in accordance with BS 4142:1997.

3. NOISE CRITERIA

NOISE POLICY STATEMENT FOR ENGLAND (NPSE)

3.1 The Noise Policy Statement for England (NPSE) [2] was published in March 2010. It sets out the long term vision of government noise policy, which is fundamentally to: "Promote good health and good quality of life through the effective management and control of noise within the context of Government policy on sustainable development". The vision is supported by three key aims:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and reduce to a minimum other adverse impacts on health; and
- Where possible, contribute to the improvement of health and quality of life.

3.2 The NPSE should apply to all forms of noise including environmental noise, neighbour noise and neighbourhood noise but does not apply to noise in the workplace. The NPSE adopts the following concepts, to help consider whether noise is likely to have "significant adverse" or "adverse" effects on health and quality of life:

SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.
LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.
NOEL – No Observed Effect Level. This is he level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

Table 1 – Concepts Adopted in the Noise Policy Statement for England (NPSE).

3.3 The NPSE emphasises 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." (Defra, 2010)."

3.4 See Section 3.3 below for the most recent planning guidance that has been produced subsequent to the inception of NPSE.

NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

3.5 The Department for Communities and Local Government introduced the National Planning Policy Framework (NPPF) [3] in March 2012. The Framework replaced most planning policy, circulars and guidance including Planning Policy Guidance 24: Planning and Noise (1994). The NPPF defines the Government's planning policy for England and sets out the framework, within which local authorities must prepare their local and neighbourhood plans, reflecting the needs and priorities of their communities. The Government's stated purpose in producing the NPPF is to streamline policy so the planning process is less restrictive and provide a more easily understood framework for delivering sustainable development.

3.6 With particular reference to noise, under the heading of "Conserving and Enhancing the Natural Environment", aims are detailed in Section 123 of the NPPF. It is stated 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 the 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 business 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 prised for their recreational and amenity value for this reason.

Table 2 – Section 123 of the National Planning Policy Framework (NPPF).

3.7 Further NPPF aims related to noise include:

Section 109: The planning system should contribute to and enhance the natural and local environment by: preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability;

Section 111: Planning policies and decisions should encourage the effective use of land by re-using land that has been previously developed (brownfield land), provided that it is not of high environmental value. To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account...

3.8 It is stressed that the above references to noise should not be considered in isolation and that the theme, referred to as the "golden thread", of sustainability that runs through the NPPF is integral to noise.

3.9 The NPPF acknowledges that there is a host of existing sources of national and international guidance which can be used, in conjunction with the Framework, to inform the production of Local Plans and decision making.

NATIONAL PLANNING PRACTICE GUIDANCE (PPG)

3.10 Revised Planning Practice Guidance [4] was released in March 2014 to support the NPPF. The Guidance stipulates that Local Planning Authorities' plan making and decision making 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.

3.11 The table below is in the Guidance to assist recognising "when noise could be a concern".

Perception	Examples of Outcomes	Increasing Effect Level	Action
Unnoticeable	No Effect	NOEL	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	
		LOAEL	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for sleep disturbance. Affects acoustic character of the area and creates a perceived change in quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		SOAEL	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid

Perception	Examples of Outcomes	Increasing Effect Level	Action
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 3 – Planning Practice Guidance to Support National Planning Policy Framework.

BS4142:1997 RATING INDUSTRIAL NOISE IN MIXED RESIDENTIAL AND INDUSTRIAL AREAS

NB It is understood at the time of writing that BS 4142:1997 has been revised to BS 4142:2014. As local policy requirements and inferred noise criteria from Camden LBC refer to the former standard, the 1997 standard and assessment method it is used for assessment of mechanical noise within this report. This approach has been agreed with the Environmental Health Department.

3.12 The most relevant criteria to assess the impact of industrial noise levels on residential dwellings are contained within BS4142:1997 – Rating industrial noise affecting mixed residential and industrial areas. This British Standard describes a method of determining the level of a noise of an industrial nature, together with procedures for assessing whether the noise in question is likely to give rise to complaints from persons living in the vicinity.

3.13 The likelihood of complaint in response to a noise depends on factors including the margin by which it exceeds the background noise level, its absolute level, time of day, change in the noise environment, as well as local attitudes to the premises and the nature of the neighbourhood. BS4142:1997 is only concerned with the rating of a noise of an industrial nature, based on the margin by which it exceeds a background noise level with an appropriate allowance for the acoustic features present in the noise. As this margin increases, so does the likelihood of complaint.

3.14 Certain acoustic features can increase the likelihood of complaint over that expected from a simple comparison between the specific noise level and the background noise level. Where present as part of the assessment, such features are taken into account by adding 5 dB to the specific noise level to obtain the rating level:

- *The noise contains a distinguishable, discrete, continuous note (whine, hiss, screech, hum, etc.);*
- *The noise contains distinct impulses (bangs, clicks, clatters, or thumps);*
- *The noise is irregular enough to attract attention.*

3.15 The rating level is equal to the specific noise level if there are no such features present or expected to be present.

3.16 To assess the likelihood of complaints using BS4142:1997 the measured background noise level is subtracted from the rating level. The greater this difference the greater the likelihood of complaints, such as:

- *A difference of around +10 dB or more indicates that complaints are likely.*
- *A difference of around + 5 dB is of marginal significance.*
- *If the rating level is more than 10 dB below the measured background noise level then this is a positive indication that complaints are unlikely.*

4. ENVIRONMENTAL NOISE SURVEY

4.1 A study of the site's background sound climate was undertaken from Friday 7th August 2015 11am to Monday 10th August 2015 1pm in accordance with BS4142.

4.2 The equipment used during the survey consisted of the following precision sound monitoring equipment listed below in Table 4. All equipment listed has traceable calibration history to relevant British Standards, valid in accordance with BS4142.

Manufacturer	Model No.	Description	Serial No.	Next Calibration Due Date
Larson Davis	LxT	3rd Octave Band Sound Level Meter	3934	21-7-2017
Larson Davis	LxTPRM1L	Microphone pre-amplifier	29332	21-7-2017
Larson Davis	337B02	½" Electret microphone	146990	21-7-2017
Larson Davis	CAL200	Sound Level Calibrator	11165	21-7-2016

Table 4 – Noise monitoring equipment.

4.3 The calibration of the sound level meter was checked using a reference tone of 114dB at 1kHz before any measurements were taken. A validation check at the end of the survey indicated that all instruments had operated within permitted tolerances for drift and measured level.

4.4 The weather conditions were recorded at the start and the finish of the survey using a Holdpeak anemometer serial number 1231846. Start weather conditions were 18 degrees Celsius, still wind, 60% cloud cover and dry. Finish weather conditions were 22 degrees Celsius, light south westerly wind averaging no more than 0.5m/s, 100% cloud cover with a light drizzle. Reasonable measurement conditions were reported throughout the survey, such that the weather is not expected to have significantly adversely influenced the sound levels recorded.

4.5 A single monitoring location was selected to measure the environmental sound levels over the course of the survey period. The measurement position is illustrated in the Site Plan Appendix B and in the photographs in Appendix E, Figures 4 and 5 and is described as:

Position 1) A microphone was placed at 3rd floor level in the corner of a flat roof area in a position closest to the nearest noise sensitive office windows. The distance from the noise sensitive office windows was 3.5m. In addition the microphone was located 3.5m from the application façade and therefore considered as a free field measurement position.

4.6 The nearest noise sensitive receptors day time (07.00 to 23.00) to the proposed plant are sash office windows and are located 3.5m in a south west direction. There is clear line of sight.

4.7 The nearest noise sensitive receptors night time (23:00 to 07:00) are hotel bedroom windows located 15m in a north west direction.

4.8 Interval noise data was recorded at the measurement location at 15 minute periods, time synchronised with BST. The sound level meter was configured to record average equivalent (LAeq), maximum (LAmax), minimum (LAmin) and statistical (Ln) parameters.

4.9 The measured LA90 sound levels at the monitoring position are considered both for day time (07.00 to 23.00) and night time (23.00 to 07.00). In this way any potential impact can be determined for the nearest noise sensitive receptors at the offices during the day and for the hotel bedrooms at the night. It can then be assessed if it will be necessary to restrict the times of use of the plant or recommend any form of physical noise mitigation.

4.10 It has been confirmed via consultation with the Environmental Health Department of Camden Council that the proposed plant installation should seek to achieve a level at least 5dB below the background L_{A90} level if 'anonymous' in nature, else 10dB below if 'distinguishable'. These limits are set by London Borough of Camden's Local Policy DP28 – Noise and Vibration as highlighted in the Local Development Framework - Camden Development Policies 2010 to 2025 [5].

4.11 Confirmation was sought from the London Borough of Camden's Environmental Health Department that the requirements for this assessment should be in accordance with the 1997 assessment method of BS 4142.

4.12 The "typical" background sound levels as described in BS4141:1997 have been established, for the purposes of this noise assessment, from histograms of the recorded LA90, 15min data at the monitoring location. In practice, there is no single level for a background sound level as this is a fluctuating parameter, although the Standard recommends that a representative value for the period should be used. Note, this is not either the lowest or mean average value of LA90, 15min.

4.13 Free field background sound levels of 53 to 57 LA90, 15min have been recorded during the day time between the hours of 07.00 and 23.00 for the whole survey period. The background during day time is deemed to lie at 54 dB LA90, 15min as this is a representative value inside the range that can occur and was most commonly recorded at over 40% of the time (See Figure 1 below).

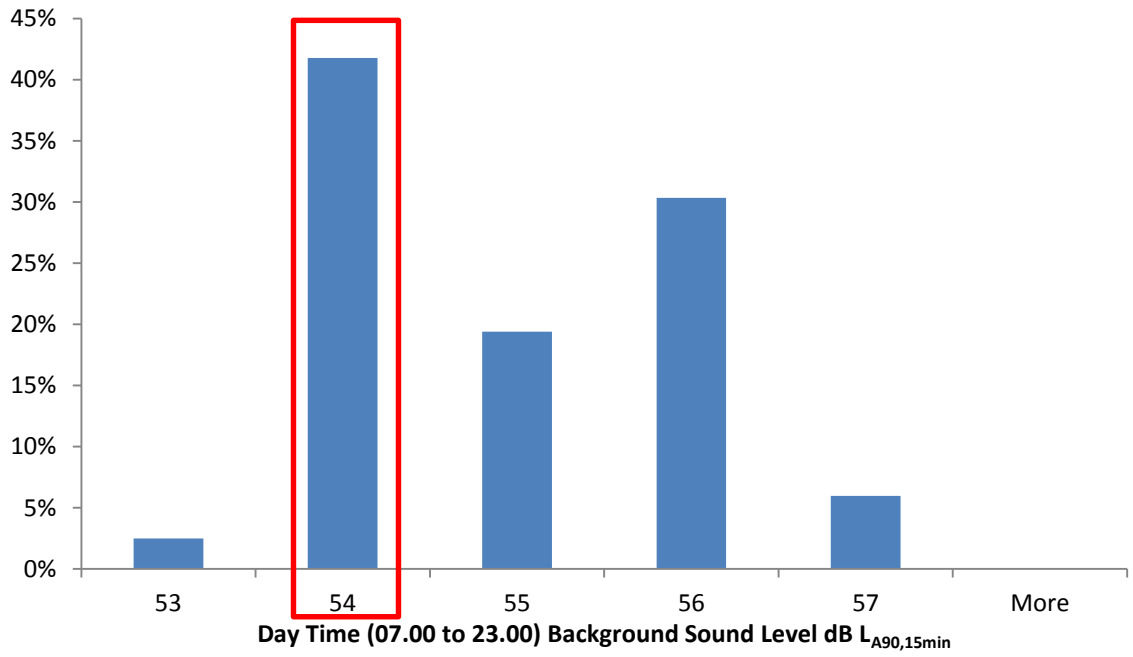


Figure 1 – Histogram of $L_{A90, 15min}$ Data Day Time (07.00 to 23.00).

4.14 For the night time (23.00 to 07.00) again background sound values of 53 to 57 dB LA90, 15min have been recorded at Position 1 over the whole monitoring period. The night time background sound level is deemed to lie at 54 dB LA90, 15mins, as this is the representative value within the range that can occur and was most commonly recorded (See Figure 2 below).

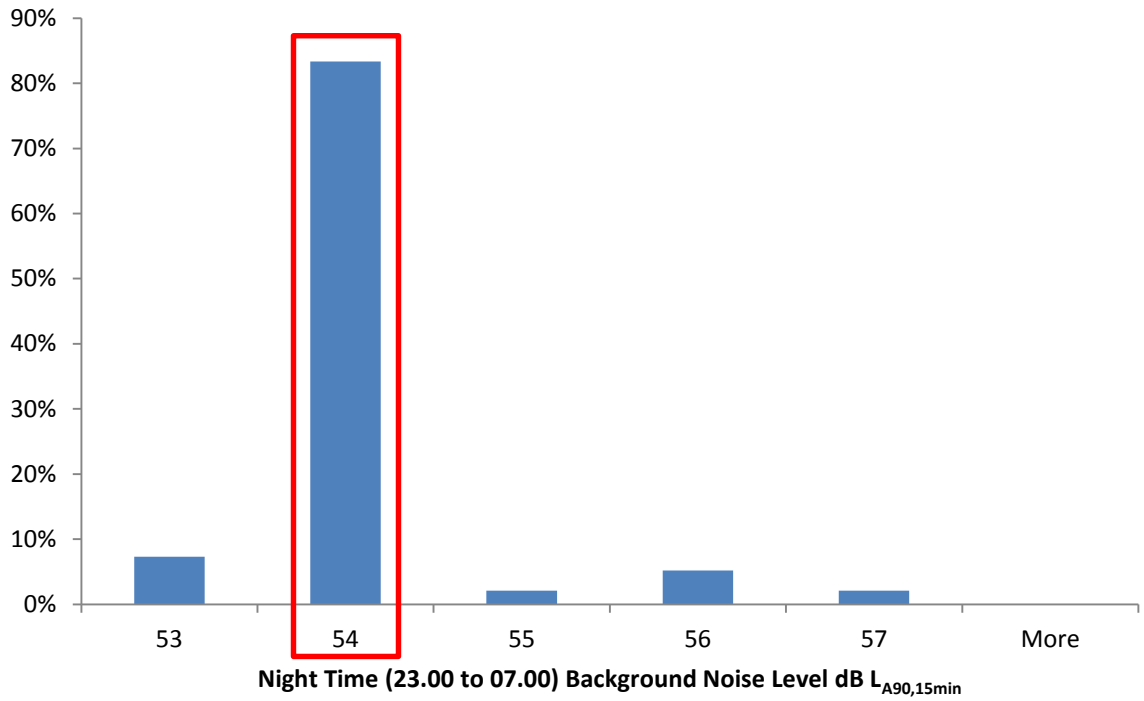


Figure 2 – Histogram of $L_{A90, 15min}$ Data Night Time (23.00 to 07.00).

4.15 The results shown in Figures 1 and 2 highlight that a representative background sound level of 54 dB LA90, 15mins is maintained through both day time and night time. Having visited site a reasonable assumption can be made that the background sound climate at the nearest noise sensitive receptor is dominated by existing plant in the vicinity.

PREDICTION OF SOUND LEVEL FROM PROPOSED MECHANICAL PLANT

Ref	Procedure	Data	Octave Band Noise Level dB								Total
			63	125	250	500	1000	2000	4000	8000	
1	Unit Sound Level	dB	57	56	55	50	50	45	42	33	**62**
2	A-weighting	dB	-26	-16	-9	-3	0	1	1	-1	
3	A-weighted level	dB	31	40	46	46	50	46	43	32	**54**
4	Distance loss	2.5m	-8	-8	-8	-8	-8	-8	-8	-8	
5	Total Sound level	dBA	26	35	41	41	45	41	38	27	**46**

Table 5 – Predicated Sound Level of the Proposed Plant at 1m from the Nearest Noise Sensitive Receptor Façade of 8 Lincoln's Inn Fields.

4.16 The proposed plant's sound level at 1m is shown in Ref 1 in Table 5 and is derived from the manufacturers' specification Appendix D.

4.17 There is an 8 dBA distance loss due to the fact that 1m from the nearest noise sensitive receptor is 2.5m from the proposed location of the plant see Ref 4 in Table 5.

4.18 The predicted sound level of the proposed plant at 1m from the nearest noise sensitive receptor is 46 dBA.

Ref	Procedure	Data	Octave Band Noise Level dB								Total
			63	125	250	500	1000	2000	4000	8000	
1	Unit Sound Level	dB	57	56	55	50	50	45	42	33	**62**
2	A-weighting	dB	-26	-16	-9	-3	0	1	1	-1	
3	A-weighted level	dB	31	40	46	46	50	46	43	32	**54**
4	Distance loss	14m	-23	-23	-23	-23	-23	-23	-23	-23	
5	Total sound level	dBA	11	20	26	26	30	26	23	12	**31**

Table 6 – Predicated Sound Level of the Proposed Plant at 1m from Chancery Court Hotel Façade which is the Nearest Night Time (23.00 to 07.00) Noise Sensitive Receptor.

4.19 From the manufacturers' sound level data for the proposed plant (Ref 1) and taking into account the distance (Ref 4) to the Chancery Court Hotel the predicted sound level at 1m from the façade is 31 dBA.

5. NOISE IMPACT ASSESSMENT

5.1 The predicted sound level from the proposed mechanical plant has been assessed 1m from the nearest noise sensitive window in line with BS4142. The difference between the rating sound level and the representative background level for day time and night time has been calculated.

5.2 Having assessed the sound specification data for the proposed plant and taking into account the location and nature of the receptors, it is not deemed necessary to apply a + 5 dBA character correction to the predicted sound levels as it is not considered the sound will include a distinguishable, discrete continuous note (whine, hiss, screech or hum).

5.3 The following BS4142 assessment can be made for the proposed development at the nearest noise sensitive receptor:

Receptor Location	Predicted Specific Sound Level dBA	Rating Penalty dBA	Typical L90, 15min Background Sound Level dBA	BS4142 Rating Assessment dBA
1m from Nearest Noise Sensitive Office Window of 8 Lincoln's Inn Fields Day Time (07.00 to 23.00)	46	0	54	-8*
1m from Nearest Noise Sensitive Office Window of 8 Lincoln's Inn Fields Night Time (23.00 to 07.00)	46	0	54	-8*
1m from Noise Sensitive Residential Window of Chancery Court Hotel Day Time (07.00 to 23.00)	31	0	54	-23*
1m from Noise Sensitive Residential Window of Chancery Court Hotel Night Time (23.00 to 07.00)	31	0	54	-23*

**Surpasses London Borough of Camden's Local Planning Policy of -5dBA.*

Table 7 - BS4142 Assessment at Noise Sensitive Locations.

5.4 Table 7 highlights that the predicted sound level 1m from the nearest noise sensitive receptor façade is 8 dBA below the measured typical background sound level. This surpasses London Borough of Camden's Local Planning Policy by 3 dBA. In accordance with the rating assessment if BS4142: 1997, this tends towards the conclusion that "complaint is unlikely" from development.

5.5 The predicted sound level 1m from the residential sensitive receptor façade of Chancery Court Hotel is 23 dBA below the measured typical background sound level. This surpasses London Borough of Camden's Local Planning Policy by 18 dBA. In accordance with the rating assessment of BS4142: 1997, this confirms that "complaint is unlikely" from development.

5.6 Further to the above assessment, considering a partly open window loss of 10 to 15 dBA will apply to the sound level experienced inside the nearest office, anticipated internal levels will lie below BS8233: 2014 internal guidelines of 40 dBA daytime for an office.

5.7 Table 6 highlights the predicted sound level from the proposed plant at 1m from the façade at Chancery Court Hotel as 31 dBA. Again, considering a partly open window loss of 10 to 15 dBA will apply to the sound level experienced inside the nearest hotel bedroom, anticipated internal levels will lie below BS8233: 2014 internal guidelines of 30 dBA night time for a level conducive to sleep.

5.8 The Noise Impact Assessment demonstrates that there will not be a requirement to restrict the times of operation of the proposed plant and noise mitigation will not be required.

6. CONCLUSIONS

6.1 Environmental sound levels were recorded between 11am Friday 7th August and 1pm Monday 10th August 2015 and are illustrated in the Graph Appendix F.

6.2 A representative $L_{A90, 15mins}$ background sound level of 54 dBA has been established for both the day time (07.00 to 23.00) and the night time (23.00 to 07.00) periods.

6.3 The methodology and assessment criteria used within this report are contained in the British Standard BS4142: 1997 "Rating Industrial Noise Affecting Mixed Residential and Industrial Areas". Predicted sound levels from the proposed mechanical plant have been calculated 1m away from the noise sensitive windows using the manufacturers' data. These are predicted as 46 dBA from the nearest noise sensitive office location of 8 Lincoln's Inn Fields and 31 dBA at the nearest residential location of Chancery Court Hotel.

6.4 The noise assessment demonstrates that the predicted rating level of 46 dBA at the nearest noise sensitive office is 8 dBA below the measured typical background sound level. The rating assessment is within the London Borough of Camden's Local Planning Policy for Noise and Vibration DP28 which specifies a minimum rating assessment level of 5 dBA below the typical background sound level. This tends towards the assessment that "Complaint is unlikely" in accordance with BS4142: 1997.

6.5 A lower level of impact is predicted from the proposed plant at 1m from the façade at Chancery Court Hotel; 23 dBA below the measured typical background sound level. In accordance with the rating assessment of BS4142: 1997, this confirms that "complaint is unlikely" from development.

6.6 The noise assessment demonstrates that the predicted internal sound levels from the proposed plant lie within guidelines for internal levels for the nearest offices during day time and also within the Chancery Court Hotel bedrooms at night time in accordance with BS8233:2014.

6.7 This Noise Impact Assessment demonstrates, in accordance with National Planning Practice Guidance (Table 3), that the development will have "no observed adverse effect" and as such a restriction on the time of operation of the proposed plant or noise mitigation will not be required.

7. REFERENCES

[1] British Standards Institution (1997). Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas. BS4142:1997.

[2] Department for Environment, Food and Rural Affairs (DEFRA) (2010). Noise Policy Statement for England (NPSE).

[3] Department of Communities and Local Government (2012). National Planning Policy Framework.

[4] Department of Communities and Local Government (2014). Revised: National Planning Practice Guidance – Noise.

[5] London Borough of Camden (2010). Local Development Framework – Camden Development Policies 2010 to 2025.

Appendix A: Glossary of Acoustic Terms

'A' weighting dB(A): Filtering of the sound frequencies designed to reflect the response of the human ear to noise. The human ear is more sensitive to noise at frequencies in the middle-high end of the audible range than to either very high or very low frequencies. Noise measurements are often A-weighted (using a electronic filter) to compensate for the sensitivity of the ear.

Attenuation: Noise reduction, measured in decibels.

Calibration: A check of the function of a sound level meter by comparing the meter reading with a known sound pressure level.

Decibel: The unit of sound level and noise exposure measurement. The range of audible sound pressures is approximately 0 dB to 140 dB.

Equivalent continuous sound pressure level (LAeq,T): A measure of the average A-weighted sound pressure level during a period of time, in dB(A). It is a notional steady sound level which would cause the same A-weighted sound energy to be received as that due to the fluctuating sound level over a given period of time (T).

Frequency (Hz): The pitch of the sound, measured in Hertz.

Frequency analysis: Analysis of a sound into its frequency components.

Hz: Hertz, the unit of frequency.

Noise spectrum: A noise represented by its frequency components.

Octave-bands: A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit. The width of the octave-bands increases at higher frequencies.

Octave-band centre frequency: The frequency at the centre of an octave band.

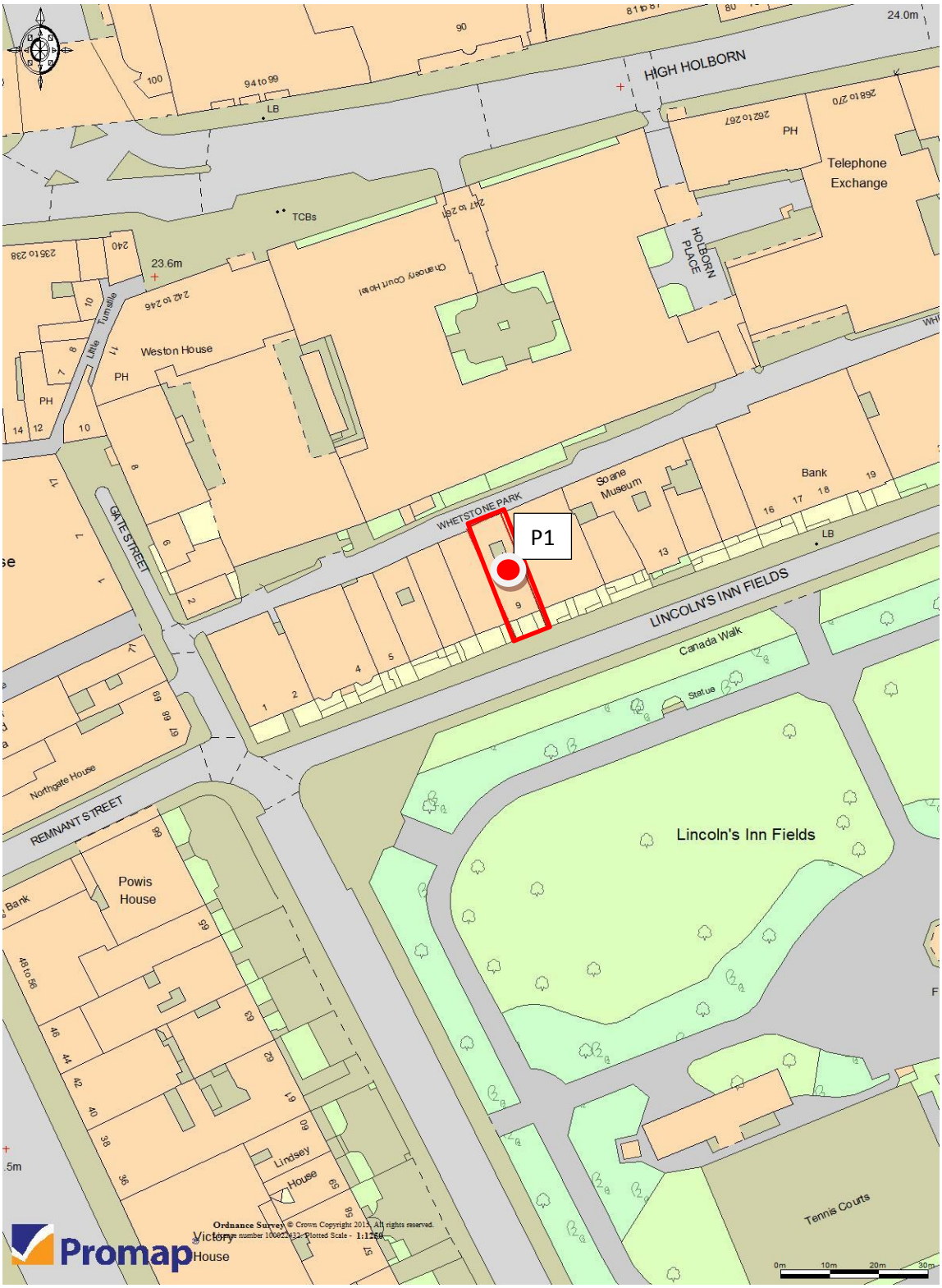
Pa: Pascal, unit of measurement of sound pressure.

Sound level meter (SLM): Instrument for measuring various noise parameters.

Sound pressure level (SPL): The basic measure of sound, expressed in decibels, usually measured with an appropriate frequency weighting (e.g. the A-weighted SPL in dB(A)).

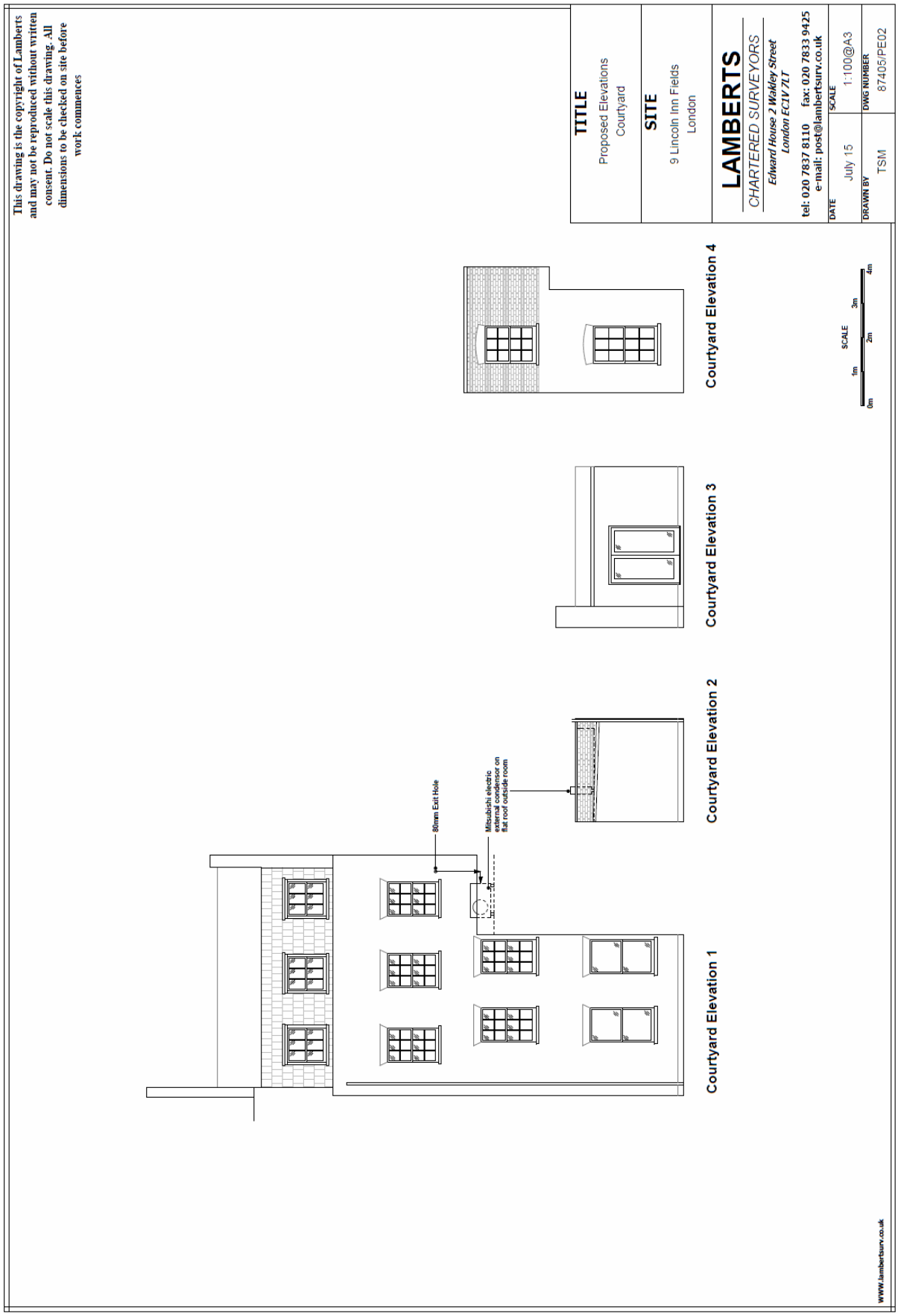
Sound power level (Lw): The sound energy radiated per unit time by a sound source measured in watts (W). Sound power can have weightings applied (e.g. A-weighted) and is not influenced by environmental or physical factors such as weather conditions or distance.

Appendix B Site Plan Including Sound Measurement Position



Measurement Position 1

Appendix C Scheme Design



Appendix D Manufacturers Specification for Proposed Plant

PKA-RP Standard Inverter Heat Pump

Wall Mounted System

The Standard Inverter range provides inverter solutions for customers who want all the benefits that inverters offer, but do not have the budget available for the Power Inverter range.

- Flat panel, compact indoor unit design
- Adjustable louvres for uniform air distribution
- Internal pipe connection to wall mounted unit for easy and neat installation
- 3-phase Standard Inverters now available

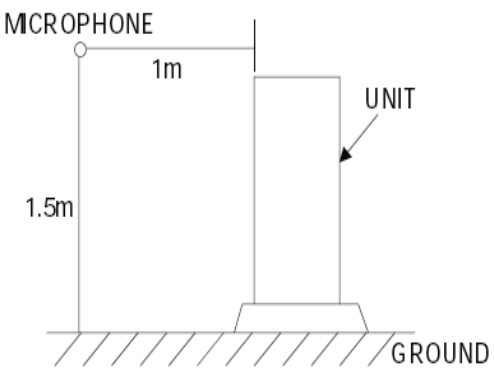
Technical Information

PKA-RP - INDOOR UNITS		
MODEL REFERENCE		PKA-RP100KAL
CAPACITY (kW)	Heating (nominal)	11.2 (4.5-12.5)
	Cooling (nominal)	9.4 (4.9-11.2)
	Heating (UK)	9.5 (3.85-10.65)
	Cooling (UK)	8.65 (4.5-10.3)
SHF (nominal & UK)		0.75
COP / EER (nominal)		3.21 / 3.01
ENERGY LABEL	Heating/Cooling	C / B
AIRFLOW (m³/min)	Lo-Mi-Hi	20-23-26
PIPE SIZE mm(in)	Gas	15.88 (5/8")
	Liquid	9.52 (3/8")
NOISE (dBA)	Lo-Mi-Hi	41-45-49
DIMENSIONS (mm)	Width	1170
	Depth	295
	Height	365
WEIGHT (kg)		21
ELECTRICAL SUPPLY		Fed by Outdoor Unit
PHASE		Single
FUSE RATING (BS88) - HRC (A)		6
INTERCONNECTING CABLE No. CORES		4

PUHZ-P - OUTDOOR UNITS		
MODEL REFERENCE		PUHZ-P100VHA3/YHA
NOISE (dBA)	Heating/Cooling (silent)	54 / 50 (47)
WEIGHT (kg)		75 / 77
DIMENSIONS (mm)	Width	950
	Depth	330 + 30
	Height	943
ELECTRICAL SUPPLY		220-240v, 50Hz / 380-415v, 50Hz
PHASE		Single / 3
SYSTEM POWER INPUT (kW)	Heating/Cooling (nominal)	3.49 / 3.12
	Heating/Cooling (UK)	3.11 / 2.65
STARTING CURRENT (A)		8 / 3
SYSTEM RUNNING CURRENT (A)	Single Phase	14.81 / 14.15 [28.6]
Heating/Cooling [MAX]	3 Phase	5.65 / 5.06 [13.6]
FUSE RATING (BS88) - HRC (A)		32 / 16
MAINS CABLE No. Cores		3 / 5
MAX PIPE LENGTH (m)		50
MAX HEIGHT DIFFERENCE (m)		30
CHARGE R410A (kg) - 20m		3.0

Figure D1 – Manufacturers data sheet for proposed plant.

6-3. NOISE CRITERION CURVES



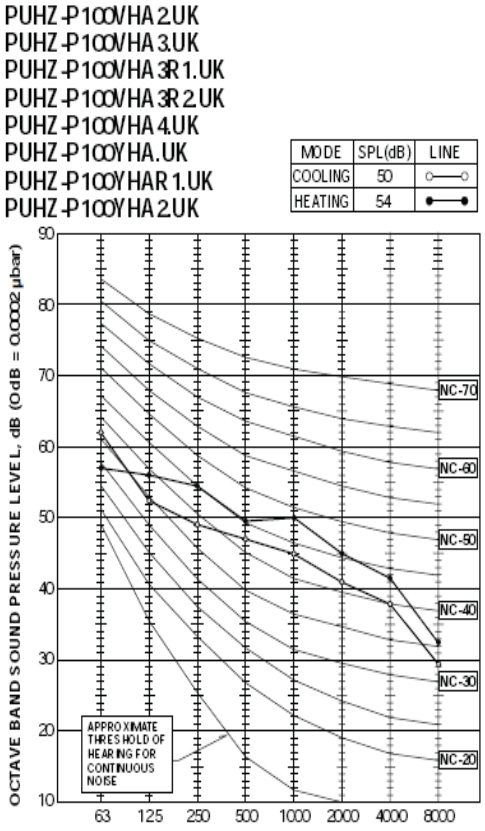


Figure D2 – Manufacturers octave band noise level data of proposed plant.

Appendix E Site Photographs

Figure E1 – Photograph of Nearest Noise Sensitive Receptor.

Figure E2 – Photograph of Chancery Court Hotel Bedrooms.

Figure E3 – Photograph of Existing Plant located to North East.

Figure E4 – Photograph of Microphone Installed at Monitoring Position 1.

Figure E5 – Photograph Monitoring Position 1 from Whetstone Park.

Appendix F: Noise Survey Data