Camden Lock Market

Planning Application

Acoustics Strategy For Planning

Prepared by Hoare Lea Acoustics
On Behalf of Castlehaven Row Ltd

August 2015

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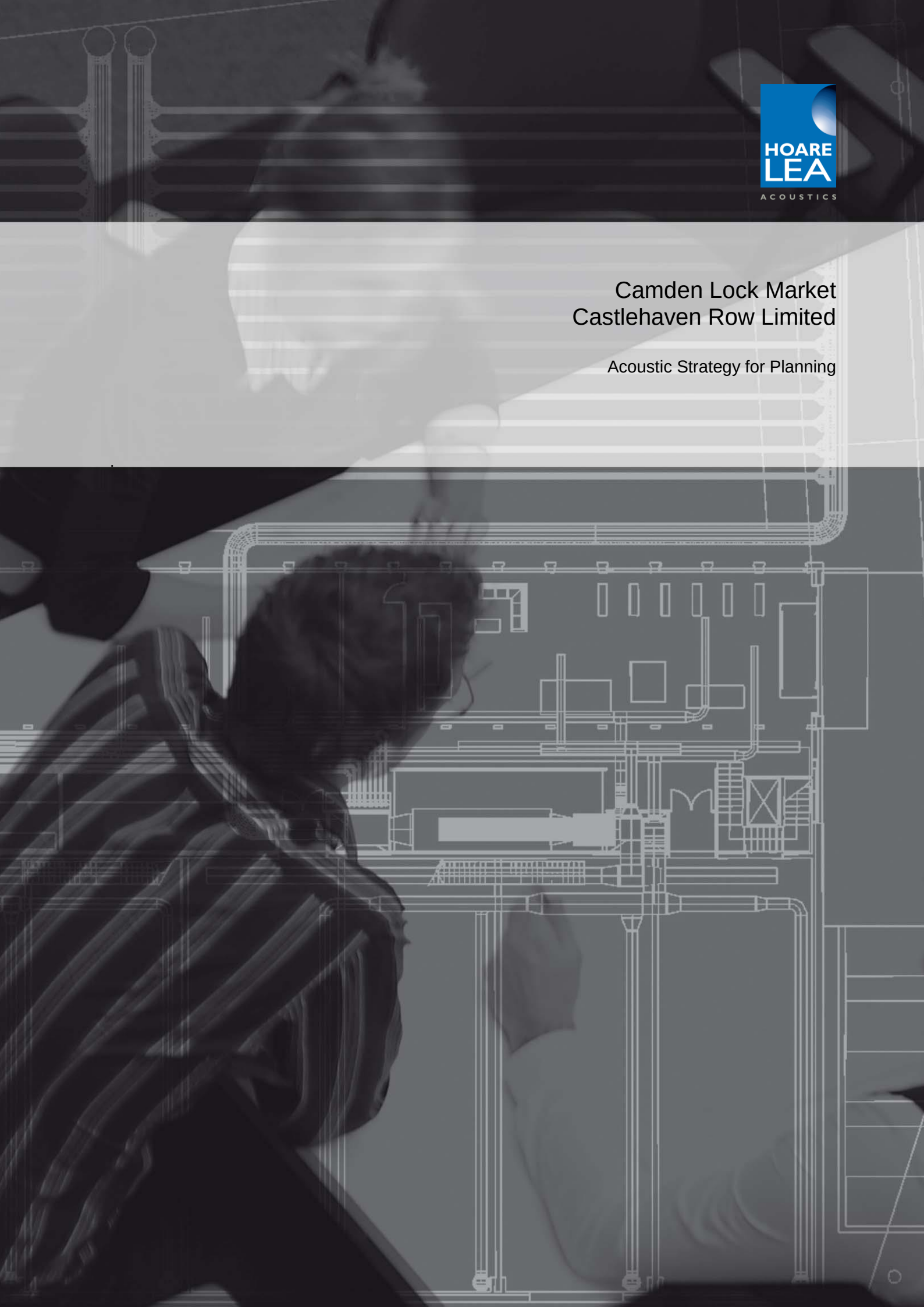

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Acoustic Strategy for Planning

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Audit Sheet

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0	Draft	23/07/2015	PD	BJ/JB
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Contents

EXECUTIVE SUMMARY

It is proposed to redevelop the existing Camden Lock Market into a mix of uses which will include A1 retail units, A5 hot food takeaway units, A3 food and beverage units, B1 office, workshops and studios.

Basis of the noise & vibration assessment

This report presents a series of assessments in relation to the Camden Lock Market planning application in accordance with London Borough of Camden noise and vibration policies.

It sets out proposed design criteria and strategies and where possible highlights provisions to be made in the design as a means of demonstrating compliance in principle with DP28 LBC's planning requirements in matter of noise and vibrations. Project specific criteria have been advised for:

- Indoor noise
- Building plant noise emission
- Level of vibration and groundbourne noise generated by underground train passage

Baseline noise & vibration surveys

An acoustic survey has been carried out in order to establish the existing noise climate at site. Road traffic and market activities are the main source of noise. Road traffic from Camden High Street is the dominant source of noise for the east side of the site. Camden Lock Market activities affect the rest of the site.

A vibration survey has also been carried out within the bounds of the site. Train movements on the London Underground Northern Line and overground trains have been measured at basement, ground and second floor level.

Façade acoustic performance

Reference has been made to established guidance and indoor sound level criteria set for different areas. Using the measured noise levels, sound reduction performance ratings have been advised for windows to aid preliminary design and cost estimates.
It should be noted that for office spaces facing Camden High Street, the cladding sound reduction performance requirements are high.

Building services noise

Noise emission limits for daytime and night-time at 1m from the nearest noise sensitive façade have been derived for any new plant associated with the development. The approach taken has been in accordance with London Borough of Camden policy on noise. The limit shall apply to the cumulative effect of any mechanical or electrical plant associated with the development. A noise assessment has been undertaken of the proposed mechanical services at roof level. The use of a louvered enclosure is recommended for the heat rejection units.

Vibration assessment

Using the measured data, the potential effects of vibration on sensitive areas has been assessed. Consideration has also been given to the risk of re-radiated noise generated from lightweight finishes being exited due to structural vibrations. It has been found that both "felt" vibration levels and re-radiated noise would be below the limit set in the LBC Noise and Vibration Policy DP28 and is therefore not an issue for the new development.

Conclusion

On the basis of all the specific assessment outcomes, it is concluded that noise and vibration should not pose an obstacle to granting planning approval where suitable control can be achieved through use of appropriate conditions.

1.0 INTRODUCTION

Hoare Lea Acoustics has been appointed by Castlehaven Row Limited to undertake a noise and vibration assessment of the proposed redevelopment of the existing Camden Lock Market and to develop a suitable outline strategy to mitigate potential adverse effects.

Assessment has been made of the local noise and vibration environment on the future occupiers of the proposed development and impact of the scheme on neighbouring noise sensitive premises/properties, taking into account local Planning Policy and other guidance standards.

A glossary of acoustic terms used in this report is given in Appendix A attached.

2.0 DESCRIPTION OFSITE, SURROUNDING AND PROPOSAL

The proposed Camden Lock Market redevelopment comprises A1 retail units, A5 hot food takeaway units, A3 food and beverage units, B1 office, workshops and studios, which throughout the report will be referred to as the "*proposed development*"

The site is located in London Borough of Camden between Camden High Street, Camden Lock Place and the Regents Canal as shown in the picture below. This will be referred to as "*the Site"* throughout the document.

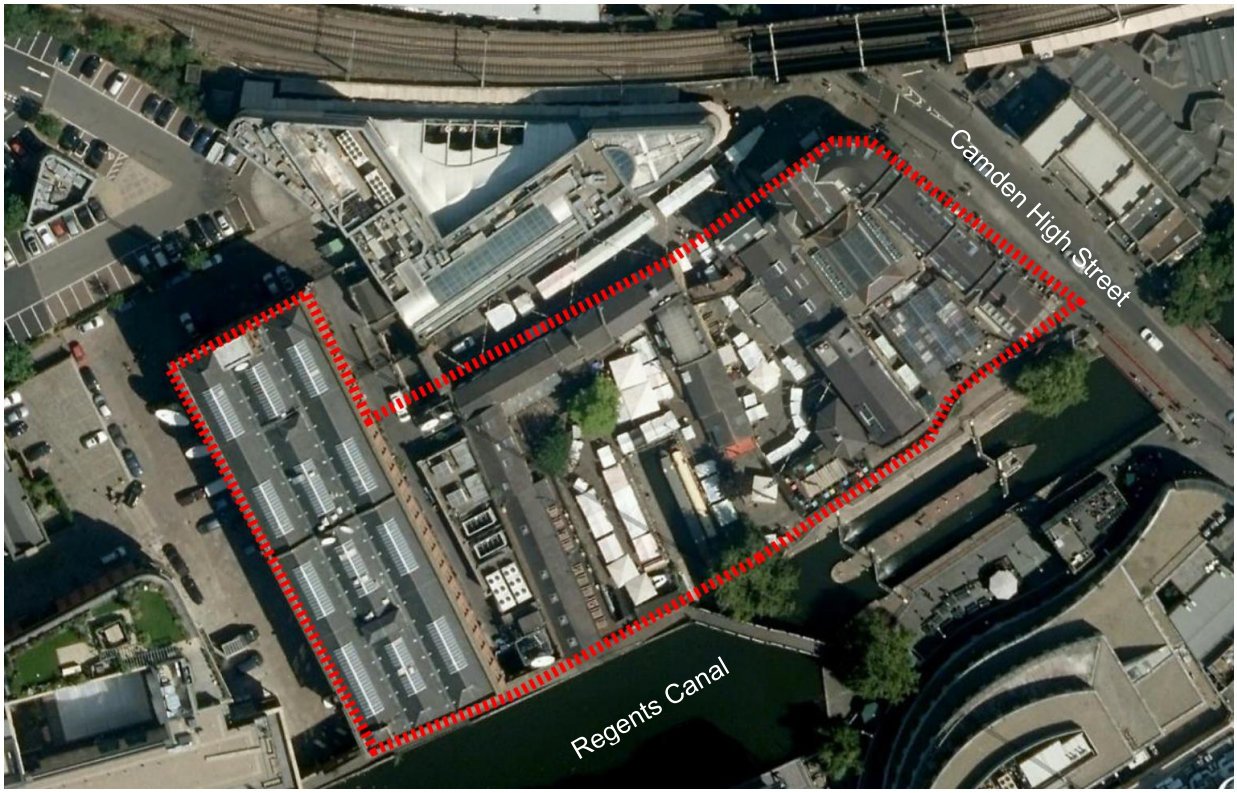

Figure 1 – Camden Lock Market Site boundaries

The North London Line segment known as Camden Junction is located to the north of the site. The London Underground Northern Line runs underneath Camden High Street.

The nearest noise sensitive property to the proposed development site of Camden Lock Market is the Holiday Inn Camden Lock, located on the other back of the Regent's Canal.

3.0 BASIS OF ASSESSMENT

Well established guidance on noise measurements, assessments and related acoustic design is available from a variety of references including:

- National Planning Policy Framework (NPPF) & Planning Practice Guidance (PPG)
- London Borough of Camden Core Strategy 2010
- Camden Local Development Framework 2010 "Camden Development Policies" – Policy DP28 - Noise and Vibration
- British Standard 8233: 2014 "Sound insulation and noise reduction for buildings – Code of Practice"
- British Standard 4142 (2014): 'Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas' (Under revision)
- World Health Organisation: 1999 "Guidelines for Community Noise"
- BREEAM New Construction 2014.
- British Council for Offices (BCO) Guide 2014 'Best practice in the specification for offices';
- BS 6472:2008 – Guide to evaluation of human exposure to vibration in buildings
- ANC Guidelines - Red Book: Measurement and Assessment of Groundborne Noise and Vibration
- ISO 14837-1:2005 Mechanical vibration – Ground-borne noise and vibration arising from rail systems

4.0 NATIONAL AND LOCAL PLANNING POLICY

4.1 National Planning Policy Framework (2012)

The NPPF sets out the Government's planning policies for England and how these are expected to be applied.

Section 11 paragraph 123 of NPPF states:

'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 upon them because of changes in nearby land uses since they were established
- 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'

Reference is made to the DEFRA Noise Policy Statement for England 2010 (NPSfE). This latter document is intended to apply to all forms of noise other than that which occurs in the workplace and includes environmental noise and neighbourhood noise in all forms.

4.2 Noise Policy Statement for England (2010)

Noise Policy Statement for England (NPSfE) advises that noise impact should be assessed on the basis of adverse and significant adverse effect but does not provide any specific guidance on assessment methods or noise limits.

NPSfE introduces the following concepts of noise effects which it states have been applied by the World Health Organisation:

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

LOAEL – Lowest Observed Adverse Effect Level
This is the level above which adverse effects on health and quality of life can be detected.
Extending these concepts for the purpose of this NPSfE leads to the concept of a significant observed adverse effect level.

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

No guidance is defined in relation to these effects in terms of limiting values of noise within the NPSfE. The World Health Organisation guidelines (WHO Night Noise Guidelines 2009) adopt these definitions but NPSfE does not apply the noise values contained in the guidelines.

The document advises that it is not possible to have 'a single objective noise based measure…. that is applicable to all sources of noise in all situations.' (paragraph 2.15) It further advises that the sound level at which an adverse effect occurs is likely to be different for different noise sources, for different receptors at different times (paragraph 2.22).

4.3 Planning Practice Guidance

On line guidance has been published to provide greater details in relation to the relevance of noise to planning following the introduction of the NPPF and NPSfE.

It states under the heading *'How to Determine the Noise Impact'* that the following should be considered by local authorities:

- 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.

The overall effect of both construction and when a development is complete should be considered.
In line with NPSfE this includes identifying where noise exposure is above or below the significant observed adverse effect level and the lowest observed adverse effect level for a given situation.

The observed effects are defined in the table given in Appendix B attached which is detailed in the section headed *'How to Recognise when Noise could be a concern?'*

It is important to note that no specific noise parameters are defined in the text or target noise levels provided.

Under the heading '*What factors influence whether noise could be a Concern?'* the subjective nature of noise is discussed. It is stated that there is no simple relationship between noise levels and the impact on those affected. This depends on how various factors combine in particular situations, these 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 (i.e. whether or not the noise contained particular high or low frequency content) and the general character of the noise (i.e. whether or not the noise contains particular tonal characteristics or other particular features). The local topology and topography should also be taken into account along with the existing and, where appropriate, the planned character of the area.*
- *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 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 noise may result in a significant adverse effect occurring even though little to no change in behaviour would be likely to occur.*
- *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.*

4.4 London Borough of Camden Local Requirements

The London Borough of Camden (LBC) is the Planning Authority applicable to the development site of Camden Lock Market. It has a Replacement Unitary Development Plan (UDP) adopted in June 2006 in which various Policies are contained, inclusive of specific thresholds for noise and vibration set-out for new proposed developments.

Under the Sustainable Development (SD) section of the LBC UDP, Policy SD6 'Amenity for occupiers and neighbours' states:

> *'The Council will not grant planning permission for development that it considers causes harm to the amenity of occupiers and neighbours. The factors the Council will consider include; d) noise and vibration levels'*

Under the Sustainable Development (SD) section of the LBC UDP, Policy SD7 'Light, noise and vibration pollution' states:

> *Unless appropriate attenuation measures are available and are included, the Council will not grant planning permission for:*
> *a) development likely to generate noise/vibration pollution; or*
> *b) development sensitive to noise/vibration in locations with noise/vibration pollution.*
> *In assessing applications against these criteria, the Council will have regard to the levels set out in Appendix 1 to this Plan.*

The '*Appendix 1'* of the LBC UDP contains various tables of noise and vibration parameters / criteria. For ease of reference, the tables have been extracted copies provided in Appendix C attached.

Under the Sustainable Development (SD) section of the LBC UDP, Policy SD8 'Disturbance' states:

> *The Council will only grant planning permission for plant or machinery, including ventilation or air handling equipment, if it can be operated without causing a loss to local amenity and does not exceed the thresholds set out in Appendix 1 - Noise and Vibration (Table E).*

5.0 ENVIRONMENTAL SOUND CONDITIONS

5.1 Environmental sounds affecting site and in surrounding

Ambient sound levels affecting the area are determined mainly by road traffic movements on Camden High Street at the east end of the site. Freight train passages through the Camden Junction viaduct of the North London Line contribute to affect the noise conditions at the north of the site. Camden Lock Market activities will affect the rest of the development area.

5.2 Baseline sound measurements

An acoustic survey was undertaken in September 2014 to establish the existing environmental sound levels around the development site.

The monitor recorded five minute contiguous samples from 2nd September 2014 until 8th September 2014. Periods with rain throughout the survey were excluded.

Multiple short-term attended measurements were also taken on the 2nd September 2014 between 12.40 and 15.00 to determine the variation in noise levels at several locations around the site.

Another attended survey was carried out on the 3rd June 2015 to verify that sound levels in the area are in line with those from the previous survey.

The figure below provides a summary of the typical environmental sound levels around the site based on data obtained for the surveys undertaken in 2014 and 2015. Full datasets are given in Appendix B. Details of the measurement equipment are provided in Appendix B.

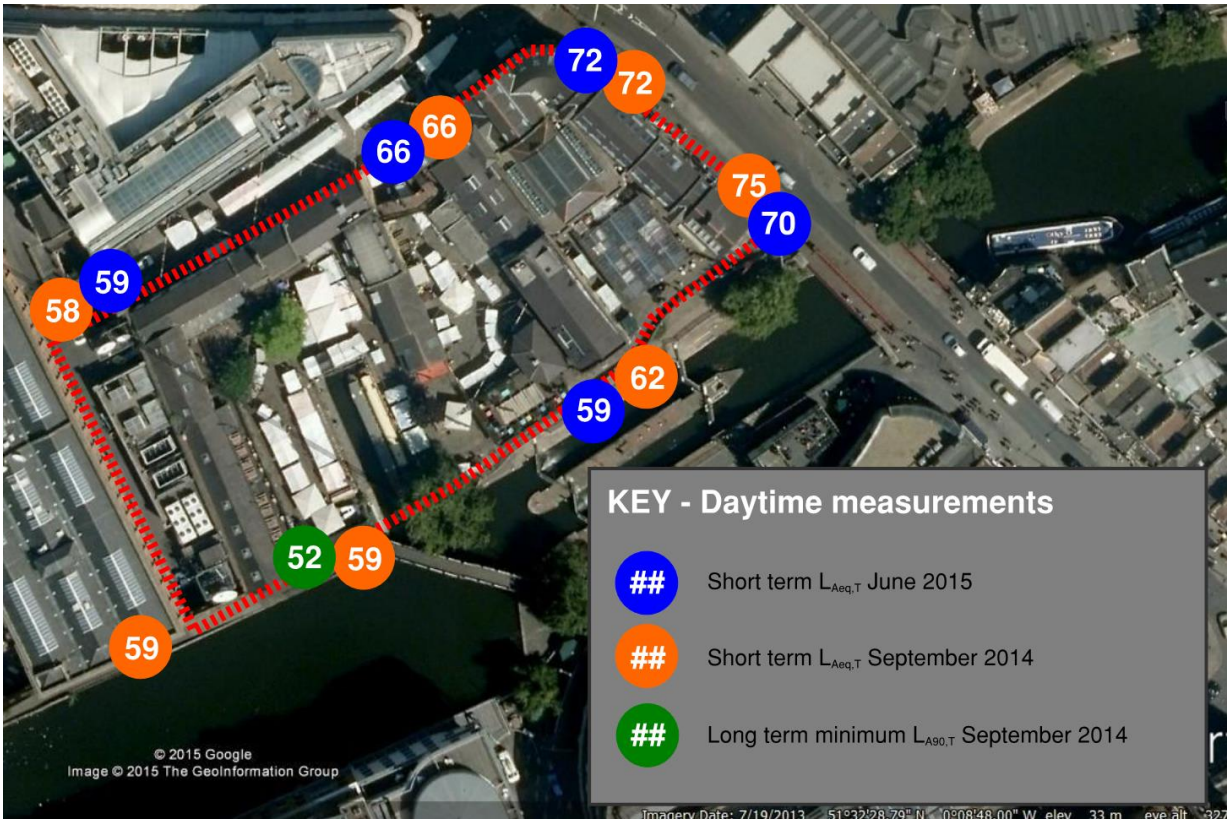

Figure 2 – Typical environmental sound levels around the site

These results have been used to determine the environmental sound levels at the various façades of the proposed development.

6.0 STRATEGY TO CONTROL NOISE INTRUSION

6.1 Indoor noise standards

National and local policies in Camden do not provides explicitly guidance for indoor sound levels for office and retail spaces.

Commonly, the indoor sound standards recommended in BS8233 are referenced as a basis for design.

Table 1 - Proposed indoor sound standards for CLM

Type of Space		**Internal ambient noise level, Design range dB L_{Aeq}, T**
Offices	Open plan	45-50
	Meeting room	35-45
	Executive office	35-40
Retail (Assuming A1 and A5 use)		50-55
Retail (assuming A3 use)		40-55

BCO criterion for open plan office is compatible with the BS8233:2014 design range; however BS8233:2014 omits the design range for cellular offices, - contained in previous versions of BS 8233 with which the BCO criteria were compatible. The BS 8233:2014 design range for executive offices states that the combined noise levels shall not be more than 40 dB $L_{eq,T}$.

6.2 Likely required façade sound reduction

The following table provides a guidance at this early stage on the likely required provisions for façade sound reduction for different areas of the scheme, estimated on the basis of the measured data and the above proposed indoor sound criteria. The intention is to offer a demonstration of how noise could be controlled in line with local national standards.

In terms façade performance for retail units, this is very much dependent upon the type of retail operation and their sensitivity to noise. The indoor sound standards range is wide from 40 dB to 55 dB.

It is recommended that at planning stage allowance be made in the base build costing for retail units (A1-A5) to be supplied with a 30 dB R_w facades systems. It is advised open plan office to be supplied with façade systems ranging between 40 dB and 30 dB R_w and cellular office between 45 dB and 35 dB R_w depending on the noise external levels. Further work will need to be undertaken post planning stage to finalise performances prior to procurement. A conservative approach has been taken at this stage so there may be scope in some instances for reduction in specification.

There are areas where this can be reduced in specification where the end users are established to have low sensitivity to noise.

Table 2 - Required provisions for façade sound reduction for different areas of the scheme

Room Type	Indoor noise standard	Typical Noise Level across façade dB(A)	Guidance on façade sound reduction performance		
			External wall	Windows	
			Rw, dB	Rw, dB	Indicative glazing configuration
Retail (A1, A5)	50-55	70-75	45	30	Double Glazing: 4 (16) 4 / Single Glazing: 5mm
		65-70	45	30	Double Glazing: 4 (16) 4 / Single Glazing: 5mm
		60-65	45	30	Double Glazing: 4 (16) 4 / Single Glazing: 5mm
Restaurant (A3)	40-55	70-75	45	40	Double Glazing: 8 (16) 6.4 Silence / Single Glazing: 12.4 Silence
		65-70	45	35	Double Glazing: 4 (16) 8 Single Glazing: 10.8mm
		60-65	45	30	Double Glazing: 4 (16) 4 / Single Glazing: 5mm
Open Plan Office	40-50	70-75	45	40	Double Glazing: 8 (16) 6.4 Silence
		65-70	45	35	Double Glazing: 4 (16) 8
		60-65	45	30	Double Glazing: 4 (16) 4
Cellular Office	35-40	70-75	45	45	Double Glazing: 10 (16) 8.4 Silence
		65-70	45	40	Double Glazing: 8 (16) 6.4 Silence
		60-65	45	35	Double Glazing: 4 (16) 8

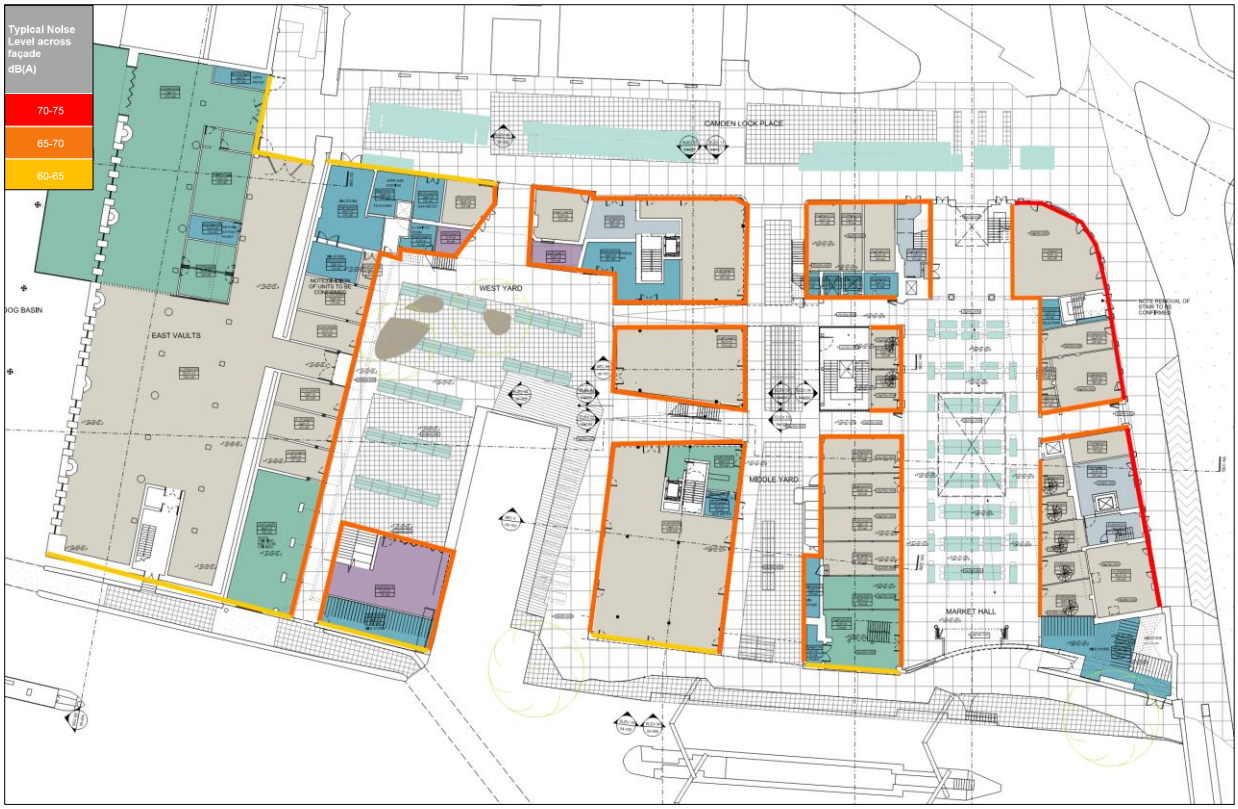

Figure 3 - Typical Noise Level across façade - Ground Floor

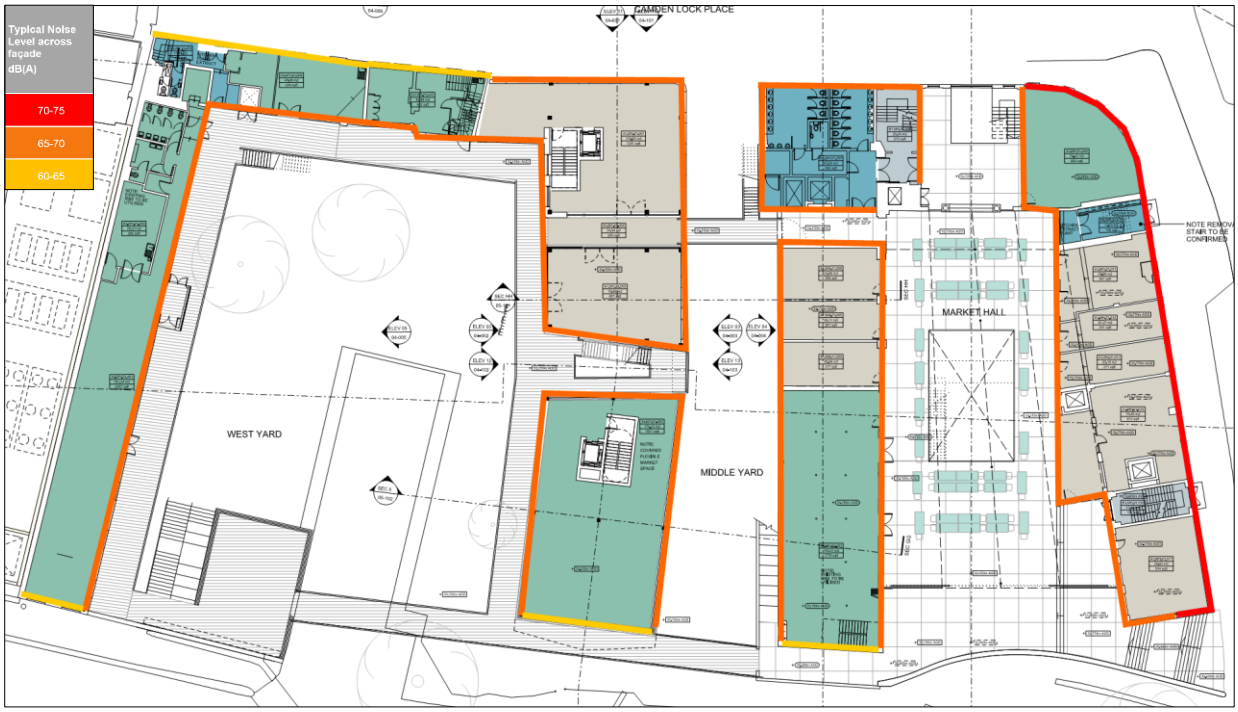

Figure 4 - Typical Noise Level across façade - Upper Ground Floor

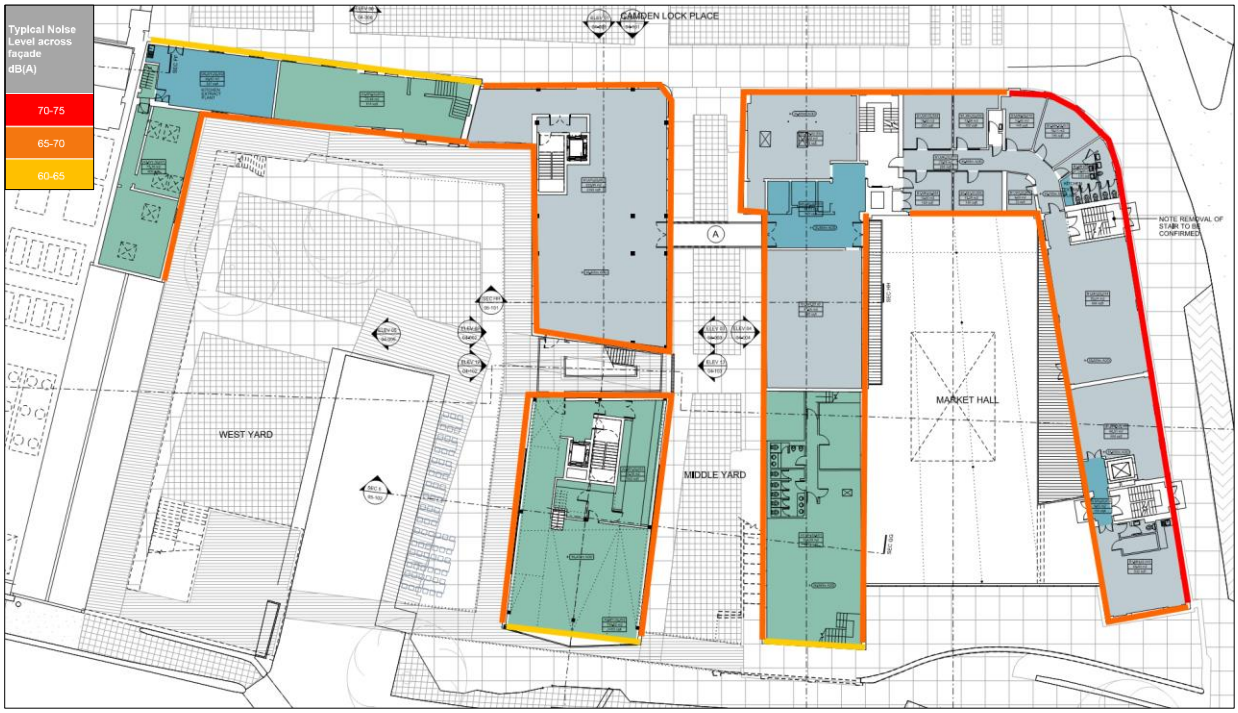

Figure 5 - Typical Noise Level across façade - First Floor

Figure 6 - Typical Noise Level across façade - Second Floor

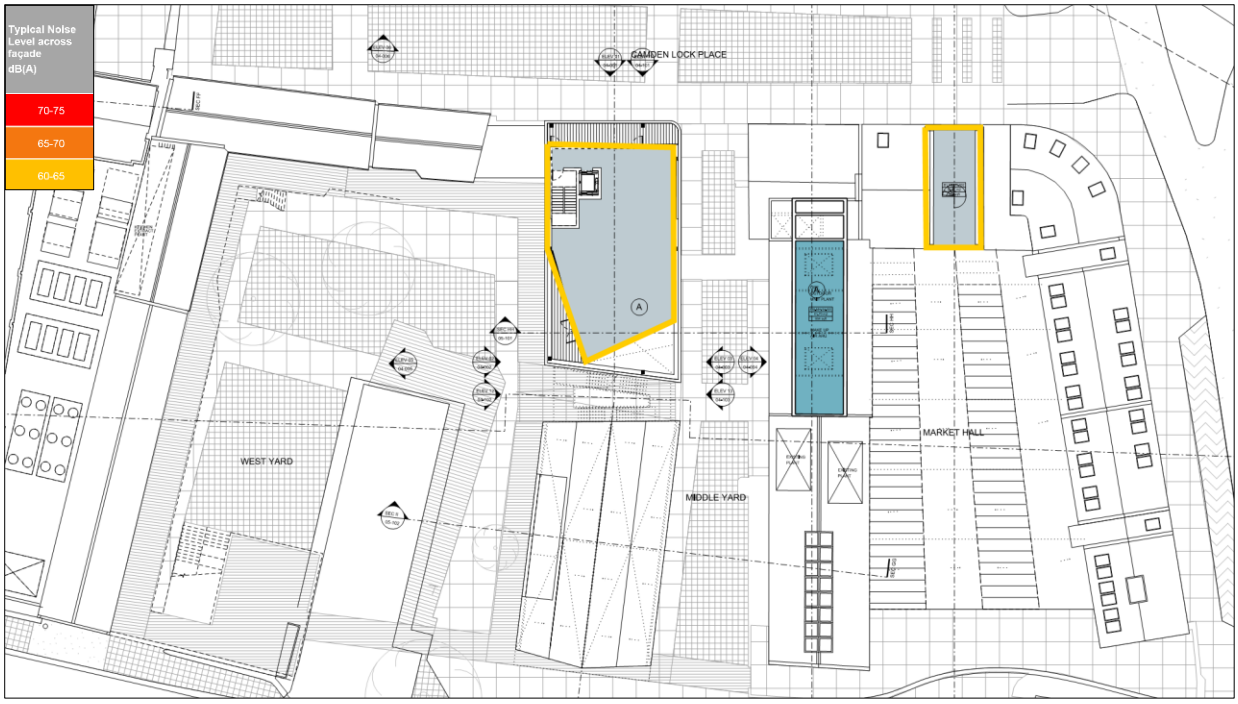

Figure 7 - Typical Noise Level across façade - Third Floor

7.0 CONTROL OF PLANT NOISE ASSOCIATED WITH SCHEME

7.1 Proposed plant noise limits

The fundamental basis of the plant noise control strategy will be to observe the following plant noise limits in the selection of equipment and determination of additional noise control measures. The limits have been derived from the lowest measured background noise levels. This approach is in line with development noise policy of the London Borough of Camden.

Table 3 - External plant emission noise limits in dB L_{Aeq}

Day, 07:00-23:00	Night, 23:00-07:00
45	40

Plant items and appropriate noise control measures will need to be selected in order to comply with the criteria set out in Table 3.

If the plant is identified as having tonal components, a further 5 dB reduction to the abovementioned set limits shall be applied.

In addition, any rotating and reciprocating plant items are to be fitted with efficient anti-vibration mountings (AVMs).

7.2 Noise sensitive neighbours

Nearby noise sensitive premises have been identified as the Holiday Inn Camden Lock façades on the opposite bank of the Regent's Canal as shown in Figure 8.

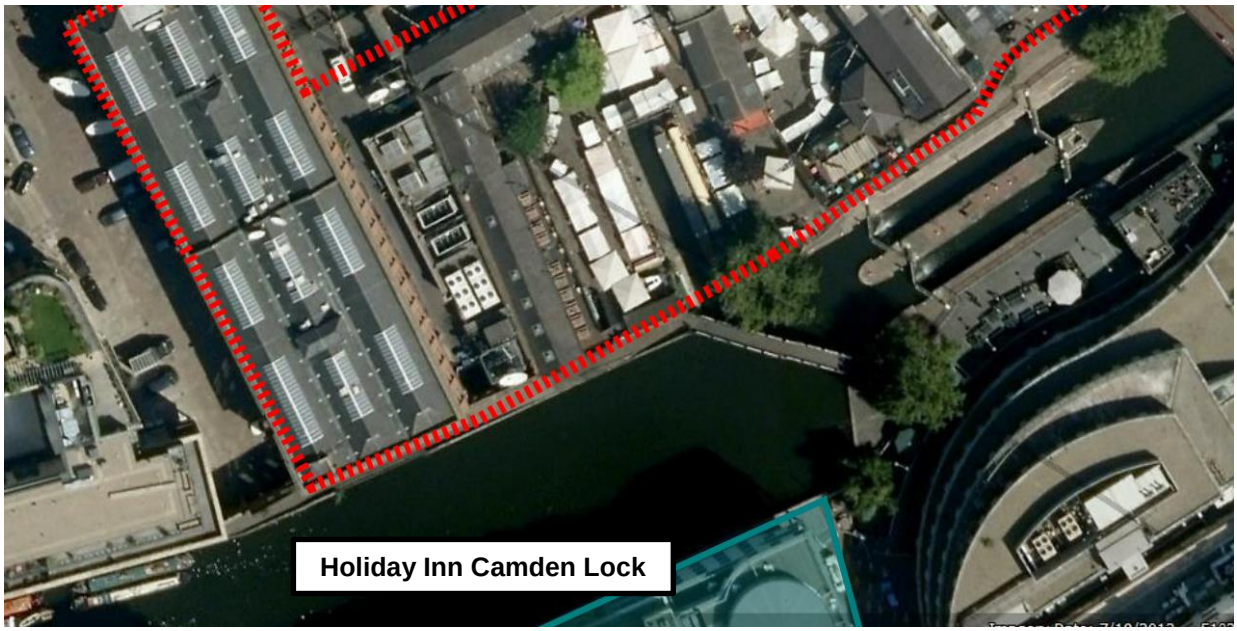

Figure 8 - Nearby noise sensitive receptors

7.3 Proposed building services plant

At this stage, the services plant design is conceptual but sufficient information has been developed in terms of equipment types and location enable an assessment of noise emissions and to identify requirements for noise control.

Plans are to install six kitchen extract fans and nine heat rejection units surrounded by a louvered enclosure on the roof of the proposed Camden Lock Market. It is understood that the plant would operate only during daytime hours (0700 – 2300). The figure below shows locations currently proposed of the abovementioned plant.

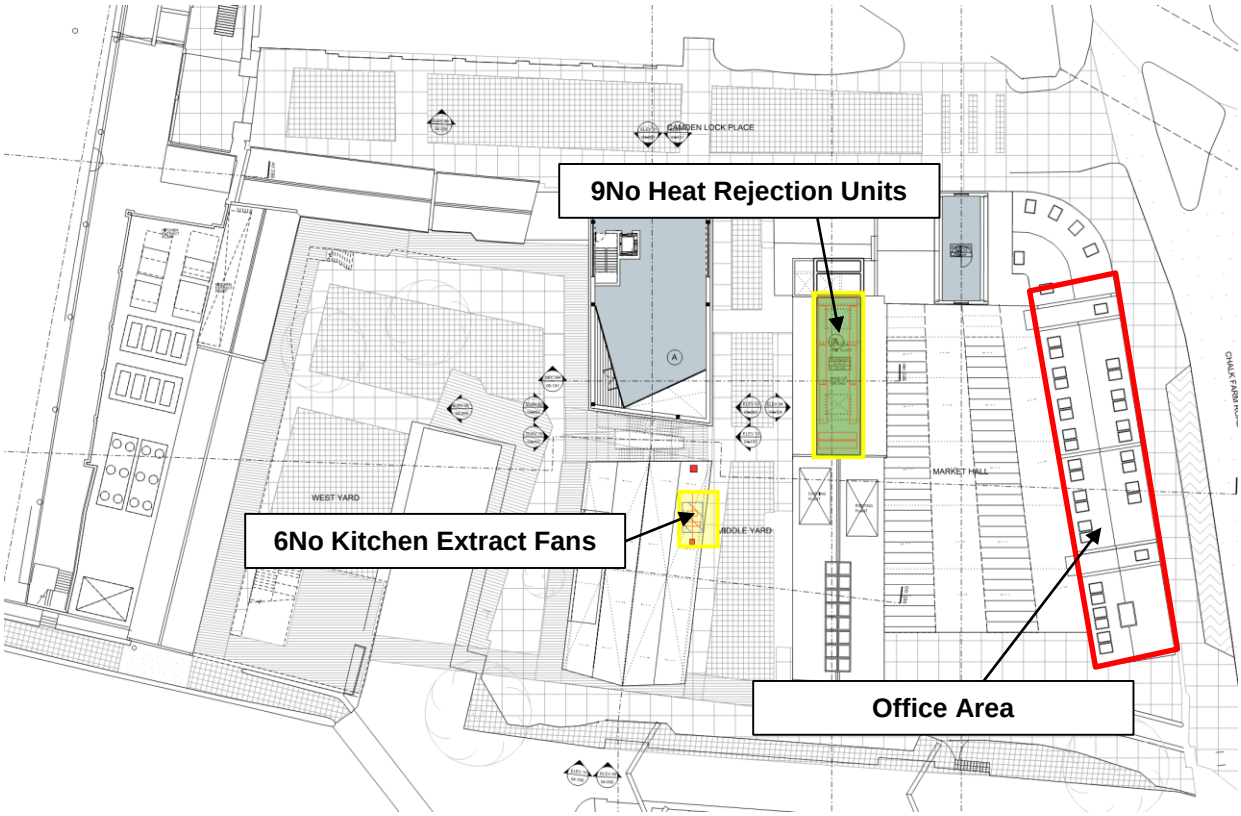

Figure 9 – Sketch of plant locations currently proposed

7.4 Outline assessment

Technical specifications and calculations used in this section are presented in Appendix D. The sound power for each mechanical unit has been considered taking into account an uncertainty as shown in Appendix D.

7.4.1 Main normally operating plant

The nearest noise sensitive façade at the Holiday Inn Hotel is approximately 75m away from the kitchen extract fans and 85m from the heat rejection units.

Table 4 presents a summary of the predicted noise levels at the nearest noise sensitive façade. Reductions to the source level include for transition from sound power level of the unit output to sound pressure level at a point in space outside the façade, geometrical spreading and distance attenuation, the screening effect of the building roof for the kitchen extract and of the acoustic louver for the heat rejection units.

Table 4 – Assessment of plant noise emissions at the nearest noise sensitive façade

Calculation Step	6No Kitchen Extract Fans	9No Heat Rejection Units
Source Level – $L_{W\,A}$, dB	99	101

Noise emission at 1m from the nearest noise sensitive façade – $L_{Aeq,T}$, dB	38	43
Total noise emission at 1m from the nearest noise sensitive façade – $L_{Aeq,T}$, dB	44	
Noise emission limit daytime, dB(A)	45	
Assessment	Level of noise at nearest noise sensitive façade complies with set noise emission limit daytime	

7.4.2 Emergency operating plant

A smoke extract fan is planned to be installed on roof levels at the location shown in the following figure and its location is approximately 80m away from the neighbouring Holiday Inn Hotel façade,

The plant unit is meant to run in event of emergency and during occasional testing only during day time hours for a short period to be defined but this is expected to be around 15 minutes. Camden Local Development Framework 2010 does not give guidance on emergency plant limit. However, it is established protocol that for emergency plant, a relaxation is normally agreed to the noise limits to minimise nuisance during the periodic tests. It is proposed here that noise emissions from the smoke fans will be set at to 5 dB above the limit set for normally operating plant at 50 dB L_{Aeq}. This equates to the typical background noise measured at the site. This, according to BS4142:2014, is an indication of the specific sound source having a low impact.

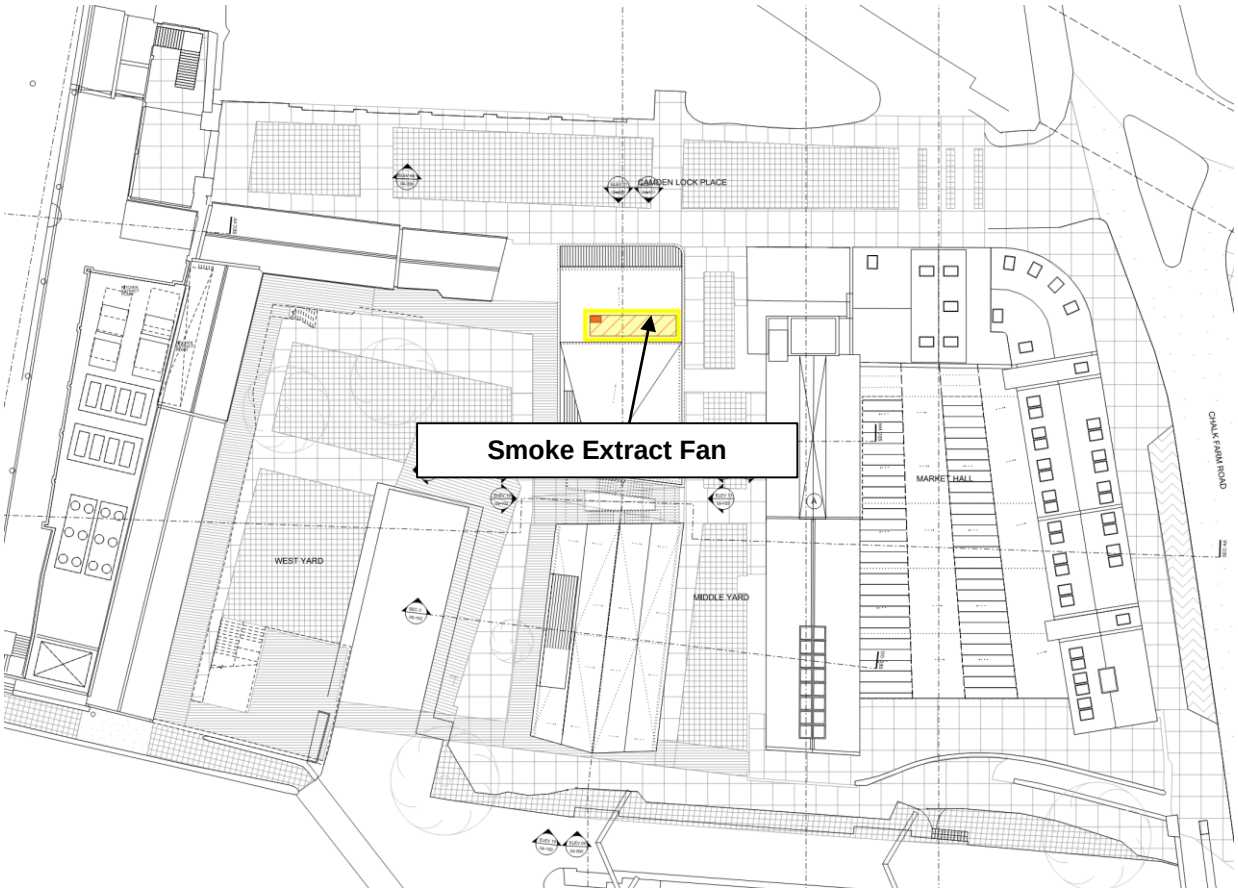

Figure 10 – Emergency Plant unit location at roof level

Table 5 presents the predicted noise levels of the emergency plant at the nearest noise sensitive façade, the Holiday Inn Hotel. Full details of calculation including uncertainty and losses for distance are provided in Appendix D.

Table 5 - Assessment of emergency plant noise emissions at the nearest noise sensitive façade

Calculation Step	**6No Kitchen Extract Fans**
Source Level – L_{WA}, dB	99
Noise emission at 1m from the nearest noise sensitive façade – $L_{Aeq,T}$, dB	50
Proposed Noise emission limit for emergency plant, 60 dB(A)	60
Assessment	Level of noise at nearest noise sensitive façade complies with suggested noise emission limit

8.0 VIBRATION SURVEY & ASSESSMENT

A vibration survey has been carried out to assess the vibration levels generated by freight train and underground train movements.

The survey was undertaken on the 21st November 2014 whereby a fixed vibration monitor was installed at the basement of Stable Market Block C (position P1) with simultaneous measurements at the second floor of the same building and at the Stable Market ground level (P3). Freight train passages through the Camden Junction of the North London Line were clearly identified in the measurement signals.

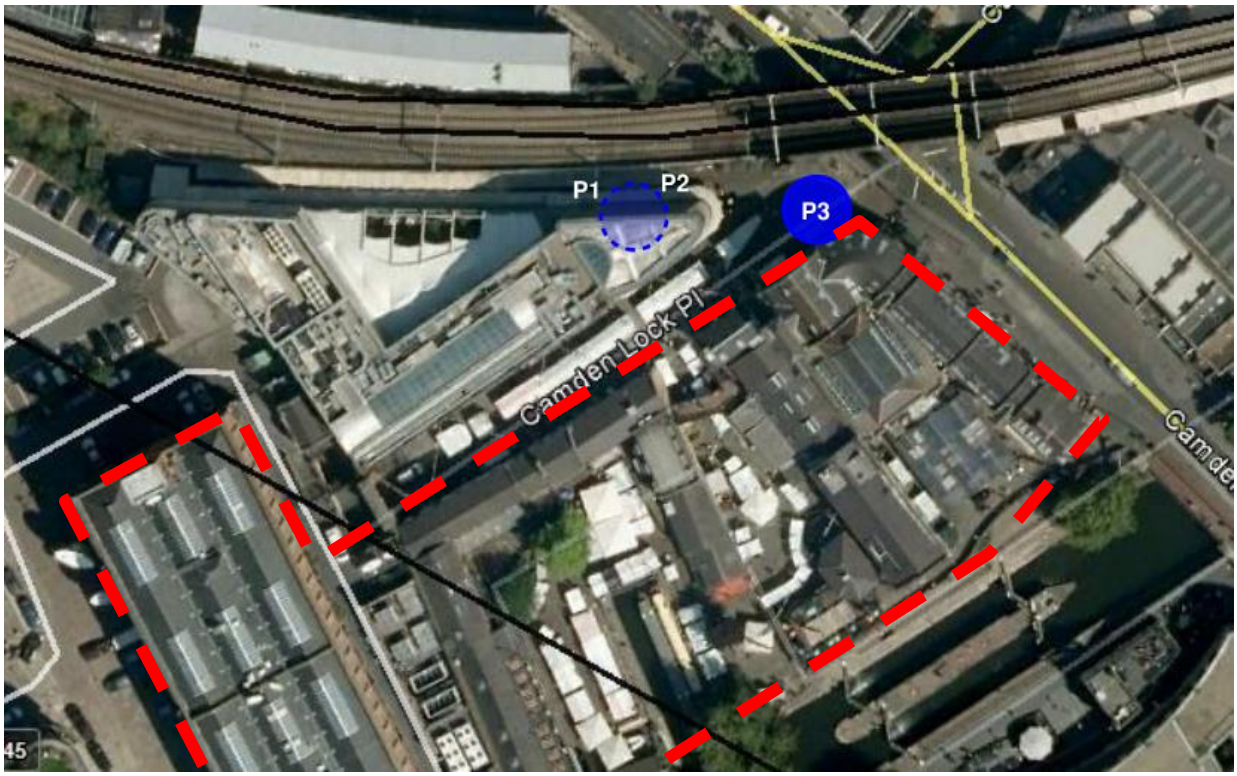

Figure 11 - Vibration measurement positions

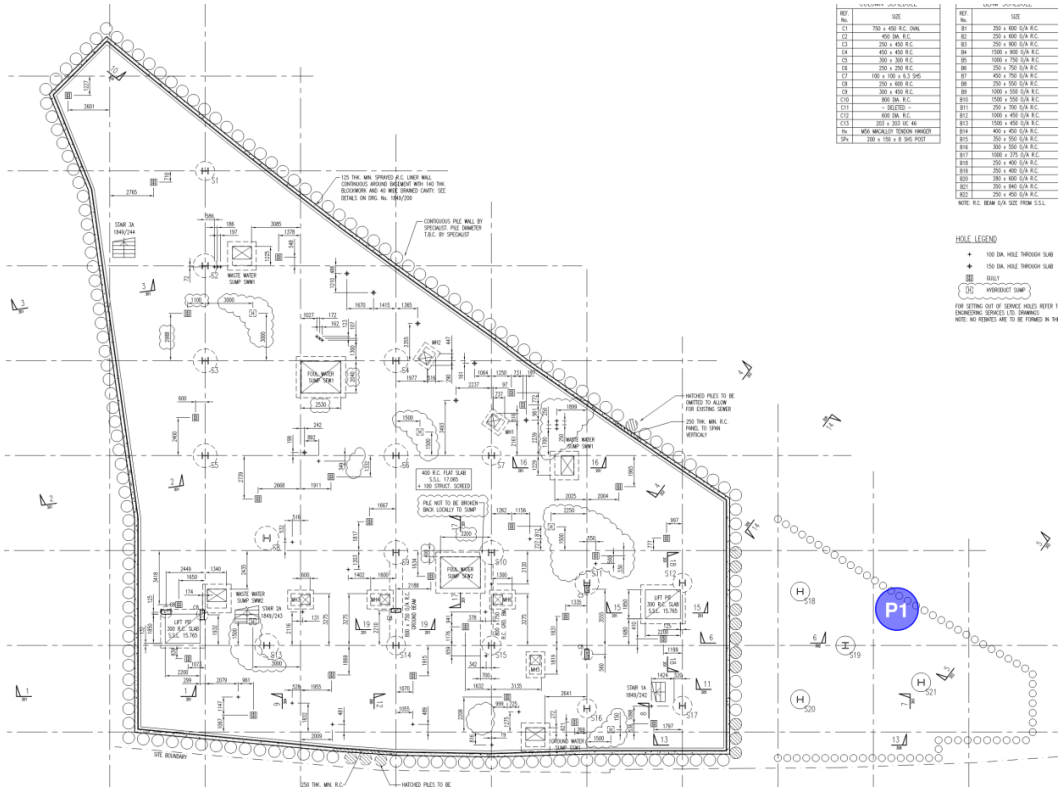

Figure 12 - Measurement location basement floor

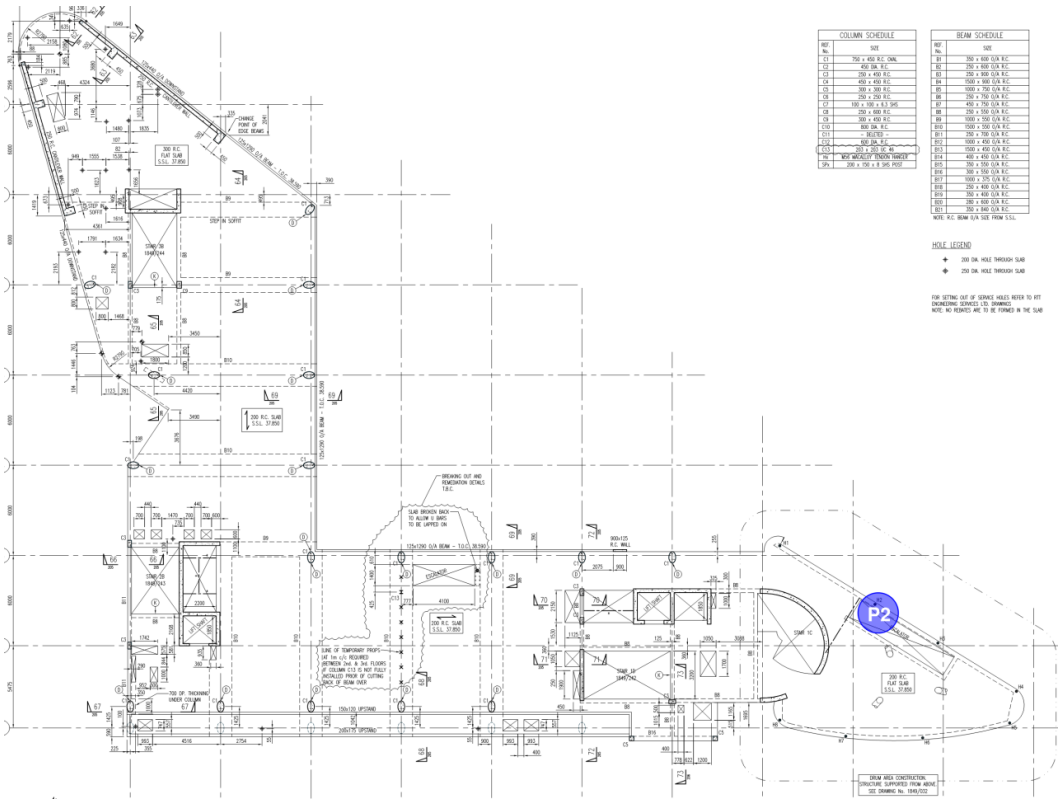

Figure 13 - Measurement location second floor

8.1 Vibration parameters

BS 6472:2008(1) – Guide to evaluation of human exposure to vibration in buildings

BS 6472 describes an approach for assessing vibration within a building against criteria for human response. The Vibration Dose Value (VDV) is used in quantifying the effect of multiple occurrences of a discrete vibration event such as train movements within a given time period (day or night).

The standard describes the calculation of the VDVs from the measurements of vibration acceleration between 1 and 80Hz. The criteria for assessing VDVs correspond to the probability of adverse comments as shown below

Table 6 - Vibration Dose Value in office space

Location	Time	Low probability of adverse comment ($m/s^{1.75}$)	Adverse comment possible ($m/s^{1.75}$)	Adverse comment probable ($m/s^{1.75}$)
Office /Retail	Day (07:00 to 23:00)	0.4 to 0.8	0.8 to 1.6	1.6 to 3.2

London Borough of Camden – Unitary Development Plan

London Borough of Camden requires levels of vibration to be limited to the following specific criteria. These align with the BS6472 guide levels.

Table 7 - LBC maximum acceptable vibration limits for different buildings

Vibration description and location of measurement	Period	Time	Vibration level – VDV ms-1.75
Vibration inside offices	Day, evening and night	0000 - 2400	0.4
Vibration inside workshops	Day, evening and night	0000 - 2400	0.8

Additionally, LBC require consideration of the potential for vibration manifesting as re-radiated noise where ground borne vibration transmits into the building structure and lightweight finishes are excited which can emit audible noise.

8.2 Re-Radiated noise criteria

Structural–borne vibration caused by underground train movements can also manifest a re-radiated noise, where lighter weight finishes can be excited and emit low frequency sound into the room.

At present, there are no UK statutory criteria that set out the limit at which groundborne noise effects become significant or result in nuisance. It is advised that a 40 dB L_{Amax} should be target. This level is referenced as standard in relation to a number of underground railway schemes including the Jubilee Line Extension and, more recently, for Crossrail.

8.3 Vibration results summary

A significant quantity of data was obtained from the measurements surveys, including raw acceleration levels for individual overground and underground train movements. The data have not been included in entirety but can be made available on request. The following offers a summary of the key findings. A glossary of terms is included in Appendix A.

Vibration Dose Values have been determined within the existing "Building C" based on the various measurements and an assessment made against the above criteria. Predictions of VDV have also been made within the proposed buildings on the basis of the measured data and assumption of similarity in structural form.

To determine the dose values over extended day and night periods, reference has been made to timetables both for underground and freight trains. Typically, there are around 20 freight movements during daytime hours (0700-2300) and 25 at night on the Camden Junction line. Typically there are 640 underground train movements on London Underground Northern Line between 07.00 and 23.00.

Table 8 summarises the VDV's caused by freight trains determined in the existing Building C at both basement and second floor level. Table 9 summarises the VDV's caused by underground trains determined in the existing Building C basement level and at the Market ground floor. The results are all significantly lower than the LBC limits, with levels well below the criteria where there would "*low probability of adverse comment*". The second floor levels were found to be higher than basement which is attributed to the mounting of the accelerometer off a lighter weight floor construction which has had an amplifying effect.

Table 8 - Vibration Dose Values in Existing Building C for freight train passages

Position in building	**Period**	**VDV** ($m/s^{1.75}$)	**Upper acceptable limit** ($m/s^{1.75}$)	
Basement	Day	0.039	0.4	Significantly below limit
Second floor	Day	0.067	0.4	Significantly below limit

The associated re-radiated noise level due to freight trains was found to be less than 33 dB, which is lower than the normally recommended limit of 40 dB $L_{Amax,S}$.

Table 9 - Vibration Dose Values for underground train passages

Position in building	**Period**	**VDV** ($m/s^{1.75}$)	**Upper acceptable limit** ($m/s^{1.75}$)	
Basement	Day	0.189	0.4	Significantly below limit
Ground Floor	Day	0.021	0.4	Significantly below limit

The associated re-radiated noise level due to freight trains was found to be 37 dB(A), which is lower than the normally recommended 40 dB $L_{Amax,S.}$

9.0 CONCLUSIONS

Hoare Lea Acoustics under appointment by Castlehaven Row Limited has undertaken an environmental noise and vibration assessment of development proposals for Camden Lock Market.

Sources of potential noise include that due to road traffic, freight train passes and market activities. There will also be operation plant in future. . The site is also adjacent to the London Underground Northern Line.

Results from the acoustic survey have been used to assess both the potential effects of noise on the scheme for future occupants and the potential impact of noise due to the scheme on the surrounding neighbours, in accordance with the LBC Noise Policy.

Outline guidance on the performance requirement of building envelop attenuation measures have been provided. Offices overlooking Camden High Street could potentially have relatively high performance cladding requirements and should be considered in early cost estimates.

Consideration has been given to the potential for noise impacts to the surrounding noise sensitive premises due to the introduction of new mechanical building services equipment. Noise limits have been derived in accordance with London Borough of Camden's UDP guidance and shall be used as the fundamental basis of the noise control strategy.

Proposed external mechanical services have been reviewed and an outline assessment with respect to the limits has been undertaken. With appropriate equipment selection, incorporation of attenuation and acoustic screening, in combination with natural losses due to distance, the limits can be achieved.

Vibration ingress due to freight and underground train passages has been measured, assessed and found to be negligible therefore vibration mitigation measures are not deemed to be required for this scheme.

Re-Radiated noise due to vibrations has been assessed to be lower than the recommended standards and should not represent a concern for the development.

On the basis of all the specific assessment outcomes, it is concluded that noise and vibration should not pose an obstacle to granting planning approval where suitable control can be achieved through use of appropriate conditions.

APPENDIX A – GLOSSARY OF ACOUSTICS TERMS

Decibel (dB)
The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). Therefore, a logarithmic scale is used to describe sound pressure levels and also sound intensity and power levels. The logarithms are taken to base 10. Hence an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascals). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

Octave and Third Octave Bands
The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz and is generally more sensitive to medium and high frequencies than to low frequencies within the range. There are many methods of describing the frequency content of a noise. The most common methods split the frequency range into defined bands, in which the mid-frequency is used as the band descriptor and in the case of octave bands is double that of the band lower. For example two adjacent octave bands are 250 Hz and 500 Hz. Third octave bands provide a fine resolution by dividing each octave band into three bands. For example third octave bands would be 160 Hz, 250 Hz, 315 Hz for the same 250 Hz octave band.

A-Weighting
The 'A' weighting is a correction term applied to the frequency range in order to mimic the sensitivity of the human ear to noise. It is generally used to obtain an overall noise level from octave or third octave band frequencies. An 'A' weighted value would be written as dB (A).

Equivalent Continuous Sound Level Leq,
The L_{eq}, is a parameter defined as the equivalent continuous sound pressure level. Over a defined time period 'T', it is the sound pressure level equivalent to the acoustic energy of the fluctuating sound signal. The $L_{eq,T}$ can be seen to be an "average" sound pressure level over a given time period (although it is not an arithmetic average). Typically the $L_{eq,T}$ will be an 'A' weighted noise level in dB(A). It is commonly used to describe all types of environmental noise sources.

Background Noise Level L90
The $L_{90,\,T}$ is a parameter defined as the sound pressure level exceeded for 90% of the measurement period 'T'. It is a statistical parameter and cannot be directly combined to other acoustic parameters. It is generally used to describe the prevailing background noise level or underlying noise level.

Rating Level
The specific noise level of the source plus any adjustment for characteristic features of the noise.

Airborne Single Number Quantity Weighting
This is a weighting procedure defined in BS EN ISO 717, Part 1 for converting third octave band R, R', D and D_{nT} values to a single number quantity denoted as R_w, R'_w, D_w or $D_{nT,w}$. It is a decibel value.

Vibration
Oscillation of a body about an equilibrium position, disturbed by an external force or internal force.

The vibratory motion of a surface can be characterised by:
(a) displacement (m),
(b) velocity (m/s), or
(c) acceleration (m/s^2).
The magnitude of the vibration can be quantified in several ways:

Peak to Peak
The total excursion of the oscillation about the zero datum.

Peak
This value gives the maximum excursion of the oscillation above or below the zero datum.

r.m.s.
This value gives the root mean square of the time history over a specific time interval (time constant).

dB
Vibration levels can be expressed in dB. A reference level of 10^{-6} m/s^2 r.m.s. is usually used for acceleration.

Vibration Dose Value, V.D.V. ($m/s^{1.75}$)
The V.D.V. assesses both the magnitude of vibration and its duration. It can be estimated from the frequency weighted r.m.s. value of the acceleration and its duration and is then referred to as the estimated Vibration Dose Value (e.V.D.V.).

Re-radiated Noise
The level of noise, in dB, radiated by a surface excited by vibration, e.g. a floor or wall.

Residual Vibration Levels
The underlying background level of vibration present during any given measurement.

APPENDIX B – EQUIPMENT DETAILS

List of equipment used

Long Term Measurements (September 2014)
- Rion NL-32 Sound Level Meter (Serial Number 01161938)
- Rion NH-21 Pre-Amplifier (Serial Number 21973)
- Brüel and Kjær 4231 Sound Calibrator (Serial Number 34172704)
- Rion UC-53A Microphone (Serial Number 311039)

Short Term Measurements (September 2014)
- Brüel and Kjær 2250 Sound Level Meter (Serial Number 3002554)
- Brüel and Kjær 2C0032 Pre-Amplifier (Serial Number 19475)
- Brüel and Kjær 4231 Sound Calibrator (Serial Number 1771159)
- Brüel and Kjær 4189 Microphone (Serial Number 2887250)

Short Term Measurements (June 2015)
- Calibrator Rion NC-74 (SN 34172704)
- SLM Rion NA-28 Analyser (SN 01260200)
- Pre-amplifier Rion NH-23 (SN 60103)
- Microphone Rion UC-59 (SN 280)

Sound level meters were field calibrated before and after noise survey and no discernible variations occurred.

Vibration Measurements (November 2014)
- Vibration Meter + Accelerometer SVAN 977 + 393B1 (SN 34104)
- Vibration Meter + Accelerometer SVAN 959 + Dytran 3191A1 (SN11224)

APPENDIX C – FULL SET OF RESULTS FROM NOISE SURVEY

Figure 14 - Noise survey results from fixed noise monitor – September 2014

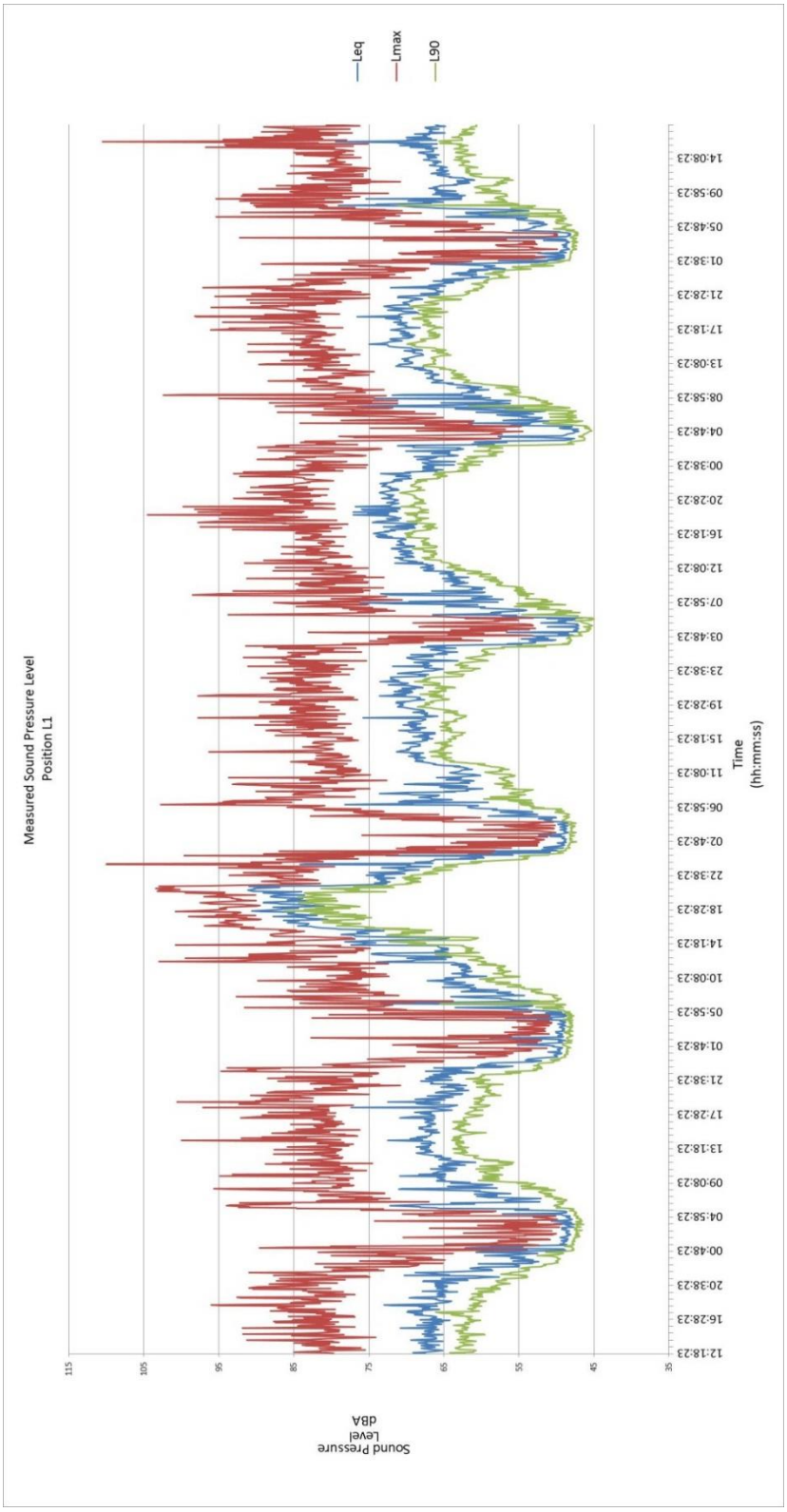

Table 10 - Short Term Measurements - September 2014

Position	Measurement Period	Duration	$L_{Aeq,T}$ dB
S1	12:40	00:05:00	58.5
S2	12:46	00:05:01	59.4
S3	12:54	00:05:00	61.5
S4	13:00	00:05:00	70.3
	13:05	00:05:00	56.9
	13:11	00:05:00	77.8
	13:17	00:05:06	77.5
S5	13:24	00:05:00	75.6
	13:30	00:05:10	62.8
	13:52	00:05:01	69.3
	13:57	00:05:00	70.0
S6	14:52	00:05:00	65.6
S7	14:58	00:05:00	57.7

Table 11 - Short Term Measurements – (June 2015)

Position	Measurement Period	Duration	$L_{Aeq,T}$ dB
4	03/06/2015 11:12	00d 00:10:00	70.2
5	03/06/2015 11:25	00d 00:10:00	72.2
6	03/06/2015 11:37	00d 00:10:00	66.2
7	03/06/2015 11:49	00d 00:10:00	59.1
1	03/06/2015 12:02	00d 00:01:03	61.8
3	03/06/2015 12:07	00d 00:10:00	58.9
6	03/06/2015 12:31	00d 00:10:00	65.9
7	03/06/2015 12:43	00d 00:10:00	58.3
3	03/06/2015 12:56	00d 00:10:00	59.8

Table 12 – Vibration Measurements, freight trains - November 2014

Area	Level	Duration of event, sec	Event Vibration acceleration, ms-2	eVDV, ms-1.75	Number of event	VDV, ms-1.75	Upper acceptable limit, ms-1.75
					DAY	DAY	DAY
Stable Market	Basement	90	0.0054	0.023	20	0.050	0.2
	Ground Floor	260	0.0016	0.007	20	0.014	
	Second Floor	30	0.0079	0.026	20	0.055	

Table 13 – Vibration Measurements, underground trains - November 2014

Area	Level	Duration of event, sec	Event Vibration acceleration, ms-2	eVDV, ms-1.75	Number of event	VDV, ms-1.75	Upper acceptable limit, ms-1.75
					DAY	DAY	DAY
Stable Market	Basement	19	0.016	0.038	640	0.189	0.2
	Ground Floor	20	0.0016	0.004	640	0.021	

APPENDIX D – PLANT NOISE ASSESSMENT

Table 14 - Kitchen Extract Fans - Acoustic Data and Assessment of plant emission level at nearest sensitive receiver

Frequency	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz	Total	6 Fans
Induct Inlet – L_{AW}, dB	82	91	87	79	73	76	76	67	84	
Induct Outlet – L_{AW}, dB	83	85	84	84	77	78	78	64	86	
Breakout – L_{AW}, dB	78	82	79	75	64	65	61	43	76	
Total – L_{AW}, dB	**86**	**92**	**89**	**86**	**79**	**80**	**80**	**69**	**88**	**96**
Uncertainty, dB	3	3	3	3	3	3	3	3		
Hemispherical correction, dB	3	3	3	3	3	3	3	3		
Distance attenuation - 75m, dB	49	49	49	49	49	49	49	49		
Barrier effect attenuation, dB	7.5	9.4	12.4	16.5	20	24	25	25		
SPL at sensitive receiver façade, dB	**36**	**40**	**34**	**27**	**16**	**14**	**13**	**1**	**30**	**38**

Table 15 – Heat Rejection Units - Acoustic Data and Assessment of plant emission level at nearest sensitive receiver

Frequency	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz	Total	9 units
Total – L_{AW}, dB	**99**	**96**	**91**	**88**	**82**	**77**	**73**	**68**	**89**	**99**
Uncertainty, dB	3	3	3	3	3	3	3	3		
Distance attenuation - 85m, dB	46	46	46	46	46	46	46	46		
Louver attenuation, dB	4	5	8	11	16	18	14	12		
Barrier effect attenuation, dB	5	5	4	3	2	0	0	0		
SPL at receiver	**48**	**43**	**36**	**30**	**22**	**16**	**16**	**13**	**33**	**43**

Table 16 – Overall plant emission level at nearest sensitive receiver

Frequency	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz	Total	Total
6No Kitchen Extract Fans – SPL, dB	36	40	34	27	16	14	13	1	30	38
9No Heat Rejection Units – SPL, dB	48	43	36	30	22	16	16	13	33	43
Total SPL at receiver, dB	**48**	**45**	**38**	**32**	**23**	**18**	**18**	**13**	**35**	**44**

Table 17 – Heat Rejection Units emission level at office level

Frequency	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz	Total	9 units
Total – L_{AW}, dB	**99**	**96**	**91**	**88**	**82**	**77**	**73**	**68**	**89**	**99**
Uncertainty, dB	3	3	3	3	3	3	3	3		
Distance attenuation - 8m, dB	29	29	29	29	29	29	29	29		
SPL at receiver, dB	**69**	**64**	**57**	**50**	**40**	**33**	**33**	**29**	**54**	**63**

Table 18 – Smoke Extract Fan Emergency Unit emission level at nearest sensitive receiver

Frequency	63	125	250	500	1k	2k	4k	8k	Total
Induct Inlet – L_{AW}, dB	92	84	91	90	85	78	72	65	90

Induct outlet – L_{AW}, dB	92	85	91	90	84	78	72	65	90
Open outlet – L_{AW}, dB	85	81	90	90	84	78	72	65	90
Open outlet – L_{AW}, dB	85	82	90	90	84	78	72	65	90
Breakout – L_{AW}, dB	87	78	84	83	73	66	56	42	82
Total – L_{AW}, dB	**96**	**90**	**97**	**96**	**90**	**84**	**78**	**71**	**96**
Uncertainty, dB	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	
Distance attenuation - 80m, dB	**49**	**49**	**49**	**49**	**49**	**49**	**49**	**49**	
SPL at receiver, dB	**50**	**44**	**51**	**50**	**44**	**38**	**32**	**25**	**50**